Capital Productivity

McKinsey
Global
Institute

with assistance from

Axel Börsch-Supan

and our Advisory Committee

Bob Solow, Chairman
Ben Friedman
Zvi Griliches
Ted Hall

Washington, D.C.

June 1996

Preface

This report is an end product of a year-long project by the McKinsey Global Institute (MGI) on capital productivity in the three leading economies of the world, Germany, Japan and the United States.

With this project we have completed our analysis of the most fundamental components of economic performance among the leading economies. GDP per capita is the single best indicator of the overall performance of an economy. That outcome, of course, is determined as the result of total factor productivity and the per capita inputs of labor and capital. Previous MGI studies focused on labor productivity[1] and employment[2] (labor inputs). This study focuses on capital inputs, capital productivity and the contribution of capital productivity to total factor productivity.

We also wanted to study capital productivity because of the relation between capital and saving. Saving is setting aside a part of income from current production to be used for future consumption. The storage device is capital. Thus, capital productivity is an important determinant of the future value of savings.

Savings were an important topic in the MGI project on capital markets.[3] There we addressed the increasing social burden coming from the aging of the industrial countries' populations. In response to this burden, retirement benefits must increasingly be provided by funded pension schemes. The ability of these schemes to meet retirement needs depends on the level of savings and the return from the investment of savings. Since capital productivity plays an important role in determining the return to savings, capital productivity affects the size of the retirement burden.

The above discussion suggests that capital productivity is related to the broader question of wealth generation and the seeming paradox of how the U.S. could create so much new wealth and at the same time save so little. We hoped that our work would serve to resolve this paradox.

In the course of our work, we also addressed two puzzling questions about Japan and Germany. The first was how material standards of living in Japan could be substantially lower than in the U.S. when Japanese workers work longer hours and Japan invests more. The second question was why labor productivity in Germany has not risen above the level in the U.S., given that the capital stock of plant and equipment per worker is much higher than in the U.S.

This report consists of six chapters and an executive summary. Chapter 1 describes our objectives and approach for the project. Chapter 2 describes the analysis and conclusions at the aggregate level. This chapter provides our conclusions about what can be learned from aggregate level analysis and what questions cannot be answered at that level and have to be addressed at the industry case study level. Chapter 3 includes our five industry case studies: auto, food processing, retail, telecommunications, and electric utilities. Each case gives the results of our capital productivity calculations and discusses the reasons for the differences we found across countries. Each case is preceded by a one-page summary of the results of the case.

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1 *Service Sector Productivity*, McKinsey Global Institute, Washington, D.C., October 1992; *Manufacturing Productivity*, McKinsey Global Institute, Washington, D.C., October 1993.

2 *Employment Performance*, McKinsey Global Institute, Washington, D.C., November 1994.

3 *Global Capital Market*, McKinsey Financial Institutions Group and McKinsey Global Institute, Washington, D.C., November 1994.

Readers more interested in our general results and less interested in the specifics of some or all of the cases may choose to read the summary rather than the entire case. Chapter 4 presents the synthesis of our findings including our overall conclusions about capital productivity. Chapter 5 discusses our findings on the relationship between capital productivity and financial performance. Chapter 6 gives implications for public policy and for corporations.

The working team for this project consisted of a core group of six McKinsey consultants transferred from their home offices to the Global Institute and one Global Institute specialist. The Global Institute consultants conducting case studies were: Raj Agrawal (Washington) – food processing; Thomas Büttgenbach (Cologne) – telecommunications; Steve Findley (New York) – auto; Aly Jeddy (San Francisco) – retailing; Markus Petry (Frankfurt) – electric utilities. In addition, James Kondo (Tokyo) and Guhan Subramanian (New York) were members of the working team in the initial phase of the project. Axel Börsch-Supan, Chairman of the Economics Department at the University of Mannheim on full-time sabbatical leave as an MGI Fellow, and Kathryn Huang, a McKinsey Global Institute economics research specialist, conducted the aggregate level analysis. Axel Börsch-Supan was responsible for the work on relating capital productivity to financial performance. Sean Greene, a senior McKinsey consultant from New York, was responsible for the day-to-day project management. Administrative support was provided by Ronni Brownlee, Rebecca Pogue and Rebecca Wright. The project was conducted under my direction, with assistance from Axel Börsch-Supan.

We were fortunate to have an outside Advisory Committee for this project. The Advisory Committee was chaired by Bob Solow, MIT, and also included Ben Friedman, Harvard University; Zvi Griliches, Harvard University; and Ted Hall, McKinsey. The working team had four all-day meetings with the Advisory Committee to review progress during the course of the project and benefited from many written comments and individual discussions.

A group of McKinsey partners assisted the working team and contributed to the Advisory Committee meetings. These McKinsey partners and their areas of special contributions were: Ennius Bergsma (New York) – project scope and synthesis; Tom Copeland (New York) – finance; Heino Fassbender (Frankfurt) – capital markets; Lenny Mendonca (San Francisco) – capital markets; Glenn Mercer (Cleveland) – automotive; Andrew Parsons (New York) – food processing and retailing; Jürgen Schrader (Dusseldorf) – telecommunications; and Somu Subramaniam (New York) – operations, technology and finance.

The undertaking of this project is part of the fulfillment of the McKinsey Global Institute's mission to help business leaders: (1) understand global economic developments, (2) improve the performance of their organizations, and (3) work for better national and international policies.

Throughout the conduct of this project we benefited from the unique worldwide perspective and knowledge of McKinsey consultants on the industries investigated in our case studies. This knowledge has been developed through client work and investment in understanding industry structure and behavior to support our work with clients. McKinsey sector leaders provided input to our case studies and reviewed our results. Their names are given following this preface.

We would also like to recognize the contributions of McKinsey consulting teams worldwide who provided us with invaluable information on the performance of all the industries we studied, while at the same time, preserving the confidentiality of information about specific McKinsey clients. McKinsey's research and information departments provided invaluable information and insight under very tight time constraints. Finally, we appreciate the warm welcome and useful information we received in our interviews with corporations, industry associations and government officials.

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Director of the McKinsey Global Institute
June 1996

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Executive summary

How well a country uses its capital ought to be extremely important to its citizens and policymakers. While labor productivity is a topic of constant debate and was the subject of earlier McKinsey Global Institute studies, far less attention has been paid to questions about the productivity of a nation's capital stock.

"Capital" actually has two interrelated meanings: physical capital (machinery and buildings) and financial capital (stocks and bonds), which lays claim on physical capital and the income it generates. Capital productivity is the measure of how well physical capital is used in providing goods and services. Productive use of physical capital and labor are the two most important sources of a nation's material standard of living.

In addition, how well a nation uses its physical capital affects the return that people get on the money they save. The higher the returns, the less they need to save for the future and the more they can consume today. This is especially critical because most developed countries have a rapidly growing proportion of retirees. Very small differences in rates of return create large differences in future retirement income.

To measure how productively major economies use capital and to understand the causes for differences in performance, the McKinsey Global Institute has studied capital productivity in Germany, Japan and the U.S. We analyzed economywide performance and also conducted case studies in five industries: auto, food processing, retail, telecommunications and electric utilities.

Our principal findings are:

¶ Significant differences exist in capital productivity across nations: productivity in Germany and Japan is about two-thirds U.S. levels.

¶ Managers in Japan and Germany could close most of the gap without a single change in regulation but do not because of lack of incentives and lack of market pressure.

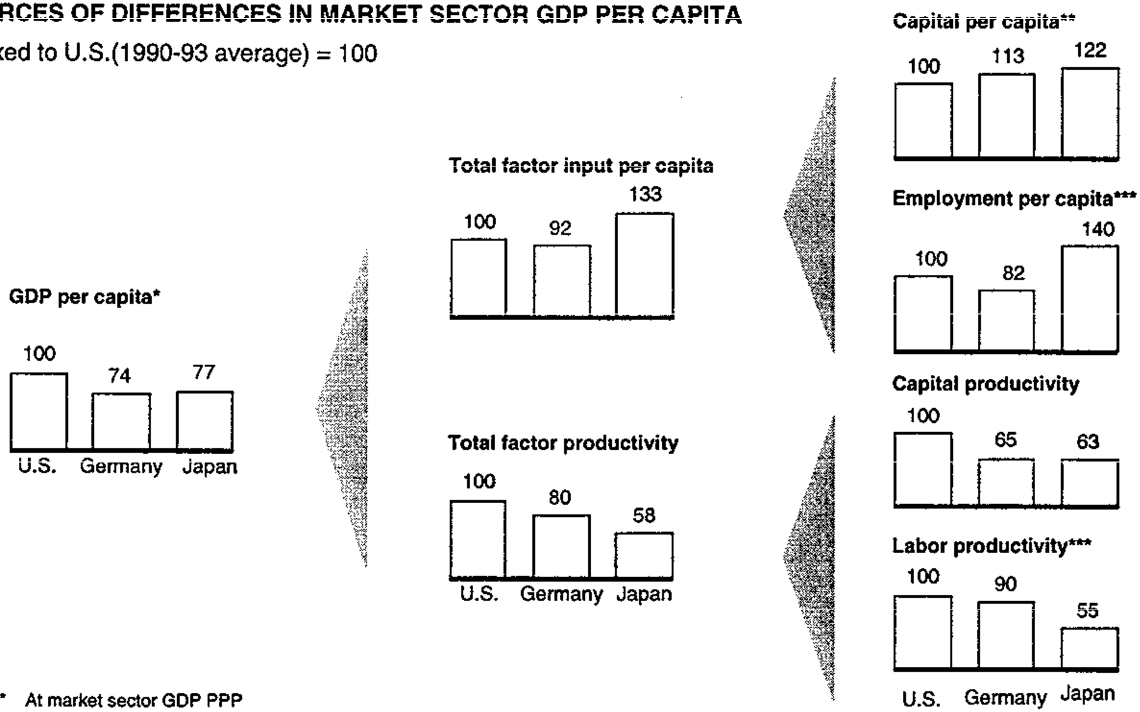
¶ Combining this work with the previous work of MGI on labor productivity, we find that the U.S. achieves leading economic performance by having higher productivity in both labor *and* capital. Japan's low productivity is due to sub-par performance in both factors, while Germany's lower overall productivity stems primarily from less productive use of a very high level of capital (**Exhibit 1**).

¶ Higher capital productivity in the U.S. has led to higher financial returns, which have more than compensated for lower savings and investment rates by generating more capital income (**Exhibit 2**). As a result, the U.S. has maintained greater financial wealth and consumed more at the same time.

Exhibit 1

SOURCES OF DIFFERENCES IN MARKET SECTOR GDP PER CAPITA

Indexed to U.S.(1990-93 average) = 100

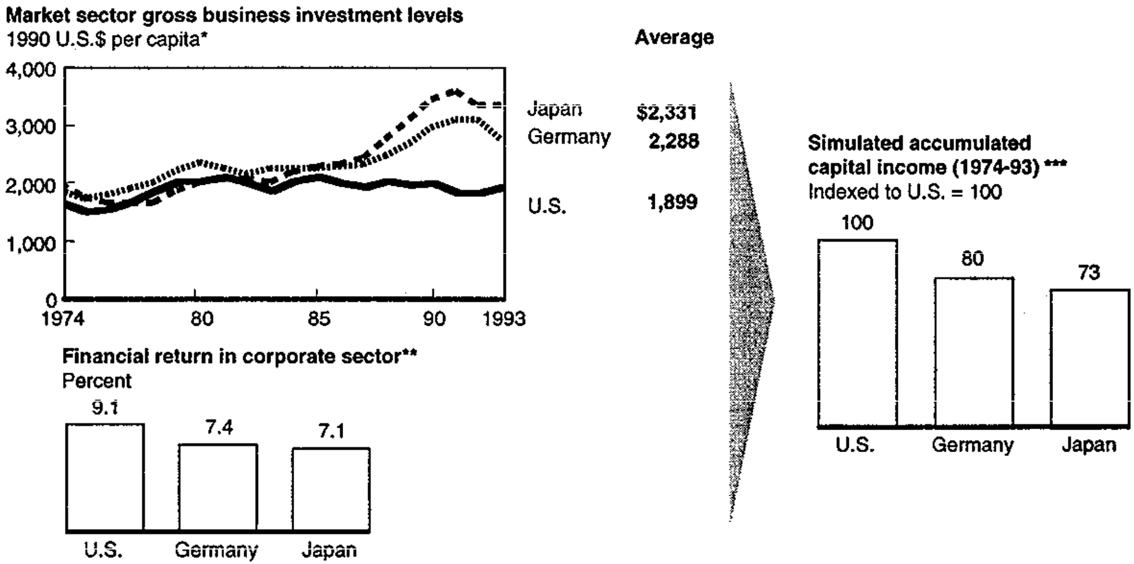


* At market sector GDP PPP
** At nonresidential structures and equipment PPP
*** Adjusted for differences in hours worked

Source: O'Mahony; Bureau of Economic Analysis; Statistisches Bundesamt; Economic Planning Agency; OECD; McKinsey analysis

Exhibit 2

ACCUMULATED CAPITAL INCOME IN THE MARKET SECTOR 1974-93



* At GDP PPP

** Calculated as the real internal rate of return to all investments (debt and equity) in the corporate sector over the time period from 1974-93. The measure includes both income and appreciation returns and is post corporate tax and preindividual income tax

*** This represents a simulation that compounds and sums annual investment levels at each country's financial return until 1993. This capital income has been partly consumed and partly reinvested

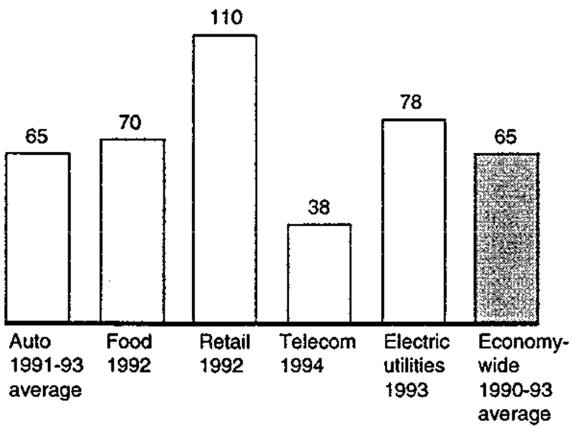
Source: O'Mahony; Bureau of Economic Analysis; Statistisches Bundesamt; Economic Planning Agency; OECD; McKinsey analysis

Exhibit 3

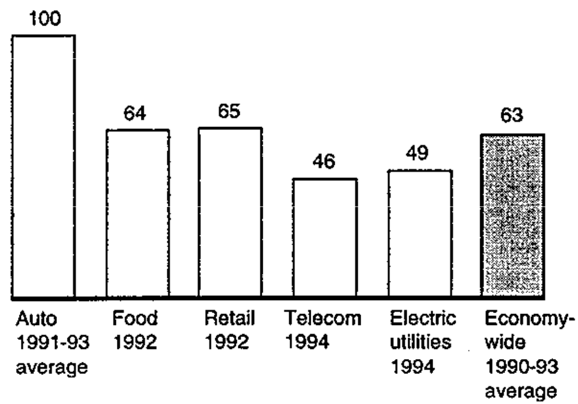
SUMMARY OF CAPITAL PRODUCTIVITY RESULTS*

Indexed to U.S. = 100

U.S.-Germany



U.S.-Japan



* For latest year in which data was available. Averages taken where there was significant volatility in results due to changes in the business cycle

Source: McKinsey analysis

The following sections summarize our findings about differences in capital productivity and how those differences affect economic and financial performance.

CAPITAL PRODUCTIVITY AND STANDARDS OF LIVING

Two paradoxes

The differing overall economic performance of the three countries poses two important paradoxes:

- Why is Japan's GDP per capita not higher than that of the U.S. when Japan has saved so much more and worked so hard?
- Why has German labor productivity not exceeded U.S. levels when Germany has invested so much more capital per worker?

The resolution of the Japan paradox is straightforward. GDP per capita is simply a product of labor and capital, and how productively they are used (Exhibit 1). Although Japan invests more capital and uses more labor than either the U.S. or Germany, extremely low productivity in both capital and labor drags down their GDP. Japan has a market sector GDP per capita similar to that of Germany, and only 77 percent of U.S. levels. Simply put, the Japanese invest a lot of money and a lot of time and energy and get comparatively little back in return.

Germany's situation is different. As Exhibit 1 shows, Germany uses far more capital than the U.S. but works significantly less. As a result, there is about 40 percent more plant and equipment for each worker hour than in the U.S. We would expect, therefore, that German labor would be more productive. It is not, however, because capital has not been used efficiently and effectively. This explains the German labor productivity paradox and shows up as capital productivity that is only two-thirds of the U.S. level.

The combination of much lower capital productivity and slightly lower labor productivity results in an overall productivity level in the German market sector that is 20 percent below the U.S. level. As shown in Exhibit 1, this lower overall productivity is the primary reason why Germany's market sector GDP per capita is 26 percent below U.S. levels. The other, less important, reason is lower labor inputs. In this sense, capital productivity is the most important factor in understanding Germany's lower GDP per capita.

Analysis of individual industries supports our overall results (**Exhibit 3**). For both Germany and Japan, in four out of our five case studies, capital productivity was significantly below U.S. levels.

Exhibit 4

SUMMARY OF CAUSALITY ANALYSIS

● Important in explaining capital productivity differences
○ Secondary in explaining capital productivity differences
x Not important

		Auto	Food	Retail	Telecom	Electric utilities	Summary
IV. External factors affecting industry dynamics	**Macroeconomic environment**	○	x	●	x	○	○
	Product market factors						
	• Demand factors	x	○	x	x	○	x
	• Competition laws/enforcement	x	○	x	○	x	x
	• Monopoly regulation	x	x	x	●	●	●
	• Regulation/market interference	●	○	●	○	x	
	Labor market factors						
	• Skills	x	x	x	x	x	x
	• Demographics	●	x	x	x	x	x
	• Rules/unionism	○	○	x	x	x	x
	Capital market factors						
	• Sources of funding/market for corporate control	x	○	●	x	x	○
	• Ownership/governance mechanisms	x	●	○	●	●	●
	Upstream and downstream market factors	x	●	○	N/A	x	○
III. Industry dynamics (Level and nature of competition for customers, capital, and labor)	**Product market**	●	●	●	○	N/A	●
	Labor market	●	○	x	x	x	x
	Capital market						
	• Alignment of goals with productivity	○	●	●	●	●	●
	• Ongoing improvement pressure	x	x	x	x	x	x
	• Forcing of exit	x	●	●	x	x	○
II. Managerial decisions	**Marketing**	x	●	●	●	●	●
	Industry chain management	●	○	●	N/A	x	○
	Production technique	●	x	○	x	x	x
	Capital expenditure decision making	○	●	x	○	●	○
	Operations effectiveness	●	○	●	x	○	●
I. Components of differences in productivity	**Capacity created with assets**	●	○	●	○	●	●
	Capacity utilization	●	●	○	●	●	●

Source: McKinsey analysis

Managers' choice

Detailed industry analysis also permits us to understand why capital productivity really differs. **Exhibit 4** summarizes the hierarchy of factors that caused productivity differences. Surprisingly, we found that managers in Japan and Germany could achieve performance close to U.S. levels if they ran their companies differently, which they appear to be free to do. Formal external constraints, such as labor laws and rules, do not fundamentally restrict improvement opportunities.

Capital productivity shows up in two ways: the amount of assets used to create a given level of capacity, and the extent to which that capacity is utilized. Different levels of capacity utilization explain 70 percent of the productivity gap between Germany and the U.S., while Japan's lower productivity is almost equally accounted for by each of the two factors. We found that managers' actions, especially their marketing decisions and the effectiveness of their operational processes, directly affect performance on both variables (**Exhibit 5**).

Why is marketing so important? Good decisions on pricing and product lines can influence demand to increase capacity utilization, which in turn means higher productivity. For example, in electric utilities, time-of-use pricing reduces peak loads and raises average utilization of power plants. Marketing can also increase the value to the consumer of each unit produced, as it does in retail through effective merchandising and new format development.

Excellent "shopfloor" operational practices are also crucial. For instance, Toyota's production system illustrates the many ways that effectiveness in operations can raise capital productivity. Interestingly, the same operational practices that improve labor productivity boost capital productivity as well. Thus, we find that high capital productivity is not achieved by throwing in more labor, nor vice versa.

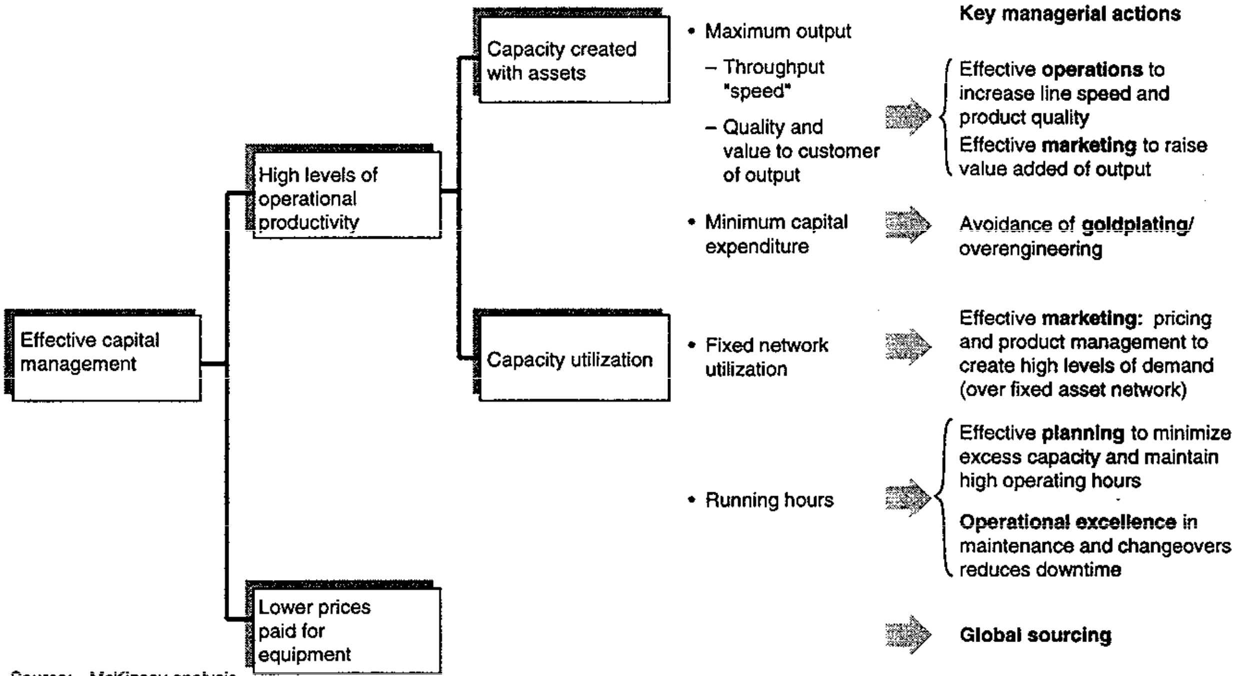
We also found that for many German firms ineffective investment planning lowered capacity utilization, and "goldplating" and overengineering were common. For example, the phone cables of Deutsche Telekom must be able to withstand being run over by a tank. We found other examples of goldplating in the auto industry.

These results further explain the two paradoxes above. Goldplated or underutilized equipment in Germany does not improve labor productivity. In addition, the U.S. achieves higher overall productivity, especially relative to Japan, through better marketing and operational practices that improve both labor and capital productivity at the same time. Amassing more resources, without changing managerial practices, does not improve productivity.

Although not impacting physical productivity, global sourcing of equipment is another way to improve financial return on capital. German and Japanese managers tend to buy their equipment locally. Yet they could vastly reduce equipment prices by buying more on the global market. The potential savings range from 10 percent in the food industry to as much as 60 percent in telecom.

Exhibit 5

SUMMARY OF CRITICAL FACTORS IN EXPLAINING DIFFERENCES IN PERFORMANCE

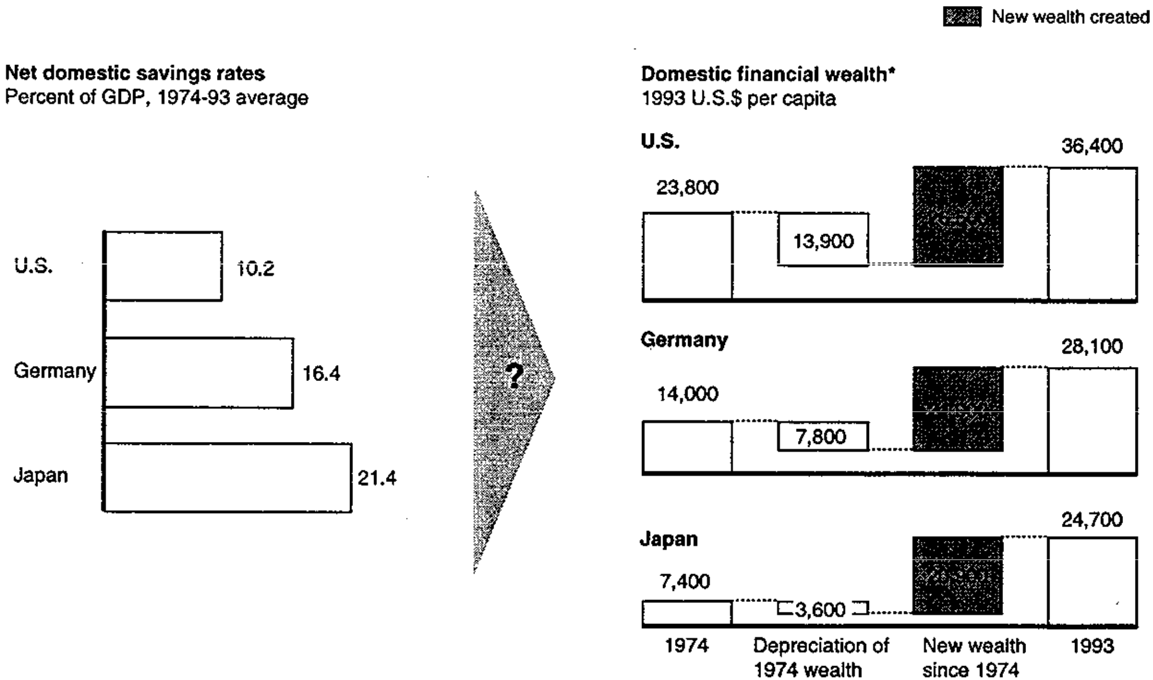


Source: McKinsey analysis

Exhibit 6

THE U.S. SAVINGS/WEALTH PARADOX

ESTIMATE



* Household net financial wealth invested in domestic business at GDP-PPP

Source: Federal Reserve Flow of Funds; Deutsche Bundesbank; Economic Planning Agency; OECD National Accounts; McKinsey analysis

Motivating managers

We do not believe that managers in one country are any more skilled, or have acted any more rationally, than in another. Rather, they have responded to the pressures and incentives placed upon them by their environments. Productivity differences across countries arise because economic systems create different dynamics of innovation, improvement and creative destruction.

A competitive product market is critical in creating a positive dynamic. Low entry barriers, intense competition on price/value trade-offs and frequent start-ups and exits spur managers to improve productivity. In all of our "non-monopoly" case studies – food, auto, retail – the more intense the product market competition, the higher the productivity. Regulations, from zoning to trade protection, were often the basic cause of differences in the nature of competition, because they raised entry barriers and constrained managerial actions.

Interestingly, in the regulated monopoly industries – telecom and electric utilities – performance differences across countries were significant. We found that higher performance levels in the U.S. were attributable to the fact that firms were owned by private investors, not the government, and that regulators focused on maintaining low prices. Both of these factors combined put more pressure on U.S. managers to use their resources well.

The capital market is also important in stimulating higher productivity. More so in the U.S. than elsewhere, the capital market boosts productivity because it gives managers a clear primary objective – financial performance – that generally guides them to use their resources productively. Furthermore, the U.S. capital market complements the competitive pressures of the product market by cutting off funds to failing firms. Consequently, the high levels of productivity attained in most U.S. industries do not square with the "conventional wisdom" that the U.S. capital market undermines economic performance by forcing firms to be too focused on short-term results.

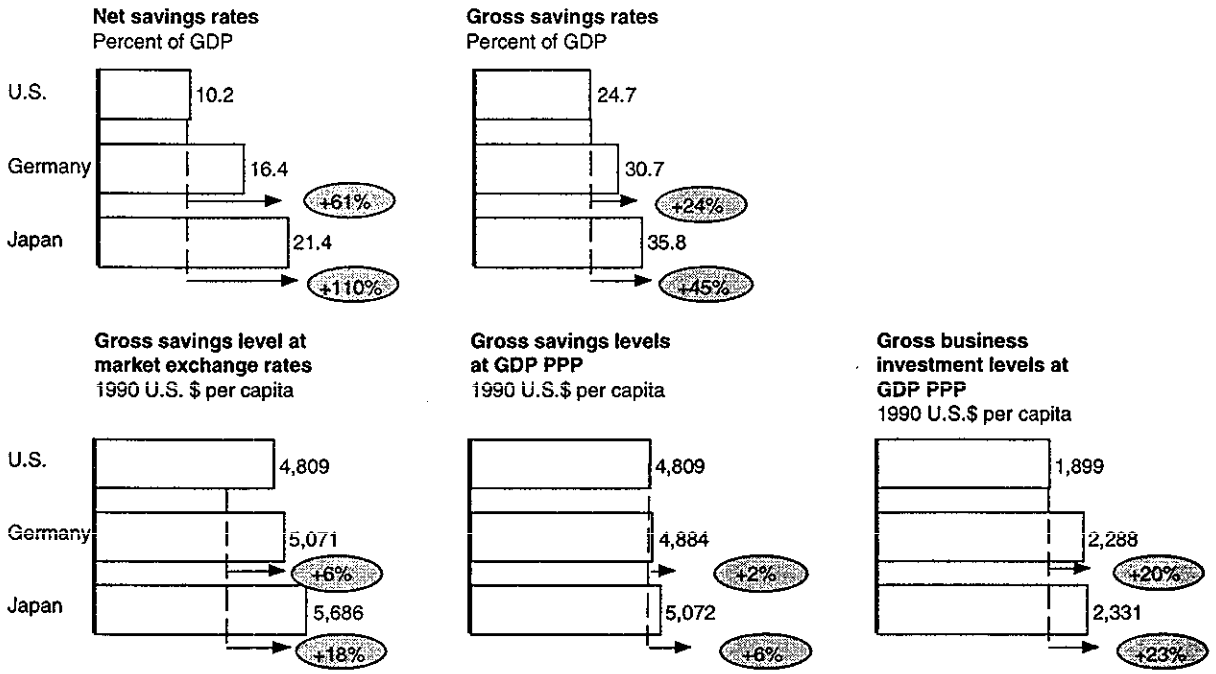
CAPITAL PRODUCTIVITY AND WEALTH

Capital also has the role as the storage device for saving some of current income for future consumption. The accumulation of these savings represents the wealth of a nation. The connection between savings and wealth raises another paradox: how could the U.S., which has saved relatively little, have created more new wealth than the other two countries (**Exhibit 6**)? As the exhibit shows, a large part of U.S. wealth existing in 1970 was eroded by underlying physical depreciation. This depreciation was offset by the creation of more new wealth than in Germany and Japan.

The explanation of higher U.S. wealth and the resolution of the paradox lies in combining the right savings numbers with the differences in capital productivity. First, U.S. savings invested in the business sector have not actually been as dramatically low relative to Germany and Japan as popular wisdom suggests,

Exhibit 7

DOMESTIC SAVINGS RATES AND INVESTMENT LEVELS 1974-93 AVERAGE

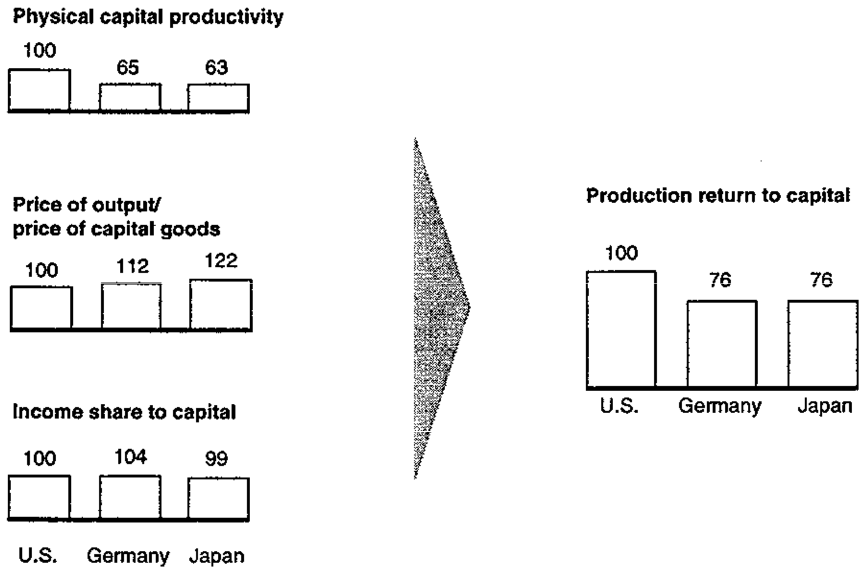


Source: McKinsey analysis

Exhibit 8

PRODUCTION RETURN TO CAPITAL

Indexed to U.S. (1990-93 average) = 100



Source: O'Mahony; Bureau of Economic Analysis; Statistisches Bundesamt; Economic Planning Agency; OECD; McKinsey analysis

once they are measured on a per capita basis and equalized for purchasing power. Commonly published net domestic savings rates feature the well-known, very large differences among Germany, Japan and the U.S. Germany's *net* domestic savings rate has been more than 60 percent higher than that of the U.S., and Japan's has been more than double.

This picture is misleading, however, when we want to explain per capita levels of new wealth creation because it is based on net rather than gross and on rates rather than levels. We care about *new* wealth creation because it, not *net* wealth creation, reflects the total, real performance of an economy. New wealth is generated from all new (gross) investment, including investment that replaces old capital. Net wealth takes into account the wearing out of old capital assets (depreciation). However, depreciation is a "fact of life" that depends on the level of initial wealth. Replacing depreciated assets is as much a part of the real performance of an economy as the addition of net wealth. To analyze new wealth created on a per capita basis thus requires starting with gross investment on a per capita basis. These numbers paint a very different picture from net savings rates (**Exhibit 7**). Between 1974 and 1993, gross business investment levels have been only about 20 percent higher in Germany and Japan than in the U.S.

Thus, our approach starts by measuring the levels of new capital invested in business and calculates new income generated, accounting for the consumption of capital in the production process as a reduction in the return generated. We analyzed only wealth generated by businesses, because other forms of wealth (real estate, government infrastructure) cannot be managed through an active production process to create income to capital.

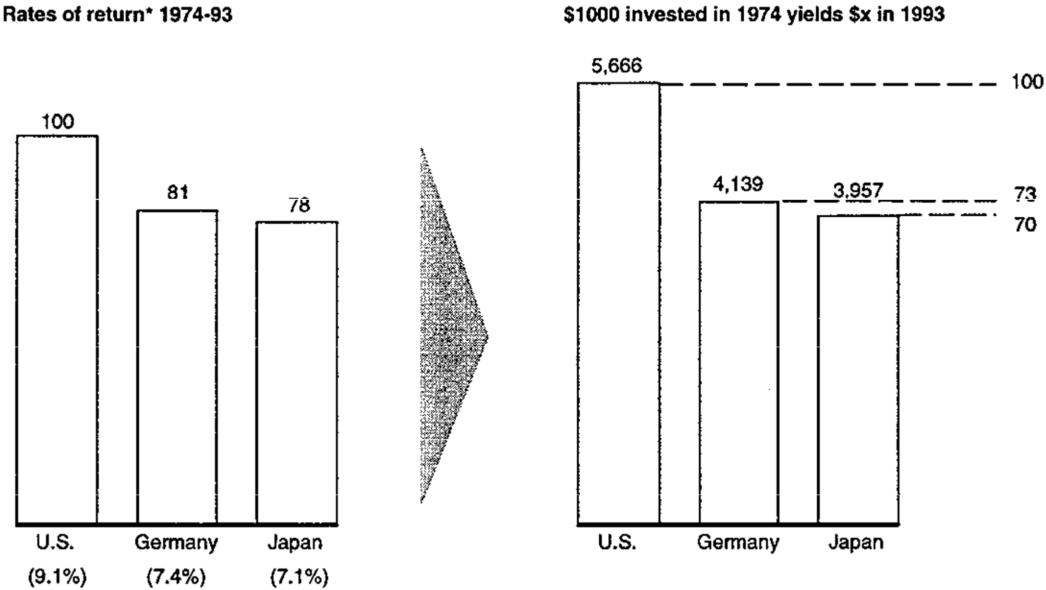
Second, higher capital productivity in the U.S. means that savings worked harder and generated higher capital income, despite the somewhat lower savings.

Our measures of financial performance demonstrate that the U.S. has earned higher returns to capital than the other two countries. By incorporating into our measure of physical capital productivity the prices of outputs and capital inputs, as well as how much of the income generated goes to capital, we can calculate the financial return that investors get in a one-year period. This static measure, which we call the production return to capital, shows that over 1990 to 1993, capital in Germany and Japan earned roughly three-quarters of what it did in the U.S. (**Exhibit 8**).

We have also calculated a dynamic measure of financial return, the real internal rate of return. This measure is dynamic because it relates current income to past investments and is market based because it includes the appreciation in the value of financial assets. This appreciation is linked to expectations of future earnings, as reflected in increases in stock market prices. Again, we see marked differences in performance over the period 1974 to 1993, with Germany and Japan earning roughly 80 percent of U.S. levels (**Exhibit 9**). German performance is consistently lower than the U.S., while for Japan, our results are sensitive to the

Exhibit 9

RATES OF RETURN AND ACCUMULATION OF CAPITAL
Indexed to U.S. = 100



* Calculated as the real internal rate of return for the entire corporate sector of each economy over the period 1974-93. The measure includes returns to both debt and equity

Source: McKinsey analysis

time period measured because of high income to capital in the early 1970s and the stock market "bubble" in the late 1980s.

These two measures of return, taken together, offer several striking conclusions. Both show marked differences in performance between countries. While each measure has its limitations and irreducible sensitivity to assumptions persists, the similarity of results from both static and dynamic measures strengthens the findings.

Differences in physical capital productivity explain the higher returns to capital. Because the income share to capital is roughly the same in the three economies, the higher financial performance in the U.S. is attributable to "a larger pie being created" and not to capital's "taking a larger share of the pie." Moreover, this correlation between productivity and return supports our observation in the case studies that a clear managerial goal of high financial performance is generally consistent with high levels of productivity.

Finally, these different rates of return compound to significant differences in wealth creation, and help explain the U.S. "savings/wealth" paradox. Higher returns create more capital income, allowing the U.S. to create more new wealth while saving less and thus consuming more today (Exhibit 2). Moreover, this higher wealth has been achieved while maintaining the highest labor productivity.

Because we have studied GDP per capita levels and not growth rates, our results have no implications for the relationship between savings rates and GDP growth.

IMPLICATIONS

These results offer clear implications for policymakers, corporations and investors in all three countries.

Policymakers should recognize the importance of capital productivity to overall standards of living and to financial returns to investors. As economies all over the world increasingly have to rely on funded pension systems, higher financial returns to investors will become a critical requirement for securing adequate retirement benefits. Policymakers can help investors exert performance pressure on managers of public corporations by improving the quality and clarity of information that investors receive in public filings.

To improve national productivity performance, governments should foster product market competition by eliminating regulations that raise barriers to entry and protect existing corporations. In the case of regulated monopolies, policymakers can increase the performance pressure on managers through the use of price cap (price reduction) regulation or prudence reviews. Finally, remaining government-owned firms should be privatized to create investor pressure on managers, which in turn should increase productivity.

Corporations should establish explicit performance goals that include both financial and operational measures of capital and asset productivity. What gets measured gets done. A growing body of research suggests that capital productivity measures such as Return on Invested Capital are key drivers of returns to investors. Adoption of these measures would go a long way to getting managers to use capital better.

Particularly in Germany and Japan, the bias to procure locally, resulting in significant cost penalties for capital goods relative to global sourcing, should be addressed. In addition, more closely linking investment decisions to customer requirements should help avoid unwarranted goldplating. Finally, a relentless focus on asset and capacity utilization, both through better marketing and adopting global best practice in shopfloor operations, should have significant impact on asset and capital productivity. In this regard, pursuit of global opportunities will provide both a window on global best practice as well as additional markets to reap the benefits of improved productivity performance.

Investors, particularly institutional investors that manage pension funds, should recognize the high cost of lower financial returns. They should demand to be better informed, seeking better financial as well as operational information on capital and asset productivity. They should also become insistent advocates of good investment performance, as they represent all of us who are dependent on investment performance for a secure retirement.

Chapter 1: Objectives and approach

In this chapter we describe our motivation, objectives and approach for studying capital productivity and relate our work to our previous research on labor productivity and employment performance.[1] Our objective for these studies has been to understand the complex relationship among the most fundamental components of economic performance – productivity, growth and employment – and identify the reasons for differences across the three leading economies, Germany, Japan and the United States.

WHY STUDY CAPITAL PRODUCTIVITY?

Capital productivity, the counterpart to labor productivity, is an important factor explaining material standards of living and is at the heart of determining rates of return. In spite of this, international differences in capital productivity have been studied very little, and even less is known about what causes capital productivity differences. We believe that McKinsey can add a helpful perspective on understanding capital productivity.

Capital productivity is an important factor in explaining standards of living and returns to investment

Physical capital in the business sector – structures, such as industrial buildings, offices and shopping malls, and equipment, such as machinery, tools and trucks – represents the largest part of the tangible, reproducible wealth of a nation (**Exhibit 1**). Physical capital in the business sector is the part of wealth that can be actively managed to create current and future income. Physical capital thus provides the only means to "store" savings for the creation of future income through active management (**Exhibit 2**). How effectively and efficiently physical capital is employed in the production process therefore significantly affects the amount of current and future income that a nation can create.

Capital productivity measures this efficiency and effectiveness. Capital productivity is the ratio of output of goods and services to the input of physical capital.[2] Its counterpart is labor productivity, the ratio of output of goods and services to labor hours used to produce this output. For any level of inputs, the

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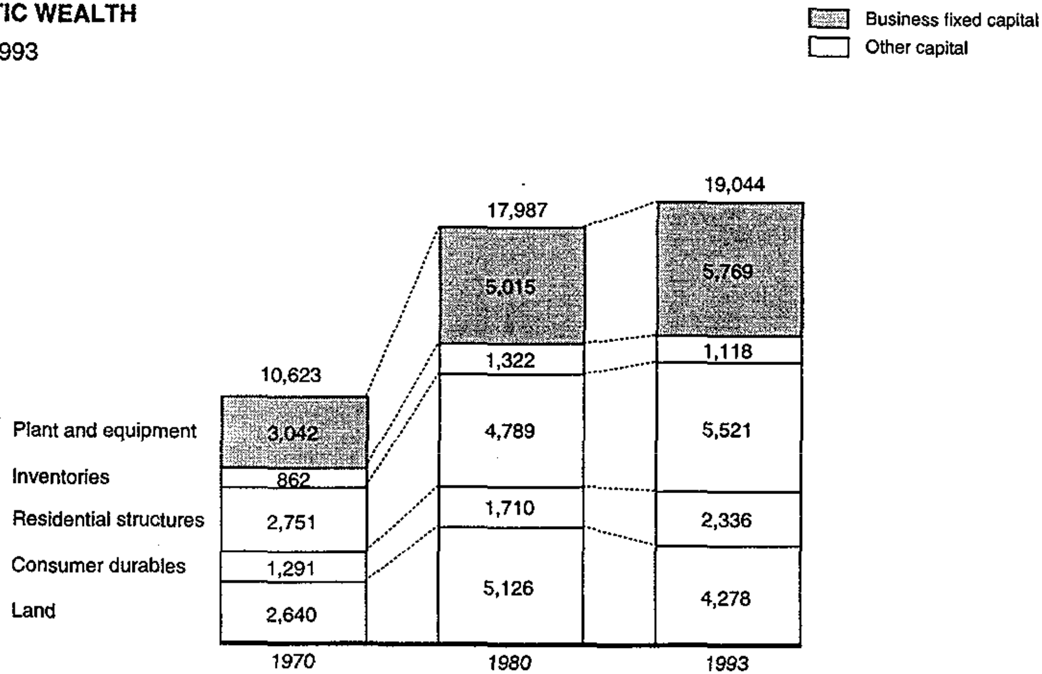
1 *Service Sector Productivity*, McKinsey Global Institute, Washington, D.C., October 1992; *Manufacturing Productivity*, McKinsey Global Institute, Washington, D.C., October 1993; *Employment Performance*, McKinsey Global Institute, Washington, D.C., November 1994.

2 More precisely, this defines *average* physical capital productivity. The concept of *marginal* capital productivity is discussed in Box 6.

Exhibit 1

U.S. DOMESTIC WEALTH

U.S.$ Billion 1993



Note: Reproducible assets at current cost, land at market value

Source: Federal Reserve; Flow of Funds; Balance Sheets for the U.S. economy 1945-93

Exhibit 2

WEALTH CREATION

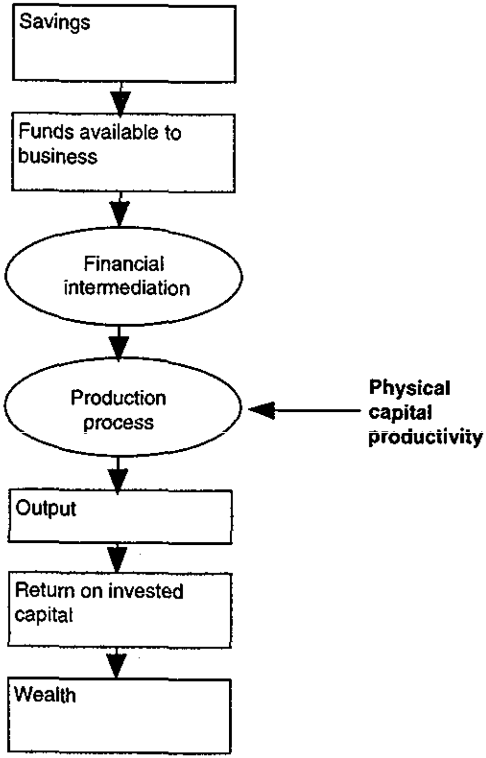
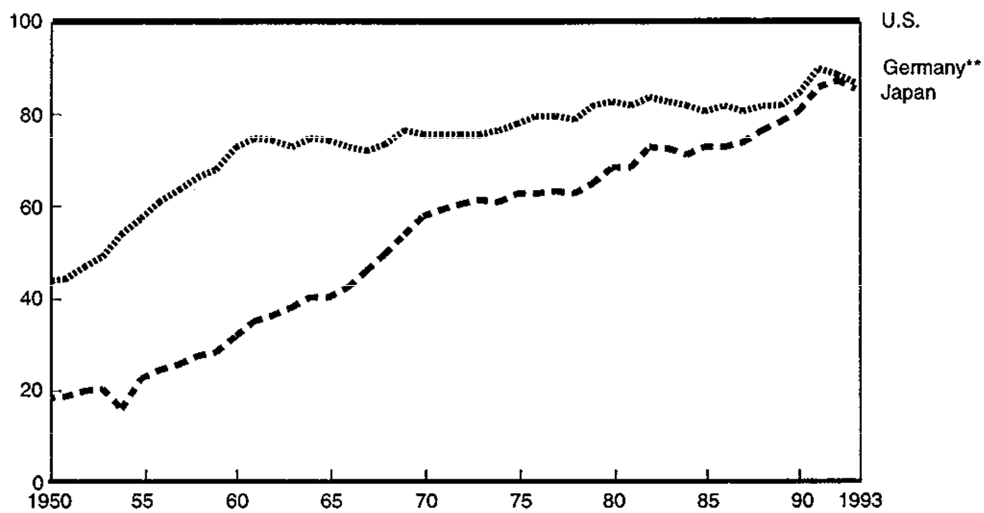


Exhibit 3

GDP PER CAPITA*

Indexed to U.S. = 100



* At GDP PPP

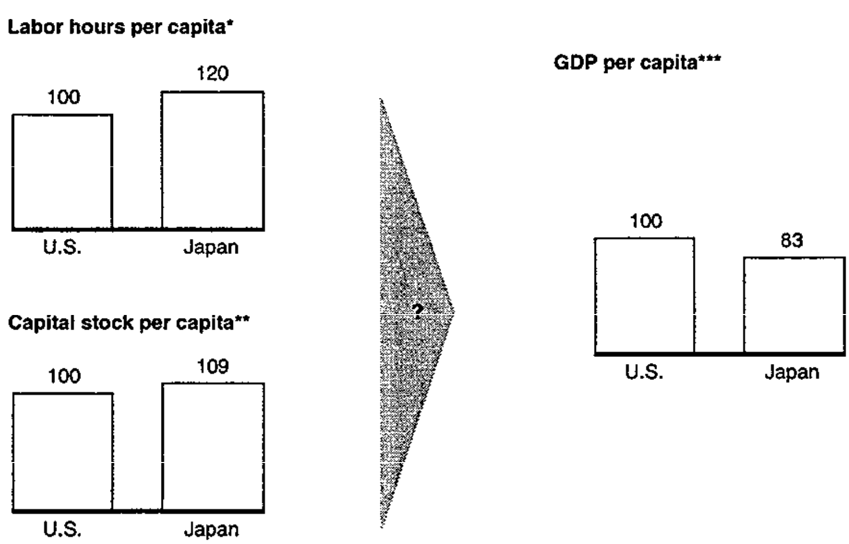
** West Germany only

Source: OECD National Accounts; McKinsey analysis

Exhibit 4

THE JAPANESE GDP PARADOX

Indexed to U.S. (1993) = 100



* Employment times statutory work hours

** Standardized gross capital stock

*** Converted at 1993 OECD GDP PPP

Note: Total economy

Source: O'Mahony; OECD National Accounts; McKinsey analysis higher the productivity, the higher the output, and thus income and the population's material standard of living.

Our measure of capital productivity relates the output generated by both labor and capital to the input of capital alone – just as labor productivity relates output only to labor. Of course, *all* elements of the production process contribute to output, including such factors as knowledge, level of technological advance, and human capital that are impossible to measure precisely. We will treat factors other than capital as causal factors in our analysis. However, the study of *capital* productivity sharpens our focus on a particular aspect of the production process, namely the management of the factor "physical capital." We also focus on capital's remuneration, the return to capital, which is closely related to capital productivity as we will show below.

Capital productivity and standards of living

Measures of national productivity – total factor productivity and its components, labor productivity and capital productivity – are important in order to understand the causes for international differences in the material standards of living.

The best aggregate measure of the material living standard of a nation is gross domestic product (GDP) per capita. To compare GDP across countries, the OECD converts national currencies into a common currency using purchasing power parity exchange rates.[3] The aggregate OECD data show that 1993 GDP per capita in West Germany was about 14 percentage points lower than in the U.S., and 17 percentage points lower in Japan, when measured in units of equal purchasing power.[4] Thus, even half a century after World War II, Germany and Japan have not caught up with the United States (**Exhibit** 3).

For Japan, this poses a paradox. It is common knowledge that Japan has devoted more labor and capital resources to production than the U.S. has. In Japan, laborers work more hours than in the U.S., and investment levels have been massive in recent years. Why has Japan produced less output than the U.S. (**Exhibit** 4)? The answer has to be in productivity.

Much work has been devoted to measure the sources of, and to understand the causes for, the growth in GDP after World War II. The standard approach is to decompose GDP growth into three sources: more labor hours, more capital inputs, and higher total factor productivity (TFP, the productivity of capital and labor combined).

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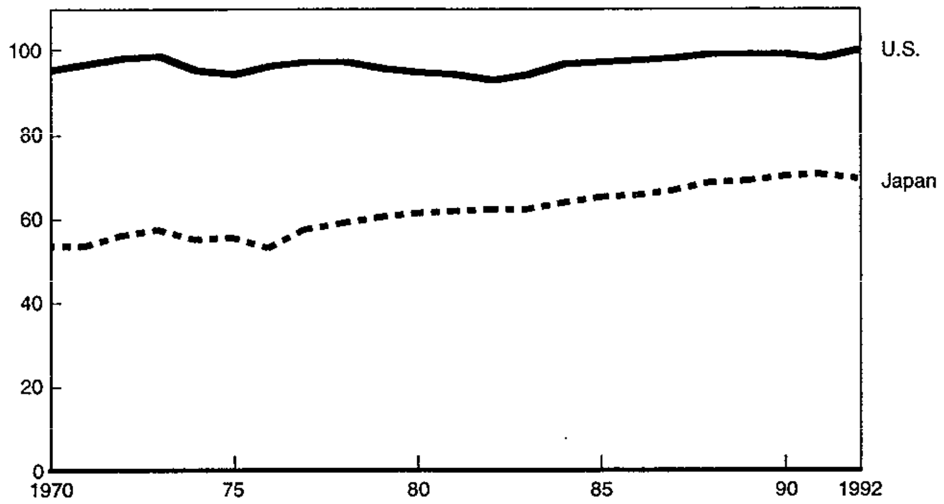
3 In this chapter, we use the 1993 OECD GDP PPP. The concept of PPPs is explained below.

4 These and the following figures are drawn from the national accounting figures published by the OECD for the aggregate economies of West Germany, Japan and the U.S., augmented by the standardized capital stock estimates by Mary O'Mahony (1993). A more careful analysis pertaining to the market sector is provided in Chapter 3.

Exhibit 5

TOTAL FACTOR PRODUCTIVITY LEVELS

Indexed to U.S. (1992) = 100



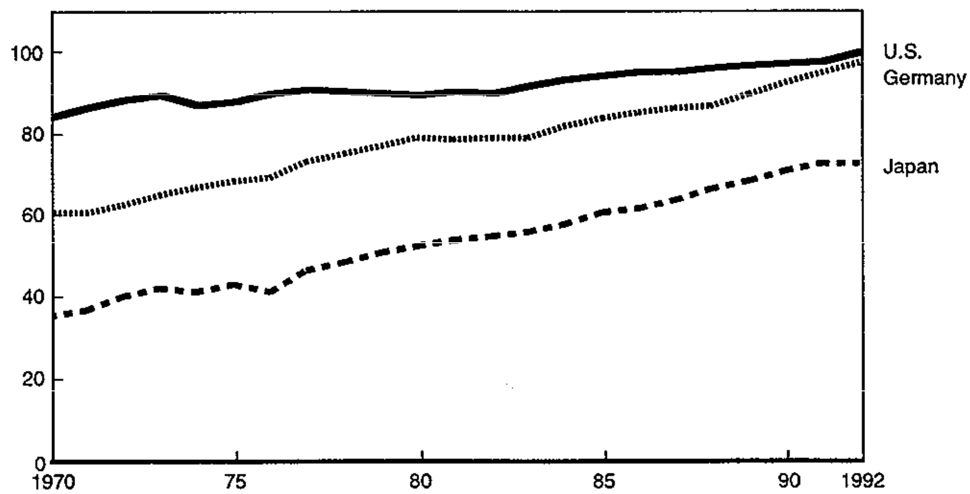
Note: Total economy, including nonmarket sector, output at OECD GDP PPP

Source: OECD National Accounts; O'Mahony; McKinsey analysis

Exhibit 6

LABOR PRODUCTIVITY LEVELS*

Indexed to U.S. (1992) = 100



* Value added per FTE (full time equivalent)

Note: Total economy, including nonmarket sector, output at OECD GDP PPP

Source: OECD National Accounts; McKinsey analysis

Even though the U.S. experienced a productivity slowdown during the 1980s, Japan's total factor productivity remained far below the TFP level of the United States (**Exhibit 5**). Hence, at any given level of total factor input – measured as a weighted combination of labor and capital – the United States could create higher output than Japan, explaining the paradox in Exhibit 4.

On a deeper level, we need to understand the causes for these international productivity differences. For this task, it is helpful to investigate labor and capital productivity differences separately, since total factor productivity is the weighted average (geometric mean) of labor productivity (output per labor hour) and capital productivity (output per unit of capital).

We have already studied labor productivity and found that Japan still lags the U.S. considerably, despite the high levels of investment in Japan (**Exhibits 6 and 7**). The remaining part of the paradox is how effectively and efficiently the capital has been employed in the production process, and why the high levels of investment in Japan have not made more of a difference.

Germany's situation also poses a paradox. Germany has increased capital intensity to levels substantially above the U.S. (Exhibit 7). However, labor productivity has only approached U.S. levels and total factor productivity is still significantly below. Why has the high capital intensity in Germany not resulted in higher labor productivity than in the U.S. (**Exhibit 8**)?

The evidence suggests that capital in Germany has not been employed as efficiently and effectively as in the U.S., and that capital productivity in Germany is low. We wanted to find out whether that is the answer to the German paradox, and if so, why capital productivity is so low.

Capital productivity and returns to investments

A second reason for drawing attention to physical capital is that capital, by definition, is the only "storage device" for savings.[5] This makes capital an important input even though labor inputs account for about twice as much total factor inputs as capital inputs do. The nature of capital as a storage device is reflected in the dual meaning of the word "capital:" it refers to physical capital (i.e., structures and equipment) as well as to financial capital (e.g., stocks and bonds) that are claims on the income of physical capital. As our modern economies learn how to operate intertemporally efficiently, they rely increasingly on the storage and transfer functions of the capital market.

If households and businesses want to transfer income from one period to another, they invest their savings mainly in physical capital in the domestic business sector (**Exhibit 9**). In the business sector, the physical capital is employed to generate output and income as was depicted in Exhibit 2. The reinvested income then generates wealth.

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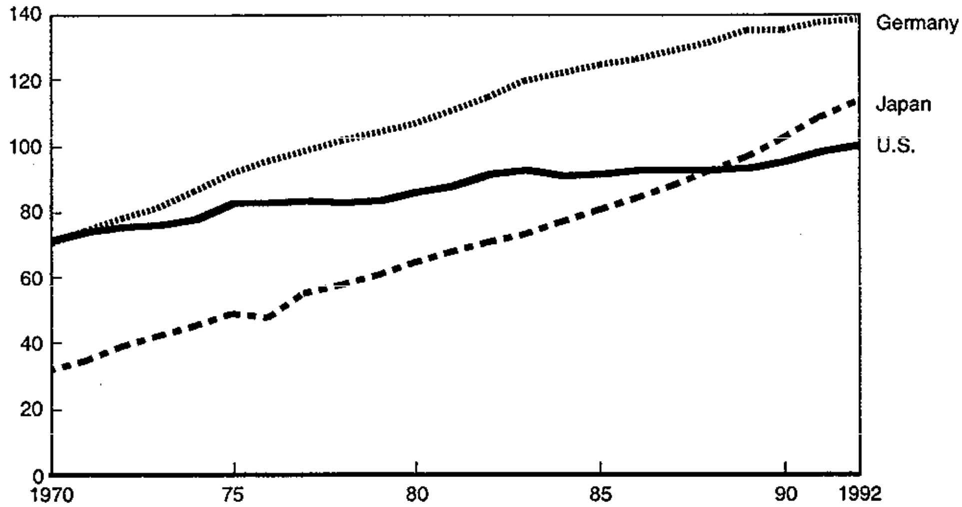
5 See the Objectives section in this chapter for a discussion of intangible capital (such as human capital).

Exhibit 7

CAPITAL INTENSITY*

Indexed to U.S. (1992) = 100



* Capital stock per FTE

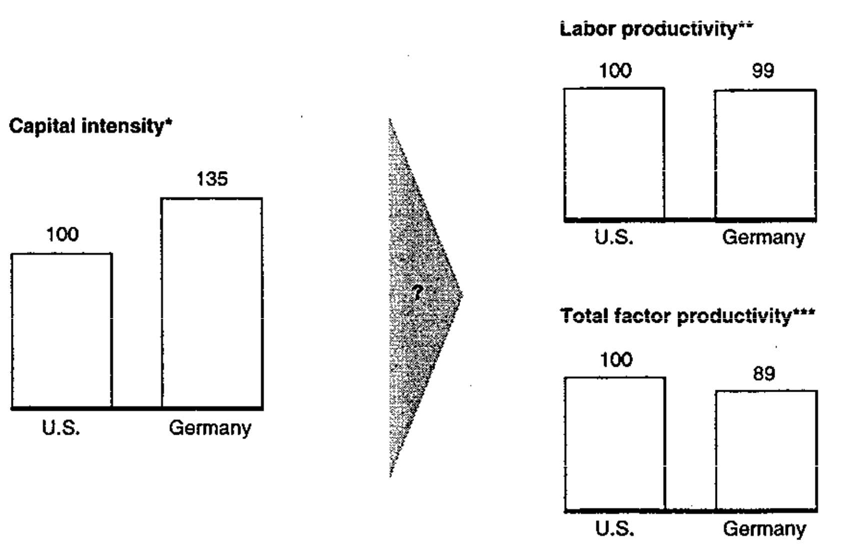
Note: Total economy, including nonmarket sector

Source: OECD National Accounts; O'Mahony; McKinsey analysis

Exhibit 8

THE GERMAN PRODUCTIVITY PARADOX – TOTAL ECONOMY

Indexed to U.S. (1993) = 100



* Capital stock per labor input

** GDP at adjusted GDP PPP per labor input (employment • statutory work hours)

*** GDP at adjusted GDP PPP per total factor input (weighted geometric mean of labor input and capital stock)

Source: O'Mahony; OECD National Accounts; McKinsey analysis

Exhibit 9

SOURCES AND USES OF GROSS SAVINGS*

Percent

Sources

	U.S.	Germany	Japan
Households**	53.9%	63.0	38.9
+ Businesses	59.4	33.3	38.7
+ Government	-13.3	3.7	22.4
= Gross domestic saving**			

Uses

	U.S.	Germany	Japan
Household tangible assets**	44.4%	36.3	19.9
+ Government GFCF***	7.7	7.1	15.1
+ Net international outflows	-4.3	5.5	6.8
+ Business GFCF	52.2	51.1	58.2

* Shares as average percentages 1990-93

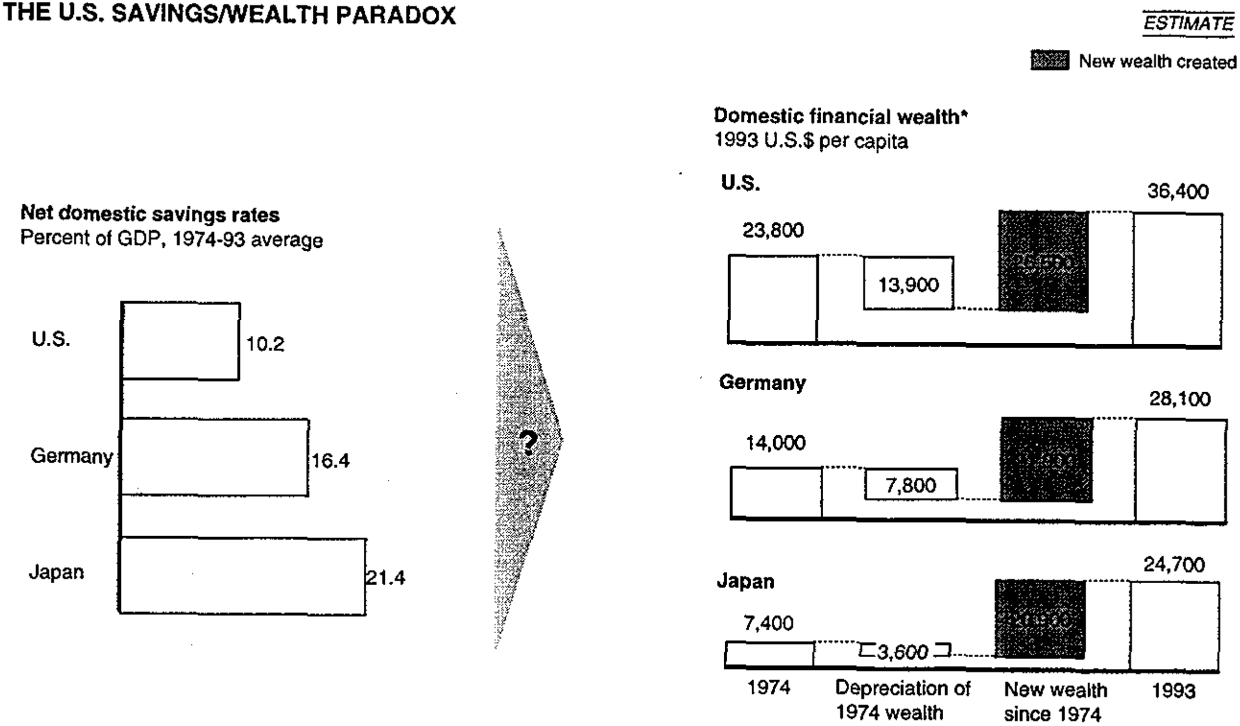
** Includes household durables

*** Gross fixed capital formation

Source: OECD National Accounts; McKinsey analysis

Exhibit 10

THE U.S. SAVINGS/WEALTH PARADOX



* Household net financial wealth invested in domestic business

Source: Federal Reserve Flow of Funds; Deutsche Bundesbank; Economic Planning Agency; OECD National Accounts; McKinsey analysis

This poses yet a third paradox: How could the U.S., which has traditionally saved relatively little, maintain such high wealth levels (**Exhibit 10**)? How could the U.S. have saved less, but created more new wealth than Germany and Japan?

Again, capital productivity differences across countries may provide the answer. The more effectively and efficiently physical capital is employed in the production process, the higher the output generated, and the higher the return from production that can flow back to the savers. Capital productivity, therefore, is an important determinant of the long-run rate of return and hence also the long-run rate of wealth creation of an economy. An economy that has a higher return to saving needs to save less at any given time in order to achieve the same level of output. Since saving is consumption foregone, an economy with a higher return to saving is better off than an economy with low rates of return.

Return to saving becomes a more important and more widespread source of income as economies all over the world rely increasingly on funded pension systems. Relatively small differences in the rate of return will create large differences in the retirement income generated from pension funds. Maintaining high returns is essential for the feasibility of funded pension systems.

While most savings are invested domestically, and most domestic investments are financed from domestic savings, the globalization of capital markets will increase the importance of achieving high rates of return.[6] Already now, a significant proportion of U.S. pension funds is invested in foreign assets in the quest for the highest return. International differences in the rates of return will have a large impact on the portfolio choice of households and businesses, further reducing the chances to attract external capital (and thus to grow) for countries that have low rates of return.

Key drivers of capital productivity differences not yet fully understood

There is no shortage of reports on productivity. However, their focus is either on labor or on total factor productivity. Labor productivity, its international differences and their causes have been studied extensively. Internationally comparable estimates of total factor productivity *growth* are also available.[7] Much less is known about the *levels* of total factor productivity. There are no international comparisons of capital productivity levels.[8]

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6 *The Global Capital Market: Supply, Demand, Pricing and Allocation*, McKinsey Financial Institutions Group and McKinsey Global Institute, Washington, D.C., October 1994.

7 The volume edited by Dale W. Jorgenson, Productivity, Volume 2: *International Comparisons of Economic Growth*, MIT Press, 1995, provides a set of international TFP growth comparisons. The article by Conrad and Jorgenson in this volume also shows aggregate and sectoral TFP levels in Germany, Japan and the U.S. for 1970 and 1979. Several other articles in this volume refer to earlier periods.

8 The paper by Martin N. Baily and Charles L. Schultze, "The Productivity of Capital in a Period of Slower Growth," Brookings Papers on Economic Activity, 1990, p.369-406, addresses the contribution of capital to TFP without attempting to compute capital productivity levels.

This is partly so because capital inputs are much harder to measure than labor inputs. The capital stock of a nation has been built up by a long history of investments, while depreciation continuously diminishes it. The actual flow of capital services used in the production process is a result of the balance between investment and depreciation. Because depreciation cannot be observed directly, quantifying this balance involves difficult measurement issues.

Work on *total factor productivity* (TFP) has been summarized by Kendrick in an OECD survey (1991).[9] Based on Robert Solow's work, Denison's pioneering growth accounting approach computed TFP as the residual once labor and capital input growth were accounted for.[10] Denison (1985) then explained the TFP-residual by economies of scale and advances in knowledge; Maddison (1987) added the effects of trade barriers and supply shocks.[11] The most econometrically consistent account is the work by Jorgenson, Gollop and Fraumeni (1987) who showed that capital inputs were the single most important source of post-war U.S. economic growth. Unfortunately, their work covers only the time until 1979. Their methodology has been extended to several international comparisons, including Germany and Japan, both on the aggregate and the sectoral levels for 1970 and 1979 (Conrad and Jorgenson, 1985). Conrad and Jorgenson find that in almost all manufacturing industries, TFP is lower in Germany and Japan than in the U.S., but that the TFP gap was closing in most industries between 1970 and 1979. More recent TFP level estimates are available only for manufacturing. Van Ark and Pilat, as part of the International Comparisons of Output and Productivity project, have compiled labor and total factor productivity levels for the manufacturing sector, 1950 to 1990. They find Germany and Japan substantially lagging behind the U.S. on both labor and total factor productivity, with the catch-up process actually reversing in the early eighties to only partially rebound in the late eighties.[12] Dollar and Wolff report similar results for the 1963 to 1985 period.[13]

While these TFP-oriented studies established a framework for measurement, they do not and cannot provide causal explanations for the observed international differences in capital productivity. Moreover, these studies do not capture the changes during the late 1980s and early 1990s. Some of these studies use capital stock data compiled in the respective national accounts which are not standardized in terms of depreciation assumptions.

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9 Kendrick , J.-W., "Total Factor Productivity – What It Does and Does Not Measure," Organization for Economic Cooperation and Development, *Technology and Productivity: The Challenge for Economic Policy*, The OECD Publications Service, Paris, 1991, p.149-156.

10 Edward F. Denison, *Accounting for United States Economic Growth, 1929 to 1969*, The Brookings Institution, Washington, D.C., 1974.

11 Edward F. Denison, *Trends in American Economic Growth, 1929-1982*, Washington, D.C., The Brookings Institution, 1985; and Angus Maddison, Growth and Slowdown in Advanced Capitalist Economies: Techniques of Quantitative Assessment, *Journal of Economic Literature* 25, no. 2, 1987, p. 649-698.

12 Bart van Ark and Dirk Pilat, "Productivity Levels in Germany, Japan and the United States: Differences and Causes," Brookings Papers on Economic Activity, 2:1993, p.1-69

13 David Dollar and Edward N. Wolff, "Capital Intensity and TFP Convergence by Industry in Manufacturing, 1963-1985," eds., Baumol, William J., and Richard R. Nelson, Edward N. Wolff, *Convergence of Productivity: Cross National Studies and Historical Evidence*, Oxford University Press, New York, 1994

Much of the work on *labor productivity* has focused on rigidities in the labor market. These rigidities may also have implications for the utilization and thus productivity of capital. Our own work on labor productivity in the manufacturing and service sectors identified competition and concentration rules and regulations in the product market as well as company ownership (private versus public) as the most important external forces determining labor productivity; the single-most important determinant internal to each company was the organization of functions and tasks. In addition, design for manufacturability and the appropriate capital-labor mix were significant drivers for international labor productivity differences in the manufacturing sector.

These factors will also influence capital productivity because they affect the output created by labor *and* capital. In addition, corporate governance and pressure exerted by the capital market are likely to play a role, though exact causes in these areas have not been explored. What appears to be lacking in the literature is evidence that could lead to a judgment on the relative importance of these factors with respect to the efficiency and effectiveness with which capital is employed in different countries.

Potential for McKinsey to add a helpful perspective

This study is based on the premise that understanding the causes of capital productivity differences at the industry level would allow us to determine the relative importance of particular product, capital and labor market factors in a way that could then be generalized to the entire economy. McKinsey's involvement in numerous countries and industries allows us to provide a better picture of capital productivity in specific industries on the micro level as well as an understanding of why productivity is higher in some countries than others. By initially focusing on individual industries for the causal analysis, we can benefit from the collective experience of McKinsey consultants working in these industries in each country. This experience gives us an insider perspective on the causes of cross-country productivity differences.

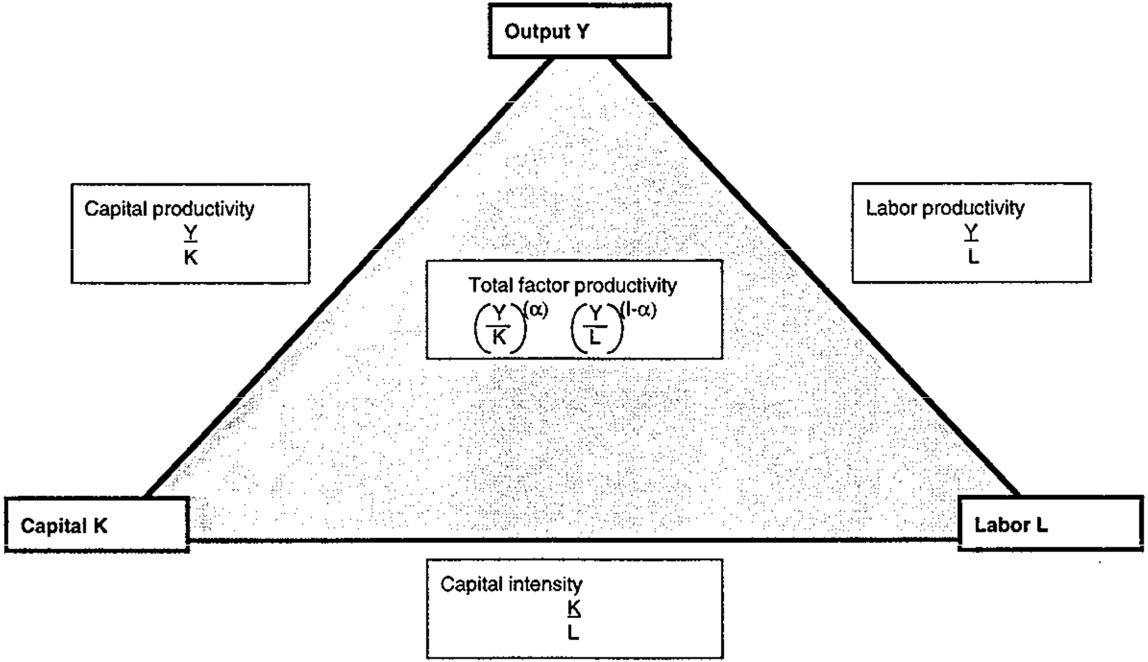
This industry approach permits us to leverage our strengths in examining microeconomic issues in the product, capital and labor markets. We address the macroeconomic issues and factors affecting productivity across the board (e.g., labor costs and regulatory restrictions), that are often at the heart of discussions about the efficient use of capital, only if their symptoms (e.g., difficulty to exploit the full capacity of the installed machinery) are found in a particular case. As a result, our findings can provide unique insight into how specific factors influence capital productivity, and how specific external forces drive managerial actions.

OBJECTIVES OF THE STUDY

The purpose of our study is threefold: to determine the differences in levels of capital productivity across the three leading economies of the world, identify the

Exhibit 11

CAPITAL PRODUCTIVITY, LABOR PRODUCTIVITY, TFP AND CAPITAL INTENSITY



Note: α is the weight of capital in the production process

Source: McKinsey analysis

causes of these differences and determine their relative importance, and draw implications for investors, management, and public policy.

This report focuses on capital productivity, although we compare it with, and contrast it to, labor and total factor productivity when appropriate. In fact, capital and labor productivity, total factor productivity and capital intensity are linked with each other as shown in **Exhibit 11**. Knowing any two of these measures suffices to compute all four measures. Economists most frequently use total factor productivity and capital intensity in their growth accounting. We decided to frame our work in terms of labor productivity and capital productivity because these two measures relate directly to the two tangible factors of production that managers attempt to manage.

This study complements two earlier studies done by the McKinsey Global Institute on productivity (*Service Sector Productivity*, October 1992, and *Manufacturing Productivity*, October 1993) and on job creation (*Employment Performance*, November 1994). Taken as a group, we believe that these four studies contribute to our understanding of the complex relationship among the most fundamental components of economic performance – productivity, growth and employment – and point toward a set of actions that countries can take in order to significantly improve the material standard of living of their citizens.

The study also complements the work performed jointly by McKinsey's Financial Institutions Group and the Global Institute on the role of capital markets (*The Global Capital Market: Demand, Supply, Pricing and Allocation*, October 1994). Taken together, our work closes the link between saving, financial performance and capital productivity.

The word "capital" often refers not only to physical capital and its financial counterpart but also to intangible capital such as human capital or knowledge capital accumulated by research and development (R&D). While many researchers view human capital, R&D and items such as software as production factors in their own right, our objective in this study is to measure and explain the productivity of *physical* capital only. We view the contribution of intangible capital to production as a causal factor that explains differences in labor and capital productivity.

This does not imply that we think that human capital and R&D are not important. It only means that we capture their contribution to production as part of the productivity of labor and capital. This view is justified by the work of Dale Jorgenson et al. (1987) on TFP-accounting who have convincingly shown that at the aggregate level, a production function with the two conventional factors of production, capital and labor, describes well economies like those of our three countries during the post-war decades.[14]

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[14] Dale Jorgenson, Frank Gollop, and Barbara Fraumeni, *Productivity and U.S. Economic Growth*, Harvard University Press, Cambridge, Mass., 1987, p. 341.

We realize that capital productivity is not necessarily a desirable goal in its own right. Neither increasing financial capital performance nor increasing physical capital productivity are necessarily increasing economic welfare – high financial capital performance may be due to monopoly power (e.g., in the case of the Deutsche Telekom), and high physical capital productivity can come at the expense of low labor productivity (e.g., in some discount stores in the U.S. retail case). We address the first problem by measuring comparable physical outputs and taking price distortions out, and the second problem by looking at total factor productivity in conjunction with capital productivity.

The second problem is related to capital-labor substitution, an important driver of aggregate employment. As mentioned before, labor productivity and capital productivity are linked with each other when substitution between labor and capital changes capital intensity but keeps output relatively unchanged (Exhibit 11). We investigate both the national level and industry level correlations of labor and capital productivity, and compare this evidence with the changes in aggregate capital intensity in order to understand any capital-labor tradeoffs that might have affected employment.

We are also aware of the potential distributional consequences of an incentive system that causes higher returns to invested capital.[15] However, inefficient use of resources, capital as well as labor, is always to the disadvantage of an economy. Thus, we believe that trade-offs between other objectives and capital productivity can best be made after one builds a full understanding of what it takes to achieve efficient use of capital.

APPROACH

Our approach has two core elements: we compare three countries with each other, and we combine aggregate evidence with causal analyses at the industry level.

The international comparison approach allows us to learn from the variation in performance across countries that has been generated by "natural experiments" in the form of their different histories and policy approaches. We selected the three largest economies in the world to study in this report: Germany, Japan and the United States. In each country, McKinsey has an established presence and depth of inside knowledge, and therefore an ability to investigate how productively capital is put to work. The three countries provided us with an opportunity to examine a broad range of performance and policy approaches.

We analyzed each country at two levels. First, we analyzed aggregate data on savings, investment, capital and output. We used mainly national accounting data compiled in an internationally consistent fashion by the OECD, and augmented this data by series from national statistical offices where the OECD

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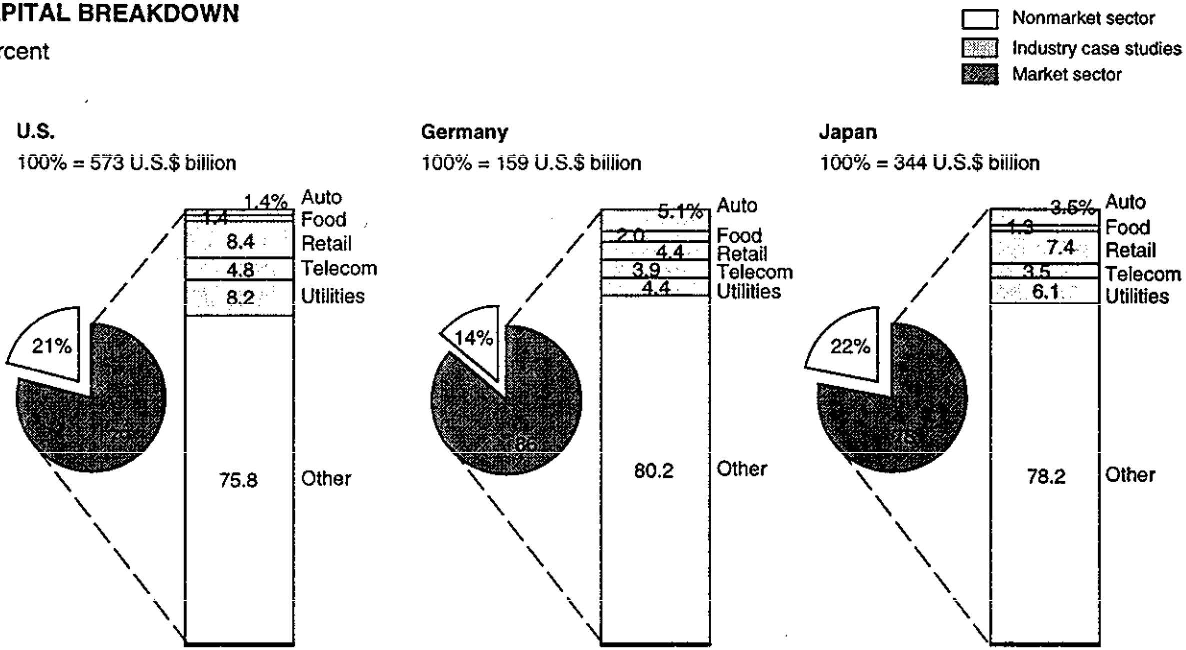
[15] A review of these issues is provided by Simon Head, *The New, Ruthless Economy*, in The New York Review of Books, February 1996.

Exhibit 12

CAPITAL BREAKDOWN

Percent



Source: McKinsey analysis

did not provide the necessary detail. We restricted our analysis to the market sector of each economy because there is no meaningful measure of output, and hence, of productivity for the non-market sector (government, education and health services). In addition to capital productivity, we measured and compared the internal rates of return of each country's corporate sector.

While this aggregate analysis gave us evidence on international differences in capital productivity and rates of return together with differences in capital intensity and labor productivity, the high level of aggregation and a number of approximations make it impossible to have full confidence in the aggregate level measures and impossible to determine the causes for international differences in capital productivity and rates of return. Thus, we conducted industry case studies to check the aggregate results and to attempt to understand the reasons for the differences in capital productivity levels. Industry data are much richer and can be combined with the knowledge McKinsey has accumulated in its industry practice.

The core of our analysis rests on five case studies: automotive, food processing, general merchandise retailing, telecommunications, and electric utilities. We chose these five sectors to include some of the most capital-intensive sectors of the economy (telecommunications, electric utilities and general merchandise retailing). Together, they cover roughly a quarter of the nonresidential physical capital stock in each of the three nations' market sector (**Exhibit 12**). In addition, these particular cases represent a broad range of sectors: manufacturing (automotive and food processing) and service sectors (retailing and telecom), domestic (retailing, telecom and electric utilities) and traded (automotive) goods, and industries dominated by small companies (retailing and food processing) as well as large companies (telecom, automotive and electric utilities). While we cite primary sources throughout the report, a complete bibliography for the industry case studies and the aggregate analysis is available upon request.

In the next section, we describe how we measured output and capital, how we constructed our measures of capital productivity, how we generated and tested our hypotheses to explain the causes of capital productivity differences, and how we synthesized our findings in order to draw implications.

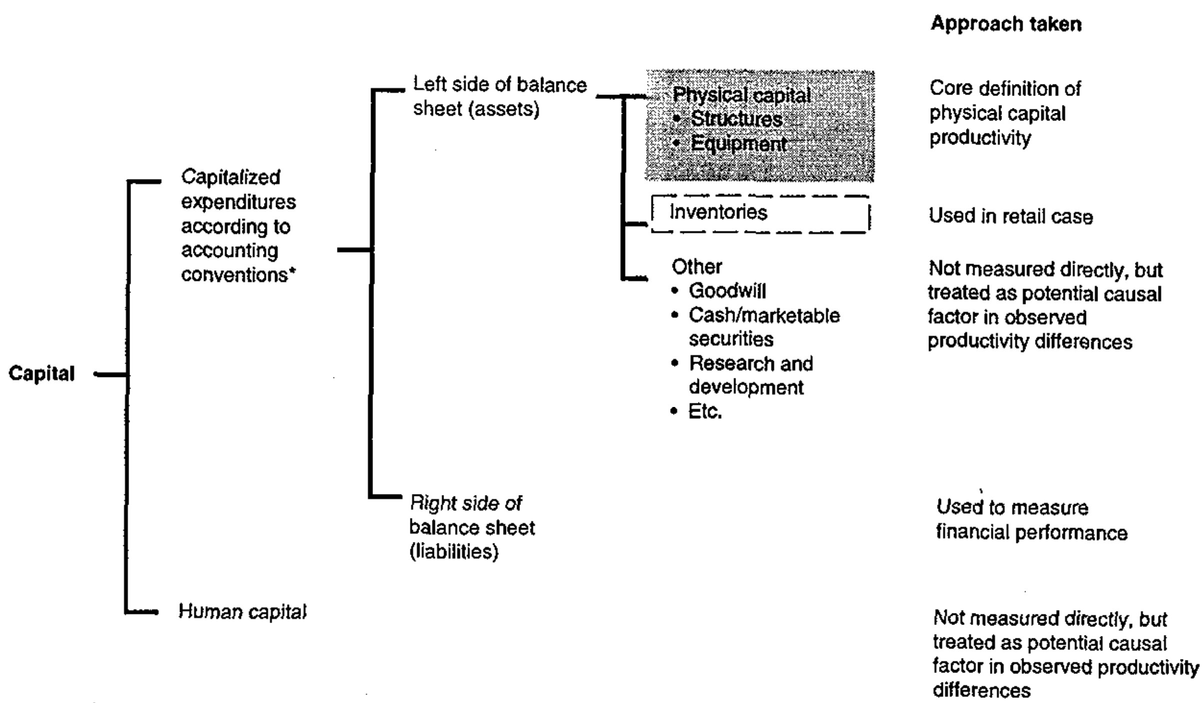
Measurement of output and capital

Our first task in the aggregate analysis, as well as within each case was to develop a core set of data on capital and output. We first defined the market sector (aggregate analysis) and each industry (case studies) in a consistent matter across the three countries, excluding nonindustry and auxiliary services. We excluded government, education and health services to obtain the market sector of the economy for the aggregate analysis, and, for example, equipment production from the telecommunications service industry.

Second, we collected data on output in each sector (see **Box 1: Productivity and the measurement of output** at the end of this chapter). When meaningful, we

Exhibit 13

DEFINITION OF CAPITAL USED



* Our approach standardizes conventions across countries

Source: McKinsey analysis

used physical output, for example kilowatt hours in electric utilities and call minutes in the telecommunications industry. In industries in which output is heterogeneous (automotive, food processing and retail) we used value added as our output measure.

Measuring capital inputs was a more difficult step. We considered only physical capital and excluded working capital, "goodwill," capitalized research and development, and intangible assets such as human capital (**Exhibit 13**). We excluded inventories because they are relatively small (except for retail where we included them). However, we explored the sensitivity of this exclusion with respect to our measure of capital productivity.

Even with these exclusions, the construction of data on physical capital was not a straightforward task. Capital stocks are not measured directly. They are built up in a "perpetual inventory," in which historical investments are added each year, and from which annual depreciation is subtracted (**Box 2: Productivity and the measurement of inputs**). We could not use data compiled by the national statistical offices of the three countries for our international analysis because each country applies different conventions to measure depreciation. These differences are large and translate directly into spurious differences in capital productivity.[16] Building on the standardized capital stock estimates by Maddison (1993) and O'Mahony (1993),[17] we therefore constructed capital stock figures for each sector, separately for structures and equipment.

We did not employ these capital stock figures directly, but used annual flows of capital services as our input measure. The annual flow of capital services describes the actual usage of heterogeneous capital during a year more accurately than the capital stock. The annual flow is computed by keeping track of each type and vintage of capital separately and dividing it by its service life (**Box 3: Capital stock and the flow of capital services**).

Value added as well as capital stock and services are denominated in local currencies. To convert them in a common currency we used purchasing power parities (PPPs). Purchasing power parity measures the price of a comparable unit of goods or services in one country relative to another country (**Box 4: Currency conversion**). Dividing industry value added by its corresponding industry-specific PPP therefore yields the number of physical units generated in this industry. Capital stock and services are converted by market-sector investment goods PPP (weighted mean of nonresidential structures PPP and general equipment PPP). Using appropriate PPPs eliminates price distortions coming from differences in the degree of competitive intensity and converts quality differences into quantity units, thereby uncovering "goldplating" in the form of unnecessary quality (**Box 5: Price distortions and goldplating**). Because our results are sensitive to the PPPs used, we either employed PPPs that are

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16 A particularly striking example for this bias can be found in the food processing industry study.

17 Angus Maddison, "Standardized Estimates of Fixed Capital Stock: A Six Country Comparison," Innovazione e Materie Prime, April 1993; Mary O'Mahony, "International Measures of Fixed Capital Stocks: A Five-Country Study," National Institute of Economic and Social Research, September 1993.

Exhibit 14

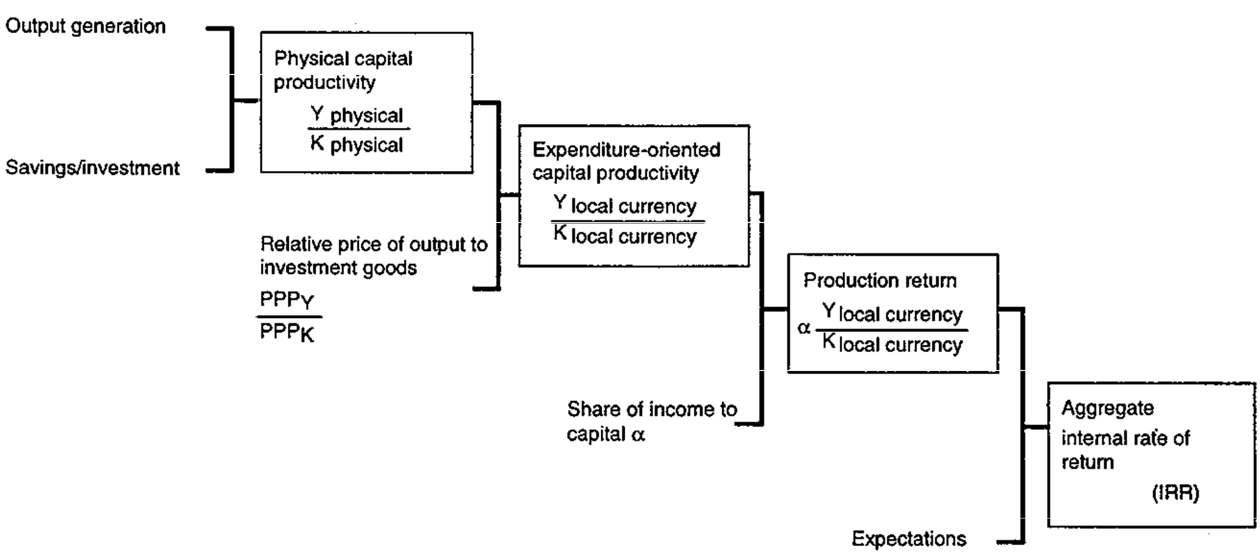
CAPITAL PRODUCTIVITY MEASURES

Physical capital productivity	Expenditure-oriented capital productivity
$\frac{Y}{KS}$	$\frac{P_Y \cdot Y}{P_K \cdot KS}$
$\frac{\text{Physical units of output}}{\text{Physical units of capital services}}$	$\frac{\text{Market value of output}}{\text{Cost of capital services}}$

Source: McKinsey analysis

Exhibit 15

CAPITAL PRODUCTIVITY AND RETURN MEASURES



based on a large number of goods and are therefore statistically reliable (such as the investment goods PPP and the household expenditures PPP provided by the OECD) or computed our own sector PPPs (such as in the automotive and the electric utilities industry studies).

We use purchasing power parity (PPP) exchange rates rather than market exchange rates because PPPs are related to the material standard of living, whereas market exchange rates are related to international trade competitiveness and international capital movements. From the point of view of consumers, the material standard of living is the goods and services they can afford. Thus, the purchasing power of local currency for *all* goods and services, not just traded goods, is the right conversion of international economic statistics for comparisons of material standards of living. Productivity measures how efficiently resource inputs (labor and capital) are used to create the material standard of living. Thus, PPPs are the right exchange conversions for comparing productivity. The most dramatic evidence that market exchange rates are not the right conversion is that they fluctuate strongly with short-run capital movements, whereas standard of living and physical productivity are much more stable.

Measures of capital productivity

Our second task, based on this body of data, was to measure capital productivity. Capital productivity, or more precisely *average* capital productivity, is simply the ratio of outputs to inputs. We used two variants of average capital productivity: physical capital productivity and expenditure-oriented capital productivity **(Exhibit 14)**.

Most of our analysis will focus on physical capital productivity, the number of physical units of output produced per physical unit of capital services. It measures the operational performance of a country or an industry with respect to capital services. This is our measure of performance in the industry case studies.

A string of additional factors links physical capital productivity to financial performance (**Exhibit 15**). The price of investment goods relative to output goods is important in determining cash flow and profits. Higher output prices (for example due to monopoly power in the product market) increase profits, while higher investment goods prices (for example due to a failure of global sourcing) reduce profits. Our second measure of capital productivity includes both pricing effects.

If we multiply this expenditure-oriented measure of capital productivity with the share of income that goes to capital, we obtain the "production return" of capital to the owners of capital.[18] This measure is the economic fundamental for the financial rate of return. Financial performance measures should also include valuation mechanisms such as the stock market, which are driven by

[18] The remainder goes to labor and taxes.

Exhibit 16

SUMMARY OF CAUSALITY ANALYSIS

IV. External factors affecting industry dynamics

Macroeconomic environment

Product market factors
- Demand factors
- Competition laws/enforcement
- Monopoly regulation
- Regulation/market interference

Labor market factors
- Skills
- Demographics
- Rules/unionism

Capital market factors
- Sources of funding/market for corporate control
- Ownership/governance mechanisms

Upstream and downstream market factors

III. Industry dynamics

Product market

Labor market

Capital market
- Alignment of goals with productivity
- Ongoing improvement pressure
- Forcing of exit

II. Managerial decisions

Marketing
- Product/product line management
- Promotion/ demand stimulation/ pricing
- Channel/ format selection

Industry chain management

Production technique
- Capital/labor mix
- Technology
- Scale

Capital expenditure decision making
- Planning
- Asset choice

Operations effectiveness

I. Components of differences in productivity

Capacity created with assets

Capacity utilization

Source: McKinsey analysis

expectations. We computed such a measure in Chapter 5: Capital Productivity and Financial Performance in this report and thus complete the chain from physical capital productivity to financial performance displayed in Exhibit 15. **Box 6: Productivity measures** shows how physical capital productivity is related to other important measures of productivity and financial performance.

Average capital productivity is influenced by all factors of production. High average capital productivity reflects both low capital inputs to produce a unit of output (denominator of productivity) as well as high output for given capital inputs (numerator of productivity) due to good labor management, good product design, good marketing or human capital such as labor skills. Although our focus in this study is on the efficient use of capital, we included these other aspects of the production process in our causal analysis of the reasons for different levels of capital productivity.

Generating and testing causality hypotheses

Our third task was more complicated. It required us to explain *why* levels of capital productivity varied by country. We used interviews with McKinsey consultants who are experts in the field, industry associations and company executives, to surface potential reasons for the differences. This was a highly efficient process in the sectors where McKinsey has deep expertise on the micro level based on our consulting work. We were quickly able to identify major operational differences and the reasons for these differences in the product, capital and labor markets. Once differences had been identified, we attempted to catalogue and quantify the differences and to measure their relative importance in explaining differences in capital productivity.

In order to identify and explain the causes of observed capital productivity differences across countries, we developed a framework that captures the major possible causes of differences in capital productivity. This causal framework is hierarchical and has four layers of causality (**Exhibit 16**). The factors on each layer explain the observed differences in capital productivity, while lower layer causality factors are themselves explained by factors on a higher layer of causality.

We *first distinguished observable components of capital productivity* (Level I): the capacity created with assets and the utilization of this capacity in the production process. We then introduced three levels of hierarchy (managerial level, industry level, and economy level) *to explain the differences in these components*. The internal causality (Level II) shows differences in managerial decisions. The external causality has two stages and describes forces that are beyond the direct control of managers. Industry dynamics (Level III) determine the competitive environment in which managers make decisions. In turn, the macroeconomic conditions and the basic rules of the game (Level IV) create the constraints under which the industry dynamics develop.

The items used in this framework were developed in a highly iterative way. Originally they were designed to test the relative importance of factors already identified by academic work or conventional wisdom. New items were added and others were removed as the cases progressed and we gained a better understanding of the drivers of differences in capital productivity performance. Detailed definitions for each item in the framework are included in the glossary appended to this chapter.

For each item, we made an analytic judgment about the importance of the factor in explaining capital productivity differences between each country and the benchmark for the industry. The benchmark was defined as the country with the highest capital productivity. Factors of primary importance in explaining international differences were marked by a black circle, of secondary importance by an open circle. Factors which did not differentiate performance between the three countries were marked by an X. An undifferentiating factor, however, may well be important in explaining the overall level of productivity in *all* three countries.

We placed a black circle in a cell whenever the factor explained approximately 30 percent or more of the difference in capital productivity between the country in question and the benchmark, an open circle whenever the factor explained 10 to 30 percent of difference in capital productivity and an X whenever there was little difference in the factor, or a difference that did not explain more than 10 percent of the capital productivity difference. A factor was considered of primary importance when it was of primary importance in at least one bilateral country comparison.

The relationship among product market, capital market and labor market factors and productivity was often very complex. In these situations, we limited our assessments to the direct effects of each factor. Many of the items examined also had important indirect effects on capital productivity. Government owners, for example, might have a significant influence on capital productivity through their influence on product market regulations. These effects were counted in full under the heading "Product market regulations" rather than under "Ownership."

The goal of the framework is to show which factors were most important in determining cross country differences in capital productivity at the case level. The insights we derive from this approach will then help us better understand the aggregate results discussed in the next chapter.

Synthesis and implications

Once we had completed the measurement of capital productivity for all five cases, we constructed a weighted average of all cases and compared this with the aggregate results in order to test the plausibility of our measure of aggregate capital productivity.

We then used the detailed understanding of causality at the case level to look for patterns across cases. We drew conclusions about the relative impact of each causal factor on aggregate capital productivity. This required us to determine which items easily translated from our cases to the entire economy and which had more limited applicability.

Finally, we drew some implications for investors, corporations and policy. We explicitly surfaced trade-offs between increasing capital productivity and other societal objectives, but, of course, left the question of the appropriate balance of these items to the political process.

Box 1

PRODUCTIVITY AND THE MEASUREMENT OF OUTPUT

Productivity reflects the efficiency with which resources are used to create value in the marketplace. It is measured by computing the ratio of output to input. Difficulties in measuring productivity arise both from the output and input sides. As such, it is often necessary to use different variants of productivity, depending on the availability and accuracy of data.

With respect to output, there are three basic measurement approaches which can be taken: physical units, value added, and gross output. While physical output is the preferred measure, it is not always feasible to compare physical output due to product variety as well as differences in quality. This approach also requires that one have data from the same part of the value chain in every country; in some countries an industry may simply assemble products while in others it may produce them from raw materials. Physical measures would tend to overestimate the productivity of the former, as fewer inputs would be required to produce the same amount of output. In only two cases in this study was this issue not a problem: telecom and electric utilities – call minutes and kilowatt hours were taken as the measure of output.

An alternative approach to physical output is to use value added. This is the approach taken in all of the case studies except telecom and electric utilities. Here value added is defined roughly as factory-gate gross output less purchased materials and energy. The advantage of using value added is that it accounts for differences in vertical integration across countries. Furthermore, it accommodates quality differences between products, as higher quality goods normally receive a price premium which translates into higher value added. One complication arises from the fact that value added is not denominated in the same currency across countries. As a result, this approach requires a mechanism to convert value added to a common currency, a topic which will be discussed in a subsequent box.

GDP can be seen as a value added concept of output. In many cases, output is not homogeneous; the GDP of a country is made up of many thousands of different goods and services. The GDP of a country is the market value of the final goods and services produced. It reflects the market value of output produced by means of the labor and capital services available within the country. The GDP also measures the labor and capital incomes earned in the course of producing it.

The third approach is to use gross output. Using shipment values, as with physical output, requires that one look at the same part of the value chain across countries. Furthermore, as with value added, a mechanism for converting gross output to a common currency is needed. This approach is normally used when the first two are not feasible due to lack of data, as was the case in some analyses of the processed food study.

Box 2

PRODUCTIVITY AND THE MEASUREMENT OF INPUTS

Physical capital used in the business sector is very heterogeneous. The capital stock consists of various kinds of structures (such as factories, offices, or stores) and equipment (such as machines, trucks, or tools). The capital stock is built up incrementally by the addition of investment (business gross fixed capital formation) to the existing capital stock. At the same time, the capital stock depreciates. Each piece of capital provides a flow of services during its service life. The value of this service is what one would pay if one were leasing this piece of capital.

There is no consistent methodology to measure the capital stock and its services directly. Standard practice is to construct the capital stock indirectly using the "perpetual inventory method" which infers the capital stock from directly measured gross fixed capital formation expenditures and presumed depreciation schedules for different kinds of capital. Starting from an initial capital stock, one year's capital expenditures are added and depreciation subtracted to compute the new capital stock, and so forth year after year.

Basing the capital stock estimates on capital expenditures also solves the problem of heterogeneity. While we cannot add different pieces of capital (unlike labor hours or employees in computations of labor productivity, one cannot add office buildings and tools), we can add the expenditures for different pieces of capital (in real terms, using an appropriate investment goods deflator). The perpetual inventory method yields an estimate of the capital stock in *expenditure* units. Comparable *physical* units of capital are computed by dividing the expenditure-based capital stock units by the investment goods PPP (see box 4 on currency conversion).

Capital stock data constructed by the perpetual inventory method are published in the national accounts. Unfortunately, these capital stock estimates are sensitive to the presumed shape of the deprecation schedule and the presumed service lives of different kinds of capital. We could not use these data because accounting conventions differ so much across countries that a meaningful international comparison is impossible. For instance, each country applied different service lives for the same asset types although we do not believe that the same kind of capital actually lasts longer in one country than in another one: Japanese equipment services lives are assumed to be only two-thirds of the U.S. service lives, while the service life of German structures is presumed to be 65 percent longer than that of U.S. structures. The longer the service life, the lower depreciation and the higher the capital stock. These differences are large and translate directly into spurious differences in capital productivity.

For the aggregate analysis, we extended the standardized capital stock estimates calculated by O'Mahony (1993) from 1989 through 1992 and split her capital stock estimates into market and non-market sectors. For the industry studies, we constructed our own capital stock estimates using the perpetual inventory method applied to published data on historical capital expenditures, deflated by the investment goods deflator.

We assumed that capital services follow the schedule called "sudden death depreciation" because we believe that this is a better approximation to actual usage patterns than linear or geometrically declining depreciation schedules. According to the sudden death schedule, each piece of capital provides a constant service flow during its useful life. After the end of the service life, the piece of capital provides no services at all. In our own calculations, we used the U.S. sector-specific service lives for structures and equipment separately. Using other service lives does not significantly change international differences in capital productivity as long as the service lives are common across countries. Similarly, international productivity differences are not sensitive to variations of the sudden death depreciation (e.g., randomly distributed rather than fixed service lives).

Box 3

Capital stock and the flow of capital services

Input to the production of goods and services is not the capital stock per se, but the flow of services generated from this stock. Capital services of a machine, for example, in one year are the total services coming from the machine during its lifetime divided by its lifetime.

If the capital stock consists only of one type of capital, the flow of capital services under the sudden death depreciation schedule is simply the capital stock divided by the years of its useful service, and therefore proportional to the capital stock.

However, if capital is heterogeneous – for instance, features a changing mix between structures and equipment across countries and from one vintage of capital to the next vintage of capital – this proportionality does not hold anymore. In this case, the annual flow of capital services describes the actual usage of capital during a year more accurately than the capital stock figure.

The annual flow of capital services is computed by keeping track of each type and vintage of capital separately, dividing it by its service life, and then adding the flows of each type and vintage of capital.

For some calculations, we added financing costs to the purchase cost of investment goods. In this case, the flow of capital services is the price of the lease of the investment good.

Box 4

CURRENCY CONVERSION (INDUSTRY PURCHASING POWER PARITY)

One way to compare output values in different countries is simply to convert them to a common currency using market exchange rates. To compare the output of the German and U.S. automotive industries in 1993, for example, the average exchange rate in 1993 between the dollar and the German mark can be used to convert German output in DM to dollars, or vice versa. The fundamental problem of using exchange rates is illustrated by the fact that comparisons of output would be biased by fluctuations in the exchange rate. In 1992, the dollar was 7 percent lower than in 1993, and U.S. output would have looked 7 percent lower than in 1993. This problem makes the use of market exchange rates questionable. A better method of conversion is to use purchasing power parities (PPPs). Ideally, one would like to have a specific PPP for the industry under examination, called an industry PPP, which compares the unit prices at the factory gate of comparable products across countries in an industry.

We constructed industry PPPs by using comparable products produced by the operations of the given industry in all three countries, such as a car with certain attributes. Suppose the factory gate price of a car in the U.S. was $15,000, while the price of the same car in Germany was 30,000 DM. The PPP in this case would be 2 DM per 1 U.S. $. The price of the standard item in mark in relation to the price in dollars gives a PPP exchange rate for the industry for the U.S.-Germany comparison and similarly for the Japan-U.S. comparison. Where we had several standard products in the same industry, we weighted the individual product PPPs to construct an average PPP exchange rate for the industry as a whole.

The most recent "benchmark" comparisons to construct PPPs have been made by the OECD in 1990 and 1993, and slightly different market baskets are used for each benchmark year. Using different benchmark results can change the productivity comparisons. Thus, we used an average of the 1990 and 1993 PPPs. More precisely, we applied the appropriate deflators between 1990 and 1993 to the 1990 benchmark prices to obtain one estimate of the 1993 PPP, and averaged this estimate with the 1993 PPPs reported by the OECD.

Industry PPPs are often very different from market exchange rates, even though one might expect them to be similar. After all, if unequal, someone can buy a product in the U.S., take it to Germany and sell it, then change the money into dollars and end up with more dollars than the product cost. Someone could, in principle, make a profit by exploiting the discrepancy between PPP rates and currency rates (i.e., arbitrage). This suggests that international trade should force market exchange rates to equal PPP rates.

One reason this does not happen is that exchange rates reflect not only flows of traded goods, but also capital flows. High interest rates in the U.S., for example, attract capital from other countries that drives the dollar up as foreign investors purchased dollars to invest in the U.S. A second reason for potential differences between PPPs and the exchange rate has to do with relative pricing differences across countries. Relative prices between countries can differ dramatically across industries, especially in nontraded sectors. In Japan the price of food relative to the price of cars is much higher than in the U.S.

A third reason for the divergence between market exchange rates and industry PPP rates is that many countries have taxes, tariffs or nontariff barriers. A 20 percent difference in price for the same goods in two different countries can simply reflect the fact that one of the countries has a 20 percent value added tax and the other does not. A final reason for the disparity between exchange rates and PPP rates is that not all items are traded. Services, in particular, are usually not traded. Moreover, a substantial portion of manufactured goods is not traded, and even tradable goods face obstacles in the form of tariffs, transportation costs and other restrictions on trade, all of which serve to prevent full-price transportation.

Box 5

PRICE DISTORTIONS AND GOLDPLATING

As explained in the previous box, purchasing power parities measure how much more expensive comparable goods and services are in one country compared to another country. Dividing industry value added – i.e., the physical quantity of goods and services generated in this industry multiplied by their prices – by its corresponding PPP therefore yields the number of physical units generated in this industry. Using appropriate PPPs therefore has two purposes: it eliminates the effects of price distortions arising from differences in the degree of local competition, and it converts quality differences into quantity units, thereby uncovering capital expenditures that were unnecessary or uneconomical for the production of the industry's good or service ("goldplating").

One reason for these price differences are price distortions due to different degrees of competition; for example, because a monopoly can set high prices in one country while competition keeps prices low in another country. Using appropriate PPPs therefore eliminates differences in the degree of local competition. If a call minute for the same distance is three times as expensive in country A as in country B, then dividing the *expenditures* for these calls in country A by the PPP of three yields the *quantity* of call minutes in country A measured in currency units of country B.

In addition, the PPPs convert quality differences in quantity units, thereby uncovering goldplating. The following example clarifies this: If country A uses machines with a very high degree of precision to make exactly the same output as country B which uses cheaper machines that have a lower degree of precision, then dividing the expenditures for the machines of country A by the PPP yields a higher quantity of machinery than in country B. Country A therefore used *more* machine inputs than country B to produce the same output.

This logic fails if the PPPs are not constructed from comparable baskets of goods and services. In this case, the PPPs do not remove the price distortions from different degrees of competitive intensity, and they are confounded with differences in quality. If the two types of machinery in the above example are not distinguished from each other, they yield the same PPP and the goldplating escapes detection.

On the aggregate level, we do not believe that this is a significant problem. In each industry study, we describe how the industry-specific PPP was constructed, and we comment on the degree to which quality and price differences have been handled appropriately.

Box 6

PRODUCTIVITY MEASURES

Although we chose to use *average capital productivity* for the major parts of our analyses, we did not ignore the contribution of other inputs to production. We realize that capital productivity can increase because of increases in the amount of labor, management and organization, improvements in technology, or advances in the skills of the work force. We have included these aspects of the production process in our causality framework for explaining productivity differences.

A more direct measure of the contribution of capital to output is *marginal capital productivity*. This is defined as the additional output made possible by an additional unit of capital services when all other inputs remained unchanged. There are two methods to measure marginal productivity. One method is to assume a mathematical expression that approximates the actual production process and to compute the derivative with respect to capital. We use this approach to link productivity to rates of return at the aggregate level. The second and more direct method is to observe a "natural experiment" where capital was added without a change in employment and other factors. Unfortunately, there are only few occasions of such "experiments" which we could exploit at the case level.

Average capital productivity on a capital stock basis (Y/K, where Y are the units of output and K the units of capital stock) is directly related to the *production rate of return from capital*. The income to capital from production is value added (Y) times the share of capital in value added (denoted by α). Relating this capital income to the capital stock yields the production rate of return from capital:

$$r = \alpha * Y/K$$

Under certain assumptions (the production process is described by a Cobb-Douglas function, and competition guarantees that the output elasticity of capital is equal to capital's income share, both of which hold approximately true for the U.S. economy), this production return is also equal to the *marginal productivity of capital*:

$$r = \partial Y/\partial K$$

Where necessary, we computed *average labor productivity* together with capital productivity. Analogous to average capital productivity (output per unit of capital services), average labor productivity is measured as output per unit of labor. We use hours worked on full-time equivalents (FTE) as the units of labor, counting part-time employees as 50 percent of full-time employees. Average labor productivity is more common in the literature of productivity analysis than capital productivity because labor is the largest factor in value added in most industries and for GDP as a whole; its compensation represents about two-thirds of GDP.

Average capital productivity on a stock basis (Y/K), average labor productivity (Y/L, where L denotes units of labor) and *capital intensity* (capital services per unit of labor, or K/L) are arithmetically linked as symbolized in Exhibit 11. This link means that when capital intensity rises, as it has done historically, labor productivity must rise faster than capital productivity. Capital productivity might even fall.

In this case, it is important to measure the combined productivity of labor and capital in order to understand whether the trade-off between labor and capital productivity was beneficial. For these analyses, we combined both capital and labor productivity to *total factor productivity* (TFP; also called multifactor productivity). TFP is the weighted (harmonic) mean of capital and labor productivity, where the weights of capital and labor are their shares in value added (α and 1- α):

$$\mathrm{TFP} = (Y/K)^{\alpha} * (Y/L)^{(1-\alpha)} = Y / (K^{\alpha} * L^{(1-\alpha)})$$

TFP can be computed on both a capital stock and a capital services basis. We computed TFP on a capital services basis for both the aggregate and the industry level.

APPENDIX

GLOSSARY OF TERMS USED IN CAUSALITY FRAMEWORK

Level I: Components of differences in productivity

Causality category	Explanation
Capacity created with assets	Effectiveness of creating high potential for output for a given investment level. For example, in manufacturing, faster throughput times per machine or the use of fewer machines for the same task would increase this
Capacity utilization	Actual performance in utilizing the capacity potential created. In manufacturing, longer operating hours or greater uptime of machines help here. In telecom or electric utilities maximizing output over a fixed asset network would be included here

Level II: Managerial decisions

Causality category	Explanation
Marketing	
Product/product line management	Includes understanding customer needs and the appropriate attribute trade-offs that different subsegments are willing to make. It therefore evaluates how well individual products match the needs of specific subsegments and how well the entire product line is managed to ensure effective market coverage. In retail this would include the merchandising capabilities of the retailers
Promotion/demand stimulation/pricing	Choice of promotion and pricing mechanisms and their effect on levels of demand
Channel/format selection	Selection of how a product is to be sold to reach the market. For example, in the retail case this refers to the evolution of new formats such as specialty stores
Industry chain management	Impact of integration with suppliers or customers to improve the effectiveness of the chain as a whole. Examples would include partnering with suppliers by Toyota in the auto industry, or the integration of logistics between Wal-Mart and its suppliers to lower costs and improve information flows in retail
Production technique	
Capital/labor mix	Explicit trade-offs of one factor of production for another, such as a decision to automate which might improve labor productivity but hurt capital productivity
Technology	Levels of technology being used, either proprietary or not. An example would be the effective application of information technology systems
Scale	Ability to achieve scale economies such as through concentration of production in one location
Capital expenditure decision making	
Planning	Choices made in the long-term capital budgeting process regarding capacity needs and investment spending levels
Asset choice	Includes impact of effective reuse of equipment and impact of "goldplating." By goldplating we mean the use of equipment with a higher degree of precision or customization than is required to produce equivalent output (at least in customer's eyes). Examples of goldplating include the ordering of costly highly customized turbines by some electric utilities in Germany
Operations effectiveness	Degree of efficiency in organizing and managing day-to-day operations of plants or other functional units once product mix and basic production technology have already been chosen. In manufacturing industries, this also includes maintenance of equipment and manufacturability of products (given a set of product parameters chosen under marketing)

Level III: Industry dynamics

Causality category	Explanation
Product market	Focuses on the nature and intensity of competition, with particular attention to the degree of entry or exit barriers in the given industry, the product attributes on which firms compete (e.g., price or variety), and the level of competitive exposure to best practice firms
Labor market	Focuses on the nature and intensity of competition in the labor market, and includes labor market outcomes affecting the flexibility and cost of labor
Capital market	Includes three potential consequences of activity in the capital market: the range of managerial goals which are encouraged or permitted by capital providers and owners, the effectiveness of ongoing corporate governance performance monitoring and the effectiveness of reallocating capital away from low performers

Level IV: External factors affecting industry dynamics

Causality category	Explanation
Macroeconomic environment	Macroeconomic and structural conditions that affect behavior, including expected economic growth rates, inflation rates, and real estate costs. For instance, the Japanese "bubble economy" in the 1980s had an impact in several industries, fueling overinvestment or real estate speculation
Product market factors	
Demand factors	Differences in tastes, buying behavior, and market size demographics. For example, in the food processing industry Japanese customers are perceived to have a greater demand for variety and freshness, driving up costs for manufacturers
Competition laws/ enforcement	Effectiveness of laws to prevent anti-competitive behaviors by firms such as collusion on supply or price-fixing
Monopoly regulation	Rules and mechanisms by which the government monitors and controls a regulated industry. Our examples are in telecom and electric utilities, which may be guided by rate-of-return or price cap regulation, and have different monitoring and review procedures
Regulation/market interference	Includes policies that affect the level and nature of competition such as trade tariffs or quotas, licensing, or zoning. Examples include trade restrictions in auto in the U.S. and Germany, the large scale retail law in Japan that requires approval to open new stores, and the store closing laws in Germany. Also includes standards imposed on output or capital, or externalities such as environmental impact or safety. An example is the requirement to put telecom and utilities cables below ground in Germany
Labor market factors	
Skills	Prevalence of skills in the labor force over which firms have little control such as inherent intelligence, basic education, or culturally formed attitudes
Demographics	Conditions such as an aging population which affect availability of a certain kind of labor. For example, in the Japanese auto industry, population trends added to the scarcity of labor for factory work
Rules/unionism	Government or union policies and rules which affect working conditions, organization, and cost of labor, and which are not primarily controllable by companies. For example, labor agreements or costs may preclude plants operating on weekends or adding a third shift
Capital market factors	
Sources of funding/market for corporate control	Factors that influence how capital is allocated to different industries and firms. This includes capital structure differences (e.g., debt vs. equity), type of intermediaries (e.g., bank lending vs. bonds), the institutional availability of capital for startups (e.g., venture capital, small business lending), and the ease of or restrictions against mergers and acquisitions
Ownership/ governance mechanisms	Effect of the identity of the owners and their goals. Includes government vs. private ownership, private vs. publicly held, interlocking ownership and conglomerates vs. "stand alone" companies, and concentrated vs. dispersed ownership Also includes effectiveness of governance structures such as corporate board representation in allowing owners and other corporate governors to monitor the performance of managers
Upstream and downstream market factors	Impact of the structure, conduct, and performance of upstream or downstream markets on the industry being studied. For instance, for the Japanese food processing industry, the highly fragmented retail and distribution system presents a potential handicap for manufacturers in terms of logistics

Chapter 2: Aggregate capital productivity

In this chapter we report our findings from aggregate measures of physical capital productivity in the market sector of Germany, Japan, and the U.S.[1] Using a consistent methodology to estimate market sector capital stocks, we found that U.S. businesses have been using physical capital more effectively and efficiently than businesses in Germany and in Japan.

For the period 1990 to 1993, capital productivities in Germany's and Japan's market sectors were about equal with each other and approximately 35 percent below the U.S. level. Between Germany and the U.S., this productivity gap existed over the entire 1970 to 1993 period. In contrast, capital productivity in Japan was only slightly below U.S. levels in 1970, but since then has been falling steadily relative to the U.S. as increases in output did not keep pace with Japan's dramatic increases in capital inputs.

This chapter also provides answers for two of the three paradoxes[2] that were raised in Chapter 1: Objectives and Approach. Why is GDP per capita in Japan not higher than in the U.S., when Japan has saved so much and worked so hard? And why has German labor productivity not exceeded U.S. levels, when Germany has invested so much more capital per labor hour?

Our calculations in Chapter 1 using readily available total economy data suggested that capital productivity plays a role in understanding these paradoxes. Our more careful analysis in this chapter of the market sector shows that GDP per capita differences among these three economies are even greater for the market sector, and that capital productivity is indeed an important component of the solution to both paradoxes.

The U.S. did not achieve higher capital productivity at the expense of lower relative labor productivity, as the U.S. had a slightly higher labor productivity level in the market sector than Germany and a substantially higher labor productivity level than Japan. Significantly lower productivity of both capital and labor is the answer to the "Japanese GDP paradox:" although Japan employed much more labor and capital in production, these low capital and labor productivity levels kept GDP per capita in the market sector substantially below the U.S. level. The relatively low capital productivity level in Germany is also a key element in understanding the "German productivity paradox:" the high level of capital per worker hour did not raise output per worker hour

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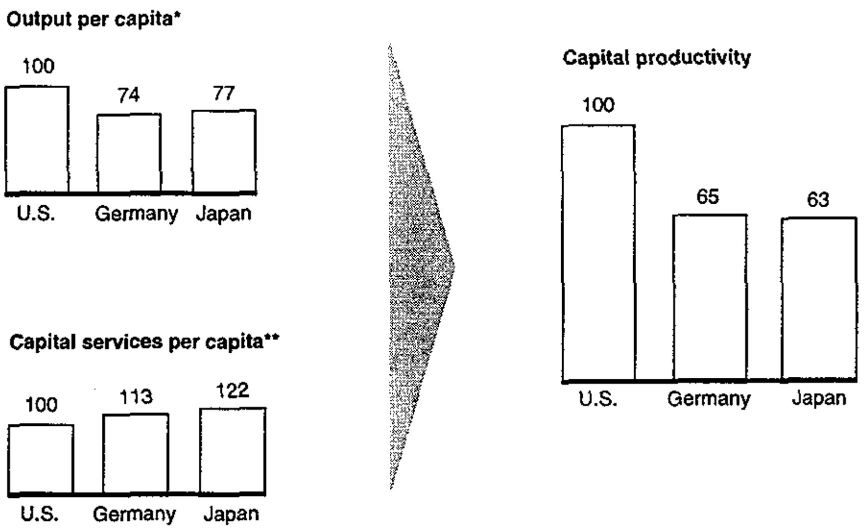
1 "Germany" refers to West Germany only.

2 The third paradox concerning the U.S. will be explored in Chapter 5: Capital Productivity and Financial Performance of this report.

Exhibit 1

MARKET SECTOR OUTPUT, CAPITAL SERVICES, AND CAPITAL PRODUCTIVITY

Indexed to U.S. (1990-93 average) = 100



* At market sector GDP PPP

** At nonresidential structures and general equipment PPPs (investment goods PPP)

Source: O'Mahony; Fixed Reproducible Tangible Wealth in the U.S.; Germany National Accounts (Reihe S.17); Gross Capital Stock of Private Enterprises (Japan); OECD; McKinsey analysis

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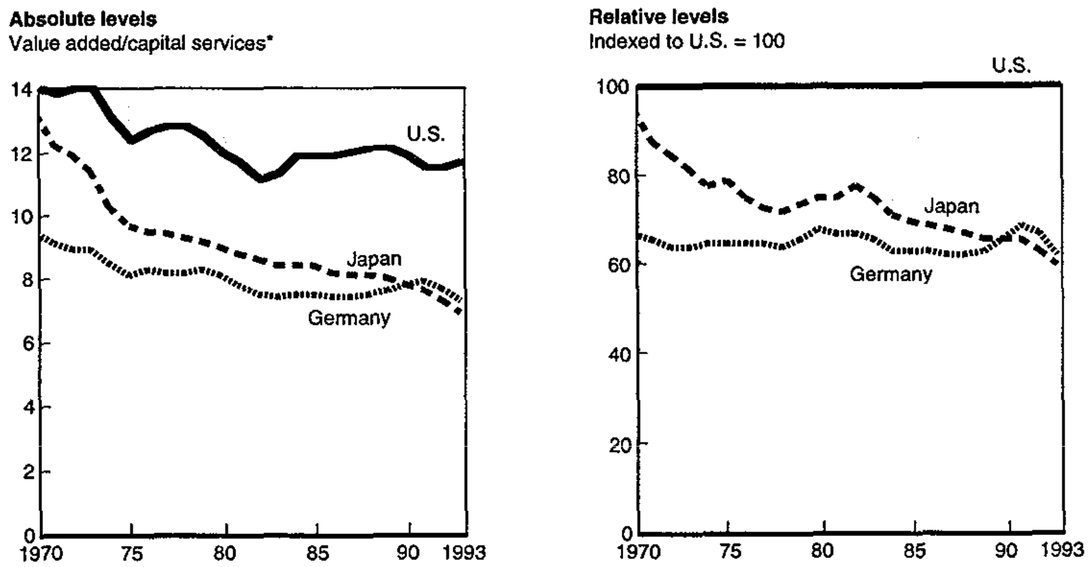
Exhibit 2

MARKET SECTOR PHYSICAL CAPITAL PRODUCTIVITY 1970-93



* Value added at market sector GDP PPP divided by capital services at investment goods PPPs

Source: O'Mahony; Fixed Reproducible Tangible Wealth in the U.S.; Germany National Accounts (Reihe S.17); Gross Capital Stock of Private Enterprises (Japan); OECD; McKinsey analysis

sufficiently to surpass the U.S. level because the capital was not used efficiently and effectively to increase output. This results in low capital productivity.

CAPITAL PRODUCTIVITY RESULTS

In the early 1990s, capital productivity was substantially higher in the U.S. than in Germany and Japan.

Capital productivity in the market sector is the value of output in the market sector divided by the capital services in the market sector. An important methodological element of our approach was to limit our analysis only to the *market sector*. We thus excluded government services, health care and education from all measures because in these areas the available measures of output (and thus productivity) are not meaningful. Chapter 1 describes the concepts of "value of output" and "capital services," and the methodological appendix to this chapter describes data and definitions used specifically in the aggregate analysis.

Exhibit 1 summarizes our main result. From 1990 to 1993, Germany's capital productivity averaged 65 percent of the U.S. level, while Japan's capital productivity averaged 63 percent. The relatively lower capital productivity in Japan manifests itself almost equally in lower output levels (23 percent lower than the U.S.) and higher capital input levels (22 percent higher than the U.S.). For Germany, approximately two-thirds of the difference shows up as lower output (74 percent of the U.S. level) and only one-third as higher capital services (13 percent above the U.S.).

As **Exhibit 2** shows, the relative capital productivity differences have been fairly stable since the mid-1970s. Although capital productivity fell in all three countries, a gap of more than 20 percentage points has prevailed between the U.S. and the other two countries since 1975. Capital productivity fell significantly faster in Japan, from a level very close to the U.S. in the early 1970s when capital was scarce, to a level below Germany's capital productivity most recently, after massive capital investments were made during the Japanese "bubble" years. The productivity gap of approximately 35 percentage points between the U.S. and Germany has remained remarkably constant over the entire period.

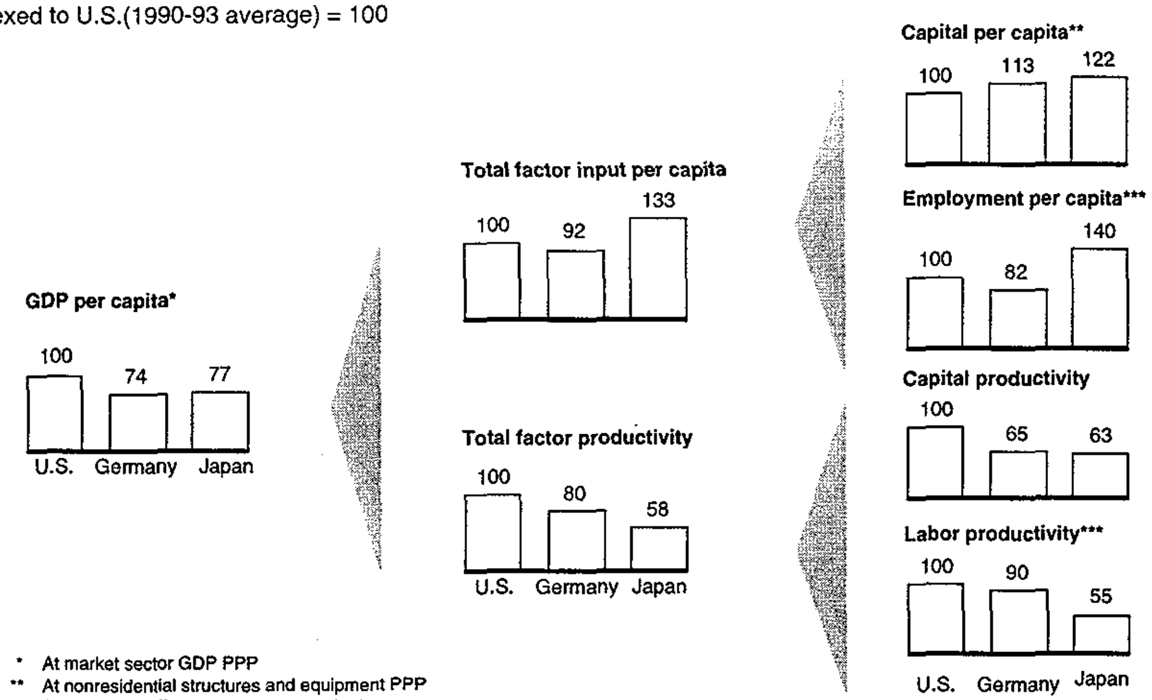
THE CONTRIBUTION OF CAPITAL PRODUCTIVITY TO THE MATERIAL STANDARD OF LIVING

The higher capital productivity in the market sector of the U.S. is an important component of its higher total factor productivity, which in turn causes the higher material standard of living in the U.S. relative to the two other countries.

Exhibit 3

SOURCES OF DIFFERENCES IN MARKET SECTOR GDP PER CAPITA

Indexed to U.S.(1990-93 average) = 100



* At market sector GDP PPP

** At nonresidential structures and equipment PPP

*** Adjusted for differences in hours worked

Source: O'Mahony; Fixed Reproducible Tangible Wealth in the U.S.; Germany National Accounts (Reihe S.17); Gross Capital Stock of Private Enterprises (Japan); OECD; McKinsey analysis

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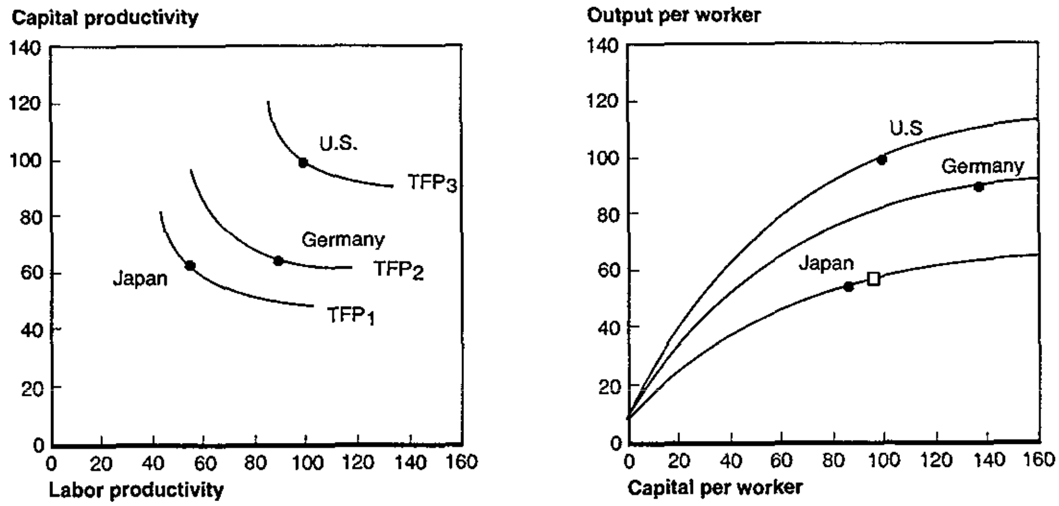
Exhibit 4

TOTAL FACTOR PRODUCTIVITY LEVELS

Indexed to U.S. (1990-93 average) = 100



Source: O'Mahony; Fixed Reproducible Tangible Wealth in the U.S.; Germany National Accounts (Reihe S.17); Gross Capital Stock of Private Enterprises (Japan); OECD; McKinsey analysis

The material standard of living, as measured by GDP per capita, is the amount of inputs used for production – capital and labor – times the productivity with which these inputs are employed. The high GDP per capita in the U.S. relative to the other two countries is mainly due to high productivity. This is shown in **Exhibit 3,** which summarizes the sources of differences in market sector GDP per capita in Germany, Japan and the U.S. for the early 1990s. Market sector GDP per capita in the U.S. is roughly a third higher than in Germany and Japan.

The crucial role of total factor productivity is evident in the U.S.-Japan comparison. The U.S. actually uses far less inputs than Japan – less labor and less capital – but offsets this lower total factor input level by much higher total factor productivity. The U.S. productivity advantage is dramatic in terms of both labor and capital productivity.

Total factor productivity differences are also critical in explaining differences in GDP per capita between Germany and the U.S. Compared to Germany, the U.S. uses slightly more inputs – about a fifth more labor, only partially offset by a lower input of capital – to create more output. In addition, U.S. total factor productivity is about a quarter higher than Germany's and accounts for two thirds of the GDP per capita difference. Most of this higher total factor productivity shows up as higher capital productivity, as U.S. labor productivity is only slightly higher than Germany's.

Higher levels of total factor productivity in the U.S. means that the U.S. has not achieved higher capital productivity simply by applying more labor. In fact, as noted above, the U.S. has both higher capital productivity and higher labor productivity. This finding is important because it shows that U.S. businesses appear to manage both factors of production better than those in Germany and Japan. **Exhibit 4** displays this graphically in two ways. The left chart shows that U.S. total factor productivity is higher because both its labor and capital productivities are higher. This result suggests the U.S. would create more output per worker than Germany or Japan for any given level of capital per worker, as depicted in the right chart of Exhibit 4. This chart also suggests that differences in labor productivity for any given level of capital intensity are more important than capital intensity in explaining differences in output levels. For example, if Japan would increase capital per worker to the U.S. level, as indicated by the hollow square in Exhibit 4, the main difference in output per worker between Japan and the U.S. would still remain.

The Japanese GDP paradox

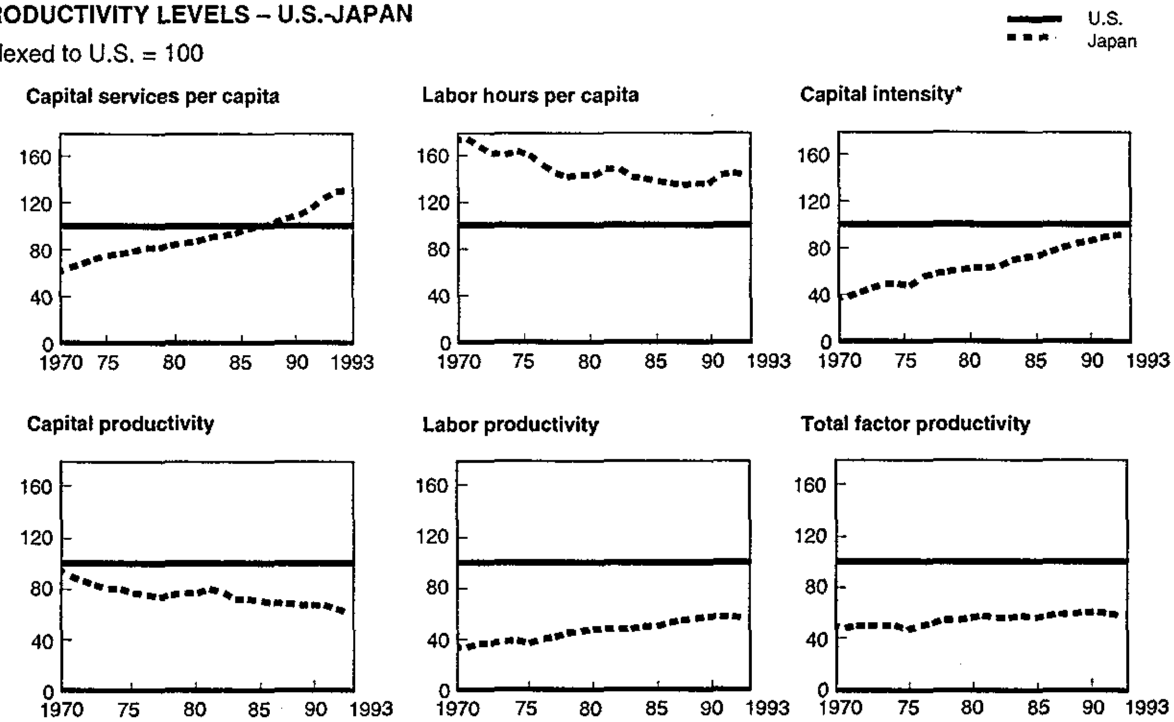
The resolution of the Japanese GDP paradox lies in productivity. Because of substantially lower productivity, Japan creates less GDP per capita despite employing more labor and capital than the U.S.

As Exhibit 3 has shown, Japan's market sector GDP per capita was 77 percent of the U.S. in the 1990s, despite total factor inputs which were 33 percent higher.

Exhibit 5

MARKET SECTOR CAPITAL INTENSITY* AND PRODUCTIVITY LEVELS – U.S.-JAPAN

Indexed to U.S. = 100



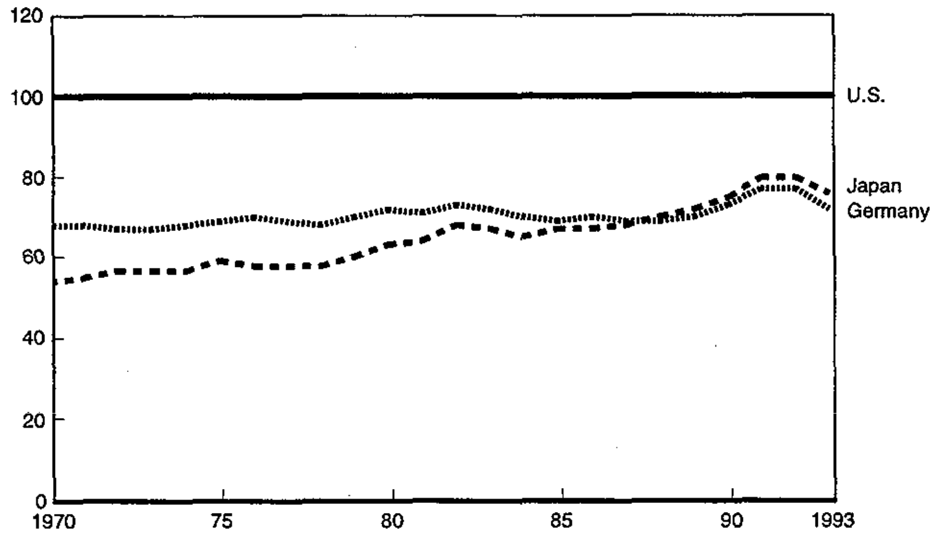
* Capital per labor hour

Source: O'Mahony; Fixed Reproducible Tangible Wealth in the U.S.; Germany National Accounts (Reihe S.17); Gross Capital Stock of Private Enterprises (Japan); OECD; McKinsey analysis

Exhibit 6

MARKET SECTOR GDP PER CAPITA*

Indexed to U.S. (1993) = 100



* 1993 market sector GDP PPP

Source: OECD; Germany National Accounts (Reihe 1.3, S.15); McKinsey analysis

Most of this higher total factor input is due to 40 percent higher labor inputs, but capital inputs were also 22 percent higher than in the U.S.

This balance of inputs was not always the case. Japan began the 1970 to 1993 period with substantially lower capital inputs per capita but even higher labor hours per capita than now (**Exhibit 5**). Over this time, businesses increased capital significantly and decreased labor inputs, resulting in capital services per worker hour that rose from 34 to 91 percent of the U.S. by 1993. Despite these huge investments and the increase in capital intensity, total factor productivity has only slightly improved relative to the U.S. The higher input levels were always much more than offset by the low level of total factor productivity, resulting in lower GDP per capita.

Japan's low total factor productivity results from *both* low labor productivity and low capital productivity. Exhibit 5 shows that the difference between Japanese and U.S. total factor productivity has changed surprisingly little from 1970 to 1993. This small change comes despite a significant increase in Japanese labor productivity. The initial gap in labor productivity has decreased from some 33 percent of U.S. labor productivity to about 55 percent. However, capital productivity has been declining very fast, nearly offsetting Japanese advances in labor productivity.

Given the small changes in total factor productivity over time, the increase in Japanese GDP per capita (**Exhibit 6**) came mainly from Japan's increase in capital services. Because of the significant productivity gap with respect to both inputs, better management of both factors is now important in further improving Japan's material standard of living.

The Germany productivity paradox

Germany's higher capital intensity has not led to labor productivity higher than in the U.S. because capital was managed less effectively and efficiently. As a result, total factor productivity has also stayed below the U.S. level.

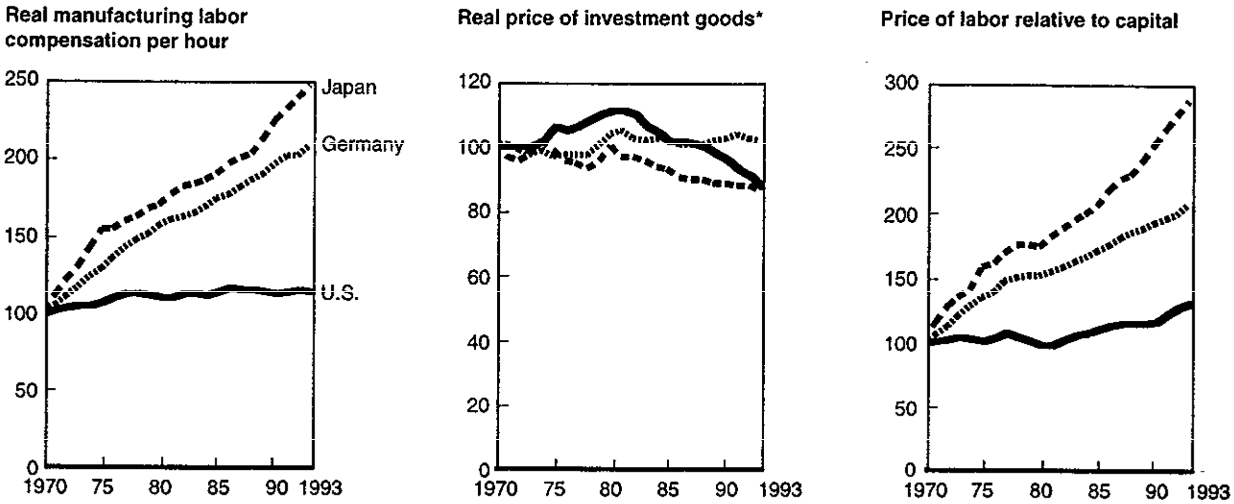
In 1970, Germany's situation was similar to Japan's current situation. Germany lagged considerably both in terms of capital and labor productivity, yielding much lower total factor productivity. Since then, Germany has decreased its labor input below U.S. levels. Germany has partially compensated for lower labor input by higher capital input. German managers may have substituted capital for labor because real labor compensation rose faster than the real cost of physical capital (**Exhibit 7**). The substitution of capital for labor resulted in a substantial increase in capital per worker, reaching a capital intensity in Germany that was by 1993 dramatically higher than in the U.S. (138 percent of U.S. level) (**Exhibit 8**).

This increase in capital intensity has raised labor productivity, but not above U.S. levels as might be expected. In the early 1990s, German labor productivity was still below U.S. levels. The main reason is that the capital was not used as

Exhibit 7

RELATIVE PRICES OF CAPITAL AND LABOR 1970-93

Indexed to 1970 = 100



* Price index of gross fixed capital formation relative to price index of GDP

Source: BLS; Institut der Deutschen Wirtschaft; OECD; McKinsey analysis

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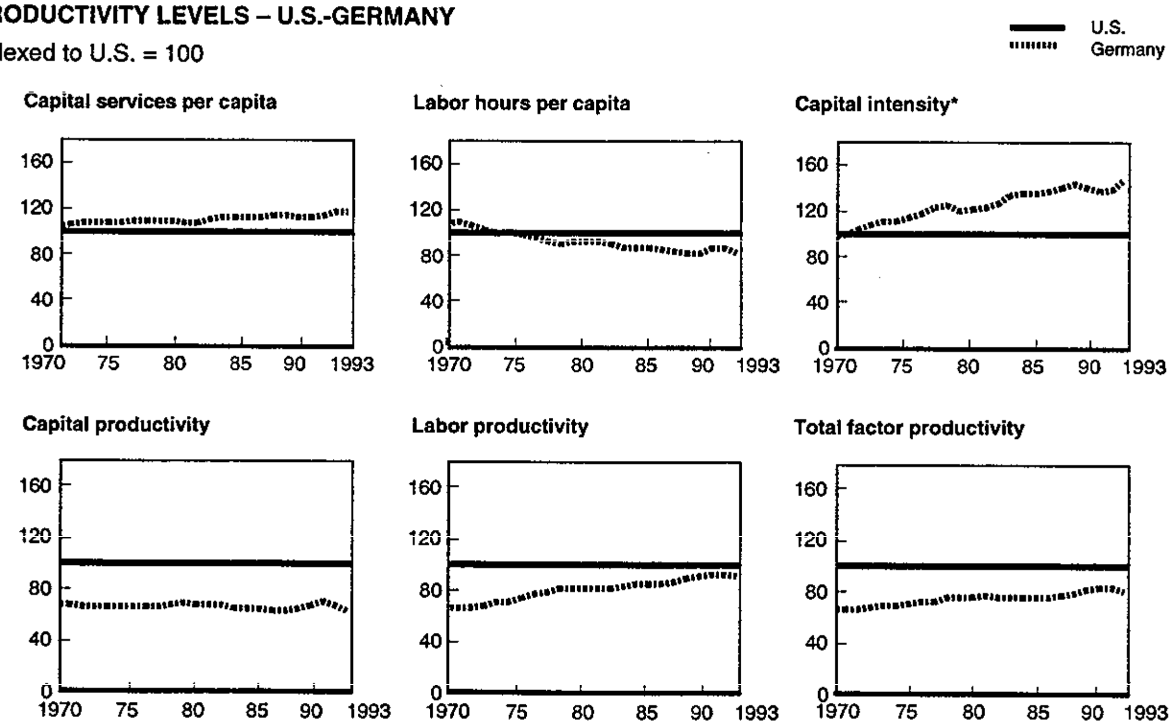
Exhibit 8

MARKET SECTOR CAPITAL INTENSITY* AND PRODUCTIVITY LEVELS – U.S.-GERMANY

Indexed to U.S. = 100



* Capital per labor hour

Source: O'Mahony; Fixed Reproducible Tangible Wealth in the U.S.; Germany National Accounts (Reihe S.17); Gross Capital Stock of Private Enterprises (Japan); OECD; McKinsey analysis

effectively and efficiently to increase output (capital productivity was lower). Diminishing returns to capital played a secondary role (see **Exhibit 9** and Box on "Capital productivity, capital intensity and diminishing returns"). The result is that the level of total factor productivity in Germany is still significantly lower than in the U.S.

The 20 percent lower total factor productivity explains more than two-thirds of the 26 percent lower GDP per capita in the German market sector, as compared to the U.S. (Exhibit 1). The remaining gap is caused by lower labor inputs.

* * *

The aggregate analysis has its limits. Since international productivity comparisons rely on the consistency of input and output data and the accuracy of the PPPs, there is considerable uncertainty surrounding our estimates of capital productivity levels in Germany, Japan and the United States.

Moreover, the analysis at the level of the market sector can only demonstrate that capital productivity is indeed an important part of the answer to the "paradoxes" of Japan and Germany. This aggregate analysis cannot provide an understanding of the underlying *reasons* for the differences in capital productivity. To uncover these reasons and to attempt to solve the "paradoxes" at a deeper level, we examined specific industries in the case studies that follow.

We conducted in-depth industry studies with three objectives in mind. The first was to confirm whether productivity measures for a sample of industries are consistent with our finding that the capital productivity of the market sector in the U.S. is approximately 35 percent higher than in Germany and Japan. We will see that this is the case. The second reason was to identify and understand the causes of the observed productivity differences in the industries studied. And last, we tried to understand the interaction of capital and labor. Managers must manage all these factors of production together and the combined factor productivity explains differences in the material standards of living.

Capital productivity, capital intensity and diminishing returns

It is often claimed that the high capital intensity in Germany causes low capital productivity because the high level of capital per worker has lower returns per unit of capital than a lower level of capital per worker would have. Economists refer to productivity that decreases with the amount of input employed as "diminishing returns."

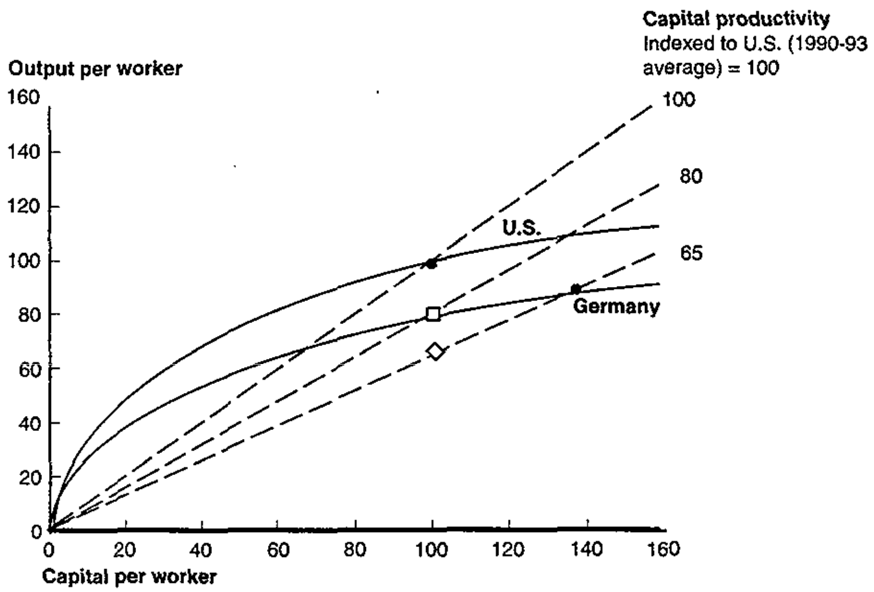
Our data show that dimishing returns are certainly not the sole, and not even the main, cause of capital productivity levels in Germany that are significantly lower than in the U.S. Rather, capital is managed less effectively and efficiently *at any level* of capital intensity. While diminishing returns to capital explain about 40 percent of the gap in capital productivity between Germany and the U.S., 60 percent is due to general inefficiency and ineffectiveness. This distinction is important because it means that changing the capital-labor mix in Germany to U.S. levels would not close the gap in capital productivity.

We have two pieces of evidence supporting this conclusion. First, while the increase in capital intensity has lowered German capital productivity in absolute terms, the decline was not faster than the corresponding decline in the U.S. As Exhibit 8 shows, Germany and the U.S. had the same capital per capita (and per labor hour) in 1970, while by 1993 Germany had accumulated more capital than the U.S. Nevertheless, the capital productivity gap remained unchanged. If diminishing returns had been significant, Germany's capital productivity would have fallen faster than U.S. capital productivity.

Second, Exhibit 9 (redrawn for clarity from Exhibit 7) can be used to estimate the capital productivity that would prevail if Germany had employed the U.S. capital-labor mix (marked by a hollow square). Diminishing returns show up as a *curved* production function, the relation between output and capital, each measured per labor unit. Specifically, the curves are Cobb-Douglas production functions with the 1990 to 1993 average capital shares and total factor productivities. Capital productivity can be measured in Exhibit 9 by the slopes of the dashed lines. German capital productivity at U.S. capital intensity would be 80 percent of U.S. capital productivity, while it is 65 percent at current capital intensity. Thus, approximately 40 percent of the capital productivity gap is due to diminishing returns, while 60 percent is due to lower labor productivity at any level of capital intensity.

Exhibit 9

CAPITAL PRODUCTIVITY, CAPITAL INTENSITY, AND DIMINISHING RETURNS



Note: Production function based on capital's share of 0.36 and 1990-93 average TFP levels

Source: O'Mahony; Fixed Reproducible Tangible Wealth in the U.S.; Germany National Accounts (Reihe S.17); Gross Capital Stock of Private Enterprises (Japan); OECD; McKinsey analysis

APPENDIX: MEASUREMENT

Our aggregate analysis is based on the *market sector* of the economy and excludes government services, health care and education because these are areas in which capital is largely not managed by business and in which output and thus productivity are extremely difficult to measure. We used the sector data in the OECD National Accounts and detailed national data series from each country to build up the market sector in a consistent manner for all three countries. **Box A1** ("Market sector definition") provides a detailed description of this "bottom up" approach.

The *value of output* in the market sector is the value added of all sectors belonging to our market sector definition. Using value added allows the summation of the thousands of different goods and services produced by a country, and eliminates the problem of double counting as intermediate goods and services are used as an input to final goods and services (see the Box "Productivity and the measurement of output" in the preceding chapter for more details).

We then converted value added into *physical units of output* by dividing it by a market sector PPP (**Exhibit A1**). Market sector PPPs are the weighted averages of those industry-specific expenditure PPPs that correspond to our market sector definition. Details are explained in **Box A2** ("Market sector PPPs"). Since this PPP is made up of many sector-specific PPPs, which are in turn based on many sector-specific product comparisons, we are confident that this market sector PPP is statistically reliable.

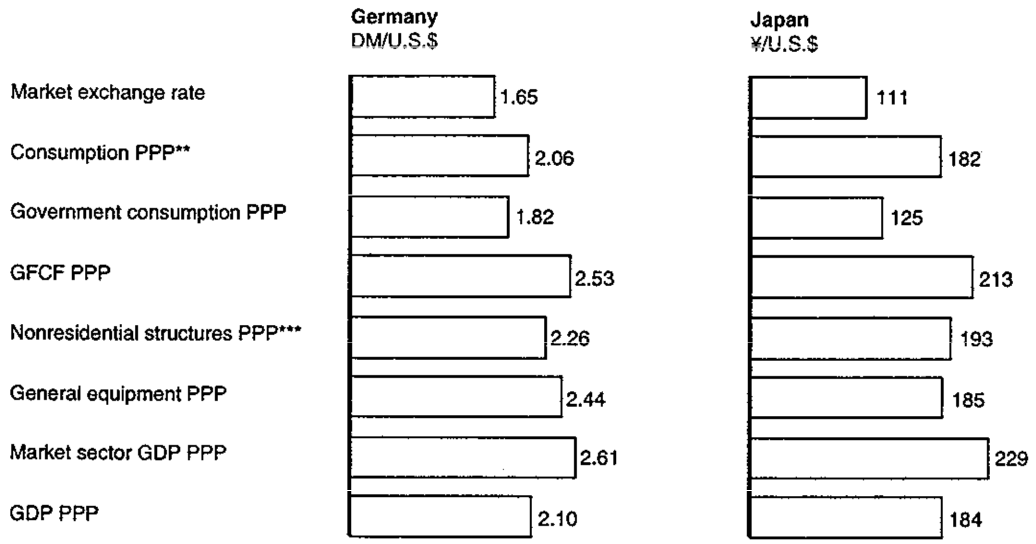
The *capital stock* in the market sector is built up by a long history of investments, while at the same time depreciation continuously diminishes it. Net investments are additions to the capital stock above and beyond replacing those plants and pieces of equipment which no longer provide services. We accumulated historical investment expenditures and subtracted standardized depreciation to make consistent capital stock estimates. See **Box A3** ("Market capital services") for a detailed description of this procedure. The value of the capital stock is converted to physical units by dividing structures by the non-residential structures PPP, and equipment by the general equipment PPP (Exhibit A1).

Exhibit A2 shows the 1970 to 1993 per capita capital stock by type in the market sector of the three countries. Although per capita capital stock grew in all of the countries, it grew much faster in Germany and Japan. The U.S. increased equipment stocks more quickly than structures, whereas Germany and Japan grew their stocks of structures faster. As opposed to national accounting figures, which are not internationally comparable, the standardized measures of physical capital show that Germany had higher levels of per capita capital stock than the U.S. as far back as 1970. This difference in stock levels grew significantly over the past two decades, due entirely to Germany's greater investments in structures.

The situation in Japan changed dramatically over the period, since Japan was at a different stage of development from the U.S. and Germany in 1970. At that time,

Exhibit A1

PURCHASING POWER PARITIES* AND EXCHANGE RATES FOR CONVERSION OF 1993 LOCAL CURRENCIES



* Average of 1990 and 1993 benchmarks

** Excludes all gross fixed capital formation

*** Market sector only

Source: OECD Purchasing Power Parities 1990 and 1993; McKinsey analysis

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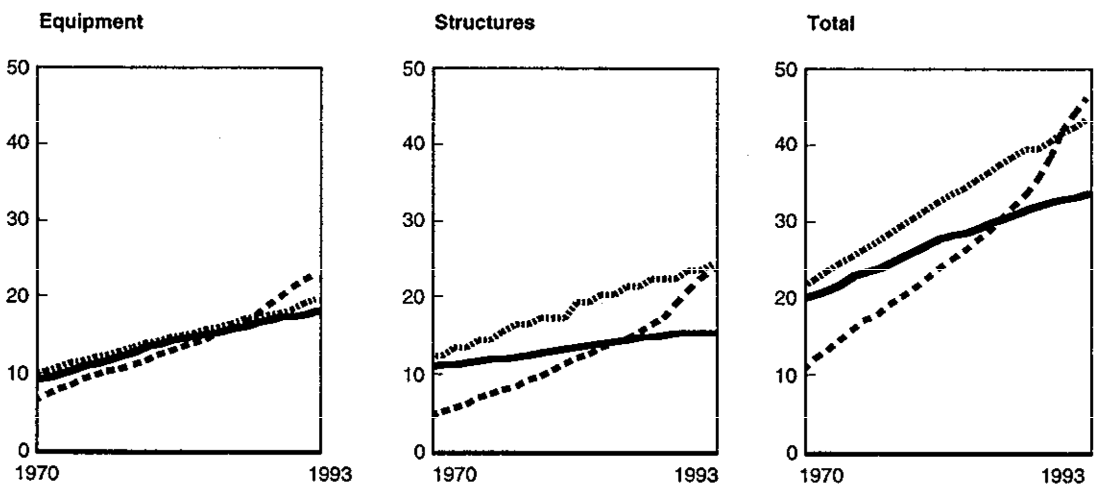
Exhibit A2

MARKET SECTOR CAPITAL STOCK PER CAPITA* 1970-93

1993 U.S.$ Thousands

U.S.
Germany
Japan



* At nonresidential structures and general machinery PPP

Source: O'Mahony; Fixed Reproducible Tangible Wealth in the U.S.; Germany National Accounts (Reihe S.17); Gross Capital Stock of Private Enterprises (Japan); OECD; McKinsey analysis

Japan's per capita amount of structures was less than 40 percent of the U.S. level, and total capital was approximately half. Since then, higher per capita net investment levels in both structures and equipment allowed Japan to surpass the U.S. total level by 1987, reaching 136 percent of the U.S. in 1993.

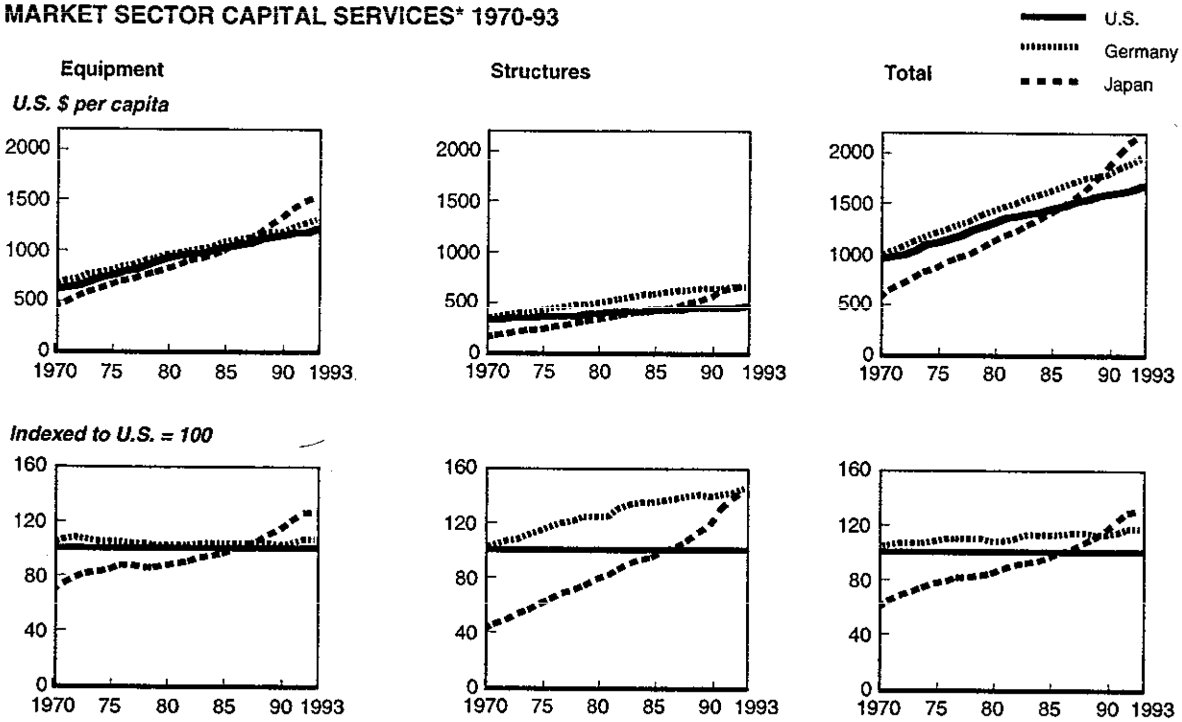
We converted the capital stock to a measure of the *flow of capital services* used in the production process (see Box A3). We applied the same service lives across countries, and assumed that the capital services flows were evenly distributed over the entire life of the capital good. **Exhibit A3** compares capital services per capita by type of capital for the same 23 years considered above. German and U.S. flows of capital services are closer to each other than their capital stocks, while flows are relatively larger in Japan. This is caused by the different composition of the capital stock: Germany has the highest and Japan the lowest share of structures, which have a longer service life and thus a relatively smaller flow of services than equipment.

Average physical capital productivity is then defined as physical output divided by the physical units of capital services used to generate that output (see the Box entitled "Productivity measures" in the previous chapter for a discussion of various measures of productivity). We have called the measure "physical capital productivity" because numerator and denominator are expressed in physical units through the use of purchasing power parity exchange rates. It is average rather than marginal productivity because we divide all output by all capital services.

The capital productivity differences in this chapter are insensitive to whether capital stock or capital services are used. The stock measure has a slightly larger negative impact on Germany's relative productivity level due to Germany's higher proportion of structures and equipment (**Exhibit A4**). We believe that the capital-service based measure is the better measure because it more closely approximates actual capital usage. The differences in capital productivity are also insensitive to whether shorter or longer service lives are assumed, as long as the same service life is used for all three countries.

Exhibit A3

MARKET SECTOR CAPITAL SERVICES* 1970-93



* At nonresidential structures and general machinery PPP

Source: O'Mahony; Fixed Reproducible Tangible Wealth in the U.S.; Germany National Accounts (Reihe S.17); Gross Capital Stock of Private Enterprises (Japan); OECD; McKinsey analysis

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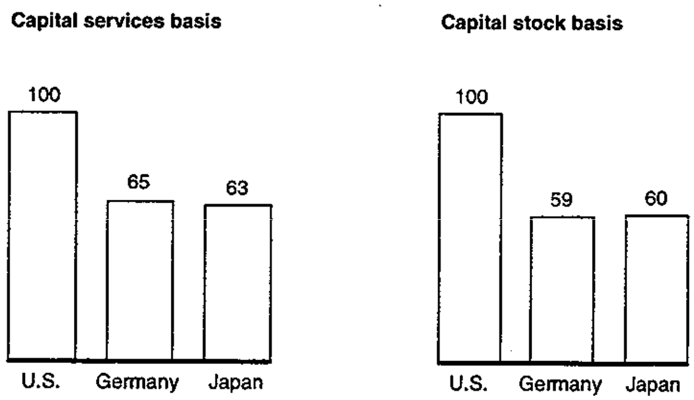
Exhibit A4

MARKET SECTOR CAPITAL PRODUCTIVITY*

Indexed to U.S. (1990-93 average) = 100



* Value added at market sector GDP PPP divided by capital at investment goods PPPs

Source: O'Mahony; Fixed Reproducible Tangible Wealth in the U.S.; Germany National Accounts (Reihe S.17); Gross Capital Stock of Private Enterprises (Japan); OECD; McKinsey analysis

Box A1

MARKET SECTOR DEFINITION

Our measurements of productivity in this chapter are confined to what we call "the market sector" of the economies in our study while the "Objectives and Approach" chapter presented total economy measures. We have excluded certain parts of the economy because the equilibrium prices and quantities (output and inputs) in these industries are not determined by market forces. Moreover, the output of these industries cannot be accurately measured or compared internationally.

In each country we attempted to exclude all of government, education, healthcare and non-profits from both value added and gross capital stocks data. This requires matching the sectoral division across the three countries. We used two criteria. It was of primary importance to exclude exactly the same industries in the two data series within each country. We also wanted to avoid excluding additional industries from the market sector. As a result of meeting these two criteria, some cross-country variation in the definition of the market sector remains.

¶ The Japanese data posed the most difficulties because of differences in industry aggregation of gross capital stocks and value added, where the most detailed breakdown of value added combines several service industries that the other countries do not. Therefore, to avoid excluding important market industries such as social services, personal and business services, and restaurants and hotels, we excluded only government and non-profits from the total economy data. Education and healthcare are predominantly government-provided or non-profits in Japan; therefore the cross-country definitional differences are reasonably small.

¶ The German data, unfortunately, aggregates publishing, culture and recreation with education. However, because these industries constitute a very small fraction of the market sector, excluding them should have only a negligible impact on the aggregate productivity results.

Box A2

MARKET SECTOR PURCHASING POWER PARITIES (PPPs)

As described in the "Purchasing Power Parity" box in the "Objectives and Approach" chapter of this report, we used PPPs to convert value units of output and capital goods into physical units for each country. Due to differences in the two benchmarks, we used the average of the OECD's 1990 and the 1993 results to obtain our 1993 PPPs.

We constructed market sector output purchasing power parities from published OECD PPPs and expenditures employing the following four steps:

¶ First, we applied 1990-93 category-specific national deflators to the 1990 PPPs to obtain one estimate of the 1993 purchasing power parity exchange rates. By averaging this estimate with the 1993 benchmarks reported by the OECD, we obtained our 1993 PPPs.

¶ Second, we excluded the government consumption, education and healthcare categories, as well as government's portion of gross fixed capital formation.

¶ Third, we reweighted and aggregated the remaining PPPs to obtain our "unadjusted" market sector output PPP. The aggregation to an internally consistent set of purchasing power parities is a complicated procedure. There is no unique way to construct an "optimal PPP estimate." For example, the different concepts of index numbers involve different weighting schemes for baskets of goods. By using the different methodologies to calculate PPPs, we can bracket the PPP estimates and obtain their range. In the case of the German/U.S. comparison, the difference between the highest and the lowest market sector output PPP estimate is 5 percent. In the Japan/U.S. comparison, the difference is only 4 percent. (The range of the investment goods PPPs is even smaller. Because the effects on numerator and denominator partially cancel, the overall impact of formula choice on measured productivity is not larger than 3 index points.)

¶ Fourth, we made an adjustment to this market sector output PPP based on the results of our *1992 Service Sector Productivity* report, because some important characteristics of the output of services appeared uncaptured by the OECD's matching process of services and prices (such as quality and convenience to the customer). We believe that the physical measures reported in our *Service Sector Productivity* report are superior to a measure that depends on the accuracy of the OECD PPP. The adjustment factor was determined by how much the case average changed using a *physical* versus a *value added* measure of labor productivity. This adjustment factor raised the German unadjusted market sector PPP by about 5 percent. A similar adjustment was impossible to compute for Japan.

Capital expenditures measured in local currencies were converted into standardized quantities of buildings and machines using the specific non-residential buildings PPP, civil engineering works PPP and general machinery PPP that resulted from the first two steps described above.

Exhibit A1 presents a table of our 1993 PPPs.

Box A3

MARKET SECTOR CAPITAL SERVICES

As described in the "Productivity and the Measurement of Inputs" box in the preceding chapter, the U.S., Germany and Japan all use the perpetual inventory method (PIM) in their national measures of gross capital stocks, but differ in the way it is implemented. These differences, especially differences in the assumed asset lives, have a large impact on comparisons of capital stock levels across countries, and thus, on comparisons of capital productivity if no standardization is done. Researchers have reservations about the accuracy of assumed differences in service lives across countries, and therefore we have measured fixed capital using consistent assumptions.

¶ O'Mahony constructed capital stocks for the entire economies of the U.S., Germany and Japan using the perpetual inventory method, consistent deflators, "sudden death" depreciation schedules with U.S. service lives of assets and similar retirement distributions. Using each country's national gross capital stock data by industry (U.S.: Bureau of Economic Analysis; Germany: Statistisches Bundesamt; Japan: Economic Planning Agency), we split O'Mahony's total gross capital stocks into non-market (government, non-profits, education and healthcare) and market sectors, taking care to correctly allocate capital stocks to the appropriate sector in Japan after the privatization of NTT, Japan Railways and Japan Tobacco. In addition, we extended the gross capital stock series from 1989 through 1992 using the annual growth rates of countries' respective national measures of gross capital stocks. We further disaggregated the data into equipment and structures for each sector.

¶ Finally, we converted all of O'Mahony's data back into local currencies and 1993 constant prices and translated them into physical units by dividing them by market sector, capital-good-specific purchasing power parities. (See the "Market Sector Purchasing Power Parities (PPP)" box for further explanation of PPPs.)

Capital services flows were calculated by dividing the value of each type of capital by the length of its service life.

Productivity in the automotive industry

In the U.S., Japan and Germany, the auto industry is one of the most high profile and important industries, both on its own and as a critical market for other industries such as steel and machine tools. Because of its importance and its increasingly global nature, the auto industry is also a focal point for policy debates on trade and industrial policy. This is exemplified by the debate over deregulation of imports in the EU, continued discussions of potential protective measures in the U.S., and continued international trade pressure on Japan. Further understanding of productivity differences and their underlying causes should help inform this debate by making the operational and external challenges facing each industry clearer. While many business and economic studies have examined the auto industry in these countries before, none, to our knowledge, have focused primarily on cross-country differences in the productivity of capital.

Furthermore, in the overall scope of this project, we wanted to include at least one of the increasingly global manufacturing industries because we believed the case could offer a contrast to other more locally competitive manufacturing and services industries. Because the assembly part of the industry is fairly concentrated in a few companies, this case also allows us to trace the actions of individual companies and the pressures they face in our causality analysis.

This case contributes to our understanding in three different ways:

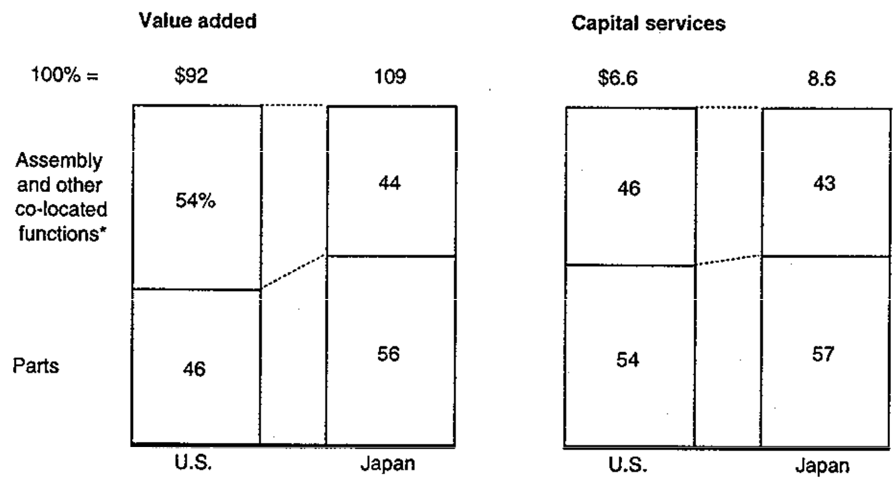
- ¶ At the company level, a key lesson of this case is that "lean production"[1] – a system pioneered by Toyota and now spreading worldwide – has many features that result in higher capital productivity, both by increasing potential output from a set of assets and by increasing effective utilization. Most studies of lean production to date have focused on its positive effects for labor productivity.
- ¶ Looking at potential trade-offs between capital and labor, such as increased automation, we find that superior overall organization of production can benefit both labor and capital productivity. Producers in all three countries have at some point over-automated and hurt overall productivity.
- ¶ At the industry level, we examine why an innovation (lean production) that occurred in one place (in Japan, mainly at Toyota) is spreading globally at different speeds. We find that the competitive environment

1 The term "lean production" was coined by the research team at MIT's International Motor Vehicle Program

Exhibit 1

BREAKDOWN OF AUTO INDUSTRY 1993

U.S.$ Billions, percent



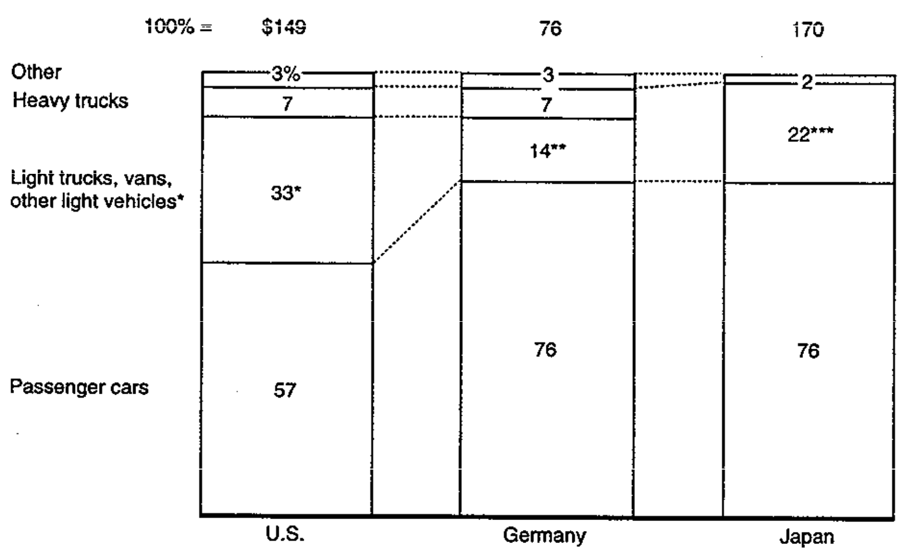
* Includes all establishments classified as primarily producing final vehicles and car bodies; if such plants have on-site stamping or other facilities which are not actually assembly, these are included here

Source: Census of Manufactures (Japan, U.S.)

Exhibit 2

FINAL VEHICLE PRODUCTION MIX BY COUNTRY 1992

U.S.$ Billions, percent of factory shipment value



* Light trucks in U.S. are trucks under 10,000 lbs. and are often used as substitutes for passenger cars

** For Germany this is composed of stationwagons and minivans (11% of total) and trucks under 4 tons (3% of total)

*** For Japan no split of heavy and light trucks is available, but most trucks are small

Source: Census of Manufactures (each country) in the product market is the primary cause of the diffusion of best practice, and that differential pressure helps explain why German producers on average trail those in the U.S. and Japan. Corporate governors and investors failed to recognize and apply sufficient pressure to correct a serious operational disadvantage in both the U.S. and Germany before product market pressures precipitated financial crisis.

INDUSTRY BACKGROUND

In this case we look at the whole auto industry, which includes both parts manufacturing and assembly of cars and trucks (and, for Germany and Japan, also motorcycles). As a share of value added and capital, parts and assembly are each around half of the industry in the U.S. and Japan (**Exhibit 1**). Such a breakdown of parts and assembly is not available for Germany. Most of the final output of the industry is cars, but light trucks (including minivans and sport-utility vehicles) play an important role in the U.S. especially (**Exhibit 2**). We have been unable to separate out heavy truck operations. However, they are a small part of the total, and thus we focus in our causal analysis on companies producing cars and light trucks and their associated parts.

The manufacture of an automobile starts with product development of the vehicle and its parts, and then production is split between original equipment manufacturers (OEMs) and parts makers. There are only a few OEMs in each country, while parts-making tends to be much more fragmented with literally thousands of companies involved. **Exhibit 3** shows the concentration of final production in each market. Some OEMs also make the majority of their own parts, while others outsource. For example, GM manufactures around 60 percent of the content of each final vehicle in-house, while Chrysler and most Japanese producers make 30 percent or less in-house.

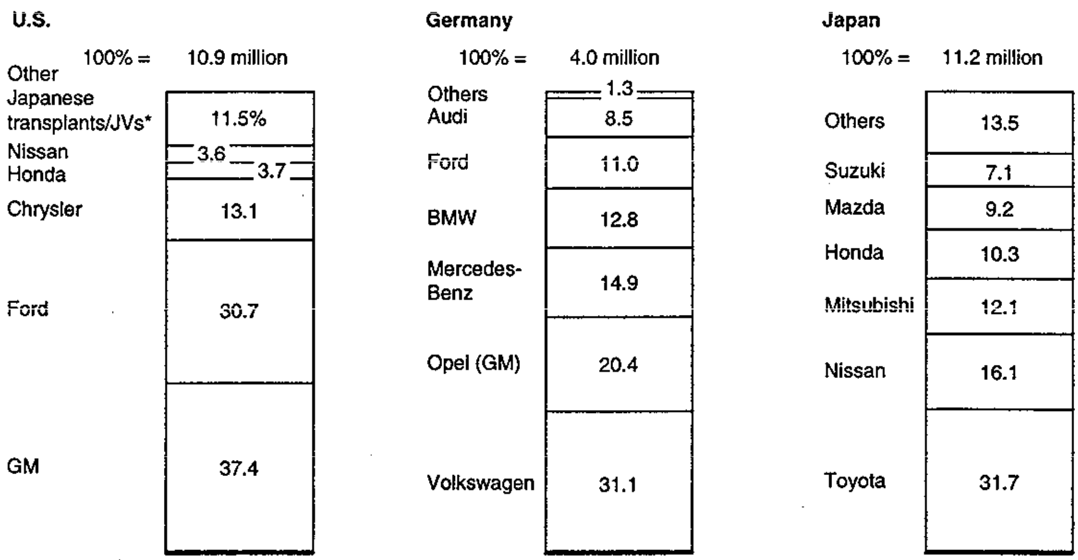
The auto industry is one of the most global, as producers from the three countries compete with each other in home and export markets with varying levels of intensity. About half of Japan's and Germany's production is exported, while just under 10 percent is for the U.S. (largely to Canada). In addition, as Exhibit 3 shows, nearly 20 percent of production in the U.S. is by recently established Japanese transplants, and over 30 percent of production in Germany is by American-owned Opel (GM) and Ford. Thus, our national average productivity measures include both locally and foreign-owned plants. This is especially important for the U.S., where transplants have raised U.S. average productivity by importing many practices directly from Japan.

Accounting for 20 to 30 percent of factor costs overall, capital is an important factor of production, although labor is a higher percentage of total costs. Of the capital stock used, about 70 percent is equipment and tooling and 30 percent structures. On a flow basis, after adjusting for the longer service life of structures, almost 90 percent of capital services is equipment and tooling. As

Exhibit 3

SHARES OF VEHICLE PRODUCTION BY COUNTRY 1993

Percent of unit output



* These are Japanese transplants and Japanese joint ventures with GM, Ford, or Chrysler

Source: *Ward's Automotive Yearbook*, 1994

Exhibit 4

CAPITAL/LABOR MIX IN ASSEMBLY PLANTS

TYPICAL ASSEMBLY PLANT

	Stamping	**Welding**	**Painting**	**Final assembly, testing**
Labor	• Small portion	• Small portion	• Small portion	• Most of labor is here
Capital	• Massive presses • Dies replaced with each model or platform	• Robots critical (best practice with 95% or more automation)	• Huge robotic system	• Typically little automation (5-10% of total steps)
Share of up-front plant equipment cost	40%*	20%	30%	10%
	Already highly automated processes in plants of these 3 advanced countries			More freedom here to automate, but at high cost per labor saved

* This 40% assumes about 20% for dies and 20% for presses

Source: McKinsey Automotive Practice

mentioned above, for the U.S. and Japan, about half of capital is in parts plants and half in assembly plants. However, this is somewhat misleading because final assembly itself is not very capital intensive, but other steps often performed alongside assembly do require substantial capital. Within a typical assembly plant, there are four easily distinguishable steps: stamping of major body panels and parts from sheet metal, welding pieces together in the "body shop," painting, and final assembly.[2] Most of the capital is in the first three stages, especially stamping, and a high level of automation is common in all three countries we consider (**Exhibit 4**). Among parts plants, those with transfer lines to make large components for engines and gear boxes are heavily capital intensive as well.

PRODUCTIVITY PERFORMANCE

We measure capital productivity in this case as standardized value added per standardized unit of capital services. Our results show the U.S. and Japan to be equally productive and Germany trailing by 35 percent.

Measurement

The "Methodology" box on the next page details the major steps and adjustments we made to measure productivity in a comparable way across countries.

The wide variety of vehicles and parts produced makes it impossible to use a physical measure of output such as number of vehicles. Therefore, we have measured industry output as value added converted at a car-specific purchasing power parity exchange rate (PPP) that removes pure price differences across the markets. This PPP also roughly adjusts for output mix differences by valuing cars from larger size classes as more output than smaller cars. Finally, this PPP adjusts for average differences in output quality traceable to actual production differences based on price premiums consumers are willing to pay for different cars (**Exhibit 5**).

For capital, we have constructed standardized capital bases for each country based on historic flows of expenditures on new structures and equipment. When dividing output by capital to get productivity, we also make a cyclical adjustment to approximate what productivity would be if each country's auto market was mid-cycle.

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2 The degree to which all four of the steps are present in assembly plants varies by country and company. For example, locating stamping either next to or in assembly plants is most common in Japan and Japanese transplants in the U.S., is somewhat less common in Europe, and is least common in the Big Three domestic U.S. producers. Therefore, for the U.S., we capture some of stamping in what we call assembly and some in parts.

METHODOLOGY

Industry coverage

We have matched the industry definitions as closely as possible to include parts and assembly. For the U.S. we use SIC 371 (motor vehicles and equipment) plus SIC 3465 (automotive stampings) for the whole industry, and SIC 3714 (motor vehicle parts and accessories) plus SIC 3465 for parts only. For Japan, we use SIC 311 for the whole industry, and SIC 3113 for parts only. For Germany, we have had to use all of SYPRO 33 (Street vehicles and repair services), which includes some non-motorized vehicles and auto repair shops; we estimate the potential effect of this inconsistency to be small. Each country also treats motorcycles, diesel engines, pistons, carburetors, and car seats slightly differently, but these are small (in most case less than 2 percent of value added).

Output

We have standardized to the U.S. Census definition of value added, which is essentially product shipment value minus raw material and energy costs only. For Japan we had to add back depreciation. For Germany we had to add back purchased services. Value added figures were converted to 1993 real values using each country's producer price index for autos.

Capital services

We have constructed capital stocks from national data as the sum of 12 years of expenditures on new equipment and tooling, and 31 years of expenditures on new structures. Land costs and rent are not included. These service lives are approximately those used in the U.S. Capital services is the stock divided by the respective service life. Because of different treatment of auxiliary (i.e., non-manufacturing) establishments, we can only make direct bilateral comparisons between U.S./Germany and U.S./Japan. In the U.S./Germany comparison, we added in capital at auxiliaries to the U.S. data because this is already included in the German data. For all three countries, we have calculated an adjustment for cyclical fluctuations in utilization each year using actual utilization relative to trend utilization. All capital figures were converted to 1993 real values using each country's gross fixed capital formation price index.

Purchasing power parities

For output we calculated our own PPP for cars and applied it to total output (since most output is cars, and light trucks compete for many of the same consumers as cars, we consider this a reasonable approximation). For each country, we calculate average price from Census data on product shipments; this unit value ratio is then adjusted for different mixes of products (See **Exhibit 5**). Finally, we made an overall quality adjustment (See **Exhibit 5**). For capital, we use the OECD PPPs for structures and for machinery and equipment, with a slight adjustment to account for estimated reductions in equipment prices paid by German auto producers since 1990. We recognize that relying on general PPPs is a weakness, but were unable to construct an auto-specific capital goods PPP.

Labor and hours

We use the number of production and non-production workers from the same sources as value added and capital. In the U.S./Germany comparison, we add in labor in auxiliary establishments to the U.S. numbers. For hours, we apply the industry average hours, which for the U.S. and Germany means assuming non-production and production workers work the same hours.

Exhibit 5

ADJUSTMENTS IN CONSTRUCTING CAR OUTPUT PPP

1990 benchmark

Each country's production classified and weighted by mix

Car class	Example	Assigned value weight
A	Fiat Panda	5
B	Ford Fiesta	7
C	VW Jetta	10
D	Honda Accord	15
E	All Mercedes	30

	Resulting mix adjustment U.S. 1990 = 100
US	100
Germany	92
Japan	78

Quality difference inferred for each country

- Quality defined as customer value derived from tangible features and reliability resulting from differences in the production process, rather than simply brand image
- U.S./Japan and Germany/Japan compared using Delphi-style interviews with McKinsey auto experts and observations of price premia
- Extrapolated 1990-93 using J.D. Power initial quality surveys

	Quality index* 1987	1990-93
US	100	100
Germany	110	103
Japan	112	108

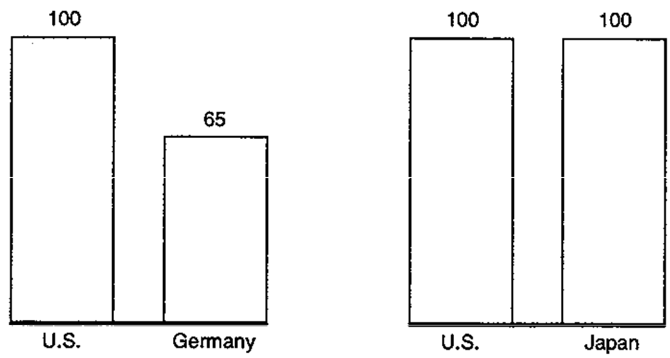
* Higher quality index indicates higher quality

Source: Value weights and classification of U.S. and Japanese cars by McKinsey Automotive Practice; American Automobile Manufactures' Association; *Ward's Automotive Yearbook, 1994*; J.D. Power; McKinsey analysis

Exhibit 6

CAPITAL PRODUCTIVITY – AUTO*

Indexed to U.S. (1991-93 average) = 100



* Bilateral comparisons made because data limitations precluded direct comparability between Japan and Germany

Source: U.S. Census of Manufactures, Annual Survey of Manufactures; Japan Census of Manufactures; Germany National Accounts (Fachserie 18, Reihe S.18), Census of Manufactures (Fachserie 4); McKinsey analysis

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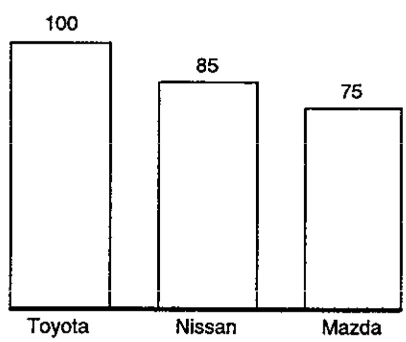
Exhibit 7

FIRM-LEVEL CAPITAL PRODUCTIVITY* – JAPAN 1987

Indexed to Toyota = 100



* While not exactly the same as our methodology at the economy level, Lieberman, Lau and Williams calculated firm-level capital productivity as value added per unit of capital stock using public company data. Capital stock was derived using capital expenditure flows and an econometric depreciation schedule

Source: Lieberman, Lau and Williams, "Firm-level Productivity and Management Influence: A Comparison of U.S. and Japanese Automobile Producers," 1990

We have also measured labor and total factor productivity in order to understand any trade-offs being made with capital. Labor productivity is measured as value added per hour worked. Total factor productivity benchmarks the same output relative to the combination of labor and capital inputs.

The source for the majority of the data is national statistics available in the Census of Manufactures and, in Germany's case, national accounts. We have made significant adjustments to this data to assure comparability across the three countries. In doing so, we were able to match U.S. and German data and U.S. and Japanese data bilaterally, but were not able to directly compare German and Japanese data.

Results

Our results show the automotive industries in Japan and the U.S. to be equally capital productive, while the German industry trails both by about 35 percent (**Exhibit 6**). It is important to understand that our measures are national averages and that there is wide variation between firms within a country. **Exhibit 7** and **Exhibit 8**, derived from previous academic work by Lieberman, Lau and Williams (1990), show a sample of the variation within Japan and within the U.S. for 1987 (note that these company-level results should not be compared across countries because no PPPs were applied). U.S. average capital productivity clearly suffered because the largest producer, GM, had relatively low productivity while Japan's average was helped because its largest producer, Toyota, had relatively high productivity.

To better understand the most recent capital productivity comparison, we have also calculated a time series for capital productivity from 1987 to 1993. As **Exhibit 9** shows, Japan's and Germany's productivities have fallen relatively over the period, while U.S. productivity has caught up with Japan.

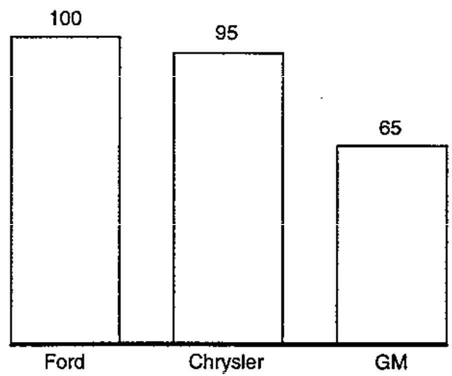
In addition, we have measured capital productivity separately for the assembly and parts industries in the U.S. and Japan (this was not possible for Germany). As **Exhibit 10** shows, Japan's parts industry is about 20 percent more productive than that of the U.S., while the U.S. assembly industry is about 15 percent more productive than that of Japan. Time series for these disaggregated measures show that the Japanese were more productive on both parts and assembly in the late 1980s.

In terms of labor productivity, the Japanese industry maintains a 20 percent lead over the U.S., while the German industry trails the U.S. industry by about 25 percent. This demonstrates that the lower capital productivity of Germany is not offset by higher labor productivity. Combining our measures of labor and capital, the Japanese industry leads on total factor productivity (TFP) by 20 percent over the U.S., and Germany trails the U.S. by 30 percent (**Exhibit 11**).

Exhibit 8

FIRM-LEVEL CAPITAL PRODUCTIVITY* – U.S. 1987

Indexed to Ford = 100



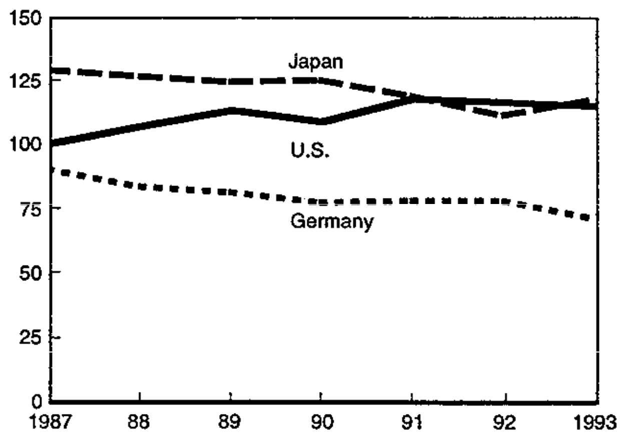
* While not exactly the same as our methodology at the economy level, Lieberman, Lau and Williams calculated firm-level capital productivity as value added per unit of capital stock using public company data. Capital stock was derived using capital expenditure flows and an econometric depreciation schedule

Source: Lieberman, Lau and Williams, "Firm-level Productivity and Management Influence: A Comparison of U.S. and Japanese Automobile Producers," 1990

Exhibit 9

TRENDS IN CAPITAL PRODUCTIVITY 1987-93, CYCLICALLY ADJUSTED* – AUTO

Indexed to U.S. (1987) = 100



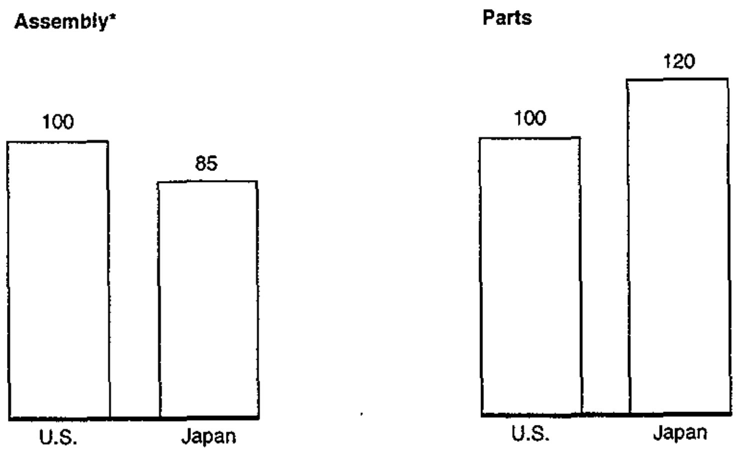
* Capital for each country adjusted each year by the percent deviation of that year's utilization from average trend utilization

Source: U.S. Census of Manufactures, Annual Survey of Manufactures; Japan Census of Manufactures; Germany National Accounts (Fachserie 18, Reihe S.18), Census of Manufactures (Fachserie 4); McKinsey analysis

Exhibit 10

CAPITAL PRODUCTIVITY IN ASSEMBLY AND PARTS

Indexed to U.S. (1991-93 average) = 100



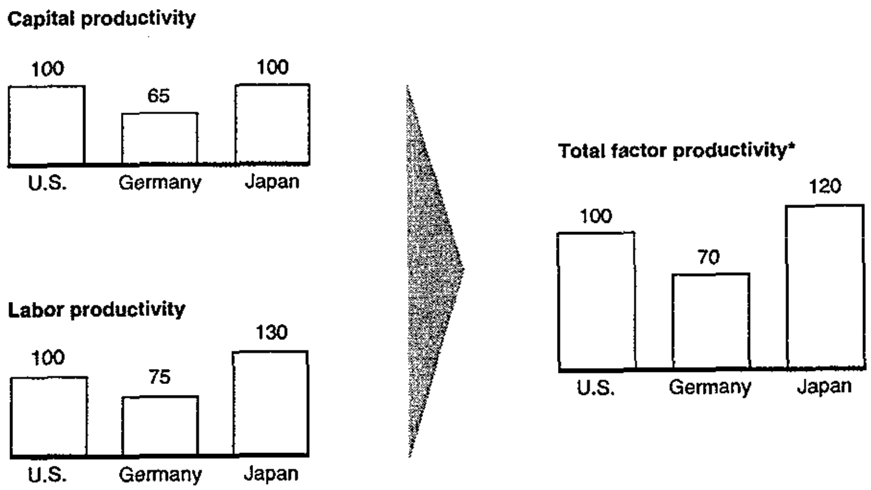
* As before, this also includes other functions which are co-located with final assembly

Source: U.S. Census of Manufactures, Annual Survey of Manufactures; Japan Census of Manufactures; McKinsey analysis

Exhibit 11

CAPITAL, LABOR, AND TOTAL FACTOR PRODUCTIVITY – AUTO

Indexed to U.S. (1991-93 average) = 100



* Assumes Cobb-Douglas production function such that $TFP=Y/(K^{0.30} \cdot L^{0.70})$ where weights based on approximate shares of value added

Source: U.S. Census of Manufactures, Annual Survey of Manufactures; Japan Census of Manufactures; Germany National Accounts (Fachserie 18, Reihe S.18), Census of Manufactures (Fachserie 4); McKinsey analysis

Exhibit 12

SUMMARY OF CAUSALITY ANALYSIS – AUTO

● Important in explaining capital productivity differences

○ Secondary in explaining capital productivity differences

x Not important

		U.S.-Germany	U.S.-Japan	Combined
IV. External factors affecting industry dynamics	**Macroeconomic environment**	x	○	○
	Product market factors			
	• Demand factors	x	x	x
	• Competition laws/enforcement	x	x	x
	• Monopoly regulation	x	x	x
	• Regulation/market interference	●	●	●
	Labor market factors			
	• Skills	x	x	x
	• Demographics	x	●	●
	• Rules/unionism	○	x	○
	Capital market factors			
	• Sources of funding/market for corporate control	x	x	x
	• Ownership/governance mechanisms	x	x	x
	Upstream and downstream market factors	x	x	x
III. Industry dynamics	**Product market**	●	●	●
	Labor market	○	●	●
	Capital market			
	• Alignment of goals with productivity	○	○	○
	• Ongoing improvement pressure	x	x	x
	• Forcing of exit	x	x	x
II. Managerial decisions	**Marketing**			
	• Product/product line management	x	x	x
	• Promotion/ demand stimulation/ pricing	x	x	x
	• Channel/ format selection	x	x	x
	Industry chain management	●	●	●
	Production technique			
	• Capital/labor mix • Technology	○	●	●
	• Scale	x	x	x
	Capital expenditure decision making			
	• Planning	x	x	x
	• Asset choice	○	○	○
	Operations effectiveness	●	●	●
I. Components of differences in productivity	**Capacity created with assets**	○	●	●
	Capacity utilization	●	●	●

Source: McKinsey analysis

CAUSES OF DIFFERENCES IN CAPITAL PRODUCTIVITY

The near equality of the U.S. and Japan in capital productivity and the lag of the German industry are best understood with a two-part explanation. First, considering the pre-1990 results, we believe the higher capital productivity of the Japanese producers is attributable to underlying advantages of the lean system of production most of them use. These production methods have been more widely adopted in the U.S., especially by Japanese transplants and Ford, than in Germany. Germany also suffers an important utilization disadvantage from shorter plant operating hours. The critical production advantages appear to be in the flexible and efficient organization of the production process, the manufacturability of products, and the close relationship between OEMs and suppliers. These factors are not mutually exclusive and jointly result in better use of capital. For example, the product development process relies on OEM-supplier cooperation, and one important result is the superior manufacturability of the products.

The second part of the explanation focuses on why the U.S. has caught up to Japan's capital productivity, and why the lag of the German industry persists. Here, we believe investment in automation (some of it mistaken, in retrospect), conversion to more "people-friendly" plants, and overinvestment in capacity in Japan hurt its capital productivity growth. At the same time, producers in the U.S., including Japanese transplants, were reaping benefits from adopting more of the practices that gave the Japanese industry its initial productivity advantage. The German industry, however, continued to lag in adopting these practices.

At a higher level of causality, we believe the more rapid adoption of these practices in the U.S. is in large part attributable to greater competitive pressures. Meanwhile, the Japanese producers' push for a more capital-intensive process came from the fear of increasing scarcity of labor for factory work, especially during the "bubble" years of the late 1980s.

We will now examine more systematically the relative importance of a variety of potential causal factors, focusing first on the different managerial actions and second on how differing external environments can help explain these managerial actions. **Exhibit 12** summarizes our view of the relative importance of different factors for each level of causality.

Components of differences in capital productivity

The most obvious way to begin to understand the differences in capital productivity is to compare capacity and utilization. However, simply comparing published capacity utilization rates is unhelpful because underlying assumptions in this measure differ by country and company. These utilization rates are mainly good for measuring cyclicality in one country over time, and we control for this in our measures with a cyclical adjustment factor. Conceptually, however, we can consistently define the capacity created from a set of assets as the output a plant would produce in a year if the machines ran 100 percent of the

Exhibit 13

PLANT OPERATING HOURS

ESTIMATE

	Days	X	Number of shifts	X	Hours per shifts	=	Plant hours per year
Japan	240-280		Uniformly 2		8-10		3,800-5,600
U.S.	Mostly 240		2-3*		8-10**		3,800-5,000
Germany	240 or less		Mostly 2		8***		Mostly 3,500-4,000

* 3 shifts common in stamping, for example, but must use at least part of shift time for maintenance, etc.

** Some plants run 2 x 10 hour shifts, 6 days per week, with 3 crews; others run 2 shifts with overtime or 3 full shifts

*** German workers also tend to have more frequent breaks during their shifts

Source: McKinsey Automotive Practice; *The Harbour Report*; The Institute for Labor and Technology (Germany) time, day and night, at the throughput rate chosen at that plant. An additional factor which affects the underlying capacity is the ratio of real output to gross production; that is, if a plant produces higher quality products (which we measure as more real output given the quality adjustment in our output PPP) or fewer defective products which must be reworked or discarded, then the capacity for net output per installed assets is higher. Capacity utilization is simply the percent of total available hours that machines actually do run.

¶ *Utilization*. We find that the most important advantages of Japan and also the U.S., as compared to Germany, are longer plant operating hours and greater machine uptime, both of which result in higher utilization. Plants in Germany are typically planned to run shorter five-day, two-shift operations, even in capital-intensive areas such as engine plants. Japanese producers clearly have the flexibility to run more days per year and more overtime. While this flexibility is being used less now due to slower demand, 2 hours of planned overtime on each of two 8-hour daily shifts was common at least until the early 1990s. In the U.S., although straight two-shift operations are the norm in final assembly, the Big Three producers do frequently run extended two-shift or three-shift operations in critical capital-intensive areas such as stamping, where utilization matters most. While comprehensive data is not available, **Exhibit 13** shows different plant schedules and how longer hours are made possible in the U.S. and Japan.

Japan also has an advantage in uptime over both the U.S. and Germany due to fewer and shorter unplanned line stoppages and quicker changeovers between products. Although uptime may vary by functional area, rough estimates by industry experts suggest that Japanese producers can achieve about 95 percent uptime, as compared to 90 percent or less for U.S. producers and 75 percent for a German producer.

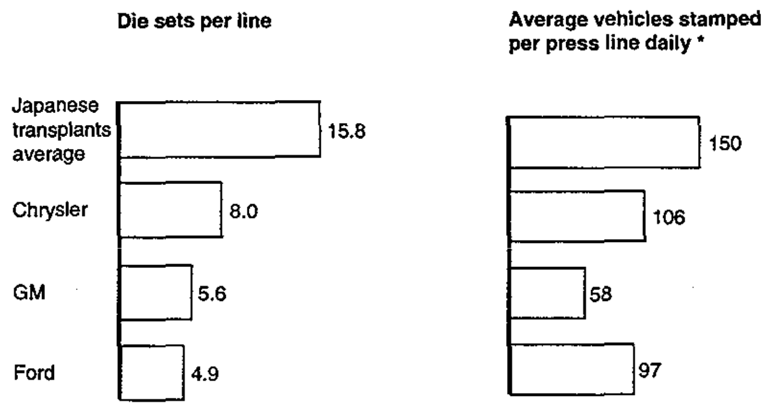
All together, while difficult to quantify, lower utilization probably accounts for 20 to 30 points of the German productivity lag. Japan's utilization advantage over the U.S. is probably in the 10 to 20 percent range.

¶ *Capacity created with assets*. Somewhat less important Japanese advantages are the avoidance of goldplating (as compared to Germany) and greater net output potential due to less rework (as compared to both the U.S. and Germany). However, the substantial increase of automation and other capital over 1987 to 1993 in Japan significantly raised the capital used per unit of capacity. Because this offset the other Japanese advantages over the U.S., resulting in equal productivities, this factor is very important. Lower capacity created with assets in Germany accounts for the remainder of its productivity lag (i.e., 5 to 15 points).

Exhibit 14

STAMPING PRESS PRODUCTIVITY INDICATORS – NORTH AMERICAN PLANTS

1993-94 average



* The Harbour Report cautions that this measure is not adjusted for level of vertical integration into parts stamping; therefore GM, in particular, is probably unduly penalized in the measure

Source: *The Harbour Report* 1994, 1995

The other determinant of capacity created is machine run speed. This is not an important explanatory factor, however, because run speeds differ less across countries and, if anything, are slower in Japanese plants (to assure a more stable flow).

Managerial decisions causing operational differences

The next step in our causal analysis is to examine the managerial practices which contribute to these differences in utilization and capacity. The most important practices explaining productivity differences are operations effectiveness (including the organization of production and design for manufacturability), the degree of healthy cooperation between OEMs and suppliers, and, because it offset some of Japan's advantage, choice of capital/labor mix.

¶ *Operations effectiveness.* The most critical factor in explaining the initial productivity advantage of Japanese producers over the U.S., and the advantage of both the U.S. and Japan over German producers, is the organization of tasks in the production process. On average, Japanese producers set up faster during changeovers, stop machines for less time to do repairs and fix other process problems, and devote less machine time to rework of defects.

- *Rapid changeovers.* Short changeover times result in greater capital flexibility and uptime. In stamping operations, for instance, Japanese transplants in the U.S. need 5 to 20 minutes to change a die (the contoured molds that form sheet metal into body parts), whereas the American-owned plants need several hours.[3] As **Exhibit 14** shows, Japanese transplant producers in the U.S. have more sets of dies per stamping press, and yet they still produce more vehicles per line in a given amount of time. In concrete terms, this means they can have fewer presses (a very expensive capital item) for a given number of different parts to produce, and keep the machines running more of the time. Quicker model changeovers (e.g., at the end of a model year) also mean fewer days for the plant to be shut down for re-tooling. For example, Honda's plant in Ohio is especially proud of its ability to change to a new model without ever stopping the final assembly line.

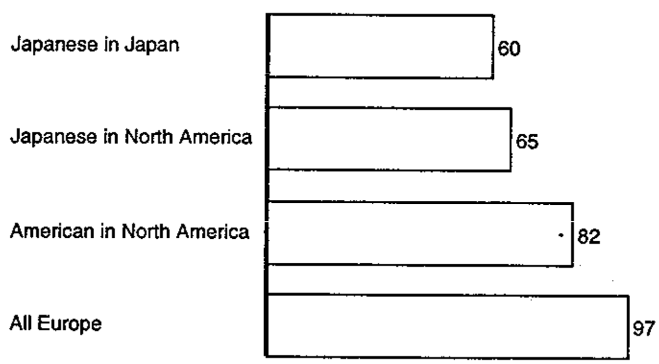
- *Shorter, fewer line stoppages.* Most Japanese plants and the best American plants achieve greater uptime by avoiding long repair and other unplanned stoppages. Although workers have more flexibility to stop the line to fix any problem they spot (each may have a pull cord, while in more traditional U.S. or German plants only a supervisor can stop the line), over time this actually means the line is stopped less because all the faults are worked out early on. Another

[3] Changeover times estimated in *The Harbour Report 1995*

Exhibit 15

DEFECT RATES BY COUNTRY OF PRODUCTION 1989

Assembly defects per 100 vehicles



Source: Womack, et al., *The Machine that Changed the World*, J.D. Power data critical explanation for better uptime performance is superior preventive maintenance. Machines go down less, and when they do go down, line workers themselves are often able to make quick repairs without waiting for a maintenance specialist. In contrast, more specialized job classifications in Germany and, to a lesser extent, in the U.S., average line workers are not allowed to do this and must wait for a maintenance specialist.

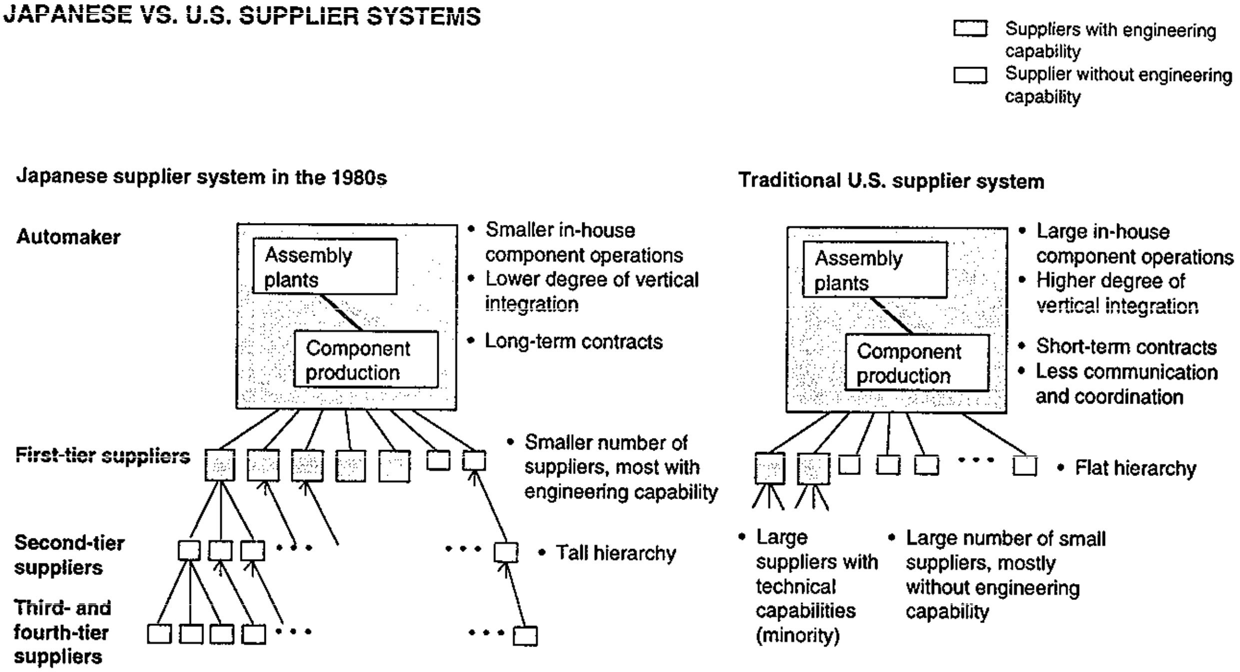
- *Less rework.* Higher yields of usable parts or vehicles mean less capital (and less labor) time must be devoted to rework. With parts, defects must be quickly identified and the problem corrected at its source. This means fewer and smaller lots must be redone. As **Exhibit 15** shows, Japanese producers tend to have lower defect rates than do U.S. or European producers. Redoing production lots reduces the effective capacity of a plant, since the first run was time wasted. In the case of defective finished vehicles, many American and German plants have large rework areas, whereas Japanese on average do not. That means less investment in plant space and tools for rework, and the labor saving is probably even greater.

To understand better how Japanese producers can achieve these results, we must look to the fundamental principles governing their operations. In order to prevent wastage and reveal quickly any faults in the production process, fewer inventory buffers are permitted between stages. A parallel feature is that production lots tend to be much smaller, so that production can be more closely tuned to demand from the next production stage (and ultimately the final customer). All this leaves little margin for error, so teams of production workers are given much of the responsibility to work out problems and continuously provide improvement suggestions (at the best producers, workers provide literally hundreds of thousands of such ideas per year). In contrast, especially in Germany, workers tend to be much more specialized and their work more compartmentalized, so they have less perspective on how to improve the overall process.

Another important practice is designing products for manufacturability (DFM) before they reach the production line. The leading Japanese producers concentrate on designing parts that require fewer steps to produce and on designing vehicles that require fewer parts and are easier to assemble. All of this enhances the stability of the production process, so workers need not stop the line as much. Fewer steps per vehicle also means more output is possible from a given set of machines. Exhibit 14 shown earlier on stamping productivity reflects this better DFM by the Japanese transplants. For example, Honda designs body panels so that they require at most four stamping hits to form, whereas American or German producers typically use more than five hits.

Exhibit 16

JAPANESE VS. U.S. SUPPLIER SYSTEMS



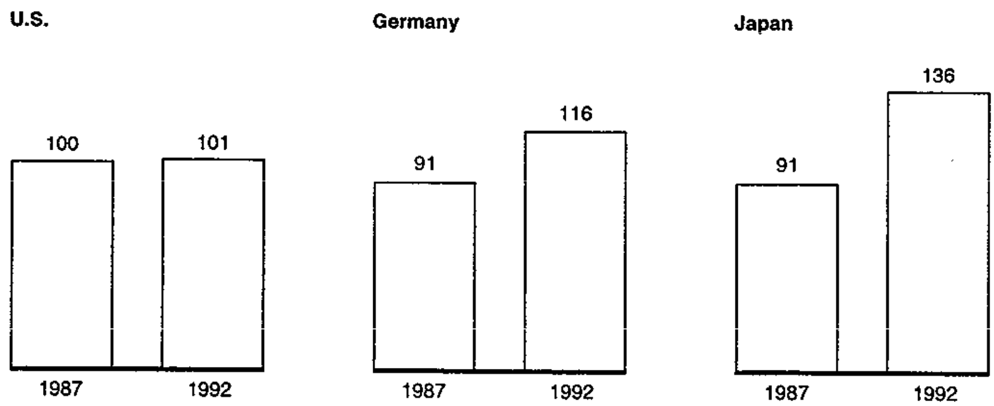
Note: This diagram is illustrative only. The size and number of suppliers in the diagram do not reflect actual data. Only 1 assembler is assumed in each case

Source: Clark and Fujimoto, *Product Development Performance*, 1991

Exhibit 17

CAPITAL INTENSITY IN AUTO PRODUCTION

Capital services per labor hour,* indexed to U.S. (1987) = 100



* Adjusted to take out cyclical fluctuations in utilization

Source: U.S. Census of Manufactures, Annual Survey of Manufactures; Japan Census of Manufactures; Germany National Accounts (Fachserie 18, Reihe S.18), Census of Manufactures (Fachserie 4); McKinsey analysis

¶ *Industry chain management.* The type of cooperative relationship common between OEMs and parts suppliers in Japan is another critical differentiator which helps explain their operational superiority. This relationship means that the practices discussed above are rapidly pushed down to the supplier base, and that OEMs can count on fewer defective parts reaching their assembly lines and causing stoppages or wastage. As shown above, the parts industry in Japan still retains a significant capital productivity lead over the U.S. supply base, even as the assembly industry in the U.S. has caught up. **Exhibit 16** compares Japan's OEM-supplier system to that in the U.S. There are several key aspects of this relationship which affect capital productivity.

- *Differences in sharing of information and responsibilities.* Japanese OEMs tend to maintain longer-term relationships with their suppliers and consolidate most of their volume for each major parts system in one or two suppliers. As part of longer-term and sometimes exclusive relationships, Japanese OEMs provide consulting-style services to their suppliers on implementing the productivity-enhancing production techniques they themselves use. Large suppliers will, in turn, help their smaller second-tier suppliers. OEMs also share more product design responsibility with their leading suppliers and ask them to come up with the most efficient designs. Joint product development results in parts that fit together better when completed, which is essential to DFM. Lastly, instead of overstating expected volume needs in order to build in a safety buffer, as is more common in the U.S., OEMs are more willing to share accurate volume forecasts with their suppliers, allowing them to manage their capacity better.

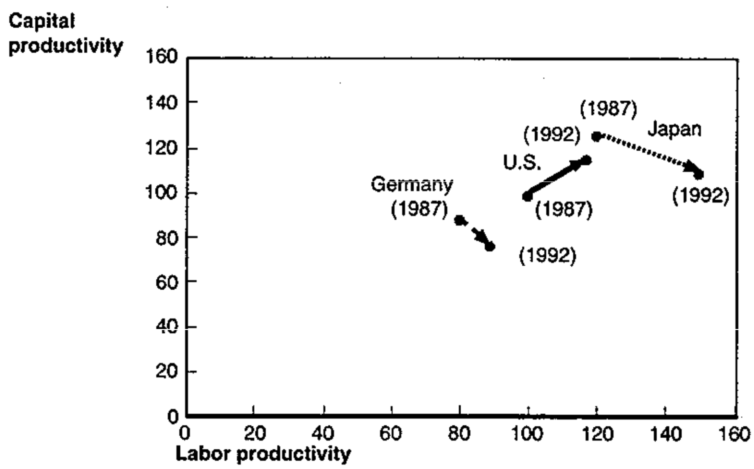
- *Differences in pricing system.* Using a technique called value engineering, the supplier and OEM work together to break down costs at each stage of production and determine the most efficient production method. Then an initial price is set with an adequate profit margin and a schedule of price declines based on minimum expected productivity improvements. The rewards of additional productivity improvement are shared fairly between OEM and supplier. Thus, the system maintains the pressure to improve. In contrast, traditional pricing systems in Europe and the U.S. have been more transaction-oriented. Also, OEMs in Europe and the U.S. tend to be more vertically integrated, and in-house suppliers may not always have adequate improvement incentives if the procurement process is biased in their favor.

¶ *Capital/labor mix and technology.* Unusually heavy investment in automation and other features over 1987 to 1993 is an important factor explaining Japan's relative fall in capital productivity. As **Exhibit 17** shows, capital intensity in 1987 was similar for all three countries, but over 1987 to 1992, it increased by almost 50 percent for Japan.

Exhibit 18

CAPITAL VS. LABOR PRODUCTIVITY 1987 AND 1992* – TOTAL INDUSTRY

Indexed to U.S. (1987) = 100



Estimated TFP growth**
1987-92

U.S.	17%
Germany	2%
Japan	14%

* 1992 used instead of 1993 because cyclical adjustments are minimal in 1992, so results are more robust

** Assumes Cobb-Douglas production function such that $TFP=Y/(K^{0.30} \cdot L^{0.70})$ where weights based on approximate shares of value added

Note: Capital is adjusted for average utilization, but labor is not adjusted because it can vary more over cycles

Source: U.S. Census of Manufactures, Annual Survey of Manufactures; Japan Census of Manufactures; Germany National Accounts (Fachserie 18, Reihe S.18), Census of Manufactures (Fachserie 4); McKinsey analysis

Exhibit 18 shows that over the same period, Japan's capital productivity fell, labor productivity grew, and TFP grew, but by a bit less than for the U.S. Had producers in Japan not increased capital intensity so dramatically, we believe they would have at least maintained and likely improved on their 1987 capital productivity and had faster TFP growth.

There were two related management actions that led to the increasing capital intensity. First, producers increased the level of automation. For example, in the late 1980s when Toyota built a new line at its Tahara plant to build the Lexus, it loaded it with a level of automation unprecedented for Toyota. However, over-investment in automation may have been detrimental to overall TFP as well as capital productivity. Toyota has publicly stated that it now believes too much emphasis was put on automation and that many tasks should be transferred back to labor's hands, allowing workers to improve the process over time and to conduct their own simple maintenance. In addition to increasing automation, Japanese producers spent capital to make plants more attractive for workers in other ways. Fearing a growing shortage of labor for heavy factory work, increasing attention was paid to sound dampening, air conditioning, and easing the load of lifting tasks. Around 1990, both Nissan and Toyota invested in plants on the southern Japanese island of Kyushu specifically because labor was more abundant there.

Some European producers, including Volkswagen and Fiat, also attempted over the 1980s to substantially increase levels of automation to reduce the need for high-cost labor, with mixed results for overall efficiency. Capital intensity also increased in Germany over the period examined (again, Exhibit 17), and this probably accounts for part of the fall in their capital productivity.

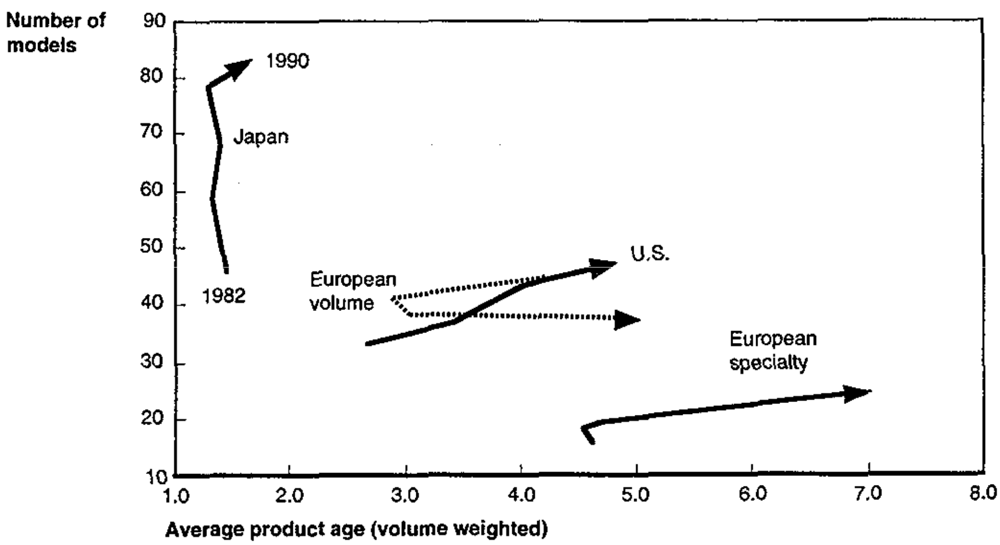
Earlier attempts to dramatically increase automation at GM in the U.S. clearly had hurt its capital productivity and TFP. From the early 1980s until about 1987, also in an attempt to save on costly labor, GM undertook a massive investment campaign to upgrade and build new facilities with the latest technology available. However, the results were often disastrous, with plants unable to operate consistently due to equipment failures and lack of worker training. Many purchased robots were never even installed. After 1987, GM backed away from this investment drive. Over 1987 to 1992 capital intensity actually stayed roughly constant in the U.S. (again, Exhibit 17).

¶ *Factors of secondary importance as differentiators*

- *Asset choice*. We believe different decisions about which specific assets to put in place have had some differentiating effect. First, in Germany, there has been some tendency toward "goldplating" or overengineering in choice of machines. That is, producers were

Exhibit 19

PRODUCT STRATEGIES FOR PASSENGER CARS 1982-90



Source: International Motor Vehicle Program; McKinsey analysis paying extra to acquire machines with higher levels of precision than necessary given their designated production tasks. German producers have recently begun paying more attention to the cost implications of these buying practices, but our measure of capital includes historic expenditures.

A second way in which different asset choice decisions help explain productivity differences is that Japanese producers tend to use simpler machines where possible, and tailor the machines to meet but not exceed their needs. Using multiple simple machines instead of one complex one probably helps them keep the machines running more of the time, and allows more maintenance to be performed by line workers. Honda and Toyota have divisions which make many of their own machines (such as welding robots) and tailor them to their specific production process and products.

¶ *Factors not important as differentiators*

- *Product line.* Because each country's producers have had at best mixed success in managing their product lines for asset productivity, we believe this is not one of the important sources of differences.

In Japan, a streamlined product development process has enabled OEMs to introduce new models much faster (mainly in their home market) than their counterparts in Europe and the U.S. (**Exhibit 19**). On the positive side, shorter lived, fresher products tend to have more consistent sales over their lives. This should result in better utilization of a model's production line. On the negative side, however, rapid introductions means much less volume over which to amortize the tooling and other capital specific to a model (although some of this volume penalty is offset by the use of lighter, cheaper dies). Greater model variety at any one time also requires more changeovers during production, which hurts utilization. While some producers (e.g., Honda) appear to balance these trade-offs very well, other Japanese producers have erred on the side of excess proliferation. In the last few years (mostly after our period of analysis), these producers have begun focusing more on using common parts across molds and resisting shortening product cycles further.

In the U.S., there has been wide variation in product line success and its implications for productivity. For example, under GM's "GM-10" program in the 1980s, four variants of the same family-size car platform were to be produced in four different plants (corresponding to the four GM nameplates), each with duplicate copies of much of the equipment. Introduced late and lower in quality than competitors' models, the cars failed to sell well and plants were underutilized, directly lowering capital productivity. On the other hand, the U.S. Big Three have improved product development since

Exhibit 20

COMPETITIVE DYNAMICS – AUTO

	U.S.	Germany	Japan
Structure	• High historic concentration of Big 3 • Reduced concentration with transplants	• Moderate concentration	• Low concentration
Competitive behavior	• Pre-1980 less competitive leader-follower behavior on prices, designs • Post-1980 increased import and transplant exposure with high competition especially on price	• Less exposure to import competition • Less price, more features competition • Greater segment specialization by producers	• Strong present and past domestic and export competition • Rapid product cycles
	Increasingly high exposure to global competition in most segments	Mostly European-based competition until very recently	Strong historic domestic competition and foreign competition in export markets

Source: McKinsey analysis

then. For example, since about 1989 when it started work on the new LH cars, Chrysler has instituted Japanese-style product teams (called "platform teams") focusing on DFM and maximum re-use of manufacturing equipment across models.

In Germany, while model variety is not nearly as wide as in Japan, producers do offer an extremely high degree of customization on features. Consumers can mix and match features, and cars are produced to order. However, since German producers have not introduced the more flexible organization of production described above, this variety comes at a high cost in terms of ease of assembly and therefore productivity.

- *Scale.* In the assembly industry, a plant scale of about 200,000 to 250,000 units per year is considered critical to achieve scale benefits. Most plants in these three countries do achieve such scale and so it is not a differentiating factor. For automotive parts, minimum efficient scale is achieved at varying volumes, some higher than for assembly (e.g., an automatic transmission or an engine plant is most efficient with a scale of 400,000 to 500,000). In any event, there are more large plants in the U.S. and Europe than in Japan, so this does not explain our observed differences.

Industry dynamics

Now we will discuss the industry environment in which all of the above practices have evolved. We believe differing degrees of product market pressure and differing trends in the labor market are the most important factors explaining the divergent managerial behaviors described above. Capital market effects are secondary to these.

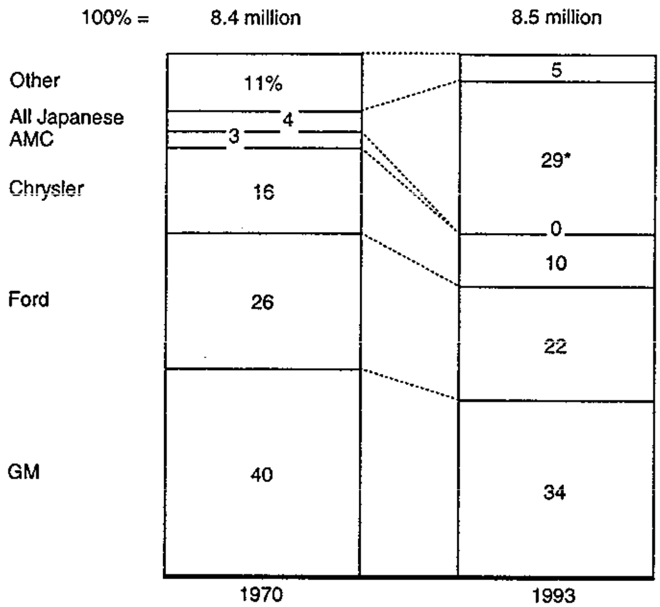
¶ *Product market.* **Exhibit 20** summarizes our views on the nature and intensity of the competition. In general, this industry has high natural barriers to entry (because of the scale required), and exit is generally uncommon for OEMs. As a result, the force of competition can take many years to cause industry change, even if not artificially restrained. That helps explain why the U.S. could lag behind Japan, and Germany behind both countries for years after fundamental innovations occurred in Japan. Changing capital productivity, especially, takes years because of capital's long life.

Because the fundamental innovations leading to higher productivity occurred in Japan (largely at Toyota), producers there have been exposed to the innovations directly for the longest. Intense competition over decades in a rapidly evolving market forced managers to adopt best practices or to be deserted by their customers for better and cheaper products. The 11 domestic producers in Japan compete especially on new product development and differentiation and also on

Exhibit 21

EVOLUTION OF U.S. CAR SALE MARKET SHARES BY BRAND

Percent of unit car sales



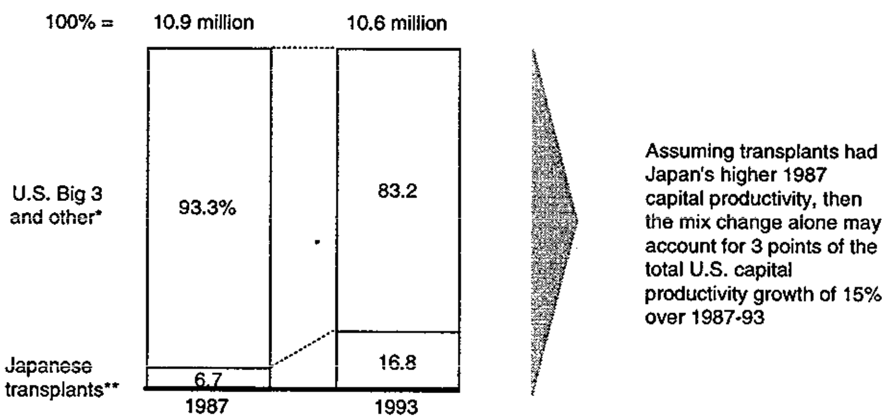
* Includes 15% sales of Japanese brands from transplants, 14% Japanese imports

Source: *World Motor Vehicle Data; Ward's Automotive Yearbook*

Exhibit 22

GROWTH OF JAPANESE TRANSPLANTS IN U.S.

Percent of unit vehicle production



* Other includes U.S. heavy truck manufacturers

** Includes joint ventures between Japanese and Big 3

Source: *Ward's Automotive Yearbook*, McKinsey analysis price. In addition to their mostly Japanese home market competition, producers face foreign competition for nearly half of their output, which they export (almost half of which goes to the U.S.).

Since the 1970s, the U.S. market was transformed from low competitive intensity by four producers (Chrysler later acquired AMC) to a much more competitive marketplace in the late 1980s which includes substantial Japanese-owned transplants and Japanese-run joint ventures producing inside the U.S. (**Exhibit 21**). Competition has become more focused on price than in either of the other two markets, forcing managers to improve the cost efficiency of their operations or lose money. Product range also plays an increasingly important role as Japanese imports and transplants have forced the three domestic OEMs to upgrade their model ranges. A very direct effect on productivity is that the transplants themselves raised U.S. aggregate productivity levels. With some simple assumptions, we estimate that the pure mix effect of increasing transplant share in U.S. production could account for about 3 percentage points of the U.S. capital productivity growth of 15 percent over 1987 to 1993 (**Exhibit 22**).

In contrast, competition in Germany has traditionally been more segmented by product type and focused less on price than on product differentiation. German automakers and many of their European competitors have had similar cost structures and imports have been restricted (as described below), so price wars have generally been avoided. We believe this has resulted in more muted pressure to improve productivity. German producers have felt price pressure in their exports to the U.S., but have been able to maintain higher prices at home. Our calculated car output PPP of about 2 marks per U.S. dollar (in 1993) demonstrates that factory-gate prices in Germany were more than 20 percent above U.S. prices when valued at prevailing market exchange rates. Prices for foreign cars, including Japanese, are also higher in Germany as producers take advantage of the price umbrella. In contrast to the U.S., there are no Japanese transplants in Germany. Transplants have arrived more slowly in Europe and have concentrated in lower-cost Britain and Spain.

¶ *Labor market*. In Japan, concern over a growing scarcity of labor in the late 1980s drove managers to automate and build more comfortable factories. Because this explains the relative fall in Japan's productivity, it is an important factor. Due to demographic and macroeconomic trends mentioned in the next section, Japanese automakers were finding it difficult to attract new workers, and turnover rates for recent hires increased significantly. While the industry slowdown since 1990 has reduced the immediate shortage of labor, industry participants are still predicting this factor will be important in the future (the industry resumed net new hiring only earlier this year).

In Germany, a history of bargaining between the strong metalworkers' union and companies has resulted in a set of rules which makes it difficult for managers to improve productivity. First, the push for shorter working hours in Germany has put a high premium on overtime, making longer hours or a third shift more costly (in most cases prohibitively) to run. While shorter plant hours may be the result of a justifiable lifestyle choice, they do reduce utilization and capital productivity. Second, work rules and specialized job categories create obstacles to establishing more flexible production practices. These obstacles are, however, being slowly removed as product market pressure on producers mounts. For this reason, we consider the product market differences described above to be more important in explaining the German productivity lag.

Similar difficulties have also existed in the U.S., but under competitive pressure early in the 1980s, Ford (and more recently Chrysler) was able to establish a better working relationship with the United Auto Workers. Moreover, the transplants are mostly non-union shops. Parts makers are often non-union shops as well. Higher productivity is not necessarily inconsistent with unionism itself as NUMMI (a successful GM-Toyota joint venture to produce small cars) and Ford demonstrate, but restrictive work practices and job classifications are an impediment.

¶ *Capital market*

- *Alignment of goals with productivity.* We believe differences in the alignment of goals have been secondary as a causal factor, but contributed to the earlier U.S. lag and the German lag. Because of distortions in the product market, managers could seek profit goals by means other than productivity improvement, at least in the short run.

  After U.S. producers suffered losses in the early 1980s, trade protection from Japanese imports and a cyclical upturn helped restore profits. This seemed to satisfy managers and, at least to some extent, their shareholders that the crisis was over. Little in the way of operational improvements were made at Chrysler or GM until later, despite more warnings.[4] At all three U.S. domestic producers, top managers put priority on diversification into financial services and technology businesses partly as a way to make their financial results less volatile. These acquisitions would have little or no effect on their underlying productivity in auto production but diverted management's attention.

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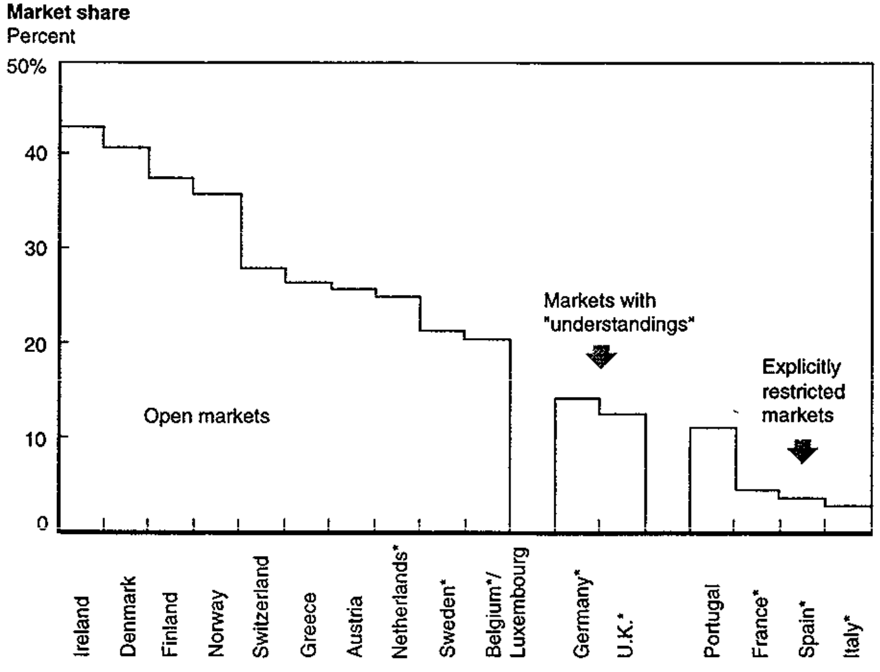
4 For example, at GM, warnings of a serious productivity disadvantage came from internal research as well as GM managers working at a joint venture with Toyota (NUMMI). Ingrassia and White (1994) provide numerous examples of failure to heed such warnings. GM did embark on its huge investment drive to increase automation in its production process, but this turned out not to be the answer to their problems.

Exhibit 23

JAPANESE CAR SALES SHARES IN EUROPE 1993



* Nations with significant production capability

Source: AID; McKinsey analysis

In Germany, leading producers also failed to fundamentally change despite losing share in the face of Japanese competition in the U.S. market. Arguably, the price umbrella of a less price competitive German market, the booming European car market in the second half of the 1980s, and the short-term demand boost starting in 1989 after German reunification allowed German producers to be unconcerned with lower productivity.

Japanese managers were focused much more on operational improvement over the entire period. This is embodied in the principle of "continuous improvement," for example.

- *Availability of funds for investment*. In general, companies in all three countries have been able to fund investment programs unless product market competition pushed them into financial crisis, so this factor is not a primary differentiator. However, from a historical perspective, a limited supply of capital before the 1970s at some Japanese producers encouraged managers to find ways to economize on capital. This was particularly true early on when their scale of production was small. It was in this environment that producers strove to make smaller lots of body parts from a single stamping press by developing quicker changeover procedures, for example. With smaller capital budgets, they did not have the option to buy numerous presses and dedicate them to particular models, as was and is more common in the other countries.

  By the late 1980s, the situation in Japan had reversed. Some auto companies raised large amounts of capital at effectively cheap rates by using convertible or warrant bonds. Investors were willing to accept low rates of interest because they expected to convert to equity as the stock market boomed. At the same time, the companies were cash rich due to a sales boom. With plenty of capital flowing in at a perceived low cost at the same time as labor was becoming more scarce, the trade-off between capital and labor clearly changed. Producers could afford to make the heavy investments described above which lowered capital productivity.

External constraints affecting industry dynamics

The most important differentiating external factors have been trade regulation, which muted pressures to improve productivity particularly in Germany, and demographic trends in the Japanese labor market, which drove managers to heavily invest in automation and plant comforts.

¶ *Regulations*. Trade regulations in both the U.S. and Germany have shielded producers from pressure to improve productivity. However, by the later 1980s, pressure to improve in the U.S. was high compared to Germany. Therefore, these regulations are an important explanation for the lower competitive pressure in Germany.

Two forms of direct protection have been most important in the U.S. A 25 percent tariff on 2-door light trucks does give U.S. producers relief in a fast growing segment of the market. More important in the early 1980s was the voluntary restraint agreement (VRA) establishing a quota on the number of car imports from Japan. However, in part to get around the VRA, Japanese producers made huge investments in U.S. production facilities over the 1980s and 1990s. Few restrictions on local content allowed them to set up assembly operations and import components, but hundreds of Japanese parts producers have also followed them to the U.S. By the late 1980s the VRA was no longer binding as imports had declined in favor of transplant production. Some of the transplants also make light trucks, muting the effect of the 25 percent light truck tariff. Thus, by the late 1980s, the U.S. market had little effective restraints on competition in the product market.

In the EU, a series of regulations continue to provide important barriers to non-European products reaching Germany. The two most important regulations have been an EU car import tariff of 10 percent, and a VRA limiting Japanese imports to Europe as a whole. In addition, industry experts believe Germany (and some other countries) have conditioned a generally supportive attitude toward trade restraints on Japanese imports in this industry.[5] A more specific EU regulation is the one which allows auto producers to require retail dealers to be exclusive;[6] this practice, which is illegal in the U.S., slows entry of new foreign players. All of this has resulted in lower competitive pressure in Germany. **Exhibit 23** shows Japanese market shares in the Western European countries, and demonstrates much higher shares in the countries with no nationally important auto industry.

¶ *Labor market factors*. The increasing scarcity of labor in Japan discussed in the previous section resulted in large part from important demographic trends. Due to rising incomes and changing lifestyle preferences, as well as an aging population and increased female participation in the workforce, the number of people willing and able to perform heavy tasks in auto plants has not kept up with demand. The economic boom of the late 1980s exacerbated this labor scarcity because many industries were simultaneously seeking more workers.

In Germany, the historical importance of unions and collective bargaining helps explain the success of the metalworkers' union in maintaining the restrictive work contracts discussed in the last section.

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5 While this kind of implicit "understanding" is important for Germany, it is not as restrictive as direct market share quotas have been in France or Italy, for example.

6 In fact, the EU has granted the auto industry a specific exemption from competition law on this point.

¶ *Factors of secondary importance as differentiators*

- *Macroeconomic environment.* In Japan, the demand boom of the bubble period led to rapid growth in auto sales over 1987 to 1990, but ended in 3 years of decline from 1990 to 1993. While we have made a cyclical adjustment to our productivity data, this was more than the usual cyclical slowdown (which in Japan before 1990 usually meant slowed growth, not an absolute decline), and certainly has hurt Japanese utilization of capacity. Producers who had been investing heavily were suddenly caught when expected market growth did not materialize.

  The macroeconomic boom also contributed to the increasing scarcity of labor and to the relative abundance of capital, as discussed above.

¶ *Factors not important as differentiators*

- *Capital markets and corporate governance mechanisms.* In both the U.S. and Germany, we saw little evidence that outside shareholders and other capital providers have done much to enforce change until product market competition puts companies into crisis. However, we do recognize that our ability to measure the impact of outside pressure (including the potential threat of takeover for smaller players, at least), is limited. Once crisis occurs, it appears both systems do force restructuring, eventually. In the U.S., external shareholders reacted strongly only to extreme signs of financial distress. For example, the GM board removed CEO Robert Stempel in 1992 only after GM had squandered market share and spent tens of billions of dollars on poorly used automated production lines. It is estimated by Stern Stewart that GM destroyed $16 billion in market value added over 1983 to 1992.[7] The same source estimates that Chrysler destroyed close to $1 billion and Ford $6 billion over this period.

  In Germany, most producers did not start making fundamental changes until after a serious market downturn in 1993. The German "insider system" of finance with long-term shareholders and corporate boards including labor representatives seems to have failed to impress upon managers the need to change sooner. A more patient attitude and greater focus on stability of labor relations probably reduced the pressure on managers to change underlying practices.

  We do observe a greater focus on operational improvement by managers in Japan, and this may well be encouraged by owners or

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7 Market value added is defined as market value of equity and debt minus book value. These data come from the *1994 Stern Stewart Performance 1000* data set.

bankers. However, we believe the most important difference has been the long history of intense competition between players.

- *Other regulations and standards*. There are many other regulations covering this industry such as those on safety, fuel efficiency, and emissions. However, these rules have converged across the three countries in terms of degree of burden (if not in terms of identical performance specifications) and therefore do not explain differences in productivity.

After assessing the relative importance of each of these external factors, we also tried to evaluate the extent to which they actually prevent managers from making improvements. Most of the factors affect managers only indirectly, through market pressures. Trade regulations, for example, only temper the pressure to improve, but do not actually restrict actions of local managers. The only constraint in auto which could be considered binding is German labor agreements that reduce flexibility and work hours in German plants. While precise measurement is not possible due to data constraints, we estimate that shorter running hours could account for up to 20 points of the 35 point German productivity lag. It is debatable, however, whether these labor arrangements really are external and uncontrollable by managers. As companies increasingly have seen the competitive need to change, agreements have been renegotiated to allow more overtime or extra shifts. Thus, at least in the longer-term, labor agreements allowing more flexibility seem to be possible. Other factors that account for the remaining gap, such as operational effectiveness and industry chain management are clearly under the control of managers. As a result, we estimate that at a minimum 15 points to as much as all 35 points of the current productivity gap could be closed by German managers.

OUTLOOK AND IMPLICATIONS

Outlook

A striking pattern has emerged as competition in the auto industry continues to globalize and pressure to adopt best practice increases. Change has been dramatic, but only after it is forced by severe competitive pressures. This is not difficult to understand. Since the major markets of Europe, North America and Japan are fairly mature, improvements in productivity which affect both capital and labor will undoubtedly result in large layoffs. New demand in these mature markets will not be sufficient to pick up the slack; hence, the resistance to change.

The U.S. was the first market to reach a crisis point in the early 1980s. As already discussed, only Ford underwent fundamental change at that time, but after a second crisis in the late 1980s and early 1990s, Chrysler and GM began their changes in earnest. By now, Chrysler's turnaround has been remarkable. New model launches of the LH cars, Neon, and Jeep Cherokee have all been highly successful, and all were designed to be easier to manufacture. Looking forward, the U.S. industry needs to stay on course for further improvement and redouble efforts particularly in parts operations.

In Germany, the crisis did not come until 1993. The end to the demand surge from re-unification with the former East Germany and to the boom in the European auto market as a whole meant 1993 was one of the worst ever downturns for the auto market. At the same time, the appreciating mark increasingly made German producers' cost structures uncompetitive in trade. Since that time, restructuring has been significant, but still has a long way to go. Volkswagen, in particular, is still on the edge of trouble – 1995 net profits were only 0.4 percent of sales, following operating losses during each of the preceding 6 years.[8] Meanwhile more Japanese transplant capacity is opening in Britain and elsewhere, and the EU's VRA on imports is scheduled to disappear, at least if political pressure does not reverse this course. In short, the pattern is looking more and more like the U.S. of the 1980s. It is still an open question whether important changes in Germany are coming quickly enough to stave off further acute industry crises.

In Japan, unheard-of negative growth in the auto market occurred from 1991 to 1994. In addition, the dramatic appreciation of the yen has hurt the profitability of exports. All producers have suffered, but particularly Mazda, Nissan and some of the smaller players. Nissan announced Japan's first ever auto plant closure and few people expect any new plants in Japan. An open question is what long-term effects such market changes will have on the high productivity production system. With more pressure to squeeze suppliers and the possibility of layoffs, the long term, stable relationships producers have counted on could be endangered. However, talk of Japanese decline in this industry has been overstated. Companies have cut costs and are coming back strongly after these setbacks. All the OEMs except Mazda saw good profit recovery in 1995.

Implications

¶ *Implications for corporations.* A number of lessons emerge from this case:

- Auto companies can be "lean" in their use of capital as well as labor and, in fact, many of the organizational and process improvements that improve productivity of labor are the same for capital because they increase effective capacity and uptime. Longer operating hours where possible in the capital intensive production steps, avoidance of "goldplating," and increased attention to use and re-use of equipment across models are all factors which will further help capital productivity on its own. Variation across and within countries on these practices is still wide, so many companies have a long way to go.

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8 Operating loss data for 1989-94 obtained from Standard and Poor's Global Vantage database; 1995 results from press announcements.

- As most participants in this industry have probably observed by now, investment in automation is not on its own the answer to a productivity problem (whether capital or labor). It must be employed carefully within the context of a workforce that is well trained to accept it and a production process that is well organized. Automating existing inefficiencies only perpetuates them.

- Particularly in a complex manufacturing industry, linkages between marketing and product development, the supply chain, and manufacturing require an integrated approach to increase overall productivity. Focusing solely on assembly plant productivity, for example, will not solve broader productivity problems.

¶ *Implications for policymakers.* The dilemma facing policymakers is how to encourage best practices to spread without causing widespread dislocation. Fortunately, capital productivity improvements will free up more of future investment funds for alternative uses, which is unambiguously good. Yet we have seen that most high productivity practices affect more than just capital, and that labor productivity should increase at the same time. That is also unambiguously good in the long term, but large layoffs can have difficult short-term repercussions. Governments can encourage rapid redeployment of workers within the economy through flexible labor market policies and removal of any barriers to growth in other industries, but a detailed analysis of these policies is not within the scope of this case.[9] What we can say is that freer product market competition appears to be the most important mechanism for encouraging the spread of best practices. Therefore, more open policies on trade and direct investment should hasten productivity improvement and create a stronger industry for the future.

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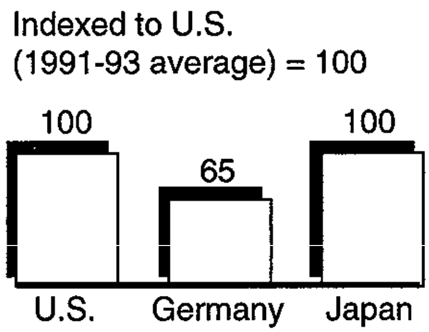
[9] A more complete discussion of policies affecting employment levels in this and other industries can be found in McKinsey Global Institute, *Employment Performance*, 1994.

AUTO CASE STUDY SUMMARY



Equal productivity in the U.S. and Japan belies very different underlying industry trends. Heavy investment, some of it in unnecessary automation, has offset an earlier advantage for Japan. The U.S. has caught up by adopting Japanese-style "lean production," while Germany continues to lag.

More flexible organization of the shop floor and better cooperation between suppliers and OEMs give Japan an underlying advantage over the U.S. and especially Germany. The practices – embodied in "lean production" – allow companies to run plants with faster changeovers between products, more up-time and less rework of defects, all of which mean producers get more out of their fixed capital and, as previous Global Institute work has shown, also out of their labor. German firms in particular have been slow to adopt lean production, so their productivity suffers.

Very heavy investment in Japan, which in many cases later proved unnecessary, has offset some of its underlying capital productivity advantage. In 1987, Japan's industry had a 25 percent capital productivity advantage over the U.S. industry. By 1993, however, extremely heavy investment had offset some of the underlying advantage as Japanese capital productivity fell. From 1987 to 1993, while U.S. producers invested only $50 billion and German producers $53 billion, Japanese producers invested $72 billion in structures and equipment, which was about 50% more investment per worker than the U.S. The heavy investment in Japan, some of which clearly turned out to be excessive, went toward increased automation, more comfortable factories, and added capacity.

Adoption of lean production in the U.S., helped close the gap between the U.S. and Japan, and widen the gap between the U.S. and Germany. In the U.S., the process of improvement began a decade earlier when Japanese imports and the growth of Japanese transplants forced U.S. automakers to completely rethink how they design and build cars. Furthermore, the growth of transplants itself contributed to overall U.S. productivity improvement. In contrast, protected by VRAs and other trade barriers, the Germany industry did not feel extreme competitive pressure until 1993. As a result, producers in Germany have not felt the same need to make the same strides toward lean production.

Productivity in the processed food industry

The food processing industry is one of the largest in the economy for all three countries. It accounted for factory shipments of over $300 billion in the U.S. and around $100 billion in Germany and Japan in 1992, placing it among the largest categories of personal consumption expenditure outside of rent and health care. The industry also represents the largest share of employment in the manufacturing sector, with 1.8 million workers in the U.S., 500,000 in Germany, and 1.1 million in Japan.[1] Its size alone, therefore, underscores its importance to any productivity comparison.

The processed food case is also interesting for reasons more specific to capital productivity. We know from previous MGI work that Japan, for example, has very low labor productivity in food processing. Given the significant differences in industry structure and capital intensity across the countries, this makes a good test case to determine the impacts of scale and level of automation on capital versus labor productivity. In addition, the food and retail cases cover both ends of the distribution system and together give an integrated perspective of the whole value chain.

This case contributes several findings to the capital productivity discussion.

- The case highlights the importance of capacity utilization as a major driver of productivity differences between the countries.
- Unlike its impact in the auto industry, the just-in-time system hurts rather than helps capital productivity in food processing. Its application by Japanese manufacturers requires them to plan capacity in substantial excess of average demand to accommodate peaks.
- Capital-labor trade-offs do not explain capital productivity differences between the countries, since relative ranking of the three countries on both capital and labor productivity is identical. Within a country, however, we do see trade-offs in productivity of one factor for the other.
- The product and capital markets function jointly to pressure managers to improve productivity and to drive inefficient players out of the market.

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1 These are underestimates because employment figures exclude establishments with less than 20 employees in Germany and less than 4 employees in the U.S.

Exhibit 1

PROCESSED FOOD INDUSTRY

Percent of total processed food value added 1992

Processed food

	Meat	Dairy	Bakery cakes	Seafood	Milling	Sugar
U.S.	17%	13	13	3	3	2
Germany	13	10	18	3	11	6
Japan	8	8	18	15	3	2

	Preserved fruits and vegetables	Confec-tionery	Pasta/ noodles	Fats and oils	Seasonings	Other
U.S.	16%	7	1	3	3	19
Germany	6	17	–	5	–	11
Japan	2	7	5	3	2	27

Source: U.S. and Japan Census of Manufactures; German Census of Manufactures (Fachserie 4); McKinsey analysis

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Exhibit 2

FOOD PRODUCTION PROCESS

DAIRY INDUSTRY EXAMPLE

	Raw agricultural product receiving	**Processing**	**Filling, packaging, and palletizing**	**Logistics and distribution**
Milk production example	• Raw milk received in tankers • Milk cooled and pumped into short-term holding tanks	• Milk fat separated out • Milk homogenized and pasteurized • Processed milk stored in surge tanks	• Filling machine draws from surge tanks and fills into various container sizes (gallon, liter, etc.) • Milk cartons grouped, stacked and sent to cold storage room	• Milk loaded from cold storage on to delivery trucks • Milk delivered to distribution centers and retail outlets
Approximate percent of total equipment in milk production	15%	20%	35%	30%

Source: Interviews; McKinsey analysis

INDUSTRY BACKGROUND

Processed food encompasses all foodstuff that does not go directly from the farm to the grocer. This includes most food categories except fresh produce. Beverages have been removed from the comparison for all countries, as have pet foods for the U.S.-Japan comparison. Several food subcategories comprise processed food, of which meat, dairy and bakery products are generally the largest across the countries in terms of value added (**Exhibit 1**).

Because of the heterogeneous mix of food products in this study, no single manufacturing process applies to the whole industry. Nevertheless, there are four broad stages of production – receiving, processing, packaging and distribution – that are similar for all processed foods (**Exhibit 2**). A specific example of milk production has been included to supplement the analysis.

Capital plays an important role in the food production process with a share of value added of about 40 percent.[2] Capital expenditures are heavily skewed towards machinery and equipment, with structures accounting for only 20 to 30 percent of expenditures. Most equipment is employed in the packaging and distribution stages of production (Exhibit 2). Only 20 percent of this equipment is specialized machinery specific to food processing; the remaining 80 percent is general industrial machinery.

Production and sales are generally dispersed among many players in the food industry. In none of the countries do the top 10 players account for more than 40 percent of total industry sales.

PRODUCTIVITY PERFORMANCE

We measure performance in food processing as industry value added per unit of capital services employed in production. We find Germany and Japan to be at 70 and 64 percent of the U.S. capital productivity level, respectively.

Measurement

Because physical food production is impossible to measure in a uniform way within or across countries, we measure output as industry value added. Our measure of capital input is capital services, indicating the amount of a structure's or a machine's service life "used" in 1 year. Both value added and capital services are converted to physical measures by standardizing local currency measures into a common unit, in this case dollars, with purchasing power parity exchange rates. We do bilateral (U.S.-Germany and U.S.-Japan) comparisons because inconsistencies in the data preclude direct Germany-Japan comparisons.

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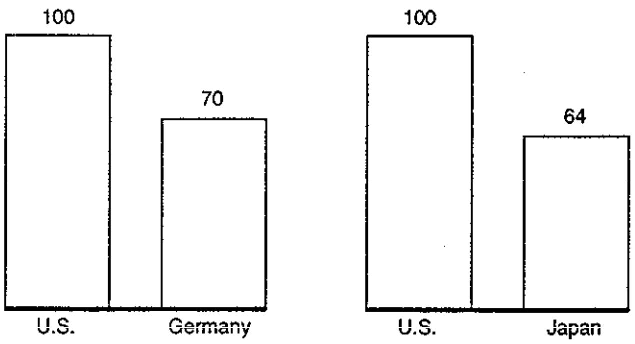
2 Capital shares differ slightly by country. U.S.: 37 percent; Germany: 33 percent; and Japan: 42 percent.

Exhibit 3

CAPITAL PRODUCTIVITY 1992

Indexed to U.S. (1992) = 100



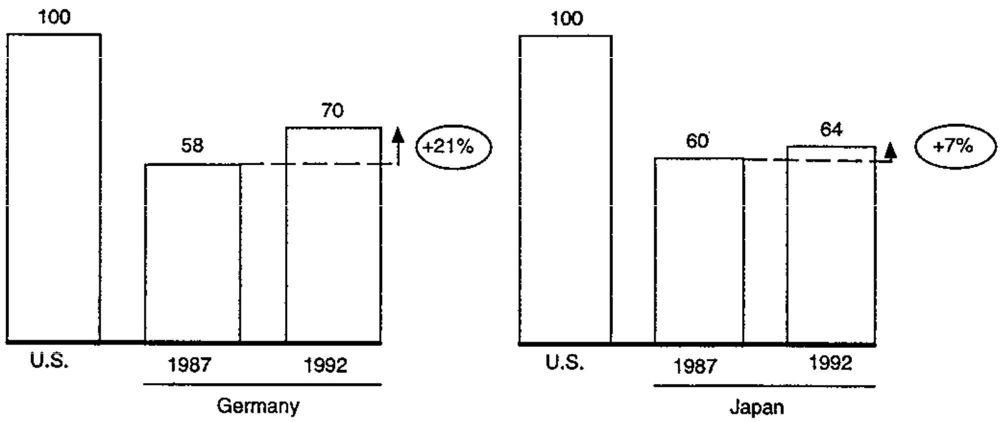
* Value added at food PPP, capital at investment goods PPP

Source: U.S. Census of Manufactures and Annual Survey of Manufactures; Japan Census of Manufactures; German National Accounts (Fachserie 18) and Census of Manufactures (Fachserie 4); McKinsey analysis

Exhibit 4

CAPITAL PRODUCTIVITY TRENDS

Indexed to U.S. (1987 and 1992) = 100



Source: U.S. Census of Manufactures and Annual Survey of Manufactures; Japan Census of Manufactures; German National Accounts (Fachserie 18) and Census of Manufactures (Fachserie 4); McKinsey analysis

(See "Methodology" box and Chapter 1: "Objectives and Approach" for greater detail.)

Consistent with the methodology of other cases, capital productivity in food processing measures output divided by capital services. Labor productivity uses the same output measure, but includes in the denominator the total number of production labor hours worked during the year. Finally, total factor productivity divides output by labor and capital weighted by their respective average shares of income across the countries and thus represents the joint productivity of both inputs.

Results

U.S. firms have higher capital productivity than both German and Japanese establishments in bilateral comparisons. In 1992, Germany and Japan register at 70 and 64 percent of U.S. productivity levels, respectively (**Exhibit 3**).

We find that over the previous 5 years, absolute productivity levels have risen modestly in the U.S. and Japan and significantly in Germany. Correspondingly, Germany has made significant advances vis-à-vis the U.S., while Japan's gains have been small (**Exhibit 4**). The results are robust to various sensitivities.[3]

With respect to subindustry structure, capital productivity differs by food product in each country, as do the relative productivity comparisons by food subcategory. While there is some variance, the U.S. consistently has the highest productivity in almost all categories (**Exhibits 5a and 5b**).

Labor productivity results mirror those of capital productivity. If U.S. food company performance is indexed to 100, German and Japanese companies produce 63 and 39 units of value added per labor hour, respectively.

Taking the capital and labor productivity results together, higher U.S. performance on both fronts combines to make U.S. total factor productivity the highest of the three countries, with Germany and Japan yielding 65 and 47 percent of the U.S. level, respectively (**Exhibit 6**).

CAUSES OF DIFFERENCES IN CAPITAL PRODUCTIVITY

Plant operating hours and downtime for changeovers, because of their impact on capacity utilization, drive capital productivity differences between the three countries. Productivity lags in Germany and Japan because companies allow excess capacity to persist and introduce products without attention to operational efficiency. Managers make such decisions because their goals are not aligned with productivity, the product market fails to punish unproductive

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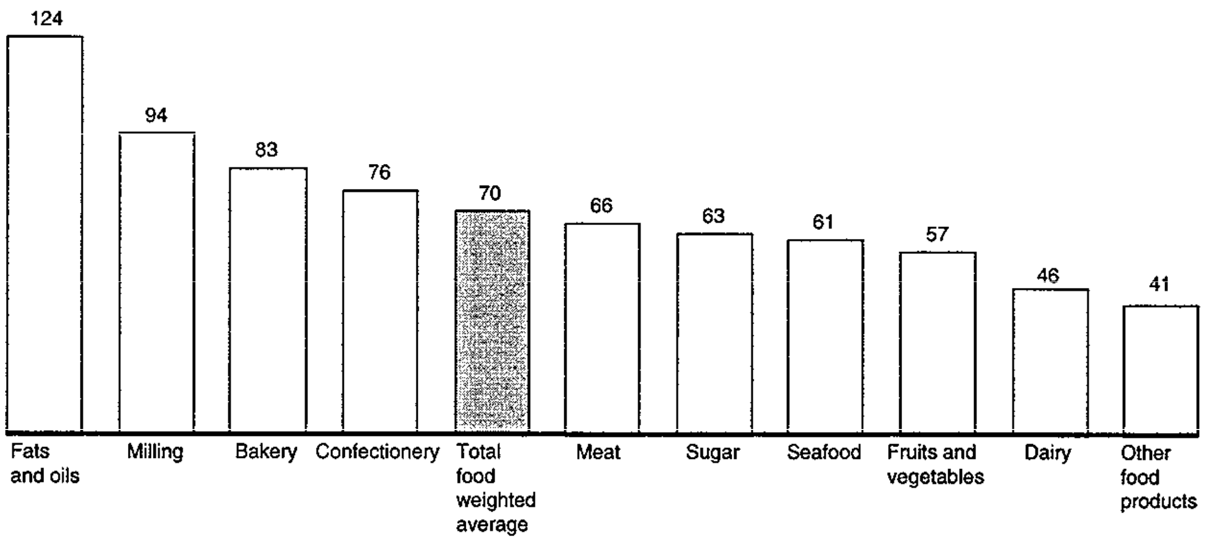
3 Relative productivities are insensitive to different service life assumptions for machinery and equipment.

Exhibit 5a

CAPITAL PRODUCTIVITY BY CATEGORY – GERMANY

Indexed by category to U.S. (1992) = 100



Note: Productivity breakdowns by category available for German legal units with more than 20 employees. Excluding smaller legal units makes German productivity for total food fall from 70 to 66

Source: U.S. Census of Manufactures and Annual Survey of Manufactures; German National Accounts (Fachserie 18) and Census of Manufactures (Fachserie 4); McKinsey analysis

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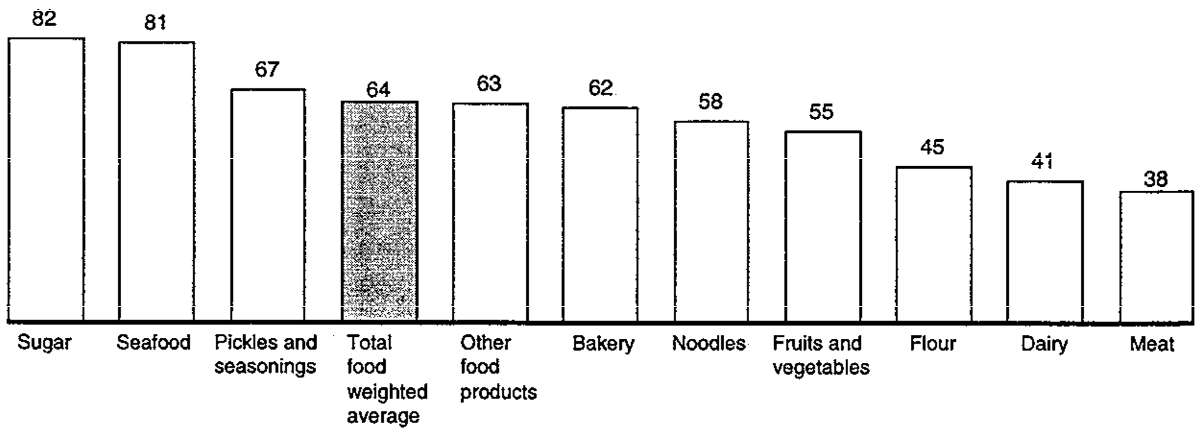
Exhibit 5b

CAPITAL PRODUCTIVITY BY CATEGORY – JAPAN

Indexed to U.S. by category (1992) = 100

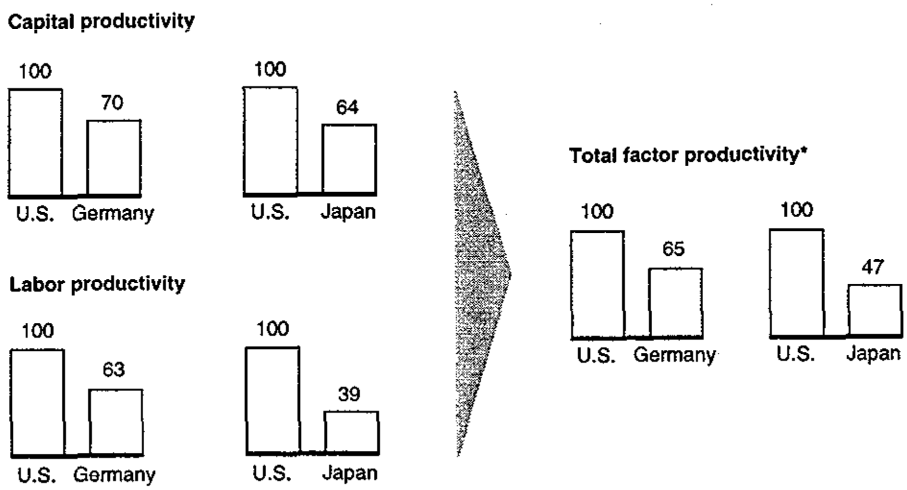


Source: U.S. Census of Manufactures and Annual Survey of Manufactures; Japan Census of Manufactures; McKinsey analysis

Exhibit 6

CAPITAL, LABOR, AND TOTAL FACTOR PRODUCTIVITY

Indexed to U.S. (1992) = 100



* TFP = $Y/(K^{\alpha *} L^{(1-\alpha)})$; shares of income to labor in each country: U.S. = 0.63, Germany = 0.67, Japan = 0.58; average of 0.62 used for all 3 countries

Note: German productivity analysis excludes legal units with less than 20 employees

Source: U.S. Census of Manufactures and Annual Survey of Manufactures; Japan Census of Manufactures; German National Accounts (Fachserie 18) and Census of Manufactures (Fachserie 4); BEA; Japanese Daiwa Institute; *Japan Statistical Yearbook*; McKinsey analysis

Exhibit 7

SUMMARY OF CAUSES OF DIFFERENCES IN CAPITAL PRODUCTIVITY – FOOD

	U.S.- Germany	U.S.- Japan
External constraints affecting industry dynamics	Regionalized production and barriers to entry limit exposure to competing food processors	Barriers to entry such as industry chain fragmentation limit exposure to competitive food processors
	Cooperative and private ownership shield companies from threat of failure or takeover in cases of under- performance	Share crossholdings and private owners allow managers to pursue some nonfinancial interests
Industry dynamics	Lower competitive intensity and avoidance of price-based competition puts less competitive pressure on managers	Lower competitive intensity and avoidance of price-based competition puts competitive pressure on managers
	Continued financing of unproductive food processors slowed industry consolidation	Managers' goals of stability and customer satisfaction lead to less focus on profitability and productivity
Managerial decisions	German managers slow either to rationalize capacity or to penetrate markets outside of region to increase volume	Focus on product variety and freshness leads to more changeovers and forces capacity to be high enough to accommodate peak demand
Components of differences	Low productivity stemming from low capacity utilization in Germany (due to fewer operating hours per plant)	Low productivity stemming primarily from low capacity utilization in Japan (due to fewer operating hours and more frequent downtime for changeovers)

Source: McKinsey analysis

companies, and the capital market does not facilitate exit. These factors result largely from the structure of ownership and the industry chain in Germany and Japan, which together reduce pressure for financial returns and prevent more efficient players from entering the market (**Exhibit 7**).

The particular distribution of the industry's capital across production of different food products in each country also affects overall productivity in food processing. Compared to the U.S., the Japanese distribution is biased towards food subcategories with more productive capital usage than others. As a result, Japan's overall food productivity is 11 percent higher than it would be if the mix were the same as in the U.S. Germany's industry mix, on the other hand, has no differentiating impact relative to the U.S.

Because the industry includes many different products, assessing causality is difficult. To do so, we called upon McKinsey experts who have served companies across many different food products worldwide for insight on operational and external factors leading to productivity differences. We then conducted a mini case to verify the importance of these factors by quantifying their impact on capital productivity with a specific example across the countries. We chose the dairy industry as this mini case for several reasons. First, it is one of the largest food categories. Second, the labor and capital productivity results in dairy correspond to those of the entire food industry. Third, a homogenous product like milk facilitates comparison across the three countries. In addition, we included nondairy examples wherever possible both to highlight key variables and to test the relevance of findings in dairy to other parts of the industry.

We explain the causes of capital productivity differences in four hierarchical levels. First we break down our capital productivity results into discrete components: the amount of capacity created with assets and capacity utilization. Next, we determine what managerial decisions are at the root of observed shop floor behavior. Finally, we examine how managers' decisions are influenced by industry dynamics and the external factors contributing to them. Within each of these stages we highlight factors as having primary, secondary or nondifferentiating importance (**Exhibit 8**).

Components of differences in capital productivity

Differences in capital productivity in food processing stem from both the level of capacity created with assets and the utilization of this capacity. The distribution of capital by type of food product is less important and is relevant only for its slightly offsetting positive impact on Japanese productivity (**Exhibit 9**). We refer to utilization here as simply the number of hours that a plant operates during a year relative to the total number of hours available. Other factors such as line speed and the organization of assets determine capacity for any given length of operation. Defined in this manner, capacity utilization is the most important

Exhibit 8

SUMMARY OF CAUSALITY ANALYSIS – FOOD

● Important in explaining capital productivity differences
O Secondary in explaining capital productivity differences
x Not important

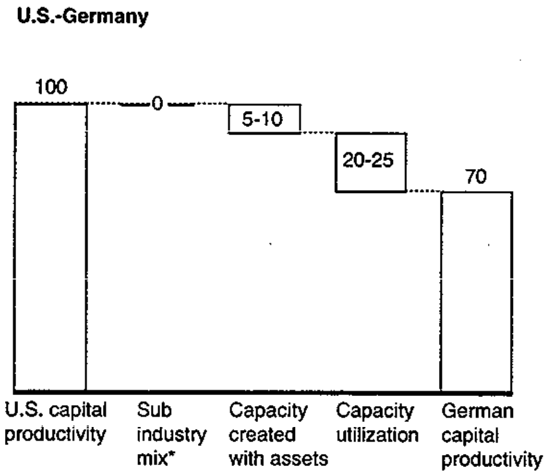
		U.S.-Germany	U.S.-Japan	Combined
IV. External factors affecting industry dynamics	**Macroeconomic environment**	x	x	x
	Product market factors			
	• Demand factors	x	O	O
	• Competition laws/enforcement	O	x	O
	• Monopoly regulation	x	x	x
	• Regulation/market interference	x	O	O
	Labor market factors			
	• Skills	x	x	x
	• Demographics	x	x	x
	• Rules/unionism	O	O	O
	Capital market factors			
	• Sources of funding/market for corporate control	O	O	O
	• Ownership/governance mechanisms	●	●	●
	Upstream and downstream market factors	●	●	●
III. Industry dynamics	**Product market**	●	●	●
	Labor market	O	O	O
	Capital market			
	• Alignment of goals with productivity	x	●	●
	• Ongoing improvement pressure	x	x	x
	• Forcing of exit	●	O	●
II. Managerial decisions	**Marketing**			
	• Product/product line management	x	●	●
	• Promotion/ demand stimulation/ pricing	x	x	x
	• Channel/ format selection	x	x	x
	Industry chain management	x	O	O
	Production technique			
	• Capital/labor mix	x	x	x
	• Technology	x	x	x
	• Scale	x	x	x
	Capital expenditure decision making			
	• Planning	●	x	●
	• Asset choice	x	x	x
	Operations effectiveness	O	x	O
I. Components of differences in productivity	**Capacity created with assets**	O	O	O
	Capacity utilization	●	●	●

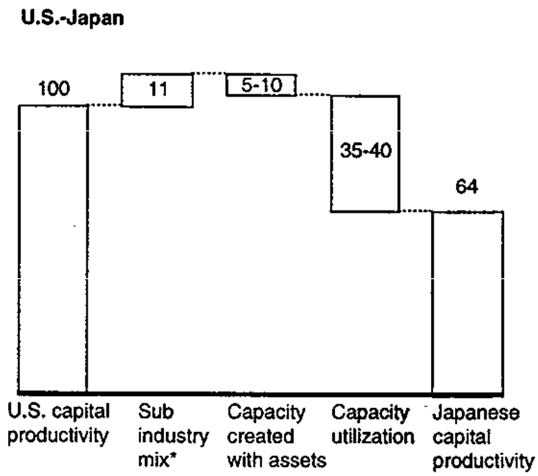
Source: McKinsey analysis

Exhibit 9

SOURCES OF PRODUCTIVITY DIFFERENCES

Indexed to U.S. (1992) = 100





* Effect on productivity if capital services were distributed by product according to U.S. distribution

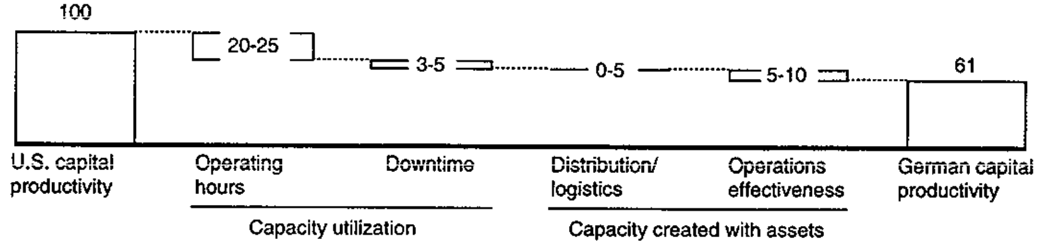
Source: U.S. Census of Manufactures and Annual Survey of Manufactures; Japan Census of Manufactures; German National Accounts (Fachserie 18) and Census of Manufactures (Fachserie 4); interviews; McKinsey analysis

Exhibit 10

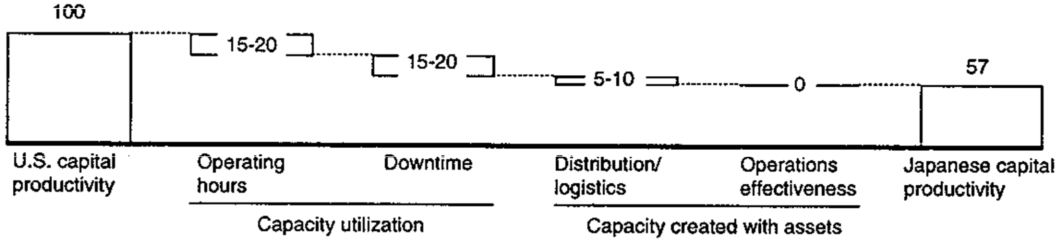
COMPONENTS OF DIFFERENCES IN CAPITAL PRODUCTIVITY *DAIRY INDUSTRY EXAMPLE*

Indexed to U.S. (1992) = 100

U.S.-Germany comparison of medium plants



U.S.-Japan comparison of large plants



Note: While dairy industry was the primary example for this quantification, we observed similar phenomena in other food industries to qualitatively support these conclusions

Source: U.S. Census of Manufactures and Annual Survey of Manufactures; Japan Census of Manufactures; German National Accounts (Fachserie 18) and Census of Manufactures (Fachserie 4); interviews; McKinsey analysis factor explaining productivity differences (**Exhibit 10**).[4] While we have quantified the impact on utilization using primarily a dairy example, we observe the same pattern in a wide range of food subindustries.

¶ *Capacity utilization*. Both German and Japanese food plants have lower total operating hours than U.S. plants, and Japanese plants also have much more downtime while operating. As a result, in dairy the average U.S. plant runs 18.6 hours per day, compared to 13.8 and 11.8 for Germany and Japan, respectively (**Exhibit 11**). Lower capacity utilization from these two factors accounts for the bulk of our productivity differences, putting Germany and Japan at a 25 and 35 percent productivity disadvantage relative to the U.S., respectively.

¶ *Capacity created with assets*. We calculated this impact on productivity as a residual. Japanese companies are at some disadvantage because they require more logistics and distribution assets for a similar product volume. We quantitatively verify this 10 percent impact on productivity later. In Germany, we saw evidence of imbalanced production lines and other operational practices that we believe penalize German productivity by roughly the 10 percent residual.

Managerial decisions causing operational differences

Managerial decisions in two areas, product line management and capital expenditure planning, cause the major differences we observe in utilization. Decisions in other areas that impact the capacity created with assets have secondary explanatory power for productivity differences. Again, while the phenomena we describe exist generally throughout the food industry, we use the dairy example to quantify effects on productivity.

¶ *Product line*. Two salient characteristics of Japanese products are key causes of capacity utilization differences between the U.S. and Japan. First, Japanese producers proliferate product varieties to provide maximum choice for the consumer, producing up to 50 percent more total Stock Keeping Units (SKUs) than do their U.S. counterparts. Of the 4,300 SKUs that one large distributor handles, for example, over 50 percent are dropped and replaced each year. Greater product variety reduces sales per product and forces Japanese lines to shut down production lines for changeovers much more often than in the U.S. (**Exhibit 12**).

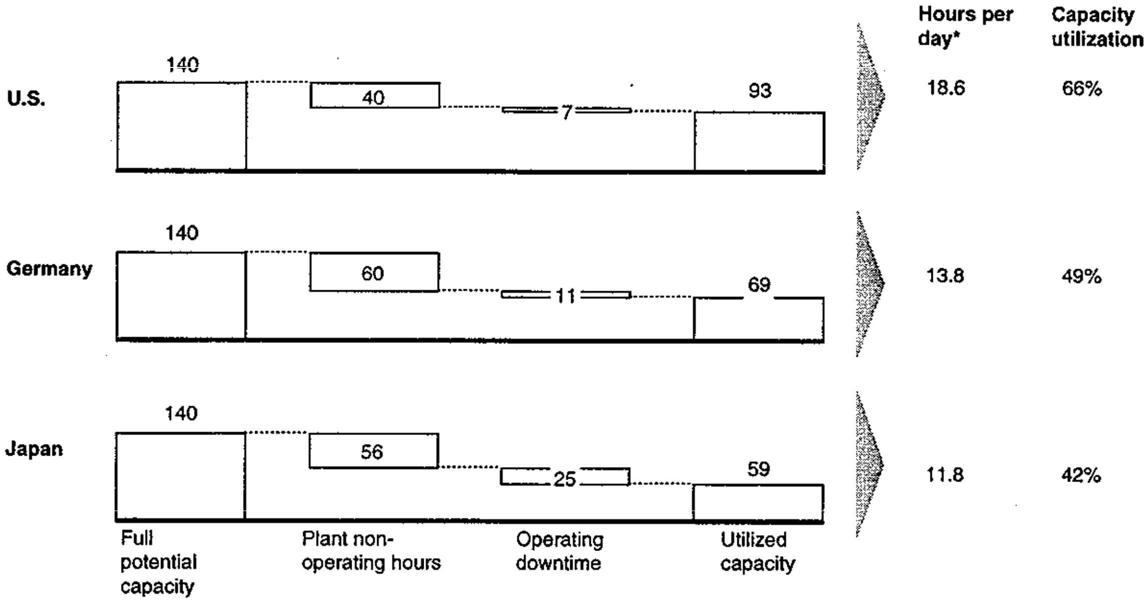
The confectionery industry, for example, is typical of this behavior; sales per product are up to 10 times higher in the U.S. for the largest companies (**Exhibit 13**). New product development in Japan explains much of this sales gap. Morinaga and Meiji, for example, tend to

4 We focus on medium plants for the U.S.-Germany comparison and large plants for the U.S.-Japan comparison because these are the largest sources of differences, as discussed in the scale section.

Exhibit 11

DAIRY INDUSTRY CAPACITY UTILIZATION

In actual hours per week 1995



* Calculated based on 5 operating days per week

Note: Full capacity assumes 7 days a week, 20 hours a day (allocating 4 hours for clean up and maintenance), with no downtime or loss due to mismatches in process speeds

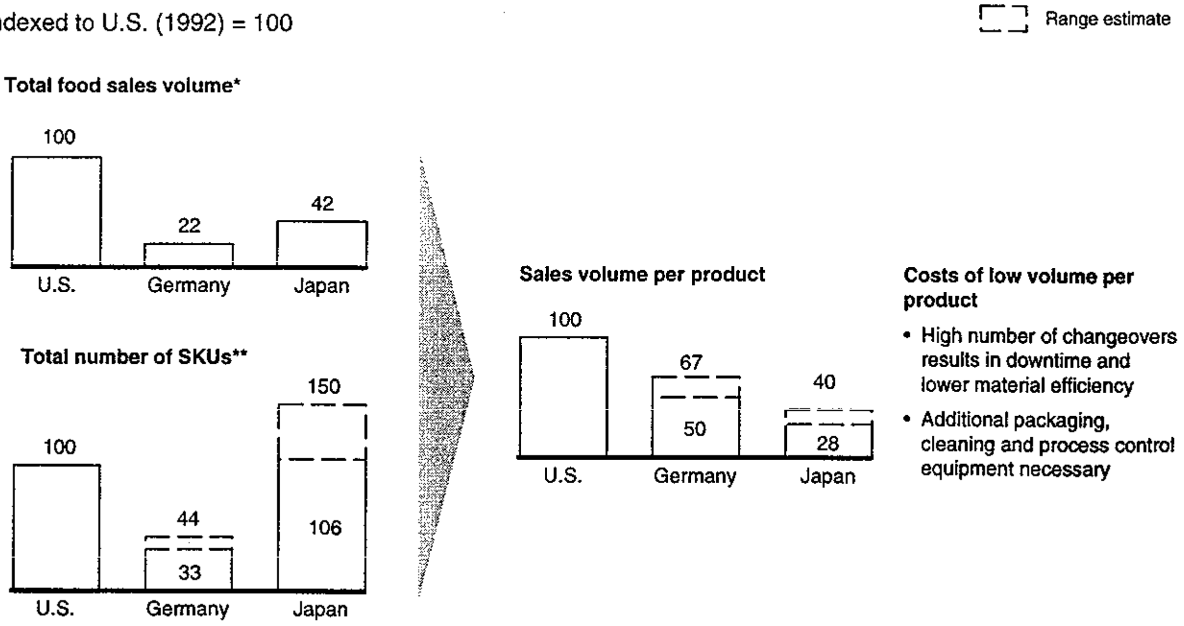
Source: Interviews; McKinsey analysis

Source: McKinsey analysis

Exhibit 12

COMPARATIVE SALES VOLUME PER FOOD PRODUCT

Indexed to U.S. (1992) = 100



* Compares 1990 real value of final expenditure on food converted at product PPPs

** Estimated with ranges due to some data uncertainty

Note: Assumes imports and exports balance on net so that total sales is representative of total food production

Source: OECD, *Purchasing Power Parities and Real Expenditures*; *McKinsey Quarterly*; *Infoscan Supermarket Review*; *Worldwide New Products Analysis*; McKinsey analysis

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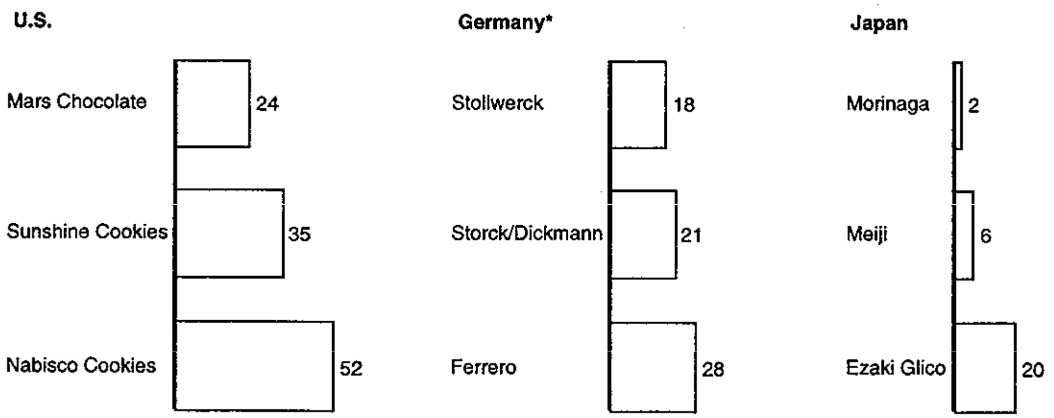
Exhibit 13

AVERAGE CONFECTIONERY SALES PER PRODUCT BY BRAND

U.S.$ Million at 1994 exchange rates



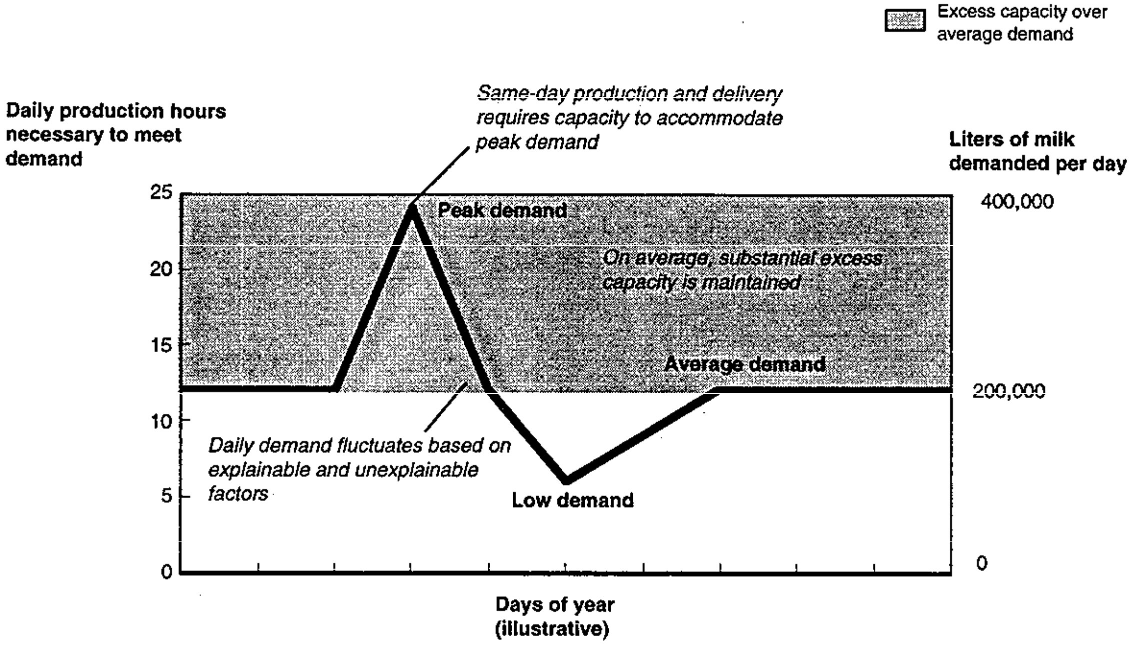
Note: German and Japanese sales figures only available for 1992; a 10% increase was assumed to yield 1994 sales figures

Source: Information Resources Incorporated; Nielsen; Nikkei Business; Annual Reports; McKinsey analysis

Exhibit 14

EXCESS CAPACITY REQUIRED FOR JIT SYSTEM

DAIRY INDUSTRY EXAMPLE



Source: Interviews; McKinsey analysis

introduce numerous products annually and let customers separate "winners" from "losers." This contrasts to the approach of actively test-marketing products and investing in promotions to create focused lines and long-lasting brands. By ensuring successful products with this approach, U.S. companies and some Japanese companies like Ezaki Glico optimize variety and enjoy high sales volume per product.

At the plant level, we again quantify the effect of this variety on utilization using a dairy example. In dairy, lines must stop for every change in container size or milkfat content. Total daily shutdown time per line amounts to roughly 1.5 hours in the U.S. compared to 5 hours in Japan, directly impacting utilization. Downtime in Germany is only slightly higher than in the U.S. at 2.25 hours. The three to four times more downtime in Japanese plants directly lowers capital and labor productivity, since production is idled.

The second salient characteristic of Japanese food products affecting utilization is a high degree of freshness in most food items, including dairy, confectionery and even canned goods. In order to provide consumers with maximum freshness, manufacturers avoid inventories by producing and distributing products just in time (JIT) the same day they receive orders.[5] Daily demand, though, can fluctuate significantly depending on day of the week and season. In our dairy example, peak daily demand is twice as high as annual average demand. Since manufacturers do not rely on inventories and do not want to leave any customer orders unfilled, they build plant capacity to accommodate the peak demand (**Exhibit 14**). This significantly lowers average capacity utilization.

It is ironic that a JIT delivery regime hurts capital productivity in the food industry, especially given its positive impact on the auto industry. The different applications of JIT in the two industries explains the apparent contradiction. JIT delivery to retailers means extreme output volatility for food manufacturers and forces them to build capacity accordingly. By contrast, final auto assemblers benefit because JIT largely applies to component delivery from parts suppliers and allows manufacturers to have a steady flow of parts without maintaining inventories. We might expect this to hurt supplier utilization (and final assembly utilization to the extent they also deliver JIT) just as it does for food manufacturers. This is not true, however, because final assemblers and parts suppliers compensate by using JIT supply as a catalyst in their continuous improvement process, simultaneously improving throughput speed and reducing defect rates (see auto case).

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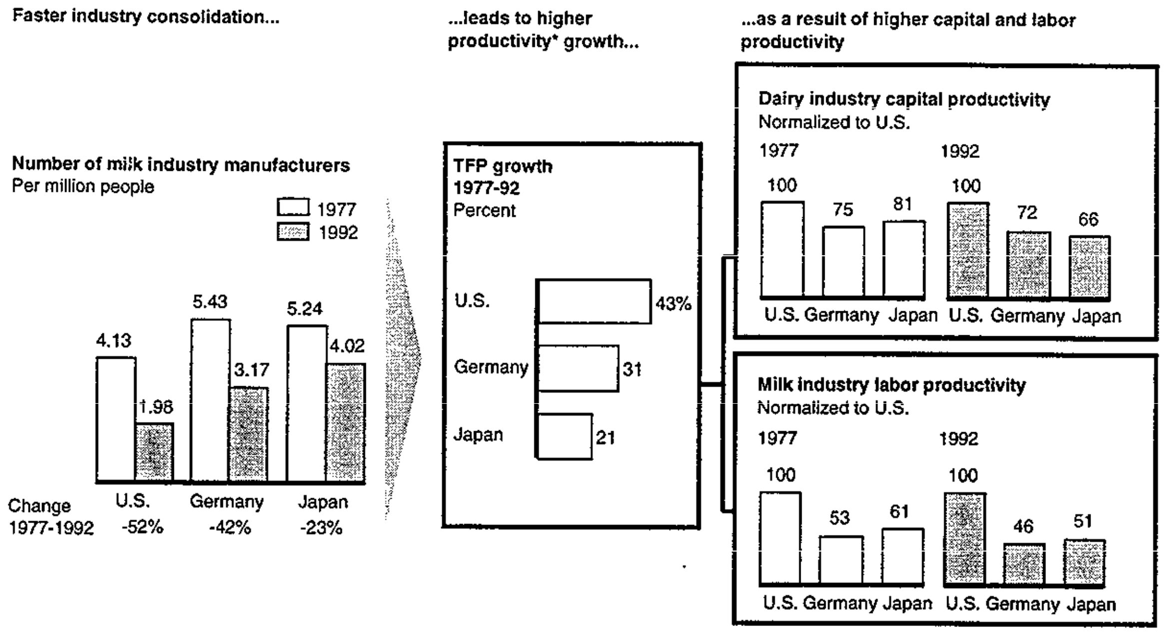
5 Some Japanese manufacturers actually receive, process and distribute orders up to three times daily, repeating the process every shift.

Exhibit 15

IMPACT OF DAIRY INDUSTRY CONSOLIDATION ON PRODUCTIVITY



* Because of changing capital intensity, it is difficult to separate capital productivity growth from labor productivity growth over this period. We hence look at both simultaneously in TFP growth

Note: Productivity results estimated with single year capital expenditures, which differs from our measure of capital services elsewhere

Source: U.S. Census of Manufactures and Annual Survey of Manufactures; Japan Census of Manufactures; German National Accounts (Fachserie 18) and Census of Manufactures (Fachserie 4); Japanese Daiwa Institute; *Japan Statistical Yearbook*; McKinsey analysis

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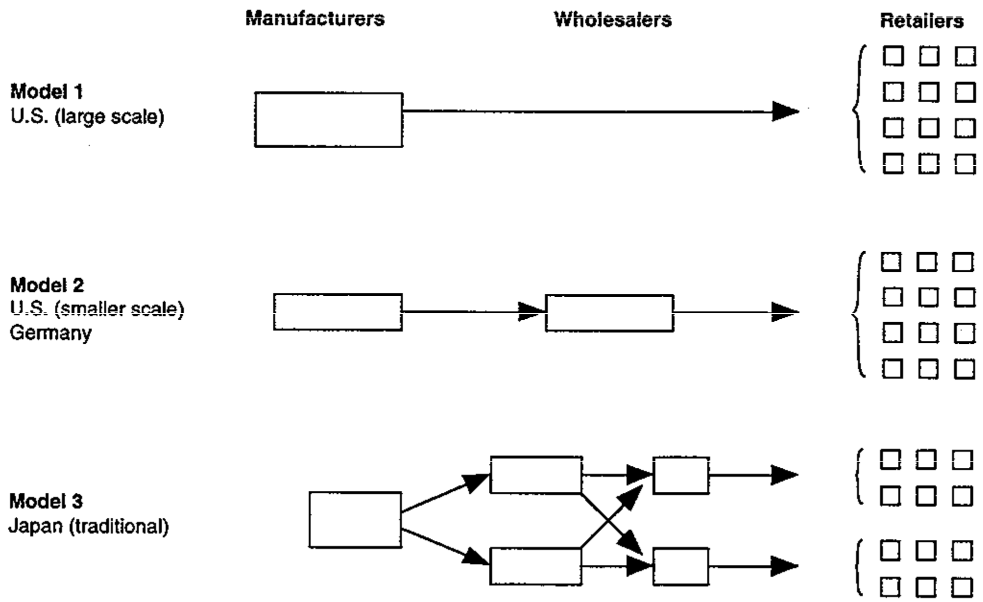
Exhibit 16

DIFFERENT PATTERNS OF FOOD DISTRIBUTION



Source: Press articles; *Retail Distribution in Japan*; Interviews; McKinsey analysis

¶ *Capital expenditure decision making/planning*. Compounding the above effects of variety and freshness, interrelated managerial planning decisions on capacity and markets selection also contribute to excess capacity and lower operating hours. The food industry was historically regionalized in all three countries, largely because of inability to transport perishable products over long distances safely. Since technology has lifted this constraint, U.S. managers have been faster than those in Germany and Japan to rationalize capacity by shutting down marginal plants. This allows them to reduce capital expenditures both by scaling back upkeep and renovation of old plants and by reusing equipment from closed plants rather than purchasing new machinery. Managers have also expanded markets to generate enough product volume to ensure full utilization of consolidated plants.

We again quantify this effect concretely for the dairy industry, where U.S. consolidation has been twice as fast as Japan's and significantly faster than Germany's (**Exhibit 15**). Concentrated production allows a core group of fully utilized plants to operate for more hours on average than if production were more dispersed. This directly increases capital productivity, and since labor has been traded off for capital during this period, the benefits manifest themselves in labor and total factor productivity as well. Because of less consolidation, improvements in Germany and Japan have been less significant.

We see the disadvantages of less consolidation exemplified by a German bakery. Industrywide overcapacity has made it difficult for the bakery to penetrate markets outside its region. Yet the bakery's current market is not large enough to absorb its potential output. This problem is exacerbated because the producer has one line for each of several bread varieties. The regional demand for a single variety, however, is not large enough to merit a three-shift operation. Because the producer has not successfully penetrated markets outside the region to leverage its capital base, it cuts back operating hours.

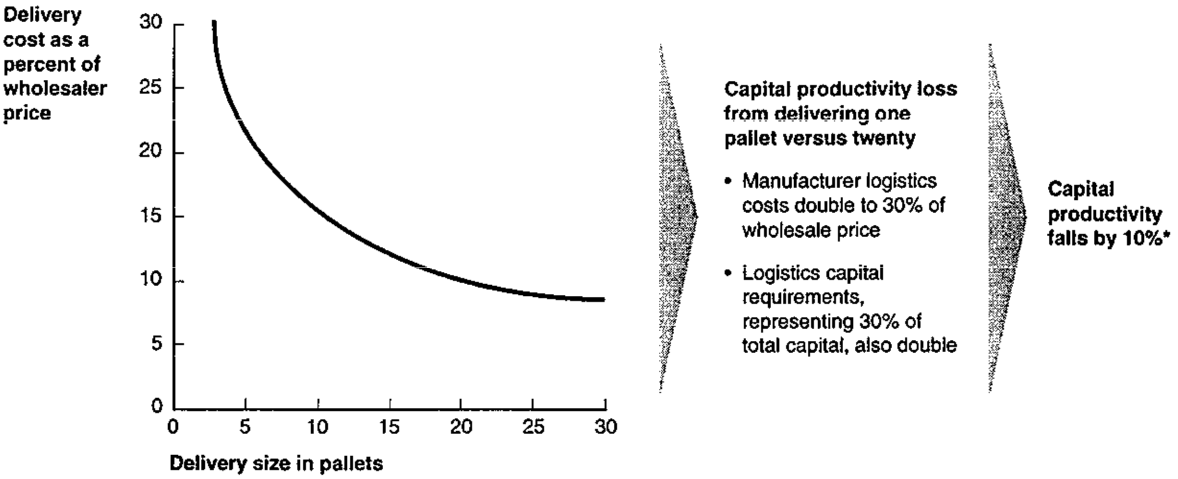
¶ *Factors of secondary importance for capital productivity differences*. Industry chain management and operational effectiveness also hurt German and Japanese productivity. These are of secondary importance because they lower the capacity created with assets, which accounts for at most 25 percent of the total productivity difference.

- *Industry chain management*. Japanese food distribution characteristically has several layers, is fragmented and supports multiple daily deliveries (**Exhibit 16**). These factors lead to inefficient small-lot delivery. While U.S. manufacturers may deliver several pallets at once, many Japanese manufacturers deliver in quantities as small as two or three items. This imposes additional costs in terms of labor and logistics equipment (e.g., trucks, forklifts, bar code translators) and lower utilization of this equipment. This

Exhibit 17

ADDITIONAL COSTS OF SMALL-LOT DELIVERY

DAIRY INDUSTRY EXAMPLE



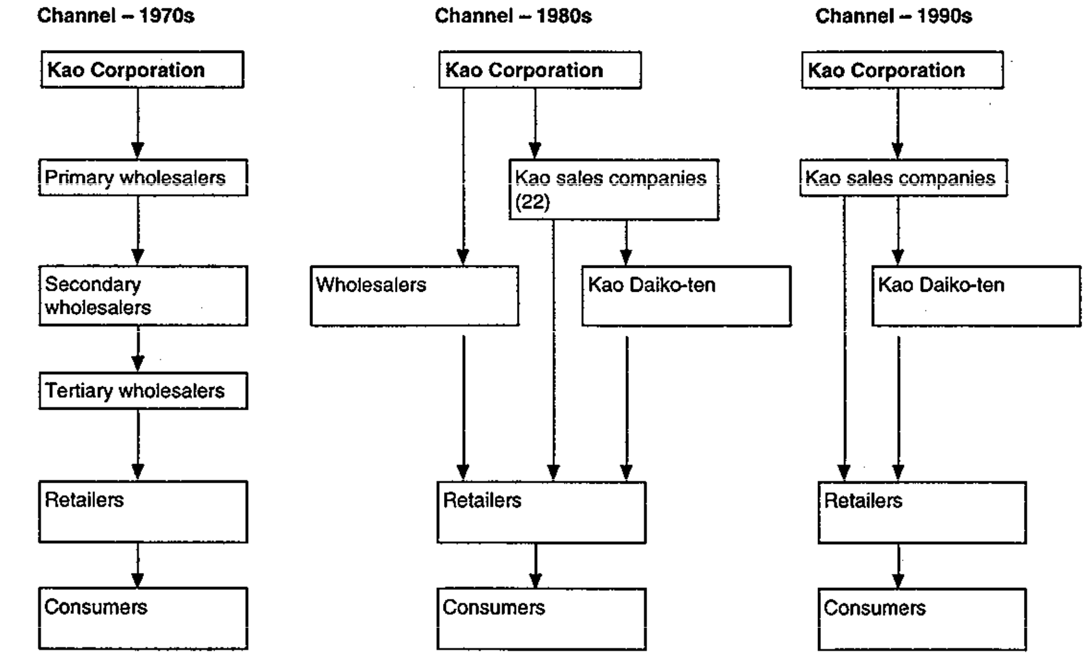
* Assumed labor and capital costs increase in same proportions and assumed that half of all manufacturers distribute their own products. Increased payments to capital measured for value added and capital expenditures, holding labor constant, in order to determine effect on capital productivity

Note: 30 pallets is a full truck load

Source: Interviews; McKinsey analysis

Exhibit 18

KAO'S DISTRIBUTION CHANNEL



Note: Kao Daiko-ten are wholesalers which invested in Kao Sales Company

Source: Press articles; *Retail Distribution in Japan* can lower capital productivity by as much as 10 index points (**Exhibit 17**).

Some Japanese manufacturers have overcome problems with distribution, demonstrating that the system is not completely beyond managers' control. Big companies like Kao and Coca-Cola have invested their own resources over the last 20 years to successfully bypass the layered distribution system (**Exhibit 18**). Even smaller companies can benefit by selling through advanced distributors, such as one that has reduced distribution layers by centralizing small-lot order picking. These examples, though, are the exception rather than the rule.

- *Operations effectiveness*. The organization of functions in some German plants is detrimental to productivity. In some of the smaller German plants, we observe higher incidences of unbalanced lines: machine speeds are mismatched so that the output of an entire line is lower than the potential output of its individual stages. In bakery, for example, the bottleneck was the common process (dough kneading) that fed multiple specialized lines (bread and pastries). This phenomenon significantly lowers capacity utilization where it occurs.

¶ *Factors not important for capital productivity differences*. A priori, we expected several other factors to be important in explaining capital productivity differences. However, these factors turned out to have little or no differential impact in food processing productivity across the three countries.

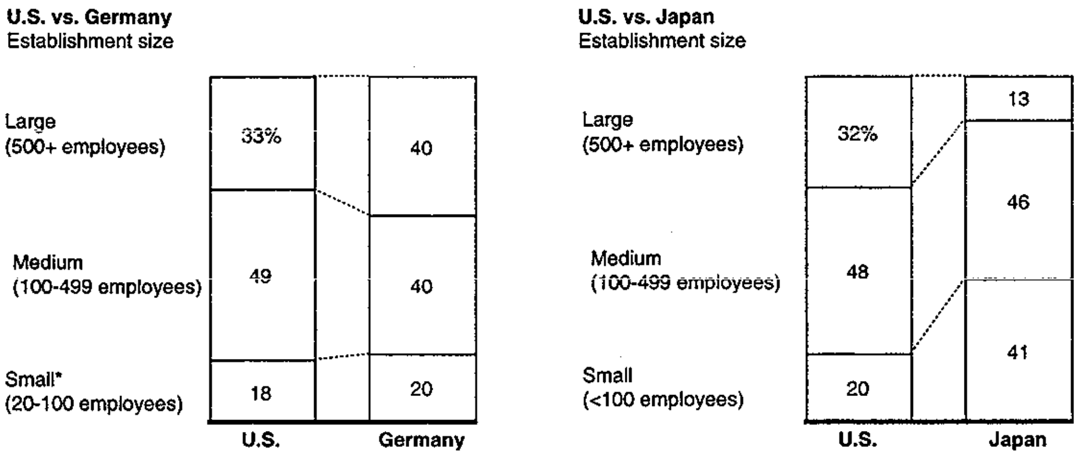
- *Scale*. The distribution of capital among establishments by employment size is similar in the U.S. and Germany and skewed towards smaller plants in Japan (**Exhibit 19**).[6] Using this size distribution as a proxy for scale, there are few differences in average scale of production between the U.S. and Germany. U.S.-Germany productivity differences result instead from differential performance within the same scale. We find that large German plants perform near U.S. levels and medium and small plants underperform relative to the U.S. (**Exhibit 20**). We think this disparity exists because European multinationals that are near world's best practice own the large plants, while inefficient regional producers own the smaller plants.

6 The U.S.-Germany comparison excludes establishments with less than 20 employees for lack of detailed data. Including these would skew Germany's distribution towards small establishments, since they account for 30 percent of value added in Germany and less than 5 percent in the U.S. For the purposes of our productivity comparison that excludes these establishments, however, the U.S. and German distributions are similar.

Exhibit 19

DISTRIBUTION OF CAPITAL SERVICES BY SIZE OF ESTABLISHMENT 1992

Percent of capital services



* Small establishments in Germany exclude legal units with less than 20 employees; U.S. food processing figures are adjusted to also exclude establishments with less than 20 employees, but doing so includes extra food items such as beverages

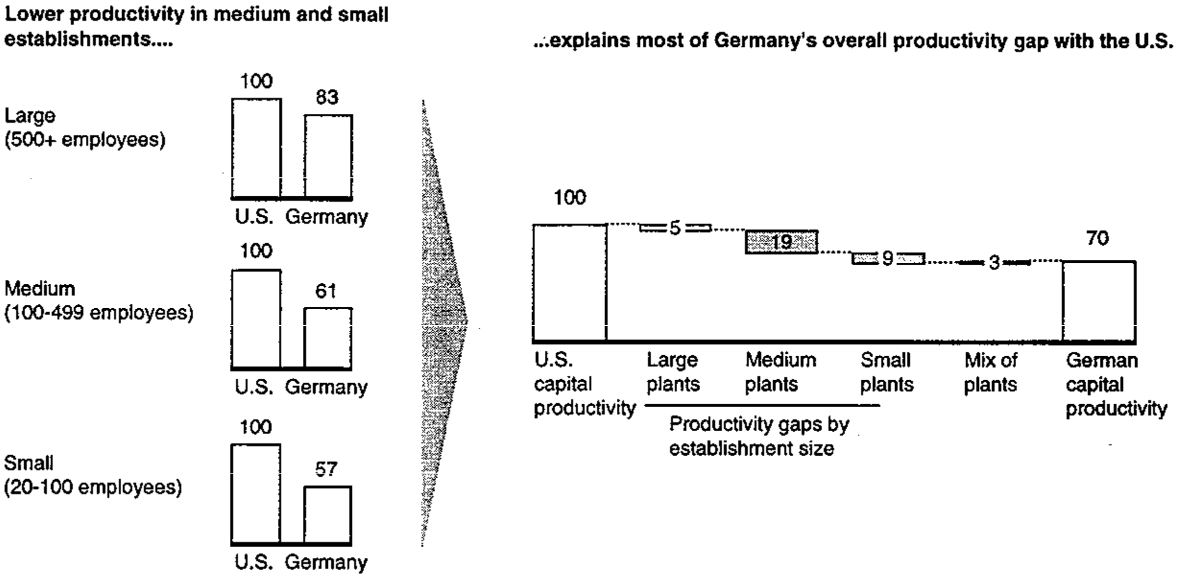
Note: Capital services are distributed by size according to 1992 capital expenditure weights; U.S. figures different in both comparisons because they were adjusted to match differing German and Japanese census definitions

Source: U.S. Census of Manufactures; Japan Census of Manufactures; German Census of Manufactures (Fachserie 4); McKinsey analysis

Exhibit 20

CAPITAL PRODUCTIVITY BY SIZE OF ESTABLISHMENT – U.S.-GERMANY

Indexed to U.S. (1992) = 100



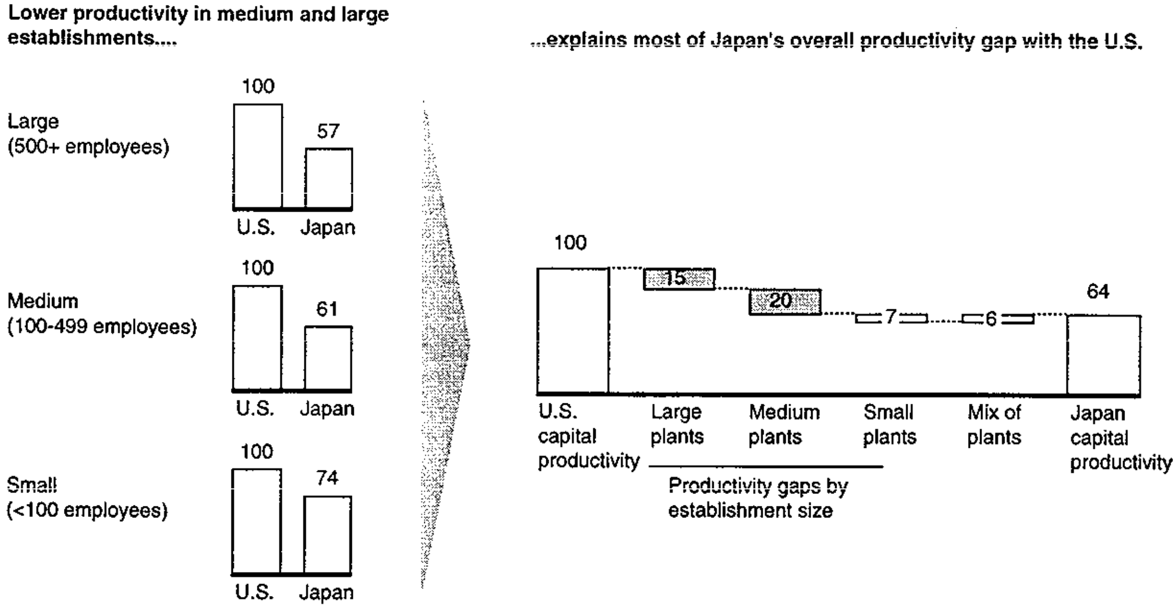
Note: Productivity analysis by size includes beverages for the U.S.

Source: U.S. Census of Manufactures and Annual Survey of Manufactures; German National Accounts (Fachserie 18) and Census of Manufactures (Fachserie 4); McKinsey analysis

Exhibit 21

CAPITAL PRODUCTIVITY BY SIZE OF ESTABLISHMENT – U.S.-JAPAN

Indexed to U.S. (1992) = 100



Note: Productivity analysis by size includes beverages for the U.S.
Source: U.S. Census of Manufactures and Annual Survey of Manufactures; Japan Census of Manufactures; McKinsey analysis

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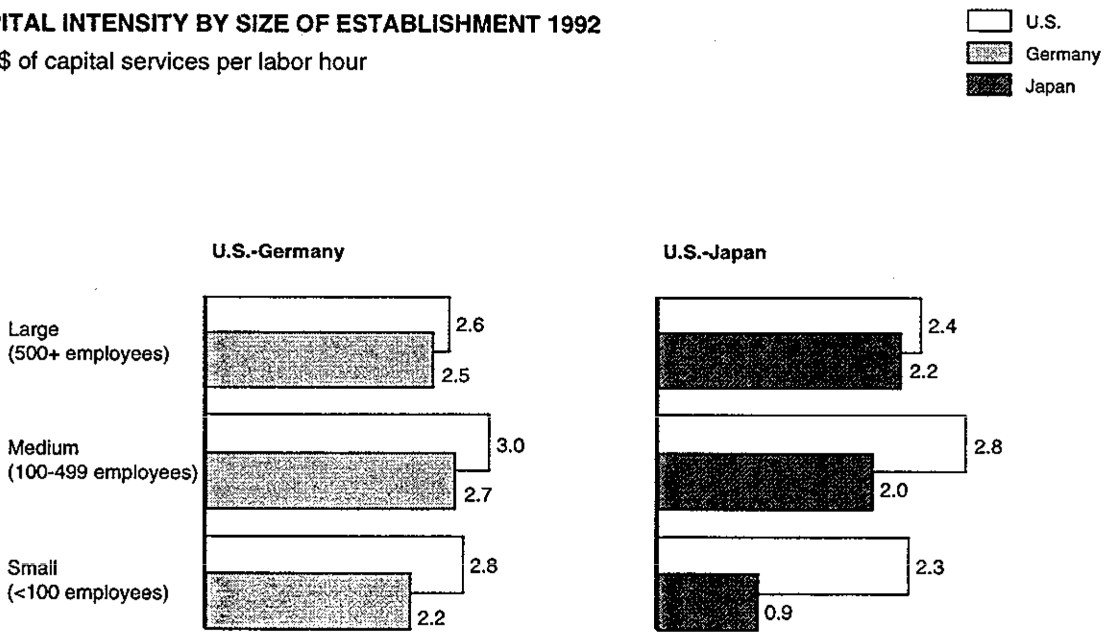
Exhibit 22

CAPITAL INTENSITY BY SIZE OF ESTABLISHMENT 1992

U.S.$ of capital services per labor hour



Note: U.S. figures different in both comparisons because they were adjusted to match differing German and Japanese census definitions
Source: U.S. Census of Manufactures; Japan Census of Manufactures; German Census of Manufactures (Fachserie 4); McKinsey analysis

Food production in Japan, on the other hand, is on average much smaller in scale than in the U.S. (Exhibit 19). Seemingly contradictory to findings in MGI's study on labor productivity, smaller scale actually improves Japan's capital productivity. This is partly because small establishments trade off capital for labor as discussed below, giving them relatively high capital productivity (**Exhibit 21**) but also extremely low labor productivity. The skewed distribution of size towards small-scale establishments in Japan, hence, cannot explain why Japanese capital productivity lags behind that of the U.S.; low capital productivity within the same scale explains most of the difference. Medium and large Japanese plants fall short of best practice partly because, unlike in Germany, multinationals have a much smaller presence in Japan (see external factors section below).

- *Installation of technology*. By and large, the technology, machinery and equipment used to produce a particular food product was uniform across the countries for medium- and large-size plants. In dairy, for example, pasteurization and homogenization are internationally standardized processes and only two or three major manufacturers worldwide supply the machinery. Filling lines are also very similar, with only slight differences in throughput speeds.

- *Capital/labor mix*. We measure capital/labor mix by capital intensity and find production to be slightly less capital intensive in Germany and significantly less so in Japan compared to the U.S. (**Exhibit 22**). Because it uses more capital relative to labor than do the other two countries, the U.S. has not achieved high capital productivity by underinvesting or at the expense of labor productivity. In fact, because technologies are similar across the countries in medium and large plants, higher capital intensity evidences a trade-off of labor for capital and may even put the U.S. at a capital productivity disadvantage. This may not be the case for small plants, where substantially higher capital intensity in the U.S. may indicate a fundamentally different production process than in Japan. Nevertheless, this phenomenon accounts for little of our overall capital productivity difference.

External factors driving managerial actions

As we have seen, specific managerial actions cause differences in capital productivity. These managerial decisions are discretionary, as evidenced by Japanese companies like Ezaki Glico that have achieved high productivity. Differential managerial abilities do not explain these decisions; external factors create industry dynamics that differentially pressure and create incentives for managers. In the U.S. food processing industry, we have seen product and capital market pressures acting in concert to force managers to continually

Exhibit 23

COMPARISONS OF JAPANESE AND U.S. CORPORATE OBJECTIVES

Key financial goals

	U.S.	
1.	Return on investment	2.43
2.	Higher stock prices	1.14
3.	Market share	0.73
4.	Improving products and introducing new products	0.71
5.	Streamlining production and distribution systems	0.46
6.	Net worth ratio	0.38
7.	Improvement of social image	0.05
8.	Improvement of working conditions	0.04

	Japan	
1.	Improving products and introducing new products	1.54
2.	Market share	1.43
3.	Return on investment	1.24
4.	Streamlining production and distribution systems	0.71
5.	Net worth ratio	0.59
6.	Improvement of social image	0.20
7.	Improvement of working conditions	0.09
8.	Higher stock prices	0.02

Note: Survey results with 3 = most important, 0 = least important

Source: Kagawa, Nonaka, Sakakibara, and Okumura: *Strategy and Organization of Japanese and American Corporations* (1981) improve performance. Managers have reacted by critically evaluating product lines and consolidating excess capacity. Below, we first discuss industry dynamics in more detail and then consider the underlying external forces.

¶ *Industry dynamics*. We find three factors to be critical in creating food industry dynamics that pressure managers to improve performance. First, a capital market that ensures that managerial goals are aligned with productivity; next, a product market that fosters competition such that unproductive players are driven towards unprofitability; and finally, a capital market that again facilitates change such that unproductive companies are forced to exit while more productive ones thrive.

In the U.S., these factors form a virtuous circle of dynamics encouraging managers to improve productivity. First, U.S. managers' goals are strongly aligned with financial performance (**Exhibit 23**). Decisions taken to improve financial performance, such as rationalizing capacity and investing appropriately to meet customer needs, also improve productivity. We support this correlation empirically because the U.S. has a similar lead over Japan in both ROIC and capital productivity (**Exhibit 24**). Moreover, within the U.S., we find that those companies with high capital productivity also have high financial performance, measured on either an operational or a market basis (**Exhibit 25**). Second, these performance goals also lead to a highly price-competitive product market that allows new players to enter and productive players to grow and makes inefficient producers unprofitable. Third, the U.S. capital market facilitates change by forcing poor performers to exit. For example, Borden and Dole have destroyed economic value in several of the last 10 years. The capital market responded by taking over and restructuring the companies. Other poor performers face similar fates.

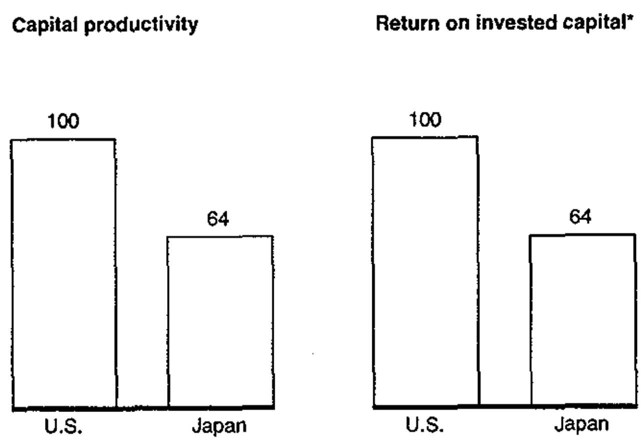
In Germany, these factors critical to positive industry dynamics fail on two of the three fronts. The product market historically failed to render inefficient manufacturers unprofitable because it did not foster price pressures. Producers were able to avoid this pressure partly because regionalism in the food industry was conducive to cooperation between competitors. In some instances, groups formed to cooperate in areas from raw material sourcing to price setting. Various barriers to entry helped protect these arrangements from challenge by productive new entrants, including industry chain factors as discussed in the next section. Existing producers could hence escape the consequences of excess capacity and other inefficiencies by passing on costs elsewhere in the industry chain and to consumers. Shielded from price pressures, German managers did not feel the same urgency as those in the U.S. of maximizing efficiency and rationalizing capacity.

In addition, even as price pressures increase, the German capital market did not play a role of forcing unprofitable food companies to exit. In

Exhibit 24

CAPITAL PRODUCTIVITY AND FINANCIAL PERFORMANCE – U.S.-JAPAN

Indexed to U.S. (1992) = 100

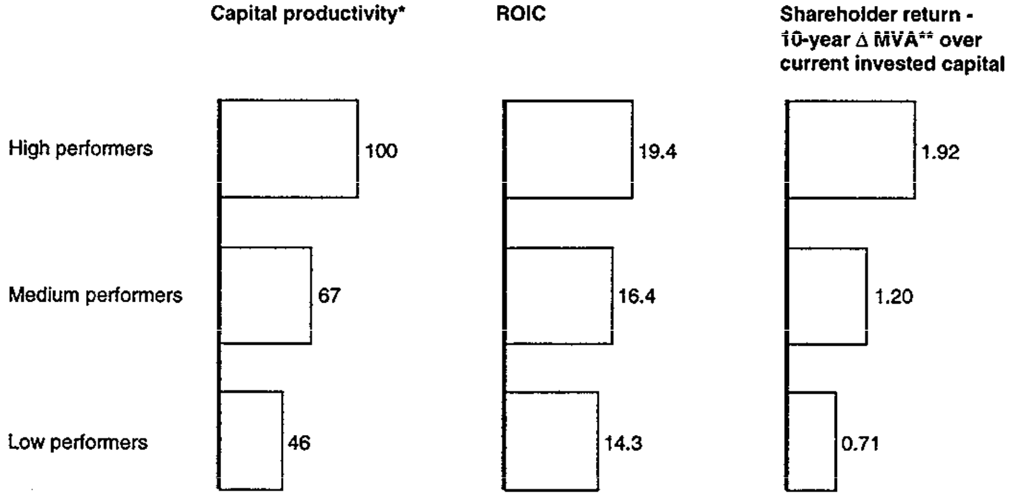


* Top 46 companies

Source: Stern Stewart; U.S. Census of Manufactures and Annual Survey of Manufactures; Japan Census of Manufactures; McKinsey analysis

Exhibit 25

CORRELATION BETWEEN CAPITAL PRODUCTIVITY AND FINANCIAL PERFORMANCE – U.S.



* Measured as (sales-cost of goods sold) over capital flow with 10-year service life

** Change in market value added

Note: High performers include 8 companies with highest capital productivity, medium performers 8 next highest, and low performers 9 lowest

Source: Stern Stewart; Compustat; McKinsey analysis

Exhibit 26

ALIGNMENT OF GOALS WITH PRODUCTIVITY

	Ezaki Glico	Large Japanese fishery
Objectives	• Profitability is explicit overall goal	• Market share and customer satisfaction are primary goals, with little explicit consideration of tradeoffs involved • Profitability is important, but less so at expense of other goals
Actions	• Limits product variety by subjecting each new product proposal to a profitability test • Each product must achieve critical volume to make production efficient and advertising cost-effective	• Have branched out from fishery core competence to other food businesses to maintain sales stature
Financial performance and productivity	• Highly successful, with average return on invested capital (ROIC) >20%	• Financially unsuccessful, with average return on invested capital (ROIC) <5%

Source: Annual reports; Interviews; McKinsey analysis

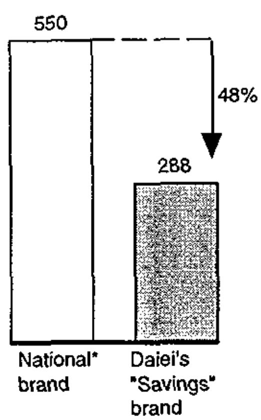
Exhibit 27

DAIEI PRIVATE BRAND EXAMPLE

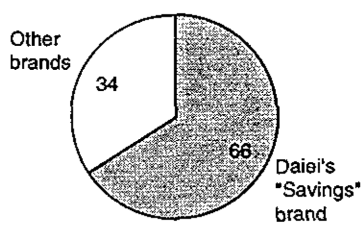
Mechanism for low-cost procurement

- Procurement of low-cost raw materials from New Zealand: 1/4-1/5 of domestic procurement cost
- Direct contract with New Zealand manufacturer, Tip Top Ice Cream, eliminating wholesalers

Price comparison
¥



Share of the premium ice cream category at Daiei stores
Percent



* Snow Brand's Liebendale vanilla ice cream 470 ml

Source: Press articles; McKinsey analysis the 1980s, the appearance of low-cost national food producers and increased grocer concentration heightened price pressure on regional producers. Though unprofitable, many regional producers continued to obtain financing due to arrangements such as cooperative ownership structures. Dairy farmers, for example, continued to finance unproductive processors by subsidizing raw milk in exchange for more ownership shares in the dairy. This was also the case in meat, preserved fruits and vegetables, and sugar production. As a result, even with price pressure, inefficient producers only slowly exited the market.

In Japan, managerial goals and the product market affect industry dynamics differentially relative to the U.S. Japanese managers give lower priority to financial performance, demonstrating the capital market's failure to align goals with productivity (Exhibit 23). Food company managers instead hold customer satisfaction and employment and market share stability as primary goals. When sales declined at a large Japanese fishery, for example, the company entered other industries to maintain sales stature instead of focusing on its core competence. To satisfy perceived customer needs, food manufacturers also increase freshness and variety with little attention to the tradeoff with operational efficiency. The contrasting performance of Ezaki Glico and the large fishery demonstrates the negative effect of these goals on productivity and profitability (**Exhibit 26**).

The Japanese product market also lacks the intensity of price competition that forces inefficient companies to lose money. It is unclear why competition does not focus on price. One possibility is that, in markets with low competitive intensity, price is the least desired variable on which to compete because it is transparent. Competing on alternative factors such as freshness makes "cheating" easier and decreases competitive pressures. Such a situation can persist because barriers to entry preclude domestic and international competitors from entering. As will be discussed in the external constraints section below, these barriers include import restrictions and fragmentation in the industry chain. Another explanation for lack of price competition suggests that consumers seek high prices for their indication of quality. Recent evidence suggests this may not be the case, however, since Daiei has substantially increased sales with low prices and private-label brands (**Exhibit 27**). In any case, lack of price pressure allows inefficient producers to persist.

Finally, though not differentially as important as the three factors above, labor market factors also influence food-industry dynamics. Third-shift wages command a 30 to 50 percent premium over day wages in Germany and Japan, while there is little or no premium in the U.S. High wages reduce the return from running a third shift, and to the extent it is uneconomical to do so, they could deter consolidation into fully utilized plants. We give this factor secondary importance because we find many German and Japanese plants willing to operate three shifts when demand permits.

¶ *External constraints affecting industry dynamics.* The two most important external factors affecting industry dynamics are differences in ownership and the industry chain across the countries. Several other external factors contribute to industry dynamics, but have secondary explanatory power because various players have overcome their effects.

- *Ownership/governance mechanisms.* Food industry ownership varies substantially across the countries. Privately held companies play a large role in Germany and Japan, accounting for 84 percent of sales in Germany and only 51 percent in the U.S.[7] Within private companies, farmer cooperative ownership is uncommon in the U.S. but common among small- and medium-sized German producers in 5 food subindustries representing 45 percent of total capital services.[8] With respect to public companies, there are large differences in the composition of shareholders between the U.S. and Japan. U.S. shareholders are predominantly institutional and individual investors while Japanese shareholders are more often top managers, banks and other corporations.

  These ownership differences account for the differential alignment of goals with productivity and the differential capital market effectiveness in facilitating exit that we discussed. With respect to alignment of goals, the U.S. shareholder focus on financial returns forces managers to have a focus on financial performance. In Japan, on the other hand, food company owners value financial and nonfinancial goals, allowing managers to also pursue interests that may not be consistent with the productive use of assets. Banks and other corporations, for example, hold shares for relationship as well as return purposes. In addition, shareholding top managers balance return goals with stability and customer satisfaction goals. This is also the case for the many companies that are privately held. In combination, such ownership allows managers to trade off some financial return for other goals without concerning owners. This is evidenced by an average ROIC for food companies of 10.9 percent in Japan, 35 percent lower than that of 16.9 percent in the U.S.[9]

  With respect to forcing exit, both private and cooperative ownership in Germany limit the effectiveness of the capital market. In a

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7 A breakdown of sales between private and public companies was not available in Japan. Nevertheless, we know from the industry structure that small companies in Japan which are mostly private account for more than twice as much industry value added in Japan as in the U.S.

8 These sub industries are dairy, meat, preserved fruits and vegetables and sugar production.

9 Calculated as a weighted average for the top 46 companies in the U.S. and in Japan from 1986 to 1994.

cooperative arrangement, several hundred farmers jointly own the manufacturer to which they supply raw foodstuff. When these plants face the danger of insolvency, farmers aid them by supplying agricultural products at lower prices in exchange for more ownership shares. This significantly lowers the threat of failure for cooperative German producers. In addition, the prevalence of private ownership can hinder consolidation. Private owners may maintain control of inefficient companies for tradition or other purposes, making restructuring through mergers and acquisitions difficult.

Ownership in Germany also acts as a barrier to entry. Because cooperative farmers dedicate supply to existing manufacturers, potential new entrants face difficulties in procuring raw materials for food production. This limited entry allows regional producers to maintain market power, resulting in low competitive intensity.

- *Upstream and downstream market factors.* The industry chain has impacted food processing capital productivity indirectly in Germany and directly and indirectly in Japan. In Germany, food distributors are regionally based and are owned by or are in close cooperation with regional manufacturers. The existing distribution system hence allows only one or two manufacturers to deliver a particular product to stores in that region. Unless a retailer or large producer establishes its own national distribution network, regional producers operate in a low competitive intensity market. Historically, retailers and large manufacturers have found it prohibitively expensive to initiate national distribution, and competition between manufacturers remained limited. Recently, growing national chain retailers and producers, however, have found it economically feasible to bypass existing regional distributors with their own systems.[10] This heightened competition results in lower prices paid to manufacturers and thus increases pressure for consolidation.

  In Japan, the complicated distribution system creates a starting point disadvantage for food companies, so that even if they manage the industry chain well, they may not be able to reach the performance level of U.S. companies. The grocery retail sector is much more fragmented in Japan, with six to seven times more outlets per capita than in the U.S.[11] Ceteris paribus, this fragmentation would directly hurt productivity by a maximum of 10 index points by requiring smaller-lot delivery (and more capital investment) than is common in the U.S. But since Kao, Coca-Cola and others have managed to overcome many distribution hurdles, we do not believe that these

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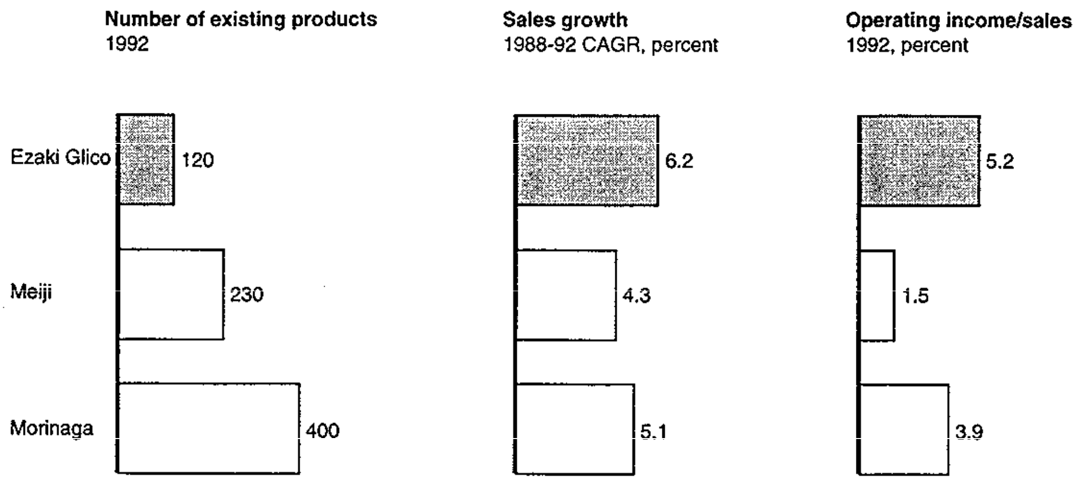
[10] The top 7 grocers, for example, accounted for 53 percent of sales in 1987 compared to 71 percent in 1993.

[11] In 1992, there were 4,700 grocery retailers per million people in Japan, versus 700 per million in the U.S.

Exhibit 28

EZAKI GLICO'S PRODUCT LINE MANAGEMENT



Source: Nikkei Company Reports; Nikkei Business; Annual Reports; McKinsey analysis

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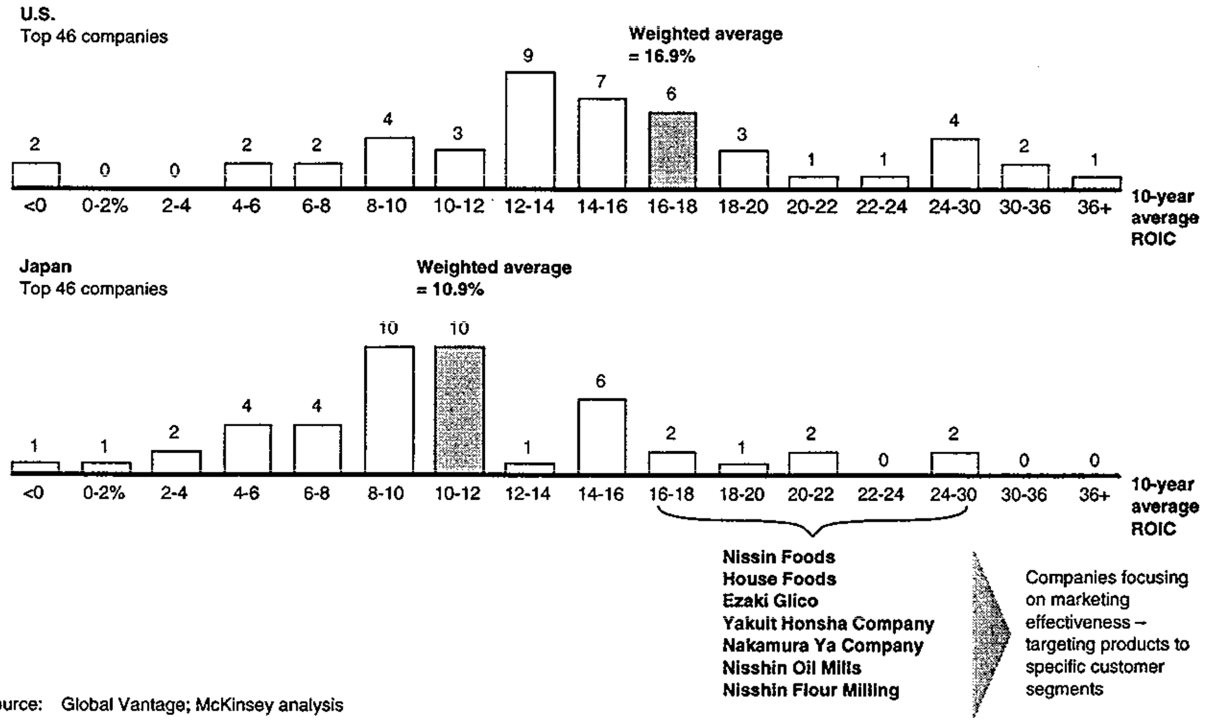
Exhibit 29

DISTRIBUTION OF COMPANIES BY AVERAGE ROIC 1986-94

Number of companies



Source: Global Vantage; McKinsey analysis difficulties are insuperable for managers.

Indirectly, the Japanese industry chain hurts productivity by acting as an informal barrier to entry. It is very difficult for new firms to establish the distribution network needed to be successful in Japan. Moreover, high fragmentation in agriculture and retailing makes achieving national scale difficult. These factors reduce the incentive for entry of new innovative firms from Japan and abroad, making tacit collusion to compete on variety and freshness easier for existing firms.

- *Factors of secondary importance for capital productivity differences.* Several other external factors differentially influence industry dynamics in the three countries. These are less important because there is evidence that they have not strictly limited managers' decisions.

  - *Demand factors.* Many manufacturers feel they must provide tremendous product variety and the utmost freshness because Japanese consumers demand these attributes in their food products. There may be some validity to this belief, as consumer surveys have confirmed the importance of freshness, for example, in buying decisions.[12]

    Nevertheless, the success of companies with different approaches suggests that competition on these variables may be due to managerial decisions more than immutable consumer preferences. By thoroughly test-marketing products before launch, for example, Ezaki Glico has been able to limit its number of products and still experience significant sales growth and profitability (**Exhibit 28**). Ezaki Glico is, in fact, one of many Japanese food processors that have successfully targeted marketing and competed on attributes other than variety and enjoyed financial success (**Exhibit 29**). Moreover, manufacturers can improve productivity by segmenting the market, providing freshness to consumers who are willing to pay, while offering less freshness in exchange for a lower price to others. Daiei has shown that this can be done and has had tremendous sales success sacrificing some freshness by shipping ice cream and orange juice from New Zealand and Brazil for sale at low prices in Japan (see Exhibit 27).

    We acknowledge that Japanese producers may not be able to suddenly reduce variety and freshness of offerings; years of

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[12] In a 1994 survey by the Tokyo Metropolitan Government, 97 percent of consumers said they read product labels before purchase, and production date was the primary item that most of these consumers looked for.

Exhibit 30

FOOD PROCESSOR EXPOSURE TO BEST PRACTICE INTERNATIONAL COMPETITION

	Germany	Japan
• Number of top 25 companies foreign-owned	9	1
• Percent of domestic food production coming from leading edge foreign transplants	13%	1%
• Leading edge imports as a percent of industry sales	1%	2%
• Exports as a percent of industry sales	1%	0%

Source: Teikoku Data Bank; Toyo Keizai; GWH Dr. Lademann & Partner: Top 500 der deutschen Ernährungsindustrie; Globalization Index competing on these attributes may have conditioned consumers to expect them. At the same time, the above examples show producers are not precluded from reconditioning consumers to seek somewhat less in terms of these attributes.

- *Labor market rules/unionism.* The bargaining power of labor unions in Germany may be higher compared to that in the U.S. The greater labor power, combined with a possibly lower preference for third-shift work in Germany and Japan, increases barriers to running a third shift for manufacturers by raising third-shift wages as discussed earlier.

- *Competition laws/enforcement.* In certain regions in Germany, there appears to be low competitive intensity on price, production volume and market served. Application of competition policy apparently has not remedied this situation, thereby allowing marginal and inefficient producers to persist by escaping competitive pressures.

- *Regulation/market interference.* While we believe the effect of restrictions is secondary to that of industry chain factors, restrictions also create barriers to entry, especially for foreign players. Direct restrictions include high tariffs and quotas on food imports. In 1990, for example, tariffs on beef, poultry and canned vegetables were 50 percent, 25 percent and 15 to 30 percent, respectively. Imports of cheese were also limited to 20,000 tons. Indirect restrictions make entry less attractive to multinationals. For example, ingredient restrictions against benzoates, preservatives and other chemicals require foreign producers to reformulate products before entering the Japanese market. As a result, only one of the top 25 producers in Japan is a foreign multinational, compared to nine of 25 in Germany (**Exhibit 30**). Both restrictions on imports and on multinationals help to preserve tacit collusion among domestic producers and allow them to continue competing on freshness and variety without being challenged by outsiders.

- *Sources of funding/market for corporate control.* Related to ownership in Japan, the food company share volume actively traded on the market is only a small fraction of the total shares outstanding. The majority of shares are held long term by top management, banks and other corporations for relationship purposes. Banks, who may have long relationships and significant capital at risk with existing customers, are more willing to continue subsidizing less efficient firms as long as they can meet interest payments. This effect is diminished in the U.S., where securities are the primary source of financing. In addition, higher levels of mergers and acquisitions in the U.S., due to both legal differences as well as the "sophistication" of the M&A

industry, forces restructuring in the food processing industry. Germany and Japan do not have the same level of sophistication in M&A.

We have also evaluated how these external factors preclude or constrain managers from reaching productivity levels comparable to the U.S. We can estimate this impact by evaluating the components of productivity differences and assessing whether external factors directly preclude improvement, create hurdles to overcome, or do not limit managers at all. In neither country does it appear that there are factors that directly prevent improvement. While managers do face some handicaps, we believe that managers could remove most of the productivity differences with actions under their control.

In Germany, for instance, relatively high third-shift wage premiums lower the economic feasibility of three-shift operations. We identified that as much as half of the 30 point productivity gap stems from differences in operating hours, while the other half stems from factors such as operating downtime and operations effectiveness. These latter factors are clearly are under managerial control. The high wages, however, are less so. Because we can not quantify how much of the lower operating hours are attributable to higher wages (as opposed to faulty capacity planning, for instance) we estimate the improvement potential for managers from zero to the full 15 points. Taken together, then, we believe that managers could close from as little as 15 to as much as all of the 30 point gap operating under their current constraints.

Similar logic applies for Japan. Three factors account for the 36 point gap with the U.S.: lower operating hours, more downtime, and higher logistics costs. Unlike in Germany, we believe that the lower operating hours are attributable primarily to managers desire to maintain excess capacity to service customers just in time, and not to disproportionately high third-shift premiums. While third-shift premiums may exist, the auto industry in Japan adapted successfully by moving to two ten-hour shifts. We also believe that more downtime attributable to greater product variety is also a factor managers can control, as demonstrated by the success of some players like Ezaki Glico. It is more difficult to make a judgment on the logistics costs, which account for 5-10 points of the overall gap. Managers in the food industry in Japan are penalized twice in Japan because of fragmented upstream and downstream markets. While we know that some firms have proved effective at circumventing the complicated distribution system, to be conservative we assume that this is a difficult constraint for managers to overcome. Even assuming this constraint can not be overcome to any extent, we believe that managers could close most of the productivity gap with the U.S., or 25-30 points of the total 36 points.

OUTLOOK AND IMPLICATIONS

Outlook

Germany has shown significant improvement vis-à-vis the U.S. since 1987, and this improvement should continue because of retailer price pressure and the breaking up of regionalized production for regionalized consumption. Japan's prospects for improvement are less predictable. The largest Japanese players are as technically advanced as in the U.S., but their productivity suffers because they compete on freshness and variety. Some players have been successful while not competing on these variables, but they are the exception. Most of the industry appears to be stuck in the prisoners' dilemma of accelerating competition on these fronts. In order to significantly improve capital productivity, Japanese players need to shift focus by changing the nature of the game and competing on factors such as price that are more aligned with productivity. If they can achieve such a shift, Japan's productivity improvement could be dramatic.

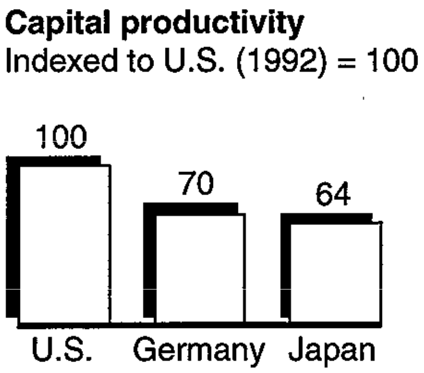
Implications

Our analysis has implications for both corporations and policymakers. With respect to food companies, we have seen that clear financial performance goals lead to better financial performance, and that better financial performance is achieved by increasing productivity. Since most of the productivity gap is due to lower capacity utilization, firms can take many actions specific to capital to improve productivity. Some straightforward steps, such as shutting down marginal plants and increasing operating hours, can directly improve utilization. German corporations, for example, should consolidate operations and pare down the number of lines so that each line operates as many hours as possible. Other steps to increase utilization and productivity are not capital-specific. In Japan, for example, firms can improve by segmenting markets carefully and targeting products to meet customer needs. Effective marketing can also increase volume and ensure higher utilization. We have also seen that improved capital productivity by these steps correlates highly with improved labor and total factor productivity.

More broadly, we have seen that product market pressures are important to steer managers into making these decisions to improve productivity. Policymakers can take several steps to promote more active product market competition. First, they should more closely scrutinize and penalize anticompetitive behavior. While such behavior has been present at times in all three markets, Japanese and especially German productivity appeared to suffer to a greater extent. In Germany, regional producers should be monitored to prohibit tacit understandings of market territory and price. In Japan, as well, markets should be closely reviewed for tacit collusion to avoid price competition.

Perhaps more importantly, barriers to entry should be removed because they allow such anticompetitive behavior to exist in the first place. In Japan, for example, the fragmented industry chain makes it difficult for new entrants to establish themselves. Policymakers should recognize that their actions, such as retail/zoning laws prohibiting large-scale grocery retailers, contribute to this fragmentation and lower the efficiency of the entire food chain. In addition, direct and indirect barriers to competition should be removed because they both hinder foreign presence in the food market and limit the sourcing options of domestic companies. Steps could include lowering agricultural tariffs and reviewing product content requirements.

PROCESSED FOOD CASE STUDY SUMMARY



Product proliferation and an excessive focus on freshness hinder Japan's performance. Surprisingly, just-in-time delivery systems – a boon to productivity in the auto industry – hurts the Japanese food industry. With competition on the increase, Germany continues to close the gap with the U.S.

U.S. plants have less downtime than their Japanese and German counterparts. In the dairy industry, for example, an average plant shuts down for 40 hours per week in the U.S., compared to 60 and 56 hours in Germany and Japan, respectively. Moreover, U.S. plants have less downtime for changeovers while they are operating because they produce fewer varieties of products. Downtime associated with product variety amounts to 7 hours per week in the U.S. compared to 11 and 25 hours in Germany and Japan.

Japanese food companies compete primarily on freshness and product variety, not price. In order to provide maximum freshness across huge their huge product lines -- which often have 50% more SKUs than U.S. counterparts -- Japanese companies have created a system in they carry virtually no inventory. Instead, they produce and distribute products on the day they receive orders the same day they receive orders. This "just-in-time" system forces them to carry excess plant capacity to meet significant daily peaks in demand. In the Japanese dairy industry, for example, peak capacity is twice the level of average daily demand. This investment in excess capacity hinder capital productivity.

Slower industry consolidation in Germany accounts for more excess capacity relative to the U.S. In the U.S. intense competition and an unforgiving capital market have forces out inefficient players, allowing the industry to consolidate. In Germany less competitive pressure is slower to push unproductive players to the brink? , and ownership structures such as cooperatives are slower to cut off funding. These trends have reversed in recent years, accelerating consolidation and fueling fast productivity growth.

The case also shows how an entire industry chain can affect productivity of individual participants in unanticipated ways. Regulations restricting large scale retailers in Japan, for example, contribute to fragmentation in distribution and manufacturing, which both directly lowers food processing productivity and makes it difficult for productive new players to enter. Although competition is increasing in Germany, a regionalized distribution structure still makes it difficult for efficient national producers to emerge and challenge static regional producers.

Productivity in the general merchandise retailing industry

Retailing, taken as a whole, is important because it is large. It comprises roughly 10 percent of the total value added (GDP) in the U.S., and about 6 to 7 percent of that in Germany and Japan. This sector is a major user of capital – even more so than telecommunications or electric utilities – accounting for 10 percent of the U.S. and Japanese capital stock, and around 7 percent of Germany's. Moreover, retailing is a good example of the service sector industries that are becoming increasingly important in developed economies.

We have studied general merchandise retailing only and we will refer to it here as retailing for brevity. This sector constitutes the front end to a large part of the economy, with up to 40 percent of final consumer expenditures occurring within it. Productivity in this sector is critical, therefore, because it directly impacts the real income of consumers.

This case study contributes two main findings to the overall discussion.

¶ Two very different ways of achieving high capital productivity emerge. By actively introducing new formats and excelling at merchandising, the U.S. creates high levels of value added for a given sales volume through the provision of more service. Germany attains high capital productivity by minimizing its asset base and using less capital to handle a given sales volume, but with less service. Japan ranks below the other two countries on both these dimensions.

¶ This case study highlights the relative impact on capital productivity of managerial actions and external constraints.

- Japanese managers could achieve a performance level close to that of the U.S. or Germany by affecting factors under their control. External constraints have not precluded the best retailers in these countries from reaching world-class productivity.

- External factors are important, however, in setting up a performance dynamic of creative destruction that pressures managers to innovate, improve or lose market share. This case illustrates how product and capital markets are working in tandem to create such a cycle. The process is driven by product markets that are vigorously competitive and capital markets that both establish high financial returns as the performance objective and facilitate the exit of inefficient firms. Best practice spreads when high performers are allowed to enter new markets and force out less productive incumbents.

Exhibit 1

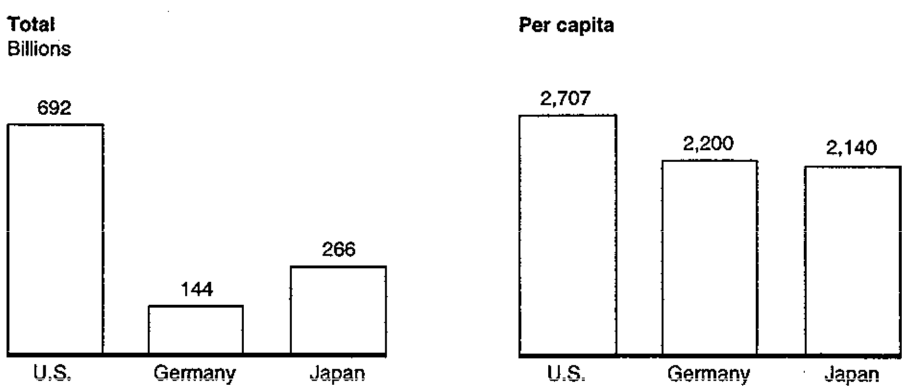
DEFINITION OF THE GENERAL MERCHANDISE RETAIL SECTOR

Included	Excluded
General merchandise stores	*Eating and drinking establishments*
Apparel and accessories stores	*Food retailers*
Building and garden supply stores	*Car dealers*
Home furnishing stores	*Oil and gas retailers*
Auto and home retailers	*Drug stores*
Furniture stores	Liquor stores
Jewelry stores	
Florists	
Sporting goods stores	
Mail order houses	
Fuel, coal and ice dealers	
Book stores	
Stationery stores	
Camera stores	
Cigar stores	

Note: *Italics* = Over 200,000 employees in the U.S.
Source: McKinsey analysis

Exhibit 2

GENERAL MERCHANDISE RETAIL SALES 1992*
U.S.$



* Converted at consumer goods PPP
Source: BEA: U.S. Census of Retail Trade; Japan Census of Commerce; Statistisches Bundesamt: Fachserie 6 Reihe 3.2

INDUSTRY OVERVIEW

General merchandise retail, defined in **Exhibit 1**, comprises roughly half of all retail sales. Our analysis concentrates on this part of retailing for two reasons. First, since food and nonfood retailing are distinctly different in their economics and in the dynamics of their markets, aggregating them leads to a result that offers insight into neither part of the industry. Second, this focus is consistent with MGI's past work on the sector. [1]

On a purchasing power parity (PPP) basis that converts to equivalent physical volumes, per capita retail sales are similar in Germany and Japan, and somewhat higher in the U.S. (**Exhibit 2**). Typically, 60 to 70 percent of these receipts is the cost of goods sold and is paid to manufacturers. The remainder, less payments for purchased services, is the return to capital and labor in retailing.

The capital employed in this industry is primarily structures and equipment, both owned and leased. Unlike the other case studies, we also include inventories. Structures include selling space as well as warehouses and other buildings. Equipment comprises not just assets like cash registers and computers, or wood pallets and shelving, but also trucks and other machinery, such as forklifts. The composition of this capital stock is similar across countries. However, inventories (and hence net working capital) form a much larger portion of the capital stock in Germany than they do in the other two countries (**Exhibit 3**). For the treatment of land, see the box on "Land Measurement."

PRODUCTIVITY PERFORMANCE

Productivity is measured as value added per unit of capital services used. U.S. and German performance is found to be comparable. Japan is 35 percent lower.

Measurement

Average capital productivity is measured as value added per unit of capital services used. ("Productivity" in the remainder of this case refers to capital productivity, except where differently specified.) This operational performance is a real output to real input measure because it removes intercountry differences in investment good and output prices. See "Methodology" box for details.

Correctly measuring the "output" of the retail sector is difficult. The true output of retailing is the service component embodied in the price of the goods sold. This service is partly the retailer's market-making function of bringing manufacturers and buyers together, but also includes other roles, like the provision of sales assistance. Thus, the product of this sector is not just

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1 See, for example, *Service Sector Productivity*, McKinsey Global Institute, October 1992 and *Employment Performance*, McKinsey Global Institute, November 1994.

LAND MEASUREMENT

Land is an important capital input but it presents difficult measurement issues, particularly with regard to owned versus leased land and market versus book values. For owned land, we only have book value numbers, and converting them to market value requires information on when each piece of land was acquired, as well as the rate of change of land market prices since that time. Lack of availability of this data precludes us from including the market value of owned land into our analysis. With leased land we face the opposite problem: we must include its current market value in capital services used because we do not have enough information to separate out the fraction of total lease payments that constitutes the return to land versus that to structures and equipment.

To establish the validity of this hybrid measure, we need to test the sensitivity of our findings to variations in the treatment of land by evaluating the impact of two extremes: first, if all land were included, and second, if none of it was added, in capital services used. We find our indexed results to be directionally robust to these sensitivities.

¶ *Including owned land.* The total value of land usage can be broken into three components: the differences in land prices across countries, variations in its location mix (urban versus suburban or rural), and differences in its physical quantity employed. We consider these factors in turn. While we cannot precisely measure these effects, preliminary analysis suggests that including them would leave German performance unchanged and lower Japan's. Relative rankings would be unaffected.

- *Differences in price* for similarly situated land (U.S. urban versus German urban, for example) would not matter to our measure in any case, because if we included land, we would adjust it using a PPP that would remove them.

- *Location mix differences* would lower both German and Japanese performance. Since urban land is more prevalently used in Germany and Japan than in the U.S., (where suburban malls as well as Wal-Mart type stand-alone stores are much more common) and such land is more expensive, we expect the location mix effect would have lowered our measured German and Japanese productivities.

- *Quantity differences* offset the location mix effect for Germany, and add to it in the case of Japan. Since, relative to the U.S., Japan has higher structures usage per unit of sales, it is likely that it also uses more land. Including land, therefore, would lower its productivity. For Germany, however, including land raises indexed productivity. Since Germany uses substantially less capital services in general, and structures in particular, than the U.S., it is reasonable to expect that it uses relatively less land as well. Consequently, unlike the location mix effect, this factor would have raised German productivity.

¶ *Excluding leased land.* Removing land from capital usage would also leave the productivity findings unaffected.

Since we do not know the fraction of lease payments that are payments to land we cannot subtract it out of leases. However, we can estimate the impact of doing so. Leases are roughly 50 percent of capital services used, and if land is, on average, 25 percent of them, it comprises 13 percent of capital services used. Even if one country differed from this estimate by 50 percent, this would translate into only a 5 to 6 index point performance difference.

METHODOLOGY

Industry coverage

General merchandise retail – defined as the retail sector less food retailers, restaurants, car dealers, oil and gas dealers, drug stores, and liquor stores – is considered here. The focus, therefore, is on 40 to 45 percent of the full sector, measured by total sales. In order to be classified as a general merchandise retailer, a firm had to have 50 percent or more of its total sales in this category.

Occasionally, where appropriately disaggregated data were unavailable, total numbers had to be allocated between general merchandise and all other retail. For example, capital in Japan was split between these two parts in the ratio of square feet of selling area.

Output

Value-added, our measure of the output of this industry, is defined as sales receipts, less the cost of goods sold and less purchased services. Equivalently, value-added is the sum of labor's compensation, all payments to capital (profits and depreciation), and leases. The former definition is used for the U.S. and the latter for Germany and Japan. Leases are included because they too represent payments to capital. The cost of goods sold and purchased services are excluded because these are the output of other industries.

Capital services

Capital services are defined as the sum of structure and equipment services, the real opportunity cost of maintaining inventories, and lease payments. This is consistent with the other cases, with one exception: inventories are included here due to their unique importance in retailing.

Leased, but not owned, land has been included in the analysis. The indexed productivity measure is insensitive to which of two consistent ways to treat land is chosen. For more details, see the box entitled "Land Measurement."

A flow measure, capital services used, is employed. Total capital stock for each country, measured using sudden-death depreciation assumptions, was divided by standardized service lives (35 years for structures and 11 years for equipment) to obtain an annual flow of capital services used. Lease payments were obtained from industry balance sheets or corporate tax data. The cost of holding inventories was calculated by multiplying the average annual inventories with a financing cost equal to each economy's internal rate of return, calculated in the Implications section.

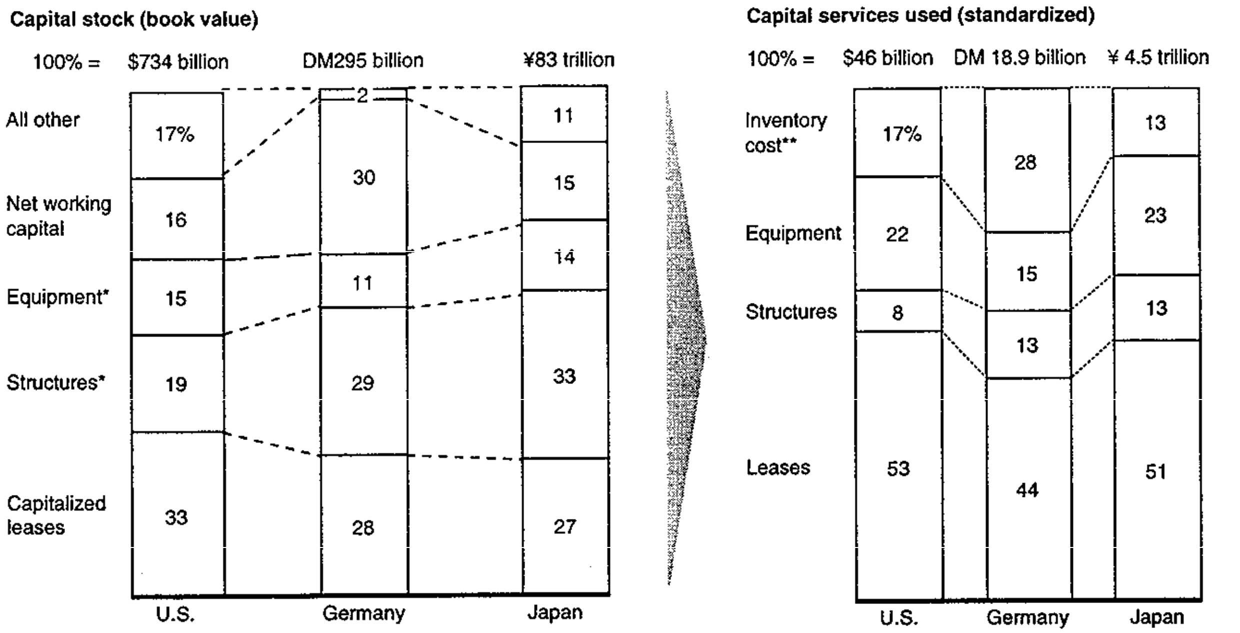
Purchasing power parities

A retail services PPP is unavailable. Consequently, we use the OECD household consumption PPP, interpreted as the opportunity cost of purchasing retailing services. Value added converted at this PPP represents the consumption foregone to obtain retailing services. Though this approach makes our output measure internationally comparable, it does not enable us to adjust, for example, for service quality differences across countries. Structures and leases are converted at the general OECD nonresidential buildings PPP while the machinery and equipment PPP is used for equipment. Inventories, because they are goods sold through retail outlets, are converted at the consumer goods PPP.

Exhibit 3

CAPITAL BREAKDOWN 1992

Percent of total capital in local currency



* The structures number includes land (at book value); the Japanese breakdown between structures and equipment is estimated

** Opportunity cost of maintaining inventories; defined as: economy IRR inventory stock, where IRRs used are those calculated in the Financial Performance section

Source: U.S. IRS Statistics of Income Corporation Source book; BEA: U.S. Census of Retail Trade; Deutsche Bundesbank Monatsbericht; Statistisches Bundesamt; Japanese Ministry of Finance Industry balance sheets; Japanese Census of Commerce; McKinsey analysis

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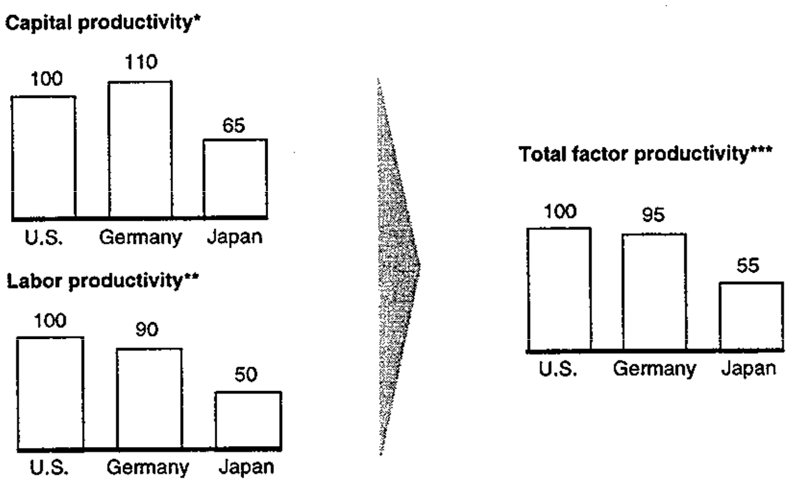
Exhibit 4

CAPITAL, LABOR, AND TOTAL FACTOR PRODUCTIVITY – RETAIL

Indexed to U.S. (1992) = 100



* Defined as total value-added produced per unit of capital services used with both input and output prices adjusted by the appropriate PPPs; see box entitled Methodology in text

** Defined as value-added per hour worked adjusted for purchasing power parity

*** Calculated using a Cobb-Douglas production function; $TFP=Y/(K^{0.3} \cdot L^{0.7})$, where the coefficients are the approximate share of income going to each factor. These numbers are for wholesale and retail trade combined since OECD data are unavailable at a finer level of disaggregation

Note: All productivity indices rounded off to the nearest five.

Source: BEA: U.S. Census of Retail Trade; BEA: U.S. Employment, Hours and Earnings; Japan Census of Commerce; Statistisches Bundesamt Fachserie 1, Reihe 4.1.1 and Fachserie 6, Reihe 3.2; McKinsey analysis "throughput," which is merely the physical volume of goods transferred through stores.

Several output definitions that attempt to capture this service component exist. They include sales, gross margin, value added and the consumer surplus generated. Data is not available to calculate some of these measures, while others include more, or less, than this sector's output.[2] In keeping with prior MGI work, we use value added as the definition of output. This measure excludes the output of other industries that retailers simply purchase, and includes the value of retail services.

Unfortunately, however, we lack a retail-specific output PPP. We address this problem by using the household consumption PPP to obtain an internationally comparable measure of value added. This measure has an opportunity cost interpretation: it is the number of baskets of consumption foregone to obtain the services of the retail sector. Our final output measure, thus, is not strictly comparable to the other case studies. Although we are able to make international comparisons using this approach, the absence of a retail PPP makes it impossible for us to appropriately adjust for monopoly pricing or differences in the quality of service provided across countries.

Results

Capital productivity in Germany and the U.S. is roughly comparable, with Japan approximately 35 percent below this level (**Exhibit 4**).

This measure includes the cost of inventory maintenance in capital services used because inventories are a significant input in retailing. If this cost is excluded to conform with the other cases, German performance rises to 125 percent of the U.S. level, while Japan's is unchanged. The change in Germany's productivity reflects the disproportionately large share of inventories in the capital services it uses.

These findings hold under a variety of sensitivity analyses. Using capital stocks instead of flows, or varying the service life assumptions, does not change the results substantively. Measured productivity is also directionally insensitive to the interest rate used to calculate the cost of maintaining inventories.

On total factor productivity, the ranking of the three countries in descending order is U.S., Germany and Japan (Exhibit 4).

We believe that our capital productivity measure overstates German performance because of service quality differences between the U.S. and Germany. Since we lack a retail PPP, however, we cannot adjust our measured productivity, as we can in the automobile industry case, to reflect these differences. Interviews with industry experts suggest that such an adjustment

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2 For a more complete discussion, see *Service Sector Productivity*, McKinsey Global Institute, October 1992.

would lower indexed German productivity. Germany's store operating hour restrictions inconvenience customers, and retailers there offer less service as well as a more limited choice of channels through which goods may be purchased. Since we cannot quantify these effects, we have not adjusted our numbers. Therefore, interpreting our results for Germany as a measure of best practice that can be successfully transferred to other countries would be inappropriate. The German productivity outcome, we believe, is the natural consequence of a wealthy consumer base being served by a retail industry that minimizes its use of space and can do so on an ongoing basis due to high land prices and other barriers to entry. These factors will be discussed fully below.

CAUSES OF DIFFERENCES IN CAPITAL PRODUCTIVITY

Managers operate quite differently in the three countries. This leads to differences in overall productivity and in how this performance is achieved. U.S. managers introduce innovative formats and improve performance within existing formats through better merchandising and industry chain management. As a result, they add more value per good sold, and employ less capital for a given sales volume, than their Japanese counterparts. German managers, on the other hand, achieve high productivity by minimizing the amount of capital (especially floor space) that they use. These differences in performance and in managerial actions are the result of distinctly different industry dynamics and external pressures in the three countries.

In the U.S., a vigorously competitive product market and a strong capital market combine to create an industry in which innovators thrive. By demanding a high financial return and cutting off funds to unprofitable firms, the capital market aligns managers' goals with operational performance. Product market competition compels retailers to find ways to deliver more value more efficiently, or else face extinction as new and more productive players enter. Low entry and exit barriers and the absence of restrictive regulations facilitate this outcome. Consequently, underperformers are pruned and industry productivity rises.

Unlike in the U.S., neither adoption of global best practices in retailing, nor evolution toward more productive formats, has occurred in Japan. This results from product market restrictions which, in turn, are caused by high land prices and regulatory constraints that create barriers to entry. Moreover, the capital market neither forces managers to focus on operating fundamentals, nor prevents underperformers from obtaining funds. A performance improvement cycle is not set up and productivity suffers.

High land prices also create barriers to entry in Germany, and reduce competitive intensity in the product market. Store operating hours regulations as well as structural barriers to exit, such as the high degree of private ownership, further decrease the dynamism of the industry relative to the U.S. However, the German capital market is more demanding of financial performance and therefore better aligns managerial goals with productivity than

Exhibit 5a

SUMMARY OF CAUSES OF DIFFERENCES IN CAPITAL PRODUCTIVITY – RETAIL

	U.S.	Germany	Japan
IV External factors affecting industry dynamics	• Low barriers to entry and exit • Absence of restrictive regulations that could impede change • Agile and responsive capital market structure	• High land prices restrict use of this input by existing retailers and present barrier to entry of new players • Very confining store operating hours regulation hinders format evolution and lowers intraformat performance • Private ownership structure confers relative immunity from capital market censure and takeover threats	• Strong barriers to product market entry due to high land prices • Zoning laws and other regulations impede format evolution • Bubble economy distortions diverted managerial focus away from operating fundamentals • Conglomerate ownership structure subsidizes unproductive retailers
III Industry dynamics	• Vigorous product market competition permits only constant innovators to thrive; all others lose market share • Capital market forces managers to focus on operational productivity by demanding superior financial performance and cutting off funds to nonperformers	• Active product market competition, except in department stores as well as rural areas • Capital market pressure, and focus on operational performance, more than that in Japan but less than U.S. levels	• Low product market competition reduces threat to the market share of largest players • Capital market pressure to focus on operations absent; underperformers not cut off from funds, and at times, even subsidized
II Managerial decisions	• Creation and adoption of new formats raises value added and minimizes the capital required to handle a given sales volume • Superior merchandising raises value added per sale • Industry chain management best practices enable minimization of capital services usage	• Extremely high sales per square foot maintained through sparing use of land • Global best practice merchandising skills not adopted • Format evolution only slightly lagging U.S. levels	• New, more productive formats neither adopted nor created • World-class merchandising skills not developed • Logistics not integrated
I Components of differences	• Highest value added per unit of throughput • High throughput per unit of capital services used	• Lower value added per unit of throughput • Dramatically higher throughput per unit of capital services used	• Lower value added per unit of throughput • Substantially lower throughput per unit of capital services used

Source: McKinsey analysis

in Japan. For instance, high land prices force retailers to use space very sparingly, raising sales per square foot far above U.S. levels. Germany's high throughput offsets the effects of its lower industry performance pressure, leaving it at par with the U.S.

Exhibit 5a summarizes this overview of the reasons for the performance gaps we observe. Below, we analyze the components of the observed capital productivity differences and examine the managerial actions that lead to them. We then account for the industry dynamics that drive manager behavior. Finally, external forces that impact industry performance are considered. These factors are ranked as having primary, secondary or no explanatory power. We highlight importance in explaining performance *differences*, not importance on *levels* (**Exhibit 5b**).

Components of difference

The concepts of "capacity created with assets" and "capacity utilization," which we have used for consistency across case studies, are not directly applicable to retailing. In this case, we analyze the equivalent of capacity created with assets by factoring operational productivity into value added per unit of throughput, and throughput per unit of capital services used. (Throughput is defined as sales adjusted by the consumer goods PPP, and is equivalent to a physical volume concept.) This separates how much value retailers add per good that they sell versus how many goods they sell for a given level of capital services usage. (This factoring is analogous to a financial analyst's looking at margins and asset turns.) We then assess the magnitude of the impact of "capacity utilization," defined as store operating hours, on this "capacity created" (**Exhibit 6**).

¶ *Capacity created with assets*

- *Value added per unit volume.* High performance along this dimension is reflected in the ability of retailers to provide high levels of service to customers. Superior merchandising, better industry chain management, and heightened operations effectiveness all increase value added per unit volume. Differences along this dimension explain about 15 to 20 index points of the Japan-U.S. gap, and lower Germany's indexed performance by about 5 to 7 points.

- *Throughput per unit capital services used.* This factor measures how much capital retailers employ to handle a given sales volume. German retailers score highest on this measure due to their very high sales per square foot. This causes a 15 to 20 index point rise in their measured performance, more than offsetting their relatively lower value added per unit volume. Japan loses 15 to 20 index points relative to the U.S. along this dimension.

¶ *Capacity utilization: store operating hours.* This factor is the retail equivalent of capacity utilization and is unique to Germany. German

Exhibit 5b

SUMMARY OF CAUSALITY ANALYSIS – RETAIL

○ Important in explaining capital productivity differences
x Secondary in explaining capital productivity differences
● Not important

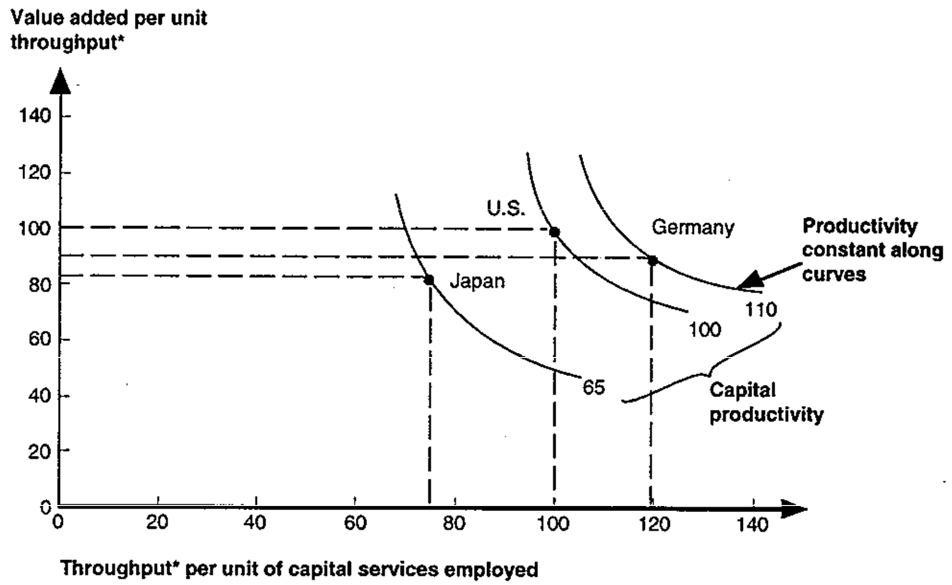
		U.S.-Germany	U.S.-Japan	Combined
IV. External factors affecting industry dynamics	**Macroeconomic environment**	○	●	●
	Product market factors			
	• Demand factors	x	x	x
	• Competition laws/enforcement	x	x	x
	• Monopoly regulation	x	x	x
	• Regulation/market interference	○	●	●
	Labor market factors			
	• Skills	x	x	x
	• Demographics	x	x	x
	• Rules/unionism	x	x	x
	Capital market factors			
	• Sources of funding/market for corporate control	○	●	●
	• Ownership/governance mechanisms	○	○	○
	Upstream and downstream market factors	○	○	○
III. Industry dynamics	**Product market**	●	●	●
	Labor market	x	x	x
	Capital market			
	• Alignment of goals with productivity	○	●	●
	• Ongoing improvement pressure	x	x	x
	• Forcing of exit	○	●	●
II. Managerial decisions	**Marketing**			
	• Product/product line management	●	●	●
	• Promotion/ demand stimulation/ pricing	x	x	x
	• Channel/ format selection	○	●	●
	Industry chain management	○	●	●
	Production technique			
	• Capital/labor mix	x	x	x
	• Technology	x	○	○
	• Scale	x	x	x
	Capital expenditure decision making			
	• Planning	x	x	x
	• Asset choice	x	x	x
	Operations effectiveness	●	○	●
I. Components of differences in productivity	**Capacity created with assets**	●	●	●
	• Value added per unit volume	○	●	●
	• Throughput per unit capital services	●	●	●
	Capacity utilization: store hours	○	x	○

Source: McKinsey analysis

Exhibit 6

BREAKDOWN OF GENERAL MERCHANDISE RETAILING CAPITAL PRODUCTIVITY

Indexed to U.S. (1992) = 100



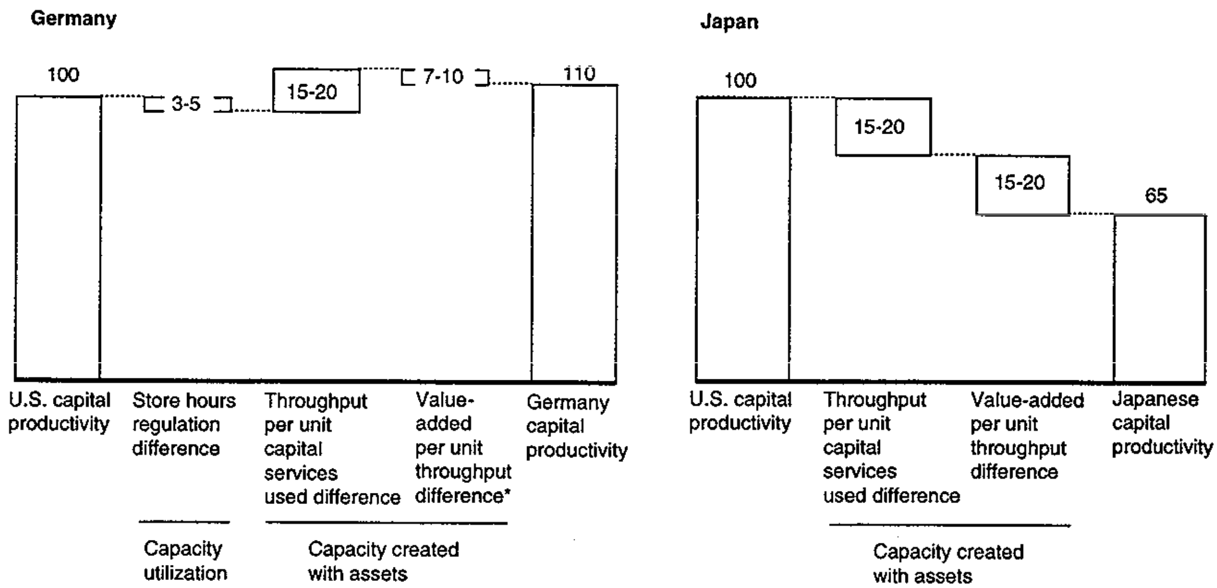
* Throughput, or the volume of goods through the system, is obtained by dividing sales by the market consumption expenditure PPP

Source: McKinsey analysis

Exhibit 7

SOURCES OF PRODUCTIVITY DIFFERENCES

Indexed to U.S. (1992) = 100



* Estimated as residual

** Estimated based on IFO Report on store closing hours regulation in Germany and the fact that, on a PPP basis, German retail sales per capita are approximately 13% lower than those in the U.S.

Source: McKinsey analysis

Source: McKinsey analysis

performance on throughput per unit capital services used would be even higher if store-operating-hour regulation did not reduce sales. These restrictions have a negative impact (estimated, using conservative analysis done by the Ifo Institute, to be 3 to 5 index points) on productivity.[3]

These factors explain the observed productivity differentials fully (**Exhibit 7**).

Managerial decisions affecting productivity

Two sets of managerial actions yield higher productivity on the dimensions just discussed: the introduction of innovative new formats and the development of better core retailing skills within an existing format.

"Format" encompasses both the price-benefit trade-off offered to customers and the organization of key functions. These factors significantly impact the economics, and consequently the performance of retailers. Since newer formats are more productive, format mix differences across countries are important and explain one-half of the performance difference between Japan and the U.S.

We also observe dramatic performance gaps across retailers within the same format. In the U.S., even among similar retailers, some players are up to two times more productive than others (**Exhibit 8**). Similarly, in Japan, well-managed retailers like Ito-Yokado outperform their peers and reach world-class performance. The wide productivity dispersions we observe among similar stores within the same country underscore the fact that the critical productivity-enhancing levers are well within managerial control. Managers achieve higher performance through excellence in merchandising, industry chain management and store operations.

The combination of format evolution and intraformat improvement is reflected in retailers' ability to target and serve precisely defined customer segments efficiently by providing a range of shopping options. Such a process has left the U.S. retail sector proliferated with a variety of players, from upscale specialty stores (high value added to unit volume) to steep discounters (very high sales volume to capital services) (**Exhibit 9**). Consequently, U.S. retailers as a whole are well-positioned to serve customers efficiently and to collect the value from doing so.

¶ *Marketing*. Marketing, here, refers both to a retail sector's format mix and to the merchandising and product line management skills of the specific players in it. The former represents the overall industry landscape while the latter affects intraformat performance.

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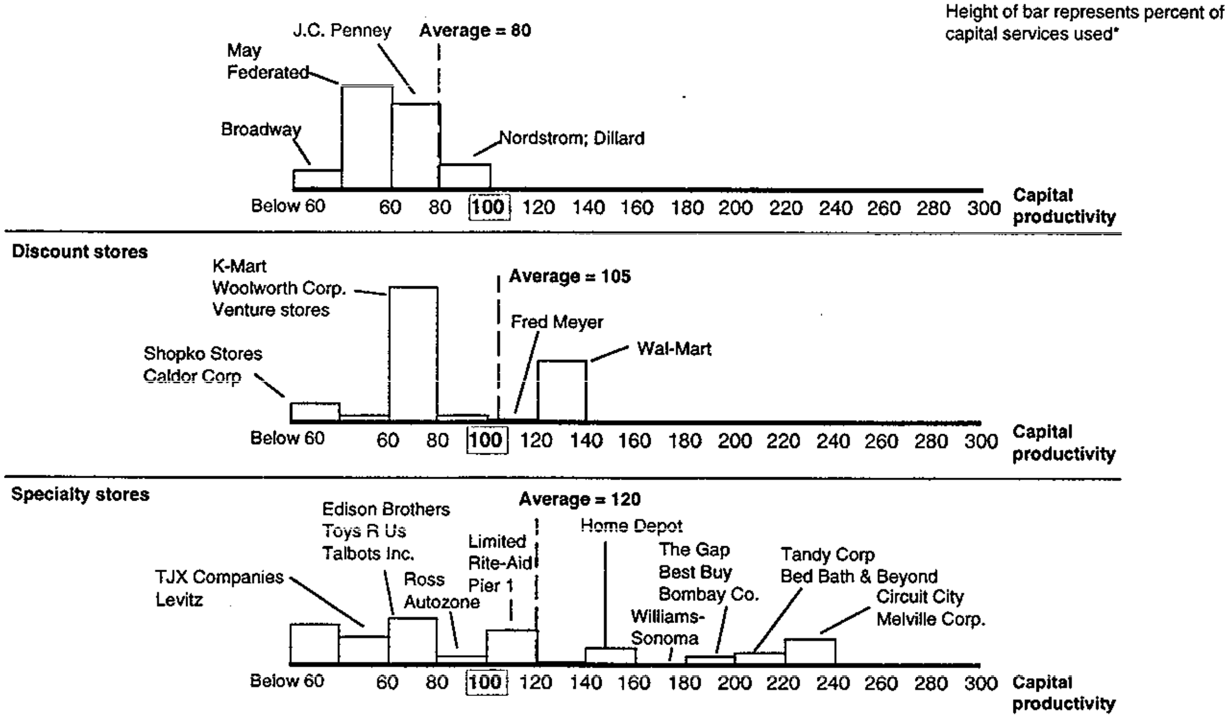
3 Ifo Institut für Wirtschaftsforschung, *Das deutsche Ladenschlußgesetz auf dem Prüfstand*, Duncker & Humblot, 1995.

Exhibit 8

CAPITAL PRODUCTIVITY BY FORMAT

Indexed to U.S. all format average (1992) = 100



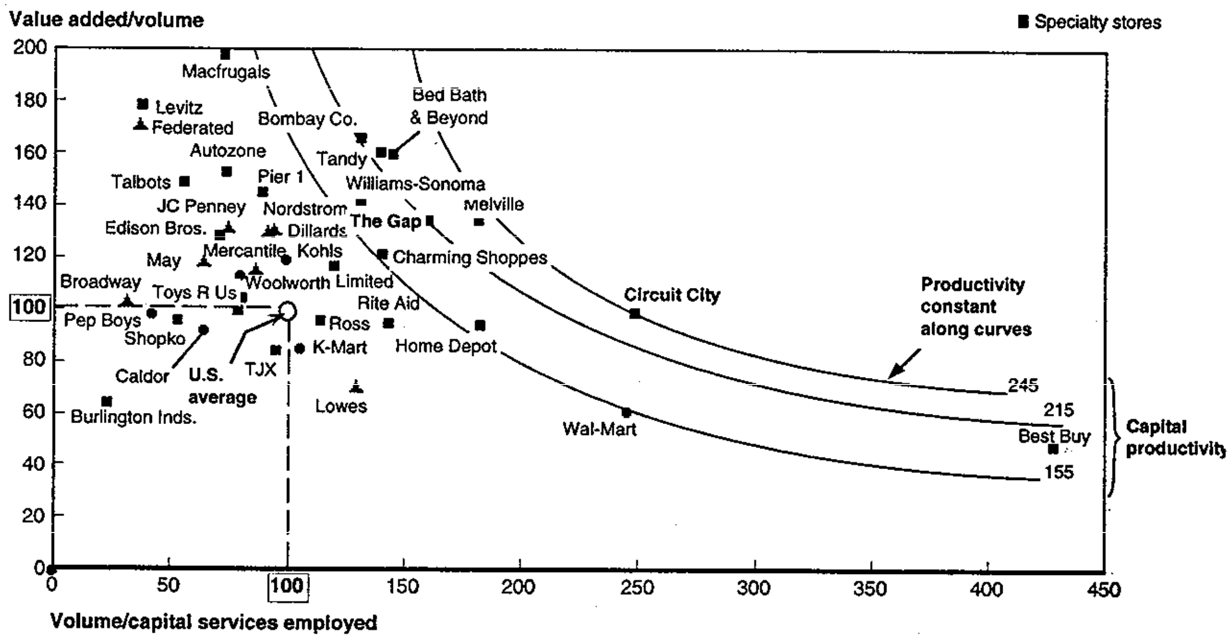
* Capital services used by each retailer as a fraction of those used by all stores in each format's sample; the sum of all capital services used for each format should therefore equal 100

Source: Compustat; McKinsey analysis

Exhibit 9

U.S. RETAILER PROLIFERATION

Indexed to U.S. all format average (1992) = 100



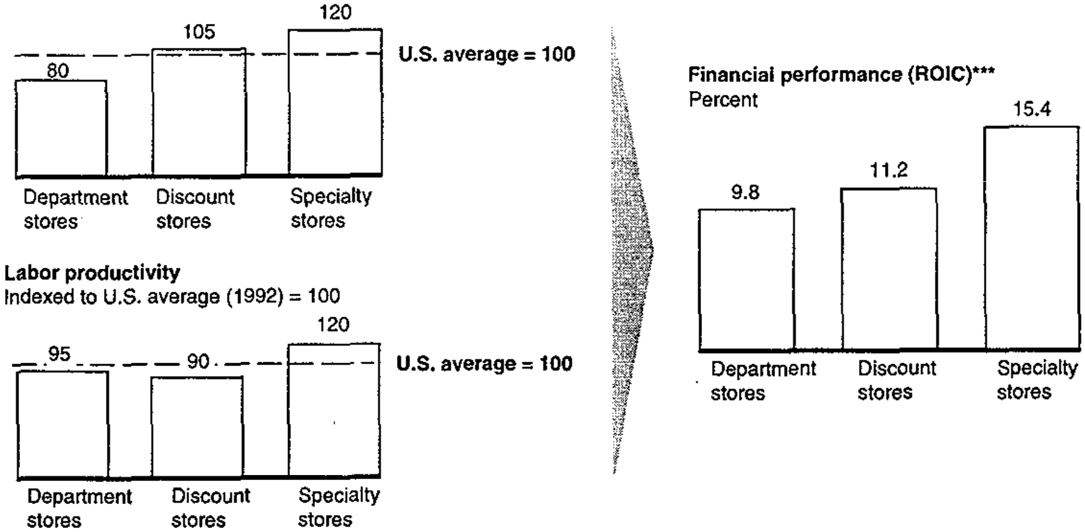
* Volume, or throughput, as described in the text, is the number of baskets of goods sold; it is calculated as sales adjusted by the consumer goods PPP

Source: Compustat; McKinsey analysis

Exhibit 10

U.S. RETAILING PERFORMANCE* BY FORMAT 1992

SAMPLE



* The productivity measure shown here uses average annual capital expenditure data to estimate capital services used. It is, therefore, not strictly comparable to the economy-wide measure shown earlier

** Based on a sample of 41 companies (8 department stores, 9 discounters and 24 specialty stores) which comprise roughly 33% of all U.S. retail sales

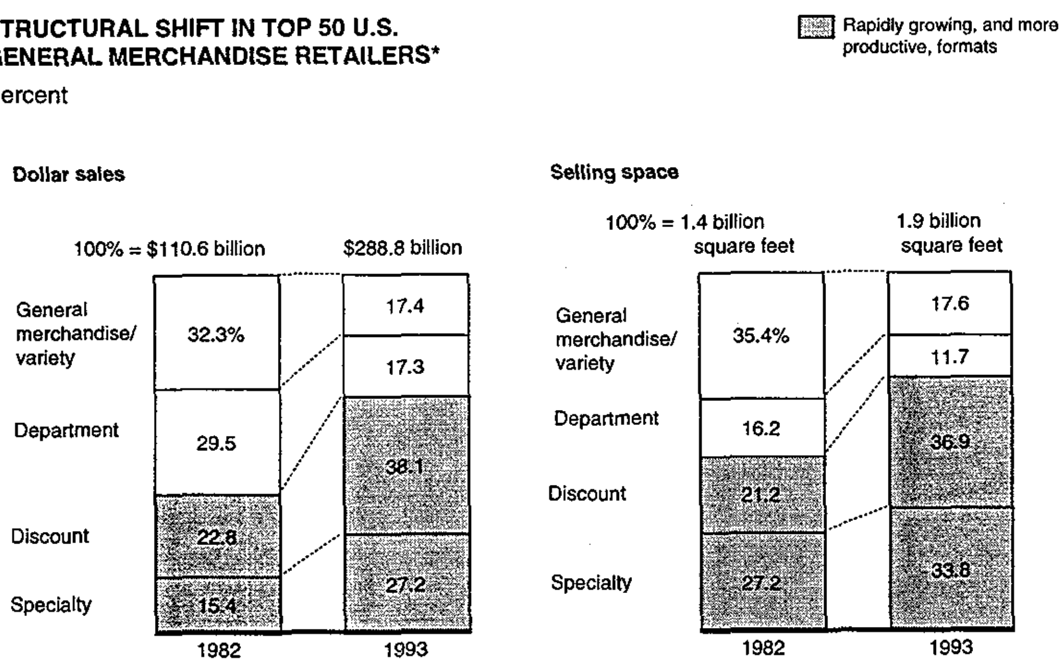
*** These results also tend to hold for a by-format comparison of shareholder value creation, as measured by standardized market value added. See exhibit in Synthesis section

Source: Compustat; McKinsey analysis

Exhibit 11

STRUCTURAL SHIFT IN TOP 50 U.S. GENERAL MERCHANDISE RETAILERS*

Percent



* Ranked by sales

Source: Annual reports; Compustat; McKinsey Retail Practice; McKinsey analysis

- *Format selection and mix*. This analysis distinguishes four formats. From oldest to most recent, they are: "mom-and-pop" stores (typically retailers with fewer than five employees), department stores (for example, Tokyu in Japan, Macy's in the U.S. and Karstadt in Germany), discount stores (for example, Wal-Mart in the U.S., or Wertkauf in Germany), and specialty store chains (for example, Benetton or The Gap). Specialty stores can be further classified into "up-scale specialty" (for example, Tiffany's) and "category killers" (for example, Aoki or Aoyama in Japan, or Best Buy in the U.S.) where the latter also have highly focused product lines but aim for a much more price-conscious market. Our analysis subsumes "category killers" under specialty stores for simplicity as well as data availability reasons. [4]

  Analysis of U.S. firms shows that the newer retailing formats are much more capital productive than the older ones. Moreover, they do not sacrifice on labor productivity. These advantages are reflected in their financial results (**Exhibit 10**). Unsurprisingly, therefore, evolution toward them has occurred rapidly in the U.S. (**Exhibit 11**).

  This evolution has not occurred in Japan where mom-and-pop and department stores have a large market share (**Exhibit 12**). Japanese managers have neither innovated themselves nor adopted more productive formats developed elsewhere. We estimate the impact of this difference by applying U.S. productivity by format to the Japanese format mix. We find that format mix differences explain about 50 percent of the observed U.S.-Japan productivity gap. This effect shows up both in value added per unit of throughput (since specialty stores, which often score high on this ratio, are relatively scarce in Japan) and in throughput per unit capital services used (since discount stores, which perform well on this dimension, have been all but non-existent).

  The U.S.-Germany format mix is similar. Thus, this factor has only a 3 to 5 index point impact on observed productivity.

- *Product line management*. World-class retailers, such as Nordstrom or The Gap, increase their value added by varying product assortments by store or aggressively changing their product line based on what does and does not sell (**Exhibit 13**). Information technology (IT) is critical to this active promotion of successful products and the aggressive pruning of losers.

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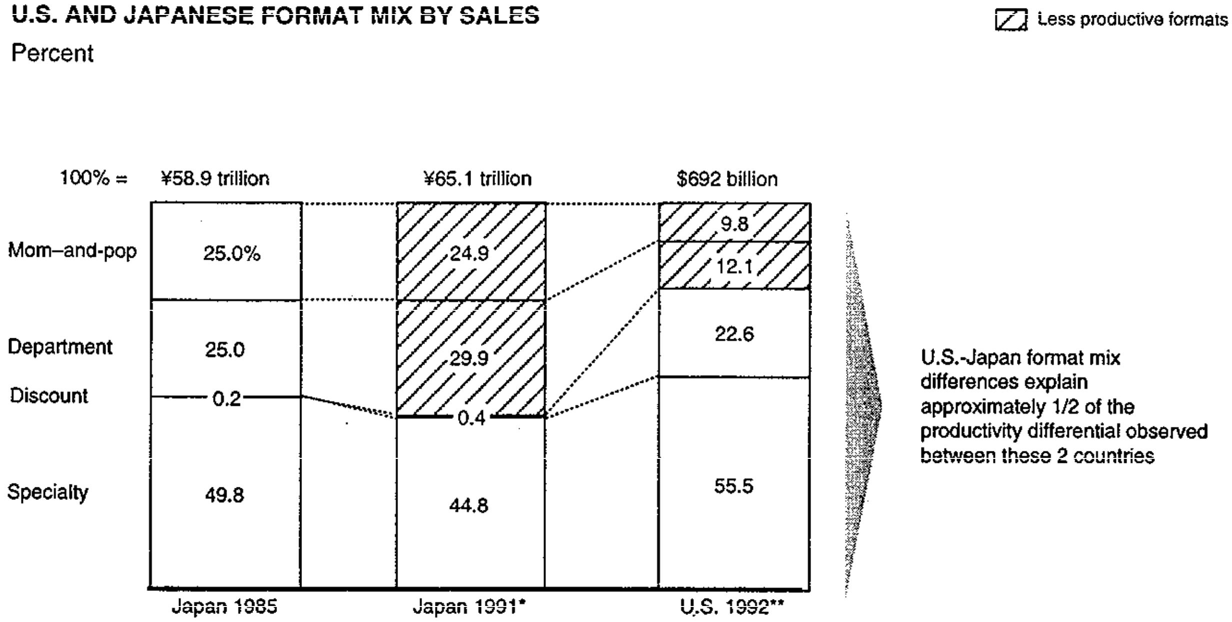
[4] Further discussion of formats can be found in *Sweden's Economic Performance*, McKinsey Global Institute, September 1995.

Exhibit 12

U.S. AND JAPANESE FORMAT MIX BY SALES

Percent



* Data for 1992 unavailable

** The U.S. format mix shown here differs from that on the previous exhibit which showed only the largest 50 retailers

Note: Japanese data on employees per firm unavailable; for comparative purposes, therefore, mom-and-pop stores defined as *stores* with fewer than 5 employees; for the U.S., mom-and-pop stores defined as *firms* with fewer than 5 employees.

Source: Census of Commerce, Japan; McKinsey Retail Practice data

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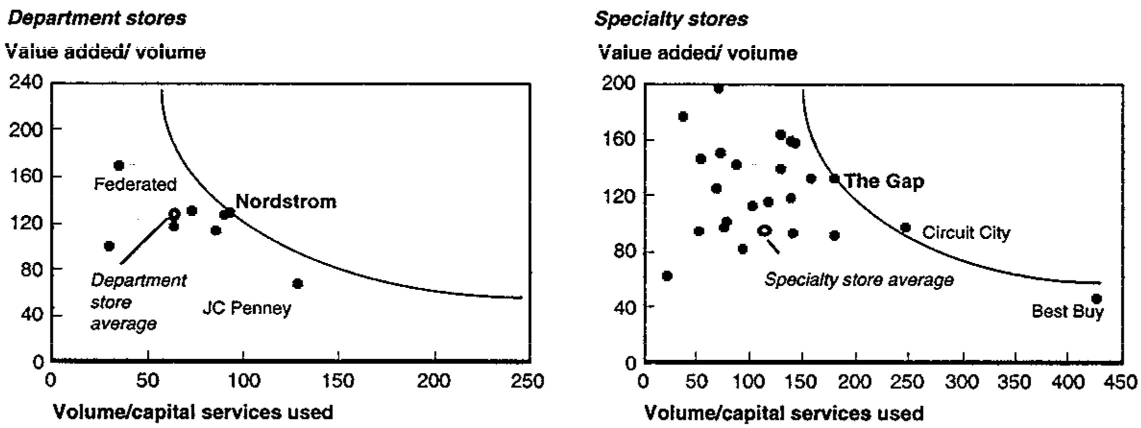
Exhibit 13

INNOVATIONS IN GENERAL MERCHANDISE RETAILING – PERFORMANCE BY FORMAT

Indexed to U.S. average (1992) = 100



Example	Nordstrom	The Gap
Nature of innovation	• Incremental change in price-benefit offering	• Innovation in value proposition to match the buying needs of a specific subsegment
Specific innovations	• Significantly superior customer service relative to other department stores: more on-floor sales assistance, friendlier returns policy, etc. • Improved store ambience • Higher margins to collect value added	• Continuously refresh selection of well-priced fashion basics • 100% private label, designed in-house • Range changes every two months • Daily identification of fast and slow movers within stores • Superior inventory management practices

Source: Compustat; McKinsey Retail Practice; McKinsey analysis

By contrast, Japanese retailers often simply offer a broad range of goods and then manage by aggregate measures like total sales. German retailers are better along this dimension than Japanese, but are not at best practice levels either.

¶ *Industry chain management.* The best retailers eliminate intermediaries and use integrated logistics to fine tune deliveries. With sophisticated IT, Wal-Mart, for example, lowered transportation costs by about 2 percent of sales, raised inventory turns up to 100 per year for some items, and reduced stock-outs (**Exhibit 14**). Such improvements in industry chain management raises volume per unit capital services used and hence productivity.

Japanese retailers, however, are encumbered by an expensive and complex multiple-wholesaler distribution system that does not permit integration and optimization across the supply chain (**Exhibit 15**). Still, the best Japanese players, like Ito-Yokado, achieve world-class performance, even though this may require building a proprietary network.

German retailers use their bargaining power to squeeze manufacturers on price and to rely on them for some upstream functions, like merchandise delivery, without bearing the cost of providing them. The retail sector in Germany thus maintains less capital than is really required to handle its sales volume. This raises its measured productivity.

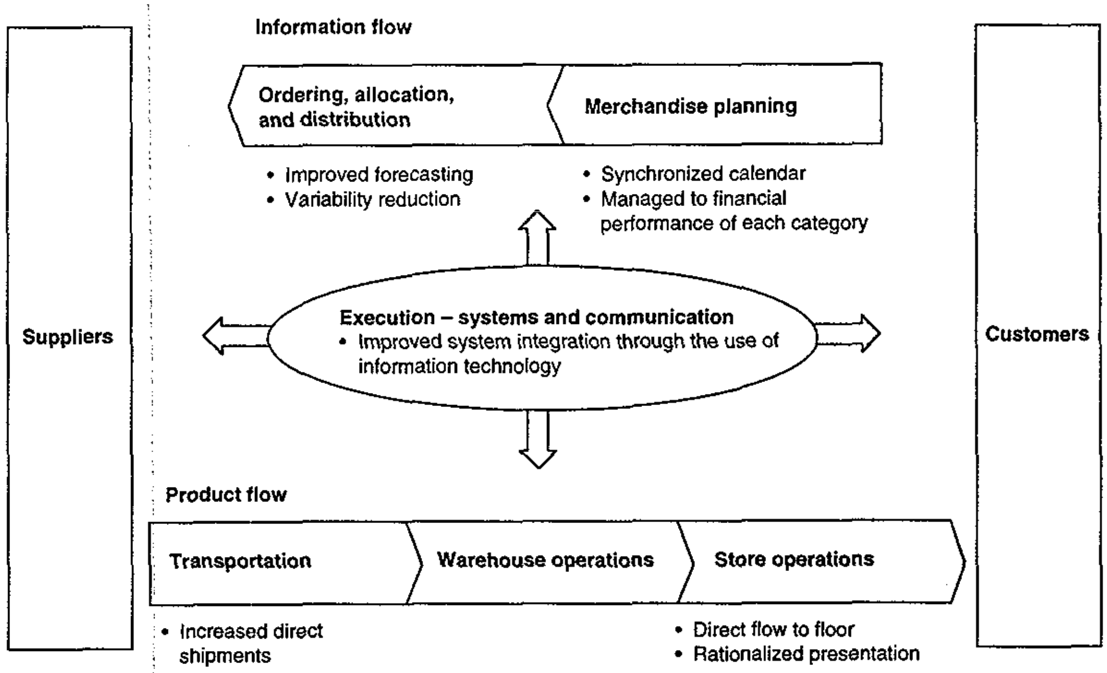
¶ *Operations effectiveness*. Operations effectiveness, distinct from the factors discussed above, refers to store operations management. This factor is important because it is Germany's high throughput per unit capital services used that more than offsets its low value added per unit volume relative to the U.S.

Specifically, higher sales per square foot in Germany allow the retail sector to hold 40 to 45 percent less floor space per capita than its U.S. counterpart (**Exhibit 16**). This more efficient use of space in Germany results in a relative productivity gain of 15 to 20 index points.

Clearly, merchandising excellence and logistics management require operational skills. To avoid redundancy, we do not account for these skills in this category. Similarly, the three countries also differ on how much IT they use and how they use it. The critical role that the productive use of this input plays is an enabling one, and its importance, therefore, unavoidably shows up under product line management, format selection and industry chain management. Since its significance has been captured through the rankings given to these factors, we rate IT as an explanatory factor of secondary importance to avoid double counting.

Exhibit 14

BEST PRACTICES IN INDUSTRY CHAIN MANAGEMENT – PARTIAL OVERVIEW *EXAMPLE: WAL-MART*

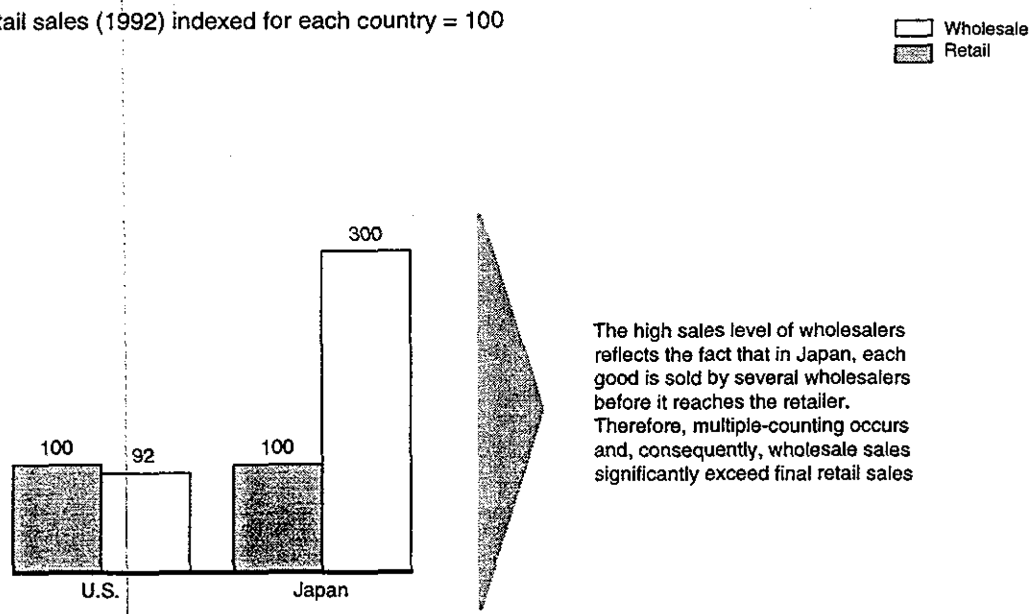


Source: McKinsey Retail Practice

Exhibit 15

U.S. – JAPAN DISTRIBUTION SYSTEM COMPARISON

Retail sales (1992) indexed for each country = 100



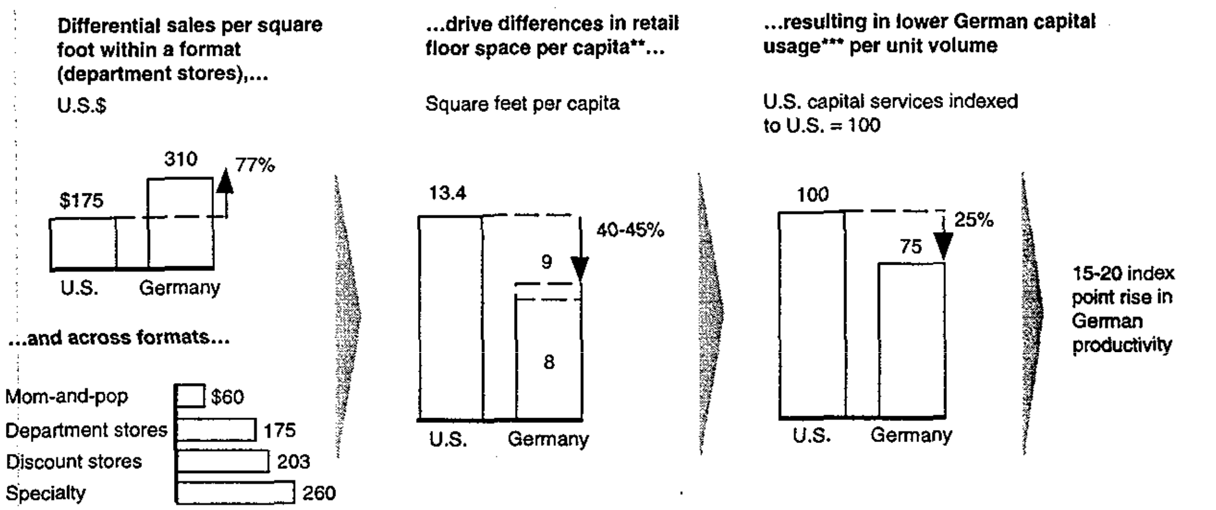
The high sales level of wholesalers reflects the fact that in Japan, each good is sold by several wholesalers before it reaches the retailer. Therefore, multiple-counting occurs and, consequently, wholesale sales significantly exceed final retail sales

Source: BEA: U.S. Census of Retail Trade; BEA: U.S. Census of Wholesale Trade; Japan Census of Commerce

Exhibit 16

IMPACT OF SALES PER SQUARE FOOT ON CAPITAL USAGE*

ESTIMATE



* Estimated for Germany using a comparison of sales per square foot for department stores which is the only format for which data is available for both countries

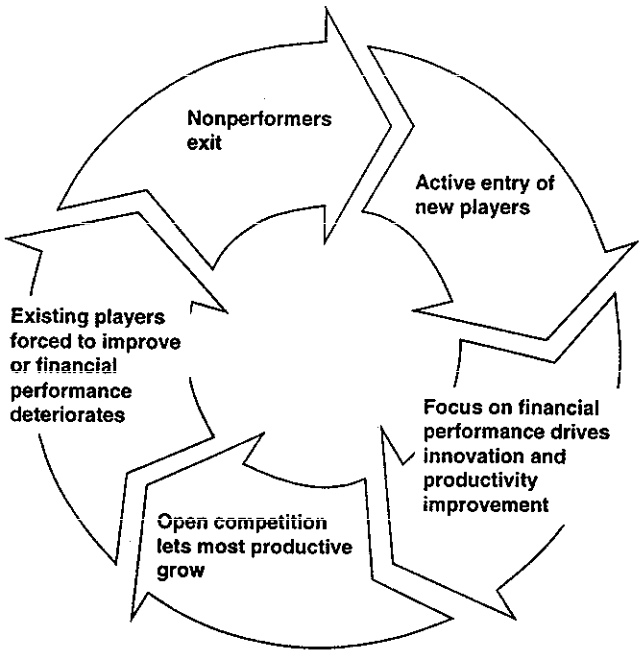
** Because of format mix differences across the two countries, overall differences are lower than intra-department store differences

*** Excludes inventories; a helpful cross-check for the number is the observed 35% higher German throughput per capital services used (excluding inventories)

Source: BEA: U.S. Census of Retail Trade; McKinsey Retail Practice data; Statistisches Bundesamt

Exhibit 17

VIRTUOUS CIRCLE OF IMPROVEMENT FUELED BY COMPLEMENTARY PRODUCT AND CAPITAL MARKET FORCES



Potential weak links in the virtuous circle

- Product market factors
  - Barriers to entry preclude introduction of new innovative players and permit oligopolistic behavior
  - Constraints on competition limit the growth of high performers and remove improvement pressure from incumbents
- Capital market factors
  - Lack of clear performance focus does not create motivation to improve
  - Barriers to exit, e.g., unwillingness to cut off inefficient players, produces overcapacity, and reduces improvement imperative

Exhibit 18

TOP GENERAL MERCHANDISE RETAILERS – U.S. AND JAPAN

Top 10 U.S. general merchandise retailers – by format*

New to top 10

Newer formats →

Department stores

1982	1992
Federated	May (Associated)
R. H. Macy	Federated (Allied)
Allied	R. H. Macy
May	Dillards
Associated	Nordstrom
Carter Hawley Hale	Dayton Hudson
Batus	Mercantile
Mercantile	Carter Hawley Hale
Dayton Hudson	Belk Stores
Dillard	P. A. Bergner

3 retailers new to top 10 (2 because of industry consolidation)

Specialty stores

1982	1992
Melville	Toys "R" Us
Tandy	The Limited
Toys "R" Us	Melville
F. W. Woolworth	F. W. Woolworth
Batus Specialty	Tandy
Edison Brothers	Circuit City
Brown Group	TJX Cos.
Rapid American	The Gap
Petrie Stores	U.S. Shoe
Alexander's	Edison Brothers

5 retailers new to top 10

Top 10 Japanese general merchandise retailers

1984	1994
Daiei	Daiei
Ito-Yokado	Ito-Yokado
Seiyu	Jusco
Jusco	Seiyu
Nichii	Nichii
Mitsukoshi	Mitsukoshi
Daimaru	Takashimaya
Takashimaya	Seibu
Seibu	Uni
Uni	Daimaru

No change in top 10 retailers

* Trend for discount stores is similar to department and specialty stores

Source: McKinsey Retail Practice

Other factors that could affect operational productivity, like the capital-labor mix or differences in capital budgeting and planning processes, were not found to be important differentiators in this case study. Scale is not an important differentiating factor either; the economics of some formats are feasible only at a certain scale but this fact has been embodied in the format mix discussion above, and clearly none of the three markets is too small to be served efficiently.

Industry dynamics and external factors

Product and capital market forces significantly affect managerial behavior and performance. External factors, especially regulatory constraints and barriers to entry and exit, directly impact how powerful these forces can be. The labor market does not play a differential role in any country relative to the others.

¶ *Industry dynamics*. Competitive retail sectors are characterized by an ongoing and self-reinforcing process of innovation, evolution and performance improvement. The capital market aligns managerial goals with operational productivity by demanding high financial returns. Meanwhile, in the product market, new, more productive players emerge and challenge incumbents to innovate. Pre-existing players who can do so, thrive. The rest face worsening financial performance due to a rapid loss of market share. Ideally, corrective corporate governance intervention occurs at this stage. Eventually, if there is chronic underperformance, the capital market cuts off funds and provides capital to more promising retailers. The industry's productivity rises (**Exhibit 17**). Where this virtuous circle is weakened, the upward spiral of rising performance is lost because managers are not pressured to improve productivity.

The U.S. most closely approximates this model. Germany's is a competitive market as well, though this is less true in rural areas as well as in the older formats. Japan's retail sector is the least dynamic.

- *Product market*. There is abundant evidence of product market performance pressure on U.S. retailers. Due to low entry and exit barriers, less productive players are forced to give way to more innovative and efficient ones. This dynamism is evident in high retailer turnover, especially in the newer formats (**Exhibit 18**).

  Germany's is a dynamic market too, but less so in the older department store format. Consolidation does occur in it, but is not as significant a force as in the U.S. Japan's retail sector is all but stagnant, with no credible threat to the largest players.

- *Capital market*. The capital market complements product market forces in the formation of the dynamic improvement cycle described above in two important ways. First, it sets the managerial agenda:

Exhibit 19

COMPARISONS OF JAPANESE AND U.S. CORPORATE OBJECTIVES

Key financial goals

U.S.

1.	Return on investment	2.43
2.	Higher stock prices	1.14
3.	Market share	0.73
4.	Improving products and introducing new products	0.71
5.	Streamlining production and distribution systems	0.46
6.	Net worth ratio	0.38
7.	Improvement of social image	0.05
8.	Improvement of working conditions	0.04

Japan

1.	Improving products and introducing new products	1.54
2.	Market share	1.43
3.	Return on investment	1.24
4.	Streamlining production and distribution systems	0.71
5.	Net worth ratio	0.59
6.	Improvement of social image	0.20
7.	Improvement of working conditions	0.09
8.	Higher stock prices	0.02

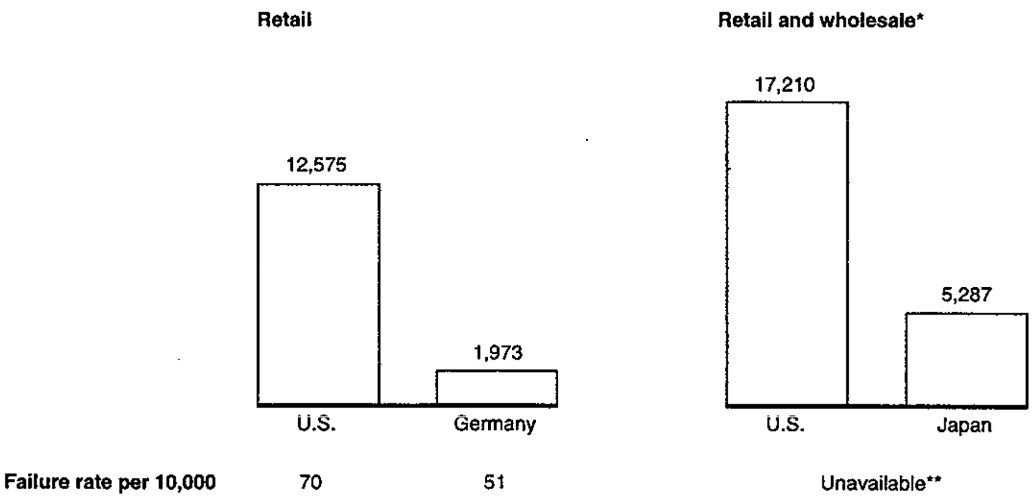
Note: Survey results with 3 = most important, 0 = least important

Source: Kagawa, Nonaka, Sakakibara, and Okumura: *Strategy and Organization of Japanese and American Corporations* (1981)

Exhibit 20

COMPARATIVE BUSINESS FAILURE TRENDS 1994

Number of firms



* Retail and wholesale numbers could not be separated

** Since the distribution industry is far more fragmented in Japan that in the U.S., the dramatically lower number of failures in that country unambiguously implies a lower business failure rate

Source: U.S. Statistical Abstract; Statistisches Bundesamt; Federation of Bankers Associations of Japan; McKinsey analysis by requiring managers to focus on financial return, it instills a performance focus that is generally aligned with productivity. Second, the capital allocation mechanism differentially facilitates product market dynamism by providing capital to the most productive firms and either cutting off underperformers or forcing them to restructure. Corporate governance, however, does not appear to generate differential ongoing performance pressure in any of the three countries. Dramatic actions occur more frequently in the U.S. when a firm is at a crisis point.

- *Alignment of managerial goals with productivity.* Analysis of the return on invested capital (ROIC) and capital productivity for 45 of the largest U.S. retailers shows a high positive correlation between financial performance and capital productivity. This is entirely plausible because actions taken to improve the bottom line (for example, lower logistics costs or better merchandising) also raise capital productivity. Since the U.S. capital market does not permit sustained losses, firms focus on financial returns (**Exhibit 19**). Consequently, their goals are aligned with capital productivity.

  Japanese firms, however, often do not see financial performance as their top priority and, therefore, the alignment of managerial goals with productivity, is much less clear (Exhibit 20). For example, Takashimaya recently invested 1.6 billion yen to build a new flagship store in Tokyo. Industry analysts challenge the economic rationale for the project, and cite prestige enhancing objectives as the impetus for it. The continued availability of capital, despite such circumstances, explains why Japanese firms have not been driven to seek performance improvements more vigorously. To the extent that retailers did focus on financial performance, the "bubble" economy in Japan created a distortion by diverting managerial attention toward land acquisition, and away from operations.

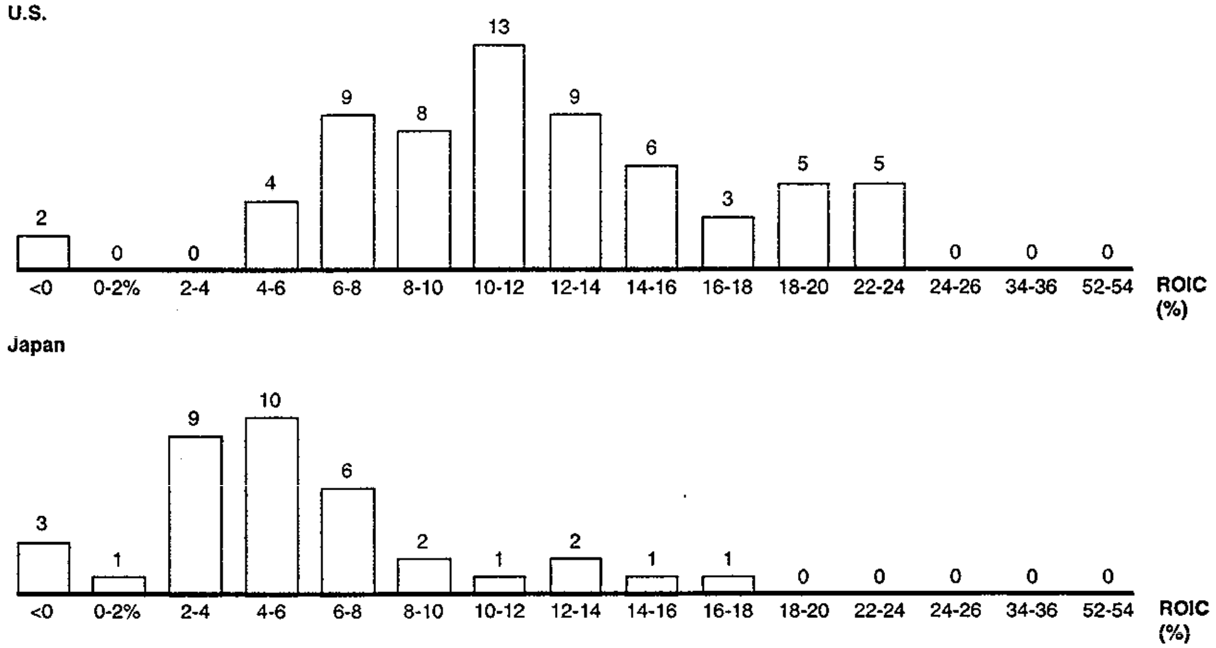
  Anecdotal evidence suggests that goals are also less aligned with operational financial returns in Germany than they are in the U.S. Employment preservation often ranks higher on managers' agenda.

- *Forcing of exit.* In the U.S., the capital market facilitates the changes effected by the product market by pruning inefficient firms. Greater capital market pressure, relative to both Germany and Japan, is evidenced in the U.S. retail industry's bankruptcy activity (**Exhibit 20**). In Japan, however, underperforming firms do not appear to be cut off from funding as evidenced by the existence of marginal players whose ROICs are barely positive (**Exhibit 21**).

Exhibit 21

DISTRIBUTION OF COMPANIES BY AVERAGE RETURN ON INVESTMENT CAPITAL (ROIC) 1984-93

Number of companies



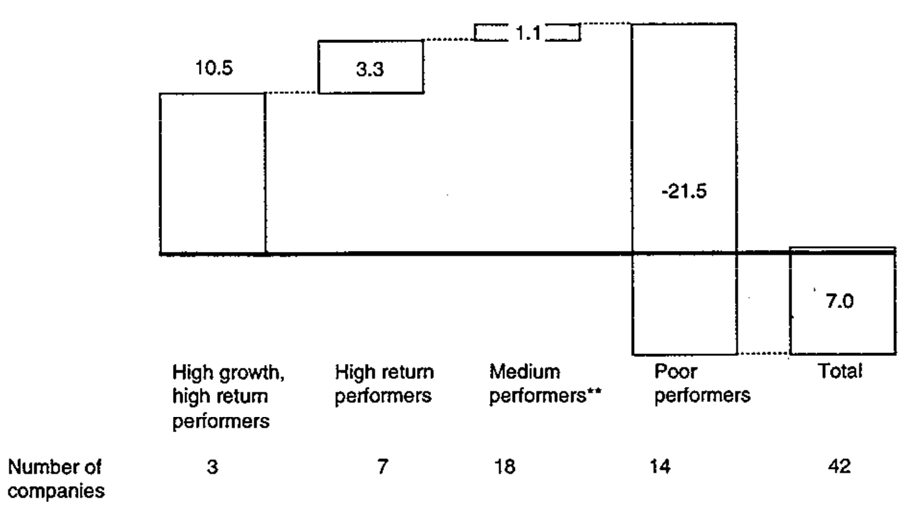
Source: Stern Stewart; Global Vantage; McKinsey analysis

Exhibit 22

VALUE CREATED IN THE U.S. RETAIL INDUSTRY 1984-93*

SAMPLE BASED

1993 U.S.$ Billion



* Sum of Economic Profit Created discounted to 1993; 42 largest retailers

** Medium performers defined as companies earning an ROIC within 2.5% of their WACC; retailers whose average returns are more than 2.5% below their WACC are classified as "poor"

Source: Stern Stewart; Global Vantage; McKinsey analysis

- *Ongoing improvement pressure*. While the U.S. capital market is better at pruning underperformers, it does not do so quickly. Prior to capital market intervention, which occurs when firms run out of cash, corporate governance appears to have been ineffective in all three countries. (We recognize, however, that there is a detection bias here because if timely corporate governance intervention steered a company away from trouble, we might not be able to detect this change. It is similarly not possible to measure the impact that an implicit threat of takeover has on managers.)

  Over the last 10 years, the largest U.S. retailers as a whole (based on a sample of 42 large retailers) barely broke even, as measured by the economic profit created during this time period (**Exhibit 22**). Even where restructuring occurred, corporate governance acted only after the firm was faced with the prospect of running out of cash.

  Since we do not have data on the cost of capital of Japanese retailers, we are precluded from doing a similar analysis for Japan. However, based on reasonable assumptions, we believe that Japanese retailers destroyed considerably more value than their U.S. peers.

We found no evidence that access to capital constrains new entrants in any of the three markets. Other barriers to entry play a much more important role. Players from Wal-Mart in the U.S., to Aoyama Trading in Japan, have all had ready access to capital. Of course, if nonavailability of funds differentially precludes retailers in a country from ever even starting up, we cannot pick up this effect.

- *Labor market*. The labor market was not found to play a differentiating role in any of the three countries. The relatively large bargaining power of German retail workers has only minimal impact on capital productivity and we estimate it to be no more than 5 index points. The more important, and indirect, effect of German unionism is the unified opposition of workers against store operating hours deregulation.

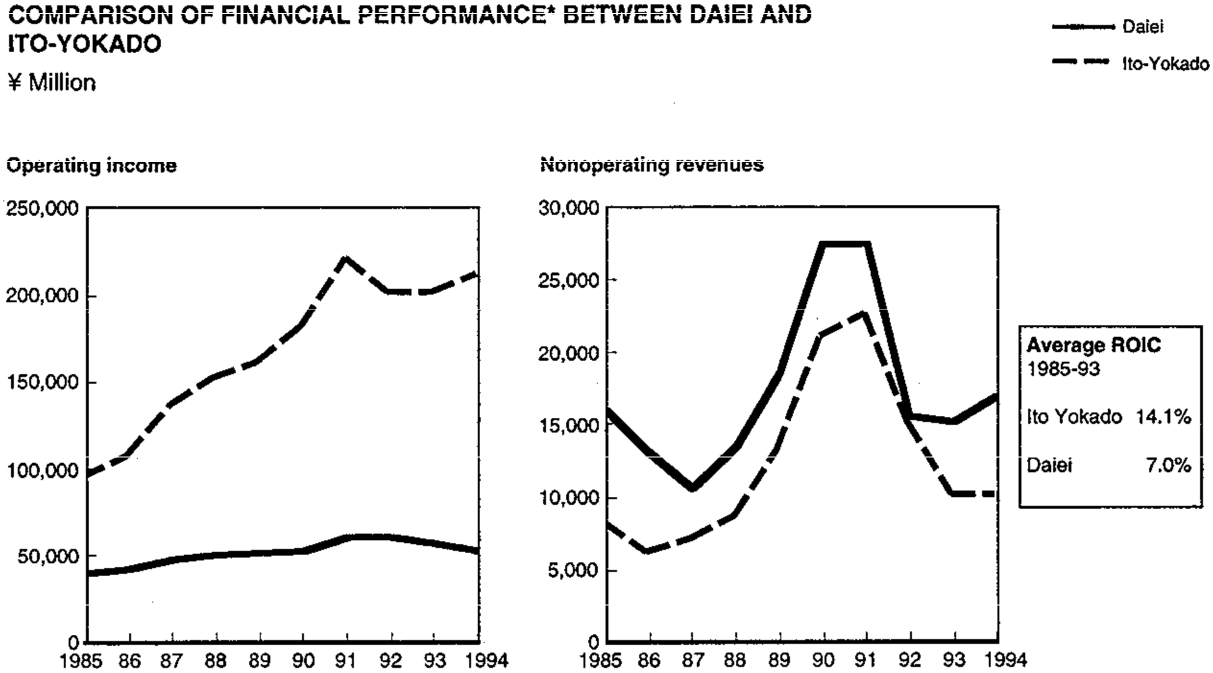
¶ *External factors*. How effectively the product and capital markets create performance pressure stems largely from three main factors.

- *Macroeconomic environment*. Land prices in particular have affected German performance in two very different ways. First, they have forced retailers to use land sparingly. This raises German retail productivity. Second, by increasing startup costs, they have tempered the industry's competitive intensity by making it harder for new players to enter.

Exhibit 23

COMPARISON OF FINANCIAL PERFORMANCE* BETWEEN DAIEI AND ITO-YOKADO

¥ Million



* Consolidated data

Source: Nikkei Corporate Information

High land prices are an important part of the U.S.-Japan causality story as well. First, by increasing barriers to entry, they reduce product market competition. Second, the handsome real estate investment returns that accompanied the bubble economy broke down the usually straightforward relationship of financial results and operational productivity. Managers responded accordingly. In retrospect, real estate speculation was not an effective strategy in its own right, and worse, diverted attention away from operating fundamentals.

Ito-Yokado and Daiei adopted opposing strategies in this regard. Daiei pursued real estate acquisitions in the 1980s, generating significant amounts of non-operating income, while Ito-Yokado focused more exclusively on operations. The latter's operating profit and ROIC are higher as a result, and its competitive position is considered stronger (**Exhibit 23**).

- *Product market factors: regulation.* In Japan, an assortment of restrictions including zoning laws, import quotas and licenses hinder the development of a vigorous product market by creating barriers against new entrants. Specifically, the large scale retail law prohibits stores over 1,000 square meters from being set up without, in effect, permission from local retailers. This limits the emergence of more efficient large scale formats.

  In Germany, store hours regulation differentially hurts new format entry. By severely curtailing shopping hours, the regulatory structure eliminates the possibility of shopping becoming, as it has in the U.S., a leisure activity. Consumers rarely have the luxury of looking through specialty stores, for example, for what they could want; often, they have time enough to buy only what they need. Moreover, by reducing sales, these regulations lower throughput per unit of capital services used and, thus, the productivity of existing retailers. In addition, zoning laws in Germany contribute to the observed high land prices discussed earlier.

- *Capital market factors*

  - *Sources of funding/market for corporate control.* The structure of the capital market, and the goals of those who provide funding are of primary importance in explaining the differential capital market pressure between the U.S. and Japan, and of secondary importance in the U.S.- Germany comparison.

    In Japan, bank lending is frequently the primary source of funding. Banks are often on the boards of companies, hold substantial proxy rights, and have significant investments in the companies. Additional loans are therefore often forthcoming to help failing companies, with whom the bank's association is publicly known. Banks that have a long relationship with a firm may be slower to cut off funding in cases of poor performance (Exhibit 22). Nagasakiya, for example, has avoided much needed restructuring and stayed afloat due to Dai Ichi Kangyo Bank's support.

Conversely, the U.S. capital market is more reliant on securities and is less likely to continue funding underperformers, as evidenced by fewer firms having extremely low ROICs. In addition, the prevalence and ease of mergers and acquisitions in this market facilitates restructuring and exit.

These issues are also relevant in Germany, though to a lesser extent. For example, one bank explained its continued funding of nonperforming enterprises by citing pressure from its customers not to let a company go bankrupt.

– *Ownership/governance mechanisms.* Cross-subsidization within conglomerates in Japan means that nonperformers are less likely to have their funding cut off, or to be forced to restructure. Daiei, among others, is reported to cross-subsidize several of its non-performing divisions. This removal of the threat of extinction short-circuits important capital market performance checks and slows down the exit of underperformers. Similarly, because many German retailers are privately owned, they are relatively immune from the threat of takeover.

  Despite differences in corporate governance structures and mechanisms (as opposed to who the owners are), we found this factor to be ineffective and nondifferentiating across the three countries. (As mentioned before, we do recognize our assessment of this factor is necessarily somewhat uncertain because it is hard to observe the subtle influences of governance.)

- *Upstream and downstream market factors.* This factor has secondary explanatory power. The multilayered, complicated Japanese distribution system imposes a performance penalty on retailers. The very best retailers, however, have bypassed this network. In Germany, the relative fragmentation of manufacturers permits retailers to exercise monopoly power. This improves their measured performance.

We have also evaluated how these external factors preclude or constrain managers from reaching best-in-class productivity levels. We can estimate this impact by evaluating the components of productivity differences and assessing whether external factors directly preclude improvement, create hurdles to overcome, or do not limit managers at all. While managers do face some handicaps, we believe that managers could remove most of the productivity differences with actions under their control.

Dividing intercountry performance differences into two categories, format mix differentials and intraformat productivity gaps, helps assess the direct impact of external constraints on performance. In terms of intraformat performance, the best Japanese retailers have achieved world-class performance, demonstrating that managers can improve productivity in the current environment. While some cite the complex distribution system as a constraint on managers, this complexity arose precisely because of the fragmentation of retailers (which is largely the result of managerial decisions). Successful retailers have shown that it is not an insurmountable obstacle.

The large scale retail law and zoning restrictions in Japan directly impeded the evolution to more productive formats. This clearly limits the emergence of discount stores, but would not prevent many specialty stores from thriving. This constraint would account for roughly 60 percent of the 15 to 20 index point productivity gap attributed to format mix differences. Responsibility for the remainder rests with managers.

Based on these considerations, we believe that the large scale retail law and zoning laws are the only external factors precluding productivity improvement. Thus, retailers in Japan can close all but about 10 index points of performance difference between them and best practice by changing things over which managers have control. This is roughly 70 percent of the measured gap.

For Germany, store-hour regulation is an important external factor that directly constrains managers. As discussed, estimates of the direct impact on productivity are relatively low (3 to 5 index points). We believe that the indirect effects are more important, because the regulation has slowed the development of high service/high value-added formats like in the U.S. However, this does not show up in our productivity comparison because we cannot measure the additional service component.

OUTLOOK AND IMPLICATIONS

Outlook

In the United States, intense product market competition will continue to force retailers to improve performance or lose market share. Those who can target and capture specific market niches while managing back-store operations efficiently will thrive, while other players will be driven out of business. In the short run, discount and specialty stores should continue to gain ground. Over the long term, the search for new and more productive formats will continue. For example, the rise of electronic shopping media holds the potential to change the entire industry in significant ways.

If store operating hour regulations are relaxed in Germany, traditional mom-and-pop as well as department store retailers will face increasing pressure as more productive formats win over their customers. In addition, because they make the relatively high German prices transparent to domestic consumers, advances in communication technology, as well as cross-border electronic shopping, are likely to force fundamental improvement.

In Japan, the collapse of the bubble economy and the ensuing recession are pressuring retailers in unprecedented ways. Discounters are emerging rapidly, and the strong yen has created a credible international mail-order challenge. Rapid change, which is not reflected in our (1992) measures, has already started to occur. Retail prices are falling as a result of the recent inroads made by a small cadre of aggressive discounters like Aoki and Aoyama. An Asahi Bank survey found that, of the 300 establishments questioned, 55 percent had been forced to lower prices. Daiei has been driven, for example, to cut the price of 20-inch televisions by 46 percent and that of color photo film by 50 percent. Fundamentally unproductive players will find it increasingly hard to compete against such a challenge.

Implications

Implications exist both for corporations and for policymakers.

¶ *Implications for corporations*. Given the large productivity differences observed both within countries, and across international borders, there is a large opportunity to be captured by best practice players, both within their domestic markets and abroad. Acquiring underperforming retailers, or entering their markets and capturing their customers, should be very attractive strategies for companies like Ito-Yokado or Wal-Mart. In order to attain the productivity levels to which they are accustomed, however, foreign best practice retailers entering Japan will have to circumvent many of the same obstacles, like the complicated distribution system, that local players face.

Local retailers who are not at best practice must either innovate or copy the advances of world-class players. Japanese retailers, in particular, will be better served if they approach the impending restructuring of their industry with initiative, rather than waiting until they are forced to adapt. As mentioned above, this is already starting to happen.

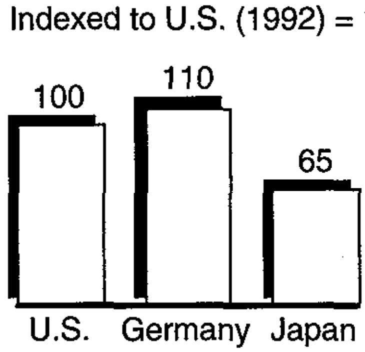
Capital is a particularly important input to retailers, and how effectively it is managed often distinguishes the best from those who are merely average. In the U.S., discounters have outperformed department stores precisely because they have managed their capital, not their labor, more efficiently. Productive investments in information technology for example, that increase the efficiency with which all other capital is used, confer a substantive advantage. This effect is compounded by the fact that most managerial practices that improve capital productivity also increase the efficiency of labor.

¶ *Implications for policymakers*. Most importantly, policymakers need to recognize the importance of constant change and dynamism for productivity. Attempts to preserve the status quo, through the protection of mom-and-pop stores, for example, prevent the entry of more productive retailers into the market and, therefore, are a cost to consumers. Policies that facilitate evolution rather than impeding it, even though such change is temporarily painful, improve operational performance in the long run.

The transfer of best practice technology does not generally occur through the mechanism of one company adopting another's superior managerial methods. Rather, such productivity enhancing transfers occur when players who have already been successful in one market enter another one themselves, either through joint ventures or direct ownership. Restrictions that create barriers to entry, such as those on foreign direct investment, therefore hinder productivity improvements. Similarly, barriers to exit prevent effective pruning of underperformers.

Product market competition is absolutely critical in forcing performance improvements, and regulations that stifle it – for example, the large scale retailing law in Japan, or the store operating hours regulation and zoning laws in Germany – hurt productivity, reduce the value the sector provides to consumers, and benefit existing, often less productive, retailers.

GENERAL MERCHANDISE RETAIL CASE SUMMARY



In Japan, a highly constrained product market and a complacent capital market have led to reduced performance pressure on managers and a less dynamic industry. Germany's high performance, in contrast, is the result of retailers there optimizing a highly constrained system. As a result, though high, their productivity does not represent internationally transferable best practice.

General merchandise retail is a doubly important industry. It is a major user of capital in the form of real estate and inventories, and is the interface through which consumers relate to a large part of the economy. This case study also underscores the importance of capital in achieving distinctive performance: for example, discount stores outperform department stores – which have a labor productivity similar to theirs – through a more efficient use of capital. (Specialty stores, however, excel on both dimensions.)

The U.S. retail industry is highly volatile, fiercely competitive, and exceptionally innovative. Retailers introduce innovative formats and improve performance within existing formats through better merchandising and industry chain management. They raise productivity by constantly adding more value to the goods they sell. This process is energized by a self-reinforcing dynamic of *performance improvement: the capital and product markets jointly create an environment in which* new, more productive players emerge and challenge incumbents. Existing players who cannot adapt lose market share until the capital market cuts off funds and steers capital to more promising retailers. The industry's productivity rises constantly as a result.

This performance improvement cycle is all but missing in Japan. Zoning laws and other regulations hamper the entry and effectiveness of new formats, reducing competitive pressure on managers. Capital market complacence further weakens performance pressure. The result is a retail sector that is the least dynamic of the three we studied: global best practices in retailing have not been adopted, nor has evolution toward more productive formats occurred. Some retailers in Japan have succeeded, however, demonstrating that the constraints of the current system do not preclude them from attaining high productivity levels.

German retailers add less value than their U.S. peers but make up for it by minimizing capital usage. Artificially high land prices, severely limited store hours and less competition have created a unique industry structure for German retailers to contend with. They have responded by aggressively optimizing the system within in its own constraints. For example, German retailers use far less floor space than U.S. retailers do. Since the high performance of German retailers relies on the quirks of the German market's structure rather than superior underlying operational productivity, it is very doubtful that German formats could work outside Germany. They are also very vulnerable to competition from high value U.S. style formats.

Productivity in the telecommunications industry

Not much more than one decade ago, the telecommunications industry all across the world represented a stable industry, dominated by heavily regulated, often state-owned, monopolies. That stability is now gone. Today, telecom is one of several industries that lies at the center of the much discussed digital and multimedia revolutions. Sparked by changes in technology and major deregulation, the last decade has seen dramatic change, especially in the U.S. market, and promises even more change in the next decade. How this change unfolds will have profound implications for all three economies, affecting not only the daily lives of private citizens but also how business is conducted and how a host of related industries will evolve.

Telecom is also an extremely capital-intensive industry and an important part of the capital in the economy, representing approximately 5 percent of the capital stock in all three countries.

We study telecom, therefore, not only to understand why we see today's differences in capital productivity, but also to draw lessons as the industry continues to evolve. In this spirit, our case study contributes to the discussion in the following ways.

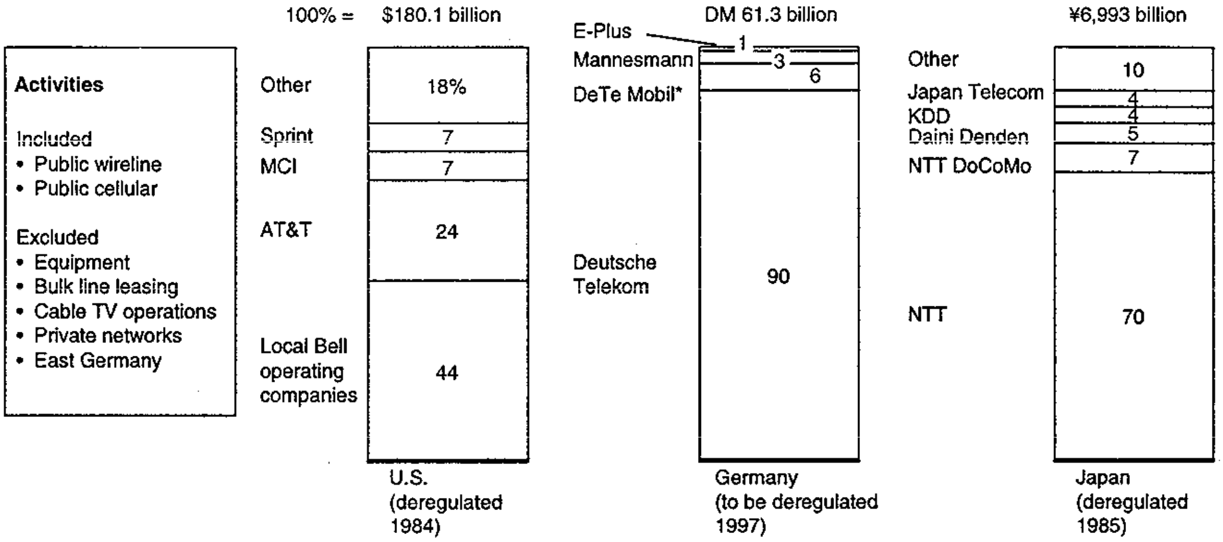
- The case highlights the importance of marketing and customer orientation on performance: primarily in terms of the effect of stimulating demand on the utilization of fixed assets, and secondarily, in terms of ensuring effectiveness of capital spending.
- The case also underscores the positive impact that regulatory mechanisms emphasizing low pricing can have on productivity by imposing the right incentives on corporations. We also see the impact of government ownership, and the pitfalls of having no separation between regulator and owner.
- Telecom also provides a natural experiment on the importance of deregulation of the product market, emphasizing not only how competition can have a positive impact, but the importance of how that competition is allowed to take place.

Four sections follow. First, we present a brief background to the industry in the three countries. Second, we discuss our methodology and present the productivity results. Third, we evaluate the causal factors that explain the differences in productivity, and finally, we assess the outlook for the industry and the implications for corporations and policymakers.

Exhibit 1

TELECOM INDUSTRY STRUCTURE 1994

Percent of sales



* DeTe Mobil is 100% owned by Deutsche Telekom AG

Source: FCC, *Statistics of Communications Common Carriers* 1993/94; Annual Reports; CompuStat

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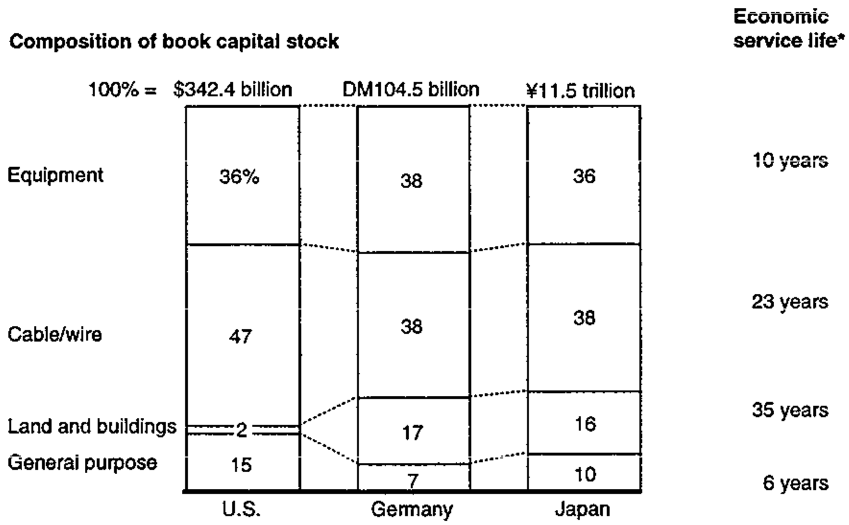
Exhibit 2

BREAKDOWN OF PHYSICAL CAPITAL STOCK

Percent



* True economic service lives calculated as middle of recommended service life range given by the FCC to the Regional Bell Operating Carriers – 1994

Note: Different mix of equipment yields the following weighted average service life of the capital stock: U.S. – 16.0 years, Germany – 18.9 years, and Japan – 18.5 years

Source: FCC Order 95-181; FCC Order 94-174; Annual Reports; FCC, *Statistics of Communications Common Carriers* 1993/94

INDUSTRY BACKGROUND

Our definition of the industry includes public wireline and public cellular phone and data services. It excludes private networks, equipment, cable television operations and bulk line leasing.

While the industry would have looked the same in each of the three countries in 1984, today the structure is significantly different as a result of deregulation (**Exhibit 1**). In the U.S., the industry structure varies by market. Each local call market is still dominated by a regional Bell operating company (RBOC). Over 1,000 other companies, who are new entrants that were not originally part of the divestiture of AT&T, also serve this market. Three carriers, AT&T, MCI and Sprint dominate the long-distance market, while hundreds of other providers have entered the fray. In cellular, seven major holding companies, including McCaw and GTE, have most of the national market, although competition is limited to two players in each region.

The Telecommunications Act of 1996 will break down much of these distinctions between markets, allowing long-distance carriers and cable companies into the local market as well as permitting the RBOCs to enter the long-distance business.

In Germany, the state-owned Deutsche Telekom holds a monopoly over both the long-distance and local wireline markets, although this is about to change dramatically. Deutsche Telekom will be privatized in 1996, and licenses will be granted allowing new players to enter the market no later than January 1, 1998. Competition currently exists in the cellular market, with three major players: DeTe Mobil (a subsidiary of Deutsche Telekom), Mannesmann, and E-Plus. As is true in all of our case studies, East Germany is excluded from our calculations.

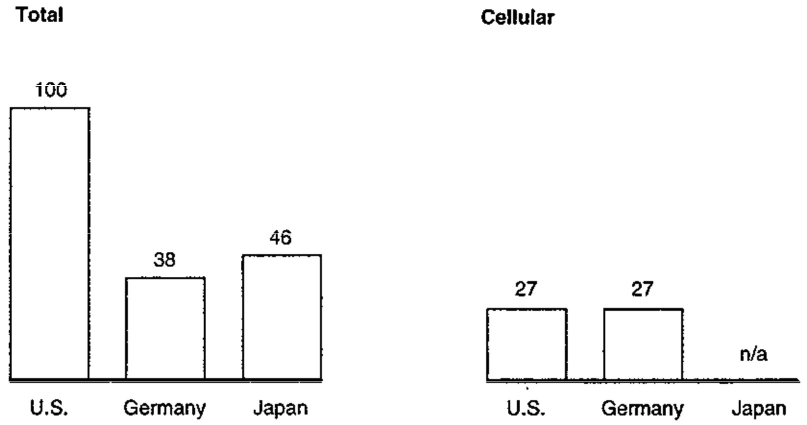
Japan has also seen major deregulation in the last decade, breaking the monopoly position of Nippon Telephone and Telegraph (NTT), and allowing competition in the long-distance market. NTT still holds approximately 70 percent of the total market, with a completely dominant position in the local markets and a large piece of the long-distance market.

In all three countries telecom remains a capital-intensive, largely fixed-cost business. Capital represents the largest part of value added and is the single largest cost component, ranging from 56 to 68 percent of value added. The composition of this capital is roughly similar across all three countries (**Exhibit 2**). Cable and wire is the largest component, accounting for 38 to 47 percent of the capital stock. Equipment, including switches and multiplexers, accounts for an additional one-third or more of the stock. Together these items make up the largely fixed-cost "network." Land, structures and other items represent the rest. Because of these high fixed costs, barriers to entry in the industry have traditionally been high, creating the "natural monopoly" that has driven both industry structure and government's regulatory role. New technologies, however, such as wireless communications, threaten to break this natural monopoly and turn the economics of the business upside down. We will discuss these issues in more detail in the last section of this case study.

Exhibit 3

CAPITAL PRODUCTIVITY

Indexed U.S. (1994) = 100



Source: FCC, *Statistics of Communications Common Carriers* 1993/94; Annual reports; McKinsey analysis

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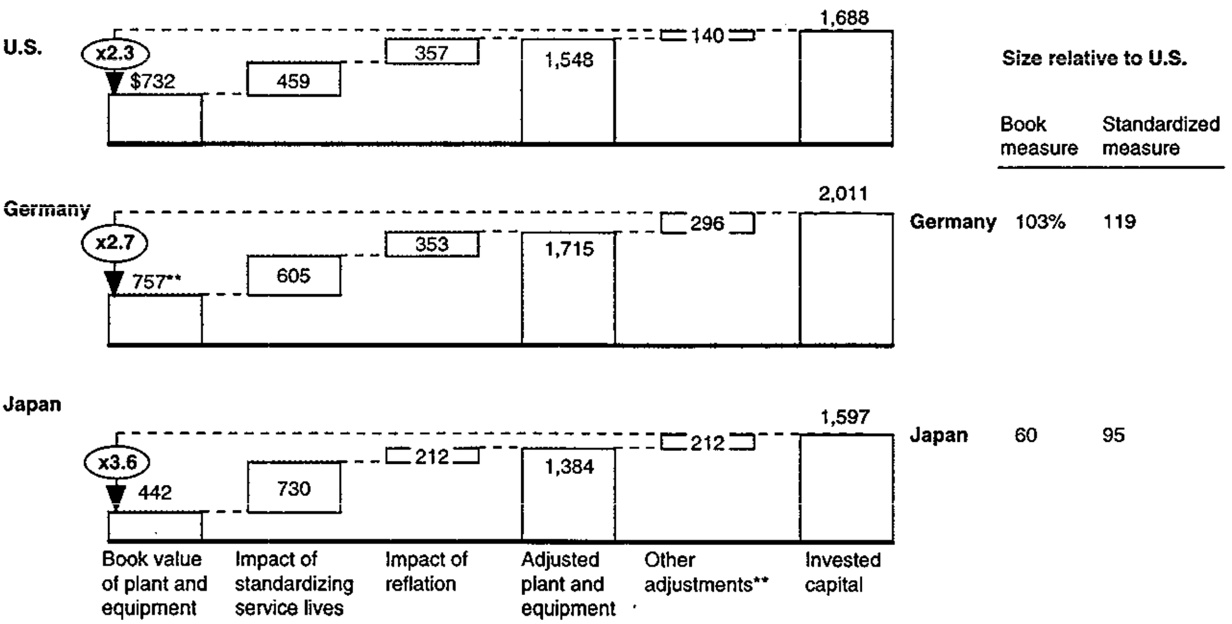
Exhibit 4

IMPACT OF ADJUSTMENTS TO PHYSICAL CAPITAL STOCK

In 1994 U.S.$ per capita



* Includes items such as capitalized leases and net working capital

** Excluding cable TV and East Germany (estimated at 27.9 billion DM book value)

Source Annual reports; McKinsey analysis

PRODUCTIVITY PERFORMANCE

*We measure capital productivity in telecom as call minutes generated per unit of capital services used. We find Germany and Japan to be at 38 and 46 percent of the U.S. capital productivity level, respectively (**Exhibit** 3).*

Measurement

For telecom we use a physical measure of output, call minutes on the network. We did not try to distinguish the quality of these minutes (i.e., we assume that none of these three countries had significant problems with cut-off calls). Therefore, our productivity measure is defined as call minutes divided by the capital services used to build the network. See Chapter 1: Objectives and Approach for a detailed discussion of the methodology for standardizing the measurement of capital services used in all of the case studies. The impact of standardizing the measurement of capital in this industry is significant. For example, estimates based on national account "book" measures portray Japanese capital stock at 60 percent of U.S. levels on a per capita basis, while our standardized measure has it at 95 percent of U.S. levels (**Exhibit 4**).

To calculate total factor productivity we used a weighted average of capital productivity and functional labor productivity. The latter is defined in MGI's report on *Service Sector Productivity*. Because capital has a larger share of value added in all three economies (averaging 64 percent), capital productivity performance figures more prominently in the TFP calculation (**Exhibit 5**).

Data for the analysis were gathered from company annual reports and Federal Communications Commission (FCC) common carrier statistics. The "Methodology" box on the following page highlights the unique adjustments made for telecom.

Results

Performance in the wireline part of the business is basically the same as the overall industry, while productivity in the cellular part of the market paints a different picture (Exhibit 3). Cellular performance is similar between Germany and the U.S. (numbers could not be broken out for Japan), but the impact on the overall result is relatively small. Interestingly, the capital productivity of cellular is only one-quarter of the productivity of wireline in the U.S., despite the fact that cellular is a less capital-intensive business. This probably reflects the fact that cellular communications are still in an early stage of development, with low mobile phone penetration and much higher prices relative to wireline.

Because the productivity differences are so great, the conclusions about relative performance are robust across a range of specific assumptions.

METHODOLOGY

Industry coverage

This case study includes public wireline and public cellular, excludes private networks, manufacture of equipment, cable television operations and bulk line leasing. East Germany is also excluded from our calculations.

Output

Call minutes is used as a standard measure across the countries. Due to data limitations, no adjustment is made to distinguish local from long distance call minutes, and international call minutes are allocated to the originating country only. We do not believe this error is large especially in comparison to our wide productivity gap.

Capital services

We have measured capital services by building capital stock estimates from annual capital expenditure data, assuming a sudden death depreciation schedule. Service life estimates were then applied to get flow measures using standardized FCC estimates for economic service life across all three countries. See Chapter 1: Objectives and Approach for a more detailed discussion of the methodology for standardizing capital estimates. We have not been able to fully account for obsolescence of assets, nor do we believe that the German equipment price deflators accurately capture recent strong price declines in digital equipment. We do not believe that the impact of this error is large, especially given the magnitude of our productivity gap.

Purchasing power parities

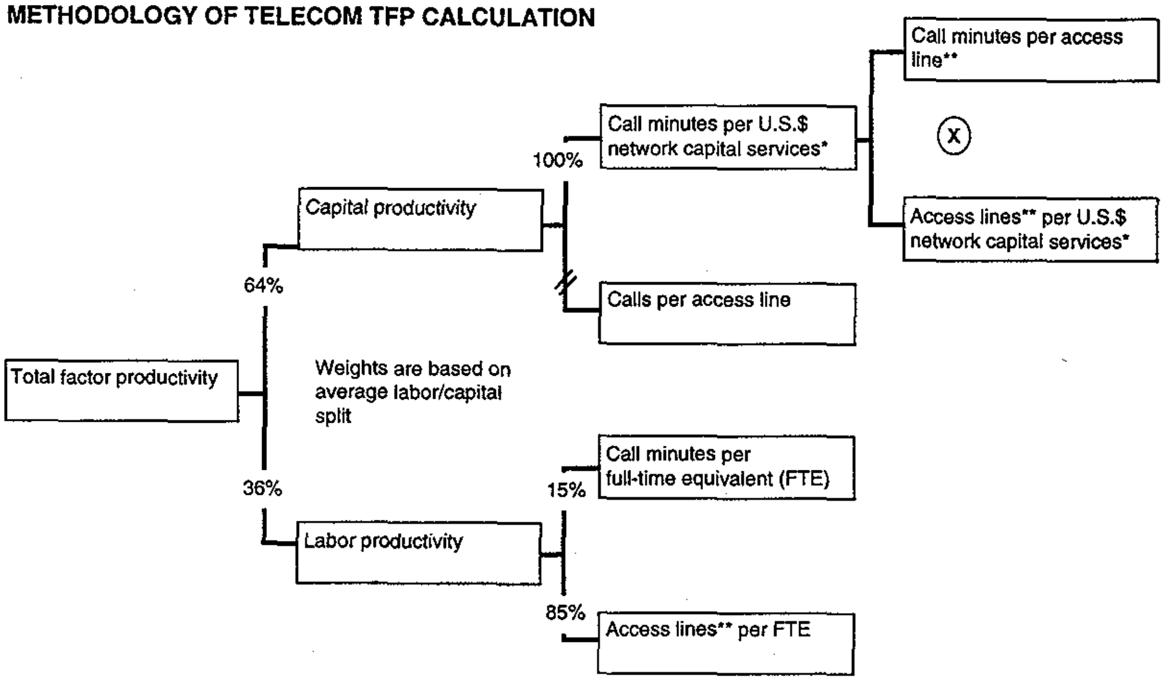
PPPs were not needed for the output measure. For investment goods we have used OECD individual category PPPs for equipment, civil engineering, and nonresidential structures and weighted them by the appropriate composition of the capital stock.

Sensitivities

We tested the validity of our results using a wide variety of assumptions, particularly regarding the estimation of capital, e.g., using German or Japanese service lives, stock versus service measures, and straight line versus sudden death depreciation schedules. Relative performance between countries changed very little under the different scenarios.

Exhibit 5

METHODOLOGY OF TELECOM TFP CALCULATION



* Converted to U.S. dollars at investment goods PPP

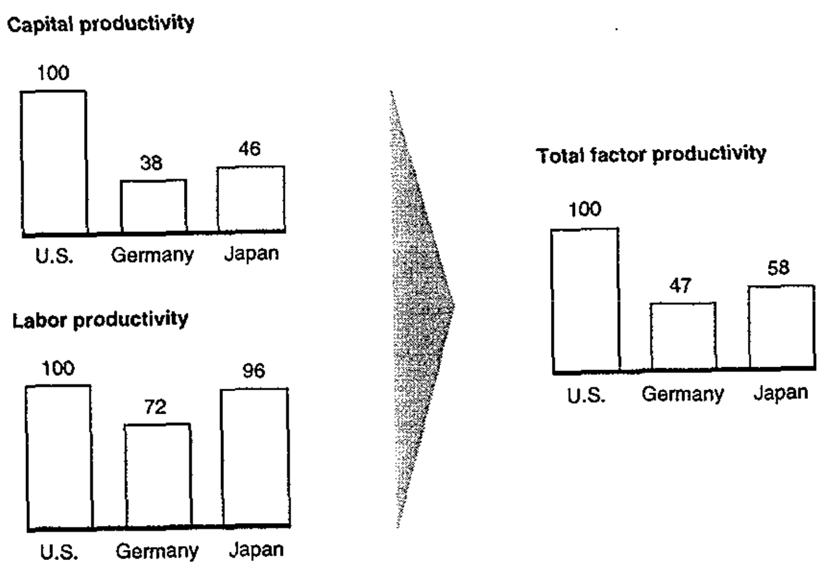
** Each access line is basically defined as a line with its own phone number

Source: McKinsey analysis

Exhibit 6

CAPITAL, LABOR, AND TOTAL FACTOR PRODUCTIVITY – TELECOM

Indexed to U.S. (1994) = 100



* Assumes Cobb-Douglas production function such that TFP = $Y/(K^{\alpha} \cdot L^{(1-\alpha)})$ and that capital's share of value added is 64%: the average for these countries

Source: FCC, *Statistics of Communications Common Carriers* 1993/94; Annual reports; McKinsey analysis

Large differences also exist in total factor productivity, with Germany just below half of U.S. levels, and Japan at 58 percent. Japanese TFP performance is buoyed by labor productivity that is comparable to U.S. levels (**Exhibit 6**).

CAUSES OF DIFFERENCES IN CAPITAL PRODUCTIVITY

Large differences in demand per capita cause much higher utilization of the fixed asset network in the U.S. and directly account for most of the observed differences in capital productivity. This higher demand level is the result of external forces pressuring managers to actively attempt to stimulate real demand in the U.S. Managers' marketing policies in the U.S. have generated higher phone usage both with low price levels and pricing structures (e.g., flat-rate pricing for local calls), as well as the active introduction of new features and functions (e.g., call waiting). Managers are not acting in a vacuum, however. A focus on financial performance and regulatory pressure to maintain low prices created the incentive for managers to behave in this way. In Germany and Japan, on the other hand, the combination of government ownership and a lack of focus on pricing on the part of the regulators imposed little pressure for managers to use resources productively (**Exhibit 7**).

Differences in the composition of the industry (cellular versus wireline) in the three countries do not explain the overall large gap in productivity. Despite the fact that performance in cellular is comparable across the countries, it is not a differentiating factor. In all three countries, cellular represents roughly 10 percent of sales and less than 4 percent of call minutes, and therefore does not have a significant impact on the overall results.

We divide our causality analysis into several hierarchical parts. First, we break down productivity performance into discrete components. Then, we assess the managerial actions that caused the productivity differences. Finally, we look at the external forces acting on managers, distinguishing between the industry dynamics and the structural factors that drive these dynamics. In each part we highlight those factors that are important in explaining differences in performance, factors of secondary importance, and factors considered not important. Again, this does not imply that factors rated "not important" are not critical to absolute productivity levels in each country; rather, it means that these are not differentiating factors in explaining relative performance across countries. **Exhibit 8** on the next page summarizes these results.

Components of productivity differences

Two factors account for higher U.S. capital productivity. First, and foremost, higher demand levels cause higher utilization of the fixed asset network. This accounts for almost all of the difference between the U.S. and Japan. Second, relative to Germany, the U.S. uses less capital to install its network (**Exhibit 9**).

Exhibit 7

SUMMARY OF CAUSES OF DIFFERENCES IN CAPITAL PRODUCTIVITY – TELECOM

IV. External factors affecting industry dynamics	• Monopolies regulated very differently – U.S. regulation focuses on maintaining low prices to consumer – Focus in Germany and Japan on security and universal service, little focus on price • Government ownership in Germany and Japan; private ownership in U.S.	• Deregulation of market in U.S. and Japan in mid-1980s created some competition
III. Industry dynamics	• Large differences in conduct even while all 3 countries had monopolies – In U.S. combination of price constraints and financial return objectives give incentive for managers to focus on using resources productively (e.g., stimulate demand to justify higher capital expenditures) – In Germany and Japan, ability to raise prices creates no incentive to use resources productively	• Higher productivity growth in both Japan and U.S. after deregulation
II. Managerial decisions	Higher focus in the U.S. on customer and on demand stimulation • Low price levels • Constant introduction of new functions and features (e.g., call waiting, etc.) • Market-driven investment decisions	
I. Components of differences	• Significant differences in performance; Japan and Germany less than half of U.S. levels – Higher demand creates better utilization: call minutes per access line are twice as high in the U.S. (Japan, Germany) – Less capital required to install network: U.S. invests 20% less capital per access line (Germany) • Performance differences evident even in early 1980s	

Source: McKinsey analysis

Exhibit 8

SUMMARY OF CAUSALITY ANALYSIS – TELECOM

● Important in explaining capital productivity differences
○ Secondary in explaining capital productivity differences
x Not important

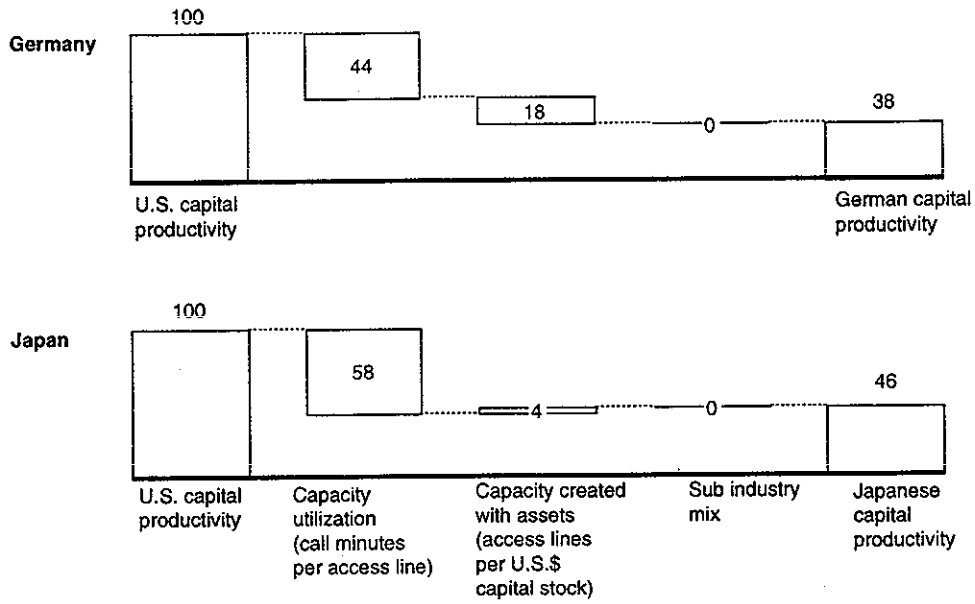
		U.S.-Germany	U.S.-Japan	Combined
IV. External factors affecting industry dynamics	**Macroeconomic environment**	x	x	x
	Product market factors			
	• Demand factors	x	x	x
	• Competition laws/enforcement	○	x	○
	• Monopoly regulation	●	●	●
	• Regulation/market interference	○	x	○
	Labor market factors			
	• Skills	x	x	x
	• Demographics	x	x	x
	• Rules/unionism	x	x	x
	Capital market factors			
	• Sources of funding/market for corporate control	x	x	x
	• Ownership/governance mechanisms	●	●	●
	Upstream and downstream market factors	x	x	x
III. Industry dynamics	**Product market**	○	x	○
	Labor market	x	x	x
	Capital market			
	• Alignment of goals with productivity	●	●	●
	• Ongoing improvement pressure	x	x	x
	• Forcing of exit	x	x	x
II. Managerial decisions	**Marketing**			
	• Product/product line management	○	○	○
	• Promotion/ demand stimulation/ pricing	●	●	●
	• Channel/ format selection	x	x	x
	Industry chain management	x	x	x
	Production technique			
	• Capital/labor mix	x	x	x
	• Technology	x	x	x
	• Scale	x	x	x
	Capital expenditure decision making			
	• Planning	○	x	○
	• Asset choice	○	○	○
	Operations effectiveness	x	x	x
I. Components of differences in productivity	**Capacity created with assets**	○	x	○
	Capacity utilization	●	●	●

Source: McKinsey analysis

Exhibit 9

SOURCES OF PRODUCTIVITY DIFFERENCES

Indexed to U.S. (1994) = 100



Source: FCC, *Statistics of Communications Common Carriers* 1993/94; Annual reports; McKinsey analysis

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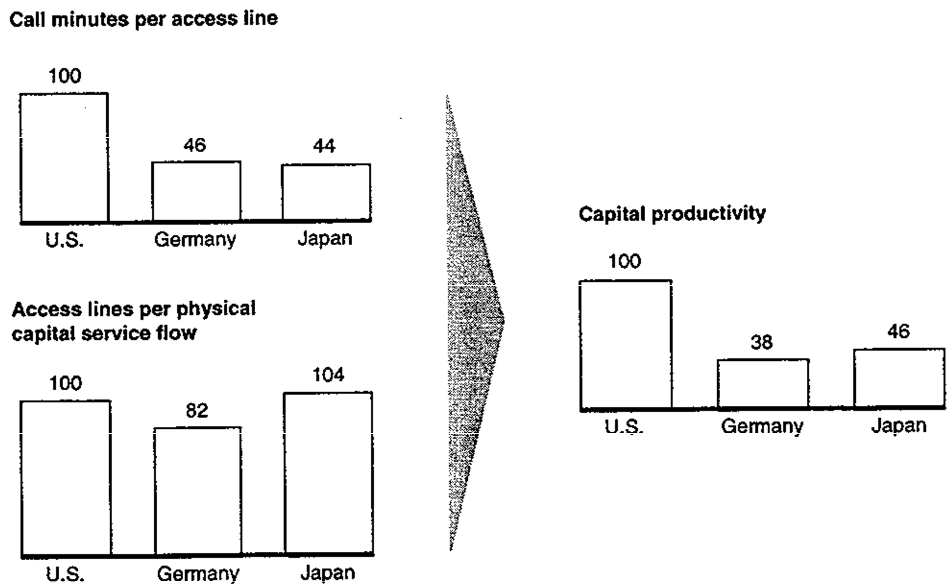
Exhibit 10

CAPITAL PRODUCTIVITY AND ITS KEY FACTORS

Indexed to U.S. (1994) = 100



Source: FCC, *Statistics of Communications Common Carriers* 1993/94; Annual reports; McKinsey analysis

¶ *Capacity utilization.* **Exhibit 10** shows that call minutes per access line are more than twice as high in the U.S. as in Germany and Japan. Because the asset base of the network is largely fixed, this higher demand drives higher utilization of the network and directly raises capital productivity. This factor alone accounts for the fact that capital productivity in both Germany and Japan is less than half of U.S. levels.

¶ *Capital required to create capacity.* German firms also put more capital into their network than both the U.S. and Japan. As a result, Germany has fewer access lines per dollar invested in the physical capital stock. Even if demand levels were the same across all three countries, these higher capital requirements would cause German productivity to be roughly 82 percent of U.S. levels (Exhibit 10).

Managerial decisions

Different productivity levels are the direct result of managerial practice.

¶ *Marketing.* Managers in the U.S. have a long history of explicit actions to shape consumer behavior and stimulate real demand. We believe that the differences in demand per capita (and consequently, utilization), which are the primary source of differences in capital productivity, are the result of these actions – particularly pricing and the introduction of new features and functionality. While some may ascribe the different demand levels to "cultural differences," we believe that it is mainly the managerial actions that have made telephone usage an accepted and important part of both social and business interactions in the U.S. This historical focus on demand stimulation has not been apparent in Japan and Germany. In fact, several decades ago, Deutsche Telekom explicitly ran an advertising campaign with the opposite intention, urging customers to " Fasse Dich kurz" – "Be Brief."

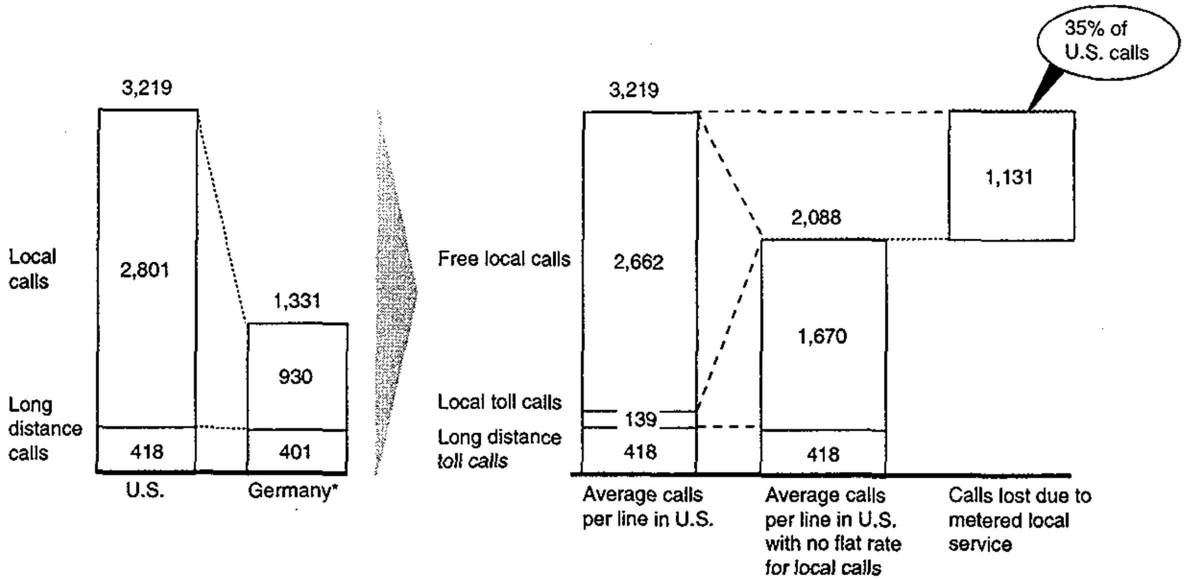
- *Pricing.* Radically different price levels and policies have had a big impact on stimulating demand. First, the flat-rate pricing scheme for local calls that predominates in the U.S. generates far more call minutes than metered local calling schemes, which exist in both Japan and Germany. Estimates show that as much as 35 percent of U.S. local calls could be lost with a metered system (**Exhibit 11**). Second, significant price differences exist for metered calls. Analyses of the price elasticity of toll calls suggest that with U.S. price levels, consumer call volume would increase by 36 percent in Germany and 12 percent in Japan (**Exhibit 12**). Moreover, by fostering the habit of telephone usage, there may be important spillover effects between the free local calls and metered ones.

This is not meant to suggest that either NTT or Deutsche Telekom were making irrational pricing decisions as monopolists to maximize its revenue (although they may not have been appropriately

Exhibit 11

IMPACT OF FLAT RATE PRICING 1994

Calls per access line in U.S.



* Adjusted for same service area as U.S.

Source: FCC, *Statistics of Communications Common Carriers*; Siemens International Telecom Statistics 1995; McKinsey analysis

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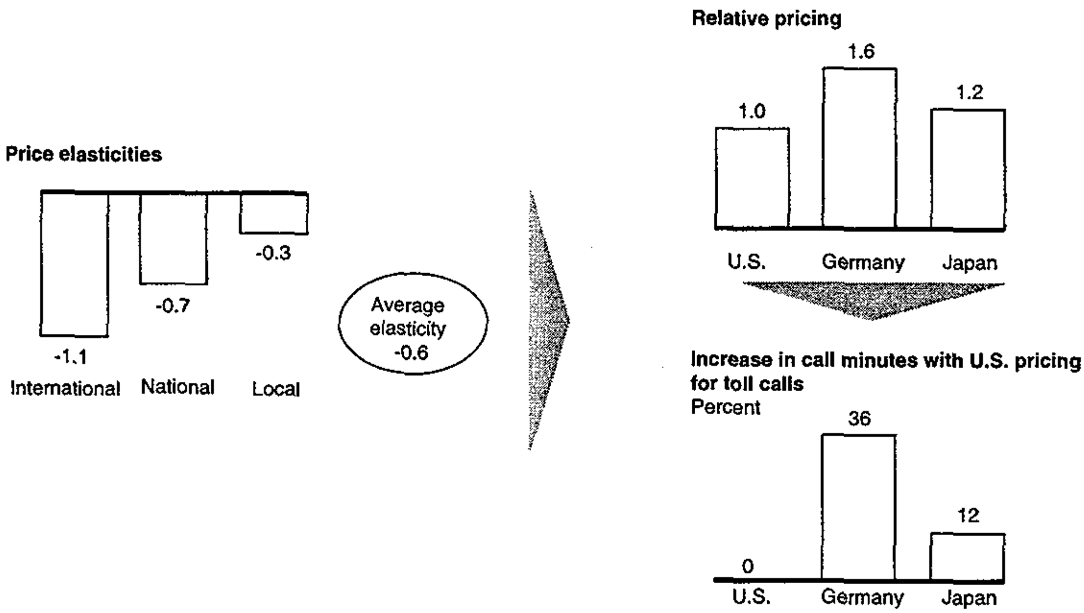
Exhibit 12

TOLL CALLS PRICE ELASTICITY



Source: U.S. and Canadian telecom regulatory filings; Meyer, J.R. et al.: "The Economics of Competition in the Telecommunications Industry," 1980; Taylor, Lester D.: "Telecommunications Demand: A Survey and Critique," 1979; total of 70 studies in the U.S. and Canada; McKinsey analysis

Exhibit 13

VARIETY OF TELEPHONE SERVICES 1992

		U.S.	Germany	Japan
Pricing	Flat rate and call charge	√	√	√
	Unlimited local calls	√		
	Volume discount	√		√*
Billing	Collect call	√		√
	Credit card call	√		√
	Prepaid card call		√	√
	Third party billing	√		√
	Toll free line	√	√	√
Operator service	Directory service	√	√	√
	Call completion service	√		
	Other operator assistance**	√		
Functional services	Call waiting	√		√
	Speed dial	√		√
	3-way calling	√		√
	Call forward	√	√	
	Priority call	√		
	Call block	√		
	Repeat call	√		
	Call trace	√		
	Other functional services***	√		

* Business customers only

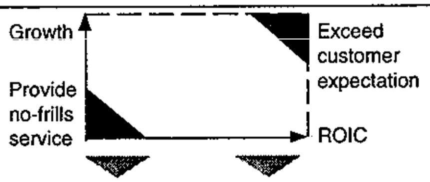
** Call verification (operator-assisted call, person-to-person call, etc.)

*** Caller ID, tone block, return call, home intercom, ultra forward

Source: Telephone books

Exhibit 14

CUSTOMER SEGMENTATION AND PRIORITIZATION OF INVESTMENTS



Market driven strategic investment planning helps to decide. . .	Sample issues	Investment decisions		Impact
...whether to invest	• Special features • Non-regulated services	• Only select features	• Full range • Package value proposition	Lower capital through • Less "goldplating" of equipment • Less unutilized equipment • More "design to cost" • Bottom up vs. fixed budgets capex planning
...what/how to invest	• Network reliability • Replacement strategy	• Maintain most economic level • Reactive	• Employ backup system • Proactive	
...when to invest	• Digitalization • New product introduction	• Opportunistic introduction • At mature stage of life cycle	• Introduce now • Be first	Benchmarks have shown capital reduction of up to 40% possible

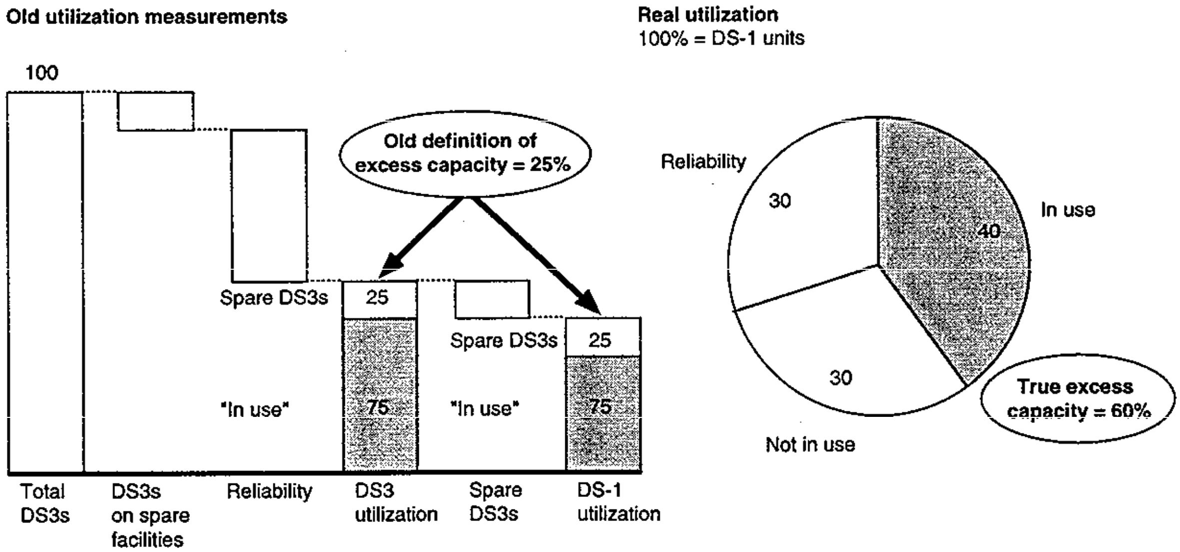
Source: McKinsey analysis

Exhibit 15

NETWORK UTILIZATION MEASUREMENTS

TELECOMMUNICATIONS COMPANY EXAMPLE

Percent



Source: McKinsey Quarterly

accounting for spillover effects). It does imply, however, that the pricing mechanisms chosen did impact the welfare of consumers, and as a result productivity.

- *Product line.* The introduction of additional features and functionality of the network, including answering machines, call waiting, toll-free (800) numbers, etc., are all widely believed to have stimulated an additional number of minutes on the network, although the impact is not as great as pricing. **Exhibit 13** shows that by 1992 consumers in the U.S. were offered a much broader range of services than in Germany and Japan.

¶ *Capital expenditure decision making.* Factors concerning the choice and management of capital have been of secondary importance in explaining performance differences by affecting the amount of capital required for each access line.

- *Planning.* Improvements in capital budgeting processes have had an impact on reducing capital expenditure in the U.S. Successful telecom companies in the U.S., including some RBOCs, have reduced their annual capital expenditure by more than 20 percent: 1) by integrating marketing and technical functions in the decision making process to assure that investments are truly meeting market needs, 2) by instituting a "bottom-up" methodology that requires justification for each investment project on its own merits, rather than setting one year's capital budget as an increase of x percent from the previous year's level, and 3) by uncovering hidden excess capacity and changing engineering guidelines to reduce capital requirements (**Exhibits 14 and 15**).

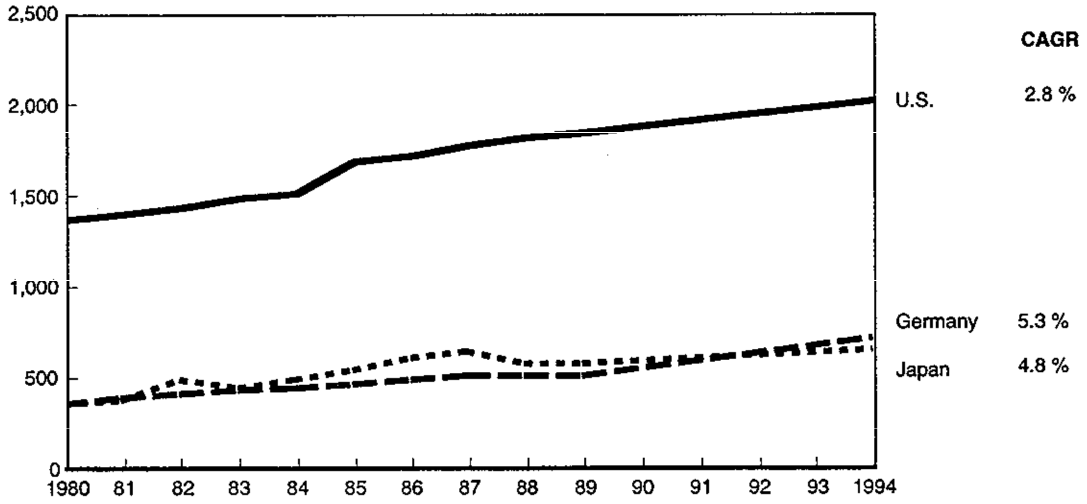
- *Asset choice.* Anecdotal evidence confirms that Deutsche Telekom, in particular, has invested more in its assets by setting specifications for its equipment that are more demanding than the function may require. As one extreme example, specifications on wires require them to be "tankproof," i.e., a tank must be able to run over them without the wires losing their functionality. In addition, some have raised the question about whether there has been "technological goldplating" in Germany and Japan. This will be discussed in more detail below.

¶ *Other factors* do not appear to be differentiating:

- *Technology.* Higher levels of technology do not account for higher U.S. performance, because the three countries studied have similar levels of technology. In fact, in some areas, such as the installation of ISDN, Germany is far ahead of the U.S.: the complete German backbone is now ISDN capable. Our static measure of productivity clearly "penalizes" Germany to the extent that recent investments in

Exhibit 16

CALLS PER CAPITA



Source: Siemens International Telecom Statistics the latest technology are included in our capital measure, but the output associated with it has not yet materialized, but may in the future. While it is clearly too early to tell if this investment was a sound one, many industry analysts have expressed their doubts, questioning whether complete ISDN capability is needed everywhere and asking if a phased implementation approach would have lessened risk of obsolescence. In this sense they refer to the ISDN investment as a kind of technological goldplating.

Outside observers point to the same issues in Japan, claiming that NTT has put technical excellence as a high priority, sometimes overinvesting in technology. The well-publicized "fiber to the home" program offers a good example. NTT announced its intention to install fiber cables to every home. Since launching that program, NTT has recognized the prohibitive costs of doing this and has backed off from its original objectives, now focusing on getting "fiber to the curb." This is more comparable to what has been done in the U.S. in using a fiber/coaxial hybrid without putting fiber in the last step.

- *Capital/labor mix*. Because the majority of the capital is in equipment that functions in a way that is not labor replacing (e.g., wire lines), we believe that higher capital productivity has not been achieved at the expense of labor productivity.

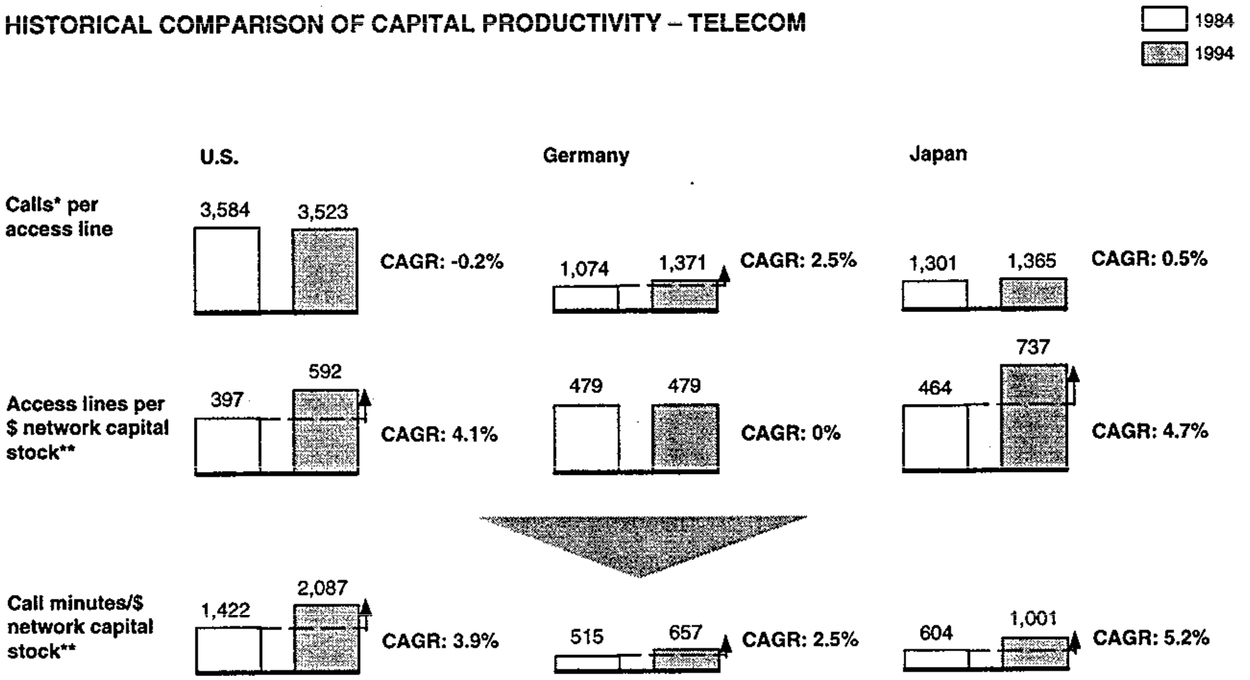
Industry dynamics and external factors

Looking at historical trends offers interesting insight into the external factors that have caused the differences in performance. While the lack of long-term series on capital expenditure prevents us from calculating long-term trends in capital productivity per se, significant differences in demand per capita – the primary driver of our performance differences – already existed in the early 1980s, when all three countries still had monopolies (**Exhibit 16**). This suggests that although the advent of competition in the U.S. and Japanese markets have changed those industries significantly, the dynamics of competition are not the principal differentiator of productivity performance.

We believe that the performance gap is so great because in Germany and Japan the basic objectives of managers, operating under the constraints imposed upon them, were not aligned with productivity. The ostensible objective for AT&T managers was to increase shareholder value, while not creating problems with the regulators. Given a fixed rate of return, the primary lever to increase value is to increase the invested capital base. To justify higher capital spending to regulators, managers had the incentive to stimulate demand, leading to lower average prices per call. In Germany, on the other hand, with Deutsche Telekom being a government agency, the objective of managers was less clear. Managers were asked to simultaneously provide universal service with high quality levels,

Exhibit 17

HISTORICAL COMPARISON OF CAPITAL PRODUCTIVITY – TELECOM



* Historical data not available for call minutes; we use calls as a proxy

** Converted using investment goods $ PPP; because of limitations on historical data, capital stock estimates assume a 10-year service life and therefore results differ slightly from previous measures

Source: Siemens International Telecom Statistics, 1995; McKinsey analysis maintain "socially acceptable" prices, and operate the business profitably to generate cash for other government agencies. Not only does this create a complicated objective function, but the managerial actions to flow from these were to maintain high prices, depressing demand and providing no incentive to utilize resources efficiently. In addition, since deregulation in the U.S., almost half of the local players have been subject to price cap rather than rate-of-return regulation, which explicitly creates the incentive to use assets more productively.

Product market competition clearly has had some impact: since the deregulation of the U.S. and Japanese markets, productivity growth has been much faster in these two economies than in Germany. Japanese annual growth rates have been double Germany's. In particular, all of the observed differences in access line per dollar network capital stock between Germany and the other two countries have developed in the last 10 years. In 1984, Germany was actually highest on this measure. While many factors potentially contribute to this improvement, including the switch to price cap regulation for the RBOCs discussed in the preceding paragraph, we believe that the competitive forces launched in the long-distance markets have played a critical role (**Exhibit 17**).

Other aspects of capital market behavior do not appear to have had a big influence. For monopoly markets, with rates of return practically guaranteed for investors, none of the companies has had problems securing capital, nor has the exit of companies been particularly relevant. Labor market behavior does not appear to have been differentiating in any manner.

Two primary external factors have driven the (mis)alignment between managerial objectives and productivity.

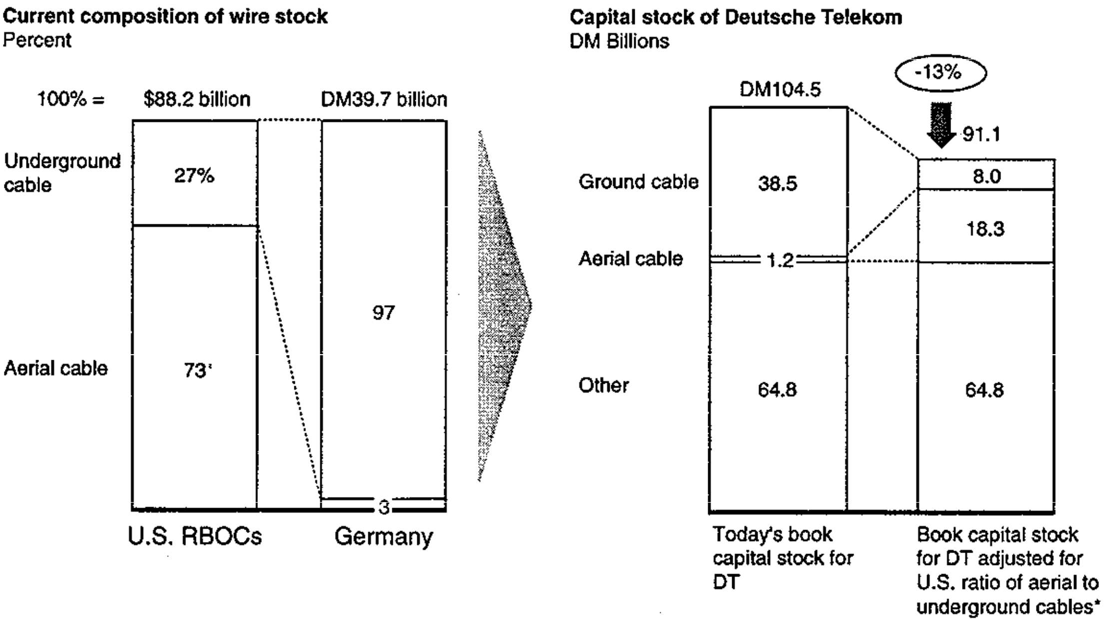
- *Monopoly regulation*. Rate-of-return regulation, which was the basic regulatory method in all three countries until the mid-1980s does not provide an incentive to improve productivity. In fact, it almost provides the opposite: given a fixed rate-of-return, a firm can create more value for shareholders only by expanding its capital base. Regulators in the U.S., however, closely monitored price levels, and pressured AT&T to reduce or maintain levels. In the absence of product market competition, this price pressure creates some incentive to use resources productively as does price cap regulation, which is more prevalent in the U.S. today. In Japan and Germany, little or no pressure was put on prices.

- *Ownership*. In Germany and Japan there was little pressure on prices because the owners (the government), were the regulators. For example, being part of the same agency, Deutsche Telekom throughout the 1980s served as a "cash cow" to fund the postal system. Government's primary objective was universal service while maintaining "socially acceptable" prices. Higher prices, however, generated more profits for the government.

Other external factors are of secondary importance.

Exhibit 18

REDUCTION IN CAPITAL STOCK USING U.S. RATIO OF AERIAL TO UNDERGROUND CABLES



* Assuming a 3 to 1 cost ratio for underground to aerial cables

Source: DT annual reports; DBP annual reports; FCC local exchange carrier statistics; McKinsey analysis

¶ *Competition laws/enforcement.* As discussed previously, the decisions to allow competition in the Japanese market and to break up AT&T and create competition in the U.S. long-distance market put pressure on managers to use their capital more frugally.

¶ *Regulation/market interference.* Exogenous factors that have a direct impact on capital productivity appear to be limited to standards. For example, Germany requires mostly underground cable; adopting the U.S. mix of aerial and underground cables would lower capital requirements by roughly 10 percent (**Exhibit 18**).

Other factors do not appear differentiating.

¶ *Sources of funding.* The advent of deregulation in the U.S. saw a flood of new entrants into the industry, and in many cases this entry was facilitated by the variety and depth of funding sources. MCI's growth, for example, was funded through junk bonds. There does not appear to be a shortage of capital in either Japan or Germany, however, in the face of an attractive business opportunity. This would suggest that capital market factors are not the differentiating factor. Again, capital was amply made available to fund the growth of the cellular industry in Germany and Japan.

We have also evaluated how these external factors preclude or constrain managers from reaching productivity levels comparable to the U.S. In Germany, the requirement for underground cable accounts for roughly 10 index points of the 60 point gap. Managers have no control over this factor. We believe, however, that German managers can control the rest of their capital expenditures. Both the U.S. and Japan have dramatically improved their effectiveness in capital spending over the last decade, as reflected in the number of access lines per capital stock, while Germany has not improved at all. Achieving comparable gains would close 20 percentage points of the gap.

Different demand levels per capita account for the remaining 30 points of the gap. As discussed, we believe that managers can stimulate higher call volume by introducing new features and by offering alternative tariff structures, including some degree of flat-rate pricing. We believe such practices could eclipse demand differences fully and still be profitable for the telcos. The introduction in competitive cellular markets of tiered pricing structures that offer different combinations of fixed fee and cost per call suggests that this is profit-maximizing behavior. In summary, then, we believe that managers could close as much as 50 points of the 60 point productivity difference.

Similar logic applies for Japan. Demand differences account for the entire 55 point gap, and we believe that this entire gap can be closed (over time) through managerial action.

DIFFERENCES IN COST OF EQUIPMENT

In our measures of capital productivity, we control for price differences for investment goods. As a result, our measure is a physical measure of productivity (call minutes per standardized units of equipment, wires, etc.) and does not include the impact of differences in the prices paid for equipment. We believe, however, that telecom companies pay significantly different prices in the three countries, and that firms in Germany and Japan have substantial opportunities to reduce their capital expenditures or get more for their money.

The case is most dramatic for Deutsche Telekom. As shown in **Exhibit 19**, purchase prices for switches and multiplexers remain roughly 60 percent above U.S. levels in terms of market exchange rates, even though prices have been dropping rapidly over the last few years.

Several factors account for these higher prices. First, historically Deutsche Telekom has sourced from local suppliers, who have not faced competition from global equipment providers in the bidding process. Second, Deutsche Telekom uses more "tailor made" as opposed to standardized equipment, adding more complicated specifications to the manufacture of equipment. This effectively raises the cost of the making of the equipment for the manufacturer. In addition, it creates an advantage for the incumbent supplier and creates a barrier to entry to low-cost international suppliers who would like to serve the market.

Comparable practices are evident in Japan as well. Although NTT has recently moved to more global sourcing, historically it has depended on local providers.

Managers justify the higher levels of specification as necessary to maintain the highest standards of technical excellence and to ensure interface compatibility with other parts of the network. While this may be true to some extent, the question remains if it justifies paying 60 percent more for the equipment. In Japan, smaller competitors have moved to purchasing switches from international suppliers because they feel that they can both offer better service to their customers and pay a lower price, even after adjusting for the added costs of making the switches compatible with the NTT network.

OUTLOOK AND IMPLICATIONS

Outlook

As discussed previously, the telecommunications industry is now undergoing major change, unleashed by three major forces that will dramatically shape telecom over the coming decades: continuing deregulation, major technological change and increasing globalization.

Deregulation and increasing competition is now a fundamental part of the landscape in all three countries. Deregulation and privatization in Germany, along with additional deregulation in the U.S. and Japan, will fundamentally change the nature of the game in each country.

Major technological change will also redefine the industry. The introduction of wireless local loop technology could break the natural monopoly that local providers have historically enjoyed. The advent of multimedia content and technologies will also blur the distinctions between the telecommunications, media and computer industries.

In addition, telecom will no longer be just a national game. Spurred by opportunities in foreign markets as well as their desire to provide seamless service globally to their nationally-based MNC customers, most of the major players have recently launched international alliances/acquisitions. These include British Telecom and MCI, Deutsche Telekom's collaboration with France Telecom (including their purchase of an interest in Sprint), as well as AT&T's alliances with KDD and a host of other players. These moves will likely intensify the pace and the nature of competition in all of the national markets.

While there is much speculation about how all of these forces will play out, no one can be sure. Faced with this uncertainty, it becomes even more important for both corporations and policymakers to learn the lessons from past performance.

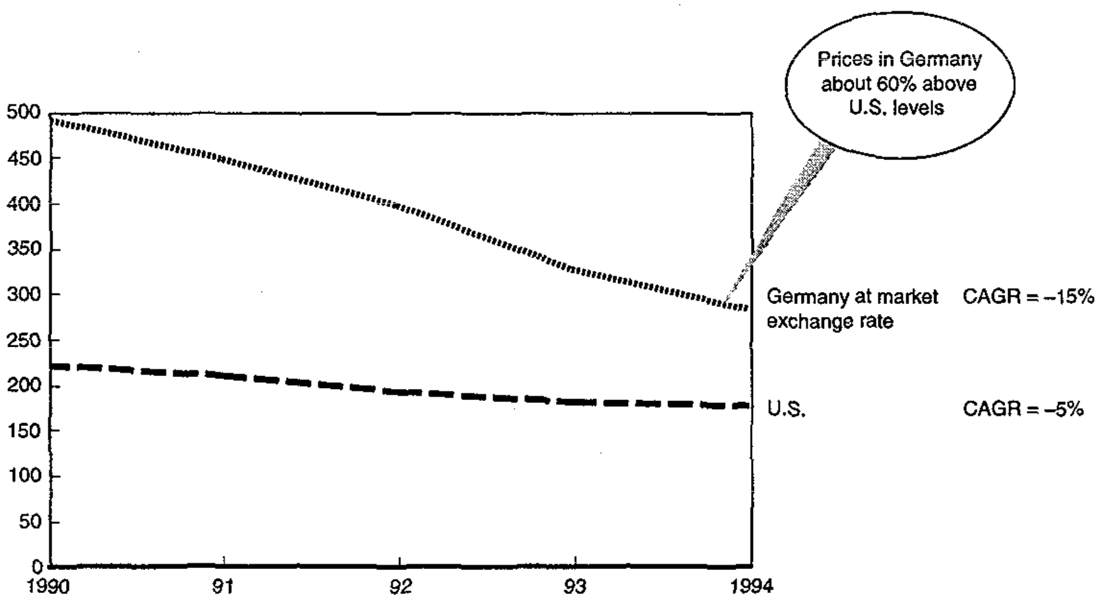
Implications

Important implications exist for corporations. First, customer orientation matters, both for stimulating demand and making sure capital investments are good ones. Second, ample opportunities exist for reducing the cost of capital goods through global sourcing (see box on facing page). Finally, there are many opportunities to learn from other telecommunications companies. Sharing best practices, particularly among noncompetitors, offers significant possibilities for improvement both in productivity and in financial returns.

These lessons also hold several implications for policymakers. First, despite the current euphoria about deregulation, the need to regulate the industry will probably continue in some form or other in each economy. There is much debate about how much and how to regulate, i.e., literature on price cap versus rate-of-

Exhibit 19

NETWORK EQUIPMENT PRICES*
1994 U.S.$ per access line



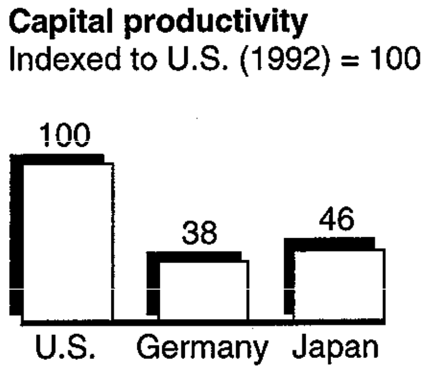
* Mostly switches and multiplexers
Source: Dataquest; McKinsey analysis

return regulation. However it is done, the key is ensuring that the right incentives are created for managers to increase productivity. Good deregulation also matters. Some analysts point to the deregulation of the UK market as one that has worked very well, both for the consumers as well as the telcos. On the other hand, they cite problems with deregulation in Japan, suggesting that policies on issues such as interconnection and pricing have seriously threatened the viability of NTT. The challenge will be to give the right incentive to lower the barriers to entry while at the same time not destroying the economics for the incumbent, if new entrants depend on the incumbents' infrastructure.

Second, policymakers should recognize the limits of government ownership. In our case study, this has obviously been recognized as the German government plans for the privatization of Deutsche Telekom in 1996. But this holds for other countries as well as other industries. Even when enterprises remain state owned, there is a strong argument to separate the regulatory body from operations.

Third, and somewhat obviously, more actively promoting competition will be important in all three countries, especially as technical advances move the industry away from the "natural monopolies" that had existed in the past.

TELECOMMUNICATIONS CASE SUMMARY



The high performance of the U.S. shows how good marketing can drive productivity. With little or no incentive to be consumer focused, German and Japanese Telcos dramatically underutilized their phone networks.

Even before deregulation, low prices and new products, boosted U.S. performance. Capital market pressure and regulations designed to make phone access cheap and widely available forced U.S. Telco's to be better at marketing phone service. They priced aggressively and innovated with new products like 800 numbers, answering machines and call waiting.

A long history of these marketing efforts has led to significantly more calls. Call volume per capita in the U.S. runs double to that of Japan and Germany. The high volume creates higher utilization of the gigantic fixed network of wires and switches. High utilization results in higher productivity for the U.S.

Government ownership leads to garbled objectives for managers and low productivity. In Germany, the government, as both owner and regulator, gives managers a host of competing objectives and incentives: universal service for consumers, high quality and reliability, technological excellence, and profits to subsidize the postal system. As a result, managers decision making rarely lines up with productivity improvement.

Since deregulation both Japan and the U.S. have become even more effective in their capital spending. Since 1984, productivity growth has been much faster in Japan and the U.S. than in Germany, which has just begun the process of deregulation. More effective capital expenditure planning in the U.S. and Japan as well as "goldplating" in Germany – where phone lines must be able to withstand being run over by a tank – account for these trends.

Global sourcing is a big opportunity for corporations. By relying on local suppliers and equipment for their own markets, both German and Japanese firms have paid well above international prices for their equipment. Despite recent price declines, Deutsche Telekom still pays as much as 60 percent above global prices for some switching equipment.

Productivity in the electric utility industry

The electric utility industry generates, transmits and distributes electric power for industrial, commercial and residential consumers and offers them administrative services such as billing and information on energy efficiency. Electricity is a very important energy source and represents a significant component of production costs of many industries (up to 25 percent of production costs, e.g., in the aluminum industry) and of household expenditures.

The industry is also a large employer in most developed countries and a large purchaser of construction work and mechanical and electronic equipment. The capital stock of electric utilities represents an important part of the total of an economy, ranging between 5 and 9 percent for the three countries examined: the U.S., Germany and Japan. This important role makes electric utilities interesting for cross-country capital productivity comparisons.

Electric utilities are a capital-intensive business. In most industries, capital's share of value added is approximately one-third, with labor receiving two-thirds. With the exception of Germany, the distribution of value added between capital and labor is reversed in electric utilities (**Exhibit 1**). Capital mainly takes the form of power generating plants and transmission and distribution (T&D) equipment.

Once deemed a relatively "quiet" industry, the electric utility industry has generated much public discussion in recent years for several reasons. First, there are continued environmental and safety concerns over power plants – especially after incidents such as the Chernobyl nuclear disaster. Second, high electricity prices are believed to negatively affect the international competitiveness of some domestic industries. Finally, the deregulation of several markets is under way in some parts of the U.S. and the European Union, and is just getting started in Japan.

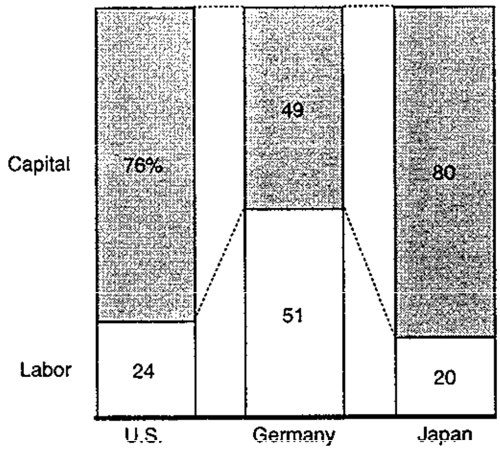
The electric utilities case study contributes in various ways to the overall discussion of capital productivity.

- This case illustrates the importance of pricing both in stimulating demand, which improves the utilization of a fixed asset base, and in managing demand volatility to improve utilization of assets that require lumpy investments.
- The electric utilities case study emphasizes the importance of the right incentive system for management even in a monopoly situation.
  - It highlights the importance of how regulatory mechanisms pressure and create incentives for managers to use their resources productively.

Exhibit 1

CAPITAL AND LABOR SHARE OF VALUE ADDED 1993

Percent



Note: The high income share of labor in Germany is driven by higher employment in utilities, limited outsourcing of activities because in-house solutions are preferred and very high wages

Source: Utility Data Institute (UDI); Statistisches Bundesamt; Japanese Ministry of Finance; Daiwa; McKinsey analysis

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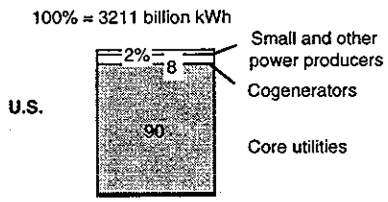
Exhibit 2

ELECTRIC UTILITY INDUSTRY STRUCTURE 1993

Percent

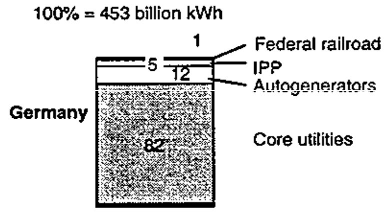
Focus of case study



Small and other power producers
- Mainly independent power producers and small hydro projects

Cogenerators
- Roughly 50% each of the power generated is own use and wholesale to utilities
- This category includes autogeneration by industrial companies and part of IPPs

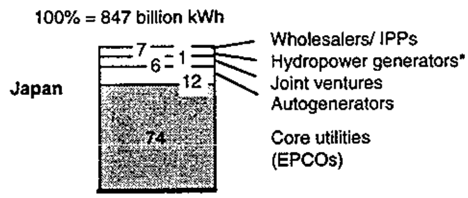
Core utilities
- Differentiation through ownership
  - Investor-owned
  - Cooperatives
  - Federal and municipal
- Fragmented industry structure (several hundred individual utilities)



IPPs
- STEAG is only IPP in Germany

Autogenerators
- Mining, chemicals (BASF), automotive (Daimler-Benz), steel (Thyssen)

Core utilities
- Top 8 regional monopolies in the West
- VEAG (newly formed utility for the new Länder)
- Several hundred regional municipal authorities (virtually no market share)
- Mostly joint public/private ownership



Wholesalers/ IPPs
- Electric Power Development Company (EPDC) and Japan Atomic Power Company (JAPC)

Joint ventures
- 20 jointly owned generation enterprises that have been founded by core utilities and large/ industrial electricity consumers

Autogenerators
- Mainly industrial auto producers

Core Utilities
- Top 10 regional monopolies
- Private ownership

Source: International Energy Agency (IEA); Energy Information Administration (EIA); Edison Electric Institute (EEI); UDI; Statistisches Bundesamt; Annual Report STEAG

- This case also demonstrates how government ownership, by constraining managers' decisions and distorting their incentive system, can negatively affect performance.

The first section provides a brief description of the electric utility industry. It is followed by the measurement of cross-country capital productivity differences. We then analyze and estimate the importance of factors that explain the observed productivity gaps. Finally, we draw conclusions and implications for policymakers and corporations.

INDUSTRY BACKGROUND

Although electric utilities are regional monopolies in all three countries, significant differences exist in industry structure (**Exhibit 2**), regulation and ownership.

The U.S. electric utility industry is very fragmented; more than 3,000 utilities monopolize local markets and are responsible for the generation as well as transmission and distribution of electricity. Only 8 percent of electric utilities are investor-owned, but those generate 80 percent of electricity sales in the country. The remaining are small cooperatives (29 percent) or owned by municipal (62 percent) or federal (1 percent) authorities. Recent deregulatory efforts have led to the emergence of cogenerators and independent power producers (IPPs), which generate electricity for on-site consumption and sale to electric utilities. Each state has a public utility commission responsible for approving retail prices for end-use customers, while a federal commission regulates wholesale prices.

The West German industry is dominated by eight major companies, which generate nearly all the electricity for the German market. These eight firms are involved in T&D to different degrees, with several hundred smaller local utilities mainly being responsible for the distribution of power to the end consumer. Except for two of these companies (PreussenElektra and Bayernwerk), electric utilities in Germany are publicly owned. Each state's Economics Ministry regulates retail prices, while the Federal Antitrust Agency oversees wholesale prices to assure fairness for industrial customers.

Japan's market is divided into 10 regions, each of which is served by 1 utility responsible both for generation and T&D. All 10 companies are privately owned and regulated by the Ministry of International Trade and Industry (MITI).

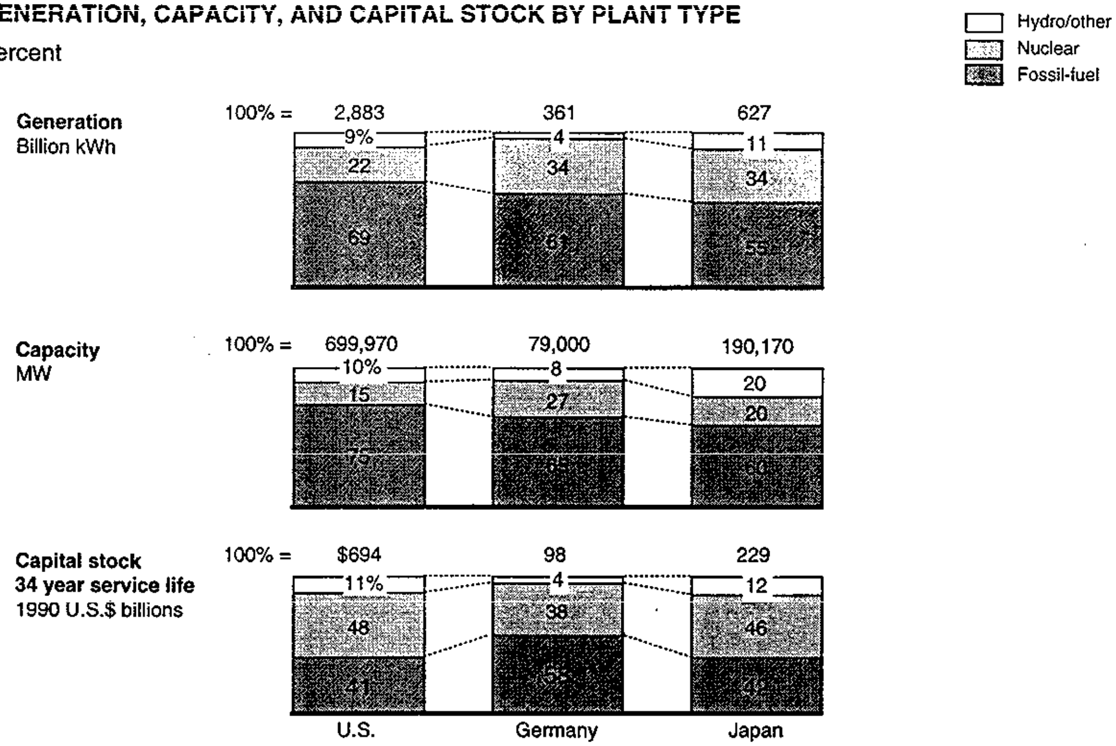
"Core" utilities refer to companies whose primary business is the generation and distribution of electricity to industrial, commercial and residential customers. These account for at least three-quarters of total output in all three countries.

Many industrial processes use or produce thermal energy in the form of hot water, hot gases or steam. A process that reuses thermal energy by coupling a thermal industrial process with thermal electric generation is called cogeneration. In the U.S., cogenerators have emerged since the late 1970s and

Exhibit 3

GENERATION, CAPACITY, AND CAPITAL STOCK BY PLANT TYPE

Percent



Source: EIA; IEA; Statistisches Bundesamt; Nikko Research Institute; NERC; Japanese Ministry of Finance

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Exhibit 4

CAPITAL COMPONENTS IN ELECTRIC UTILITIES

	Generation	Transmission and distribution
General	• Land • Construction – Material (concrete, steel, etc.) – Labor • Control devices • Environmental cleanup devices (scrubbers)* • Connection to grid – Substations – Transformers	• Land • Construction costs – Material (concrete, asphalt, steel, etc.) – Recultivation (grass, flowers, etc.) – Labor • Equipment – Substations – Transformers – Meters, switches, other electric equipment • Cable and wire
Specialized	• Equipment for fossil-fuel plants – Boilers – Generators – Turbines – Fuel funneling/ intake • Equipment for nuclear plants – Core reactor – Steam generators – Turbines – Fuel pool for storage	

* Depending on fuel: low-sulfur coal requires almost no environmental cleanup devices

Source: Interviews; McKinsey analysis

have grown to a significant proportion of total generation. In Germany and Japan, more than 10 percent of total output is produced by autogenerating industrial companies. These are predominantly manufacturers in the automotive, chemicals or mining industries that independently serve their own power needs (Exhibit 2). Because capital expenditure data for IPPs and autogenerators are not available, this study focuses on core utilities.

Several types of fuel can be used to generate electric power. In this case study we discuss nuclear, fossil fuel (coal, natural gas, oil etc.) and hydro power plants. Partly due to differences in natural resources, we observe a different mix of plant types across countries (**Exhibit 3**). In general, an inverse relationship exists between fuel cost and the construction cost associated with a plant. For example, hydro power plants are expensive to construct, but involve no fuel costs once installed. In order to take advantage of low running and fuel costs, nuclear plants generally supply power around the clock for the entire year, (except for outage periods for maintenance) servicing the minimum demand level, called the base load. Plants with low fixed costs and comparatively high variable fuel costs serve the highest daily demand levels, called the peak load. These plants are used only when demand levels make it necessary. Later we show the graph giving the demand levels over the course of the day and the year that is referred to as the load curve (see examples in Exhibit 17).

Capital in the industry is almost evenly split between generation and T&D. Although many of the components of capital across plant types are similar, some types of specialized equipment are also necessary (**Exhibit 4**). In addition to equipment, a substantial part of capital expenditure in generation goes to plant construction and grid connection. In T&D the main components are cables and wires (high, medium and low voltage), transformers, substations and meters, as well as materials for construction.

PRODUCTIVITY PERFORMANCE

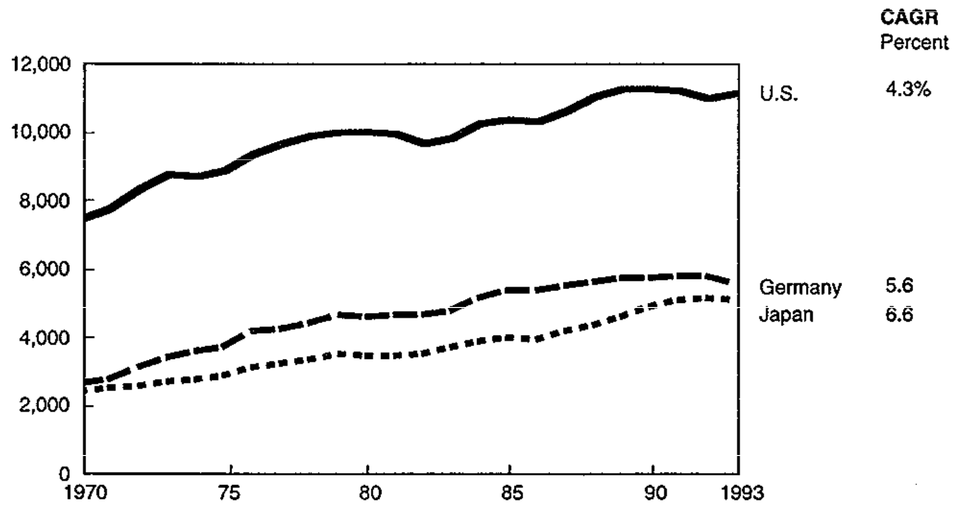
We measure capital productivity as kilowatt hours (kWh) per unit of capital employed and find German and Japanese performance to be at approximately 80 and 50 percent of the U.S. level, respectively.

Measurement

Because electric power is universally measured in kilowatt hours, the output of the electric utility industry is readily available and comparable. We use net output of electricity for our calculations, because it measures the power actually consumed by the rest of the economy and is not influenced by electricity used by power plants. Net power generation in the U.S. in 1993 was approximately five times as high as in Japan and eight times as high as in Germany, but it has grown faster in Germany and especially Japan (**Exhibit 5**). This translates into per

Exhibit 5

NET POWER GENERATION PER CAPITA 1970-93
kWh



Source: EIA (Annual Energy Review 1994); Statistisches Bundesamt; Nikko Research Institute

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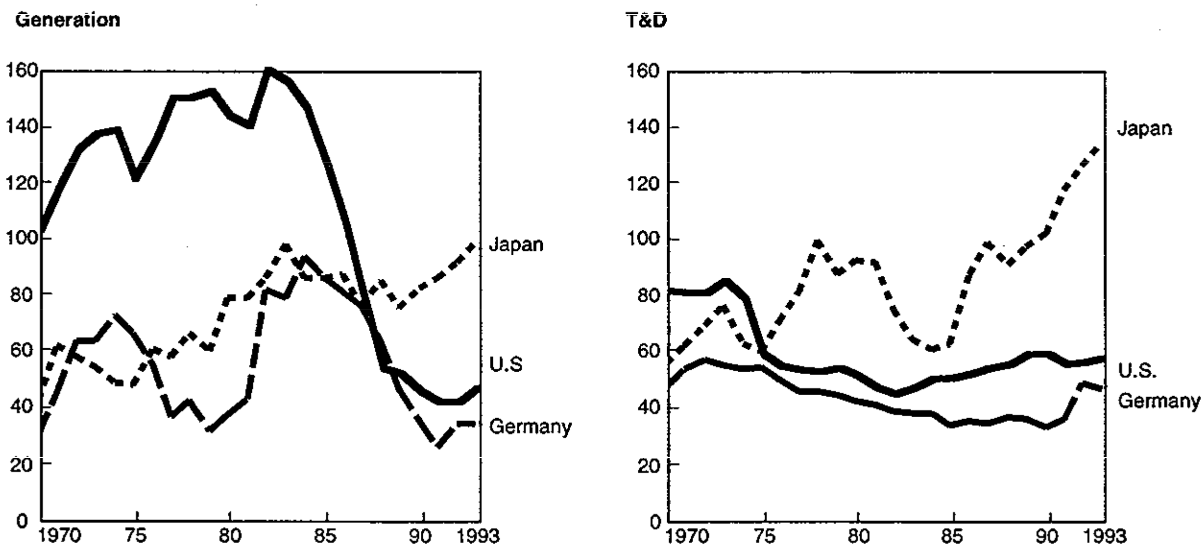
Exhibit 6

CAPITAL EXPENDITURE LEVELS PER CAPITA*
1990 U.S.$



* Converted at generation PPP of 1.80 DM/$ (Germany) and 162.0 ¥/$ (Japan) and T&D PPP of 2.55 DM/$ (Germany) and 143.0 ¥/$ (Japan)
Source: EIA; EEI; Statistisches Bundesamt; Japanese Ministry of Finance; McKinsey analysis

capita demand that is roughly twice as high in the U.S. as in the other two countries.

To estimate capital employed in the industry, we used a time series of capital expenditure data split into generation (by fuel type) and T&D. We then constructed standardized gross capital stock and flow measures by applying the same service life across the countries to structures and equipment. Capital expenditures for electricity generation in the U.S. were very high until the early 1980s, but dropped dramatically after that (**Exhibit 6**). This decline was partly offset by the fast growth of independent power producers, who quickly brought on new generating facilities. Capital spending patterns are smoother in Germany and Japan, although Japan greatly increased capital expenditures after the mid-1980s.

By dividing output in kWh by equivalent units of capital services we measure physical capital productivity in the industry. For more detail, see the "Methodology" box at the end of the case.

Results

Exhibit 7 presents the differences in capital productivity across countries. German capital productivity is approximately 20 percent lower than that of the U.S., while Japan's lags by roughly 50 percent.

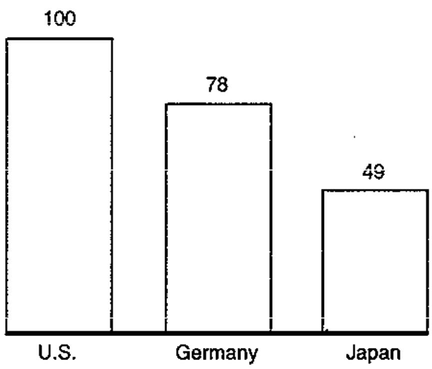
These results have been relatively stable over the past several years, except for a recent slight decline in Japan (**Exhibit 8**). This effect is chiefly due to high investment levels in the last few years relative to modest growth in output. The measurement is not sensitive to changes in service life assumptions: when using shorter service lives for structures and equipment the results do not change significantly.

The capital productivity results vary substantially by plant type across the countries (**Exhibit 9**). Although U.S. productivity is much lower in nuclear power generation relative to Germany, this is more than offset by an enormous productivity advantage in fossil fuel plants. Capital productivity across plant types varies considerably more in the U.S. than in the other two countries.

We have also calculated labor productivity and total factor productivity (TFP) results as in **Exhibit 10** (for exact methodology used to calculate TFP see Chapter 1: Objectives and Approach). Labor productivity in the U.S. and Japan is equal, with Germany lagging by a third. Due to the high share of value added accruing to capital, the same pattern that holds for capital productivity applies to total factor productivity. Despite significant differences in the shares of value added accruing to capital and labor in the three countries (see Exhibit 1), relative TFP changes only slightly even if we assume the German value added split for the U.S. and vice versa. TFP is approximately 27 percent lower in Germany and more than 40 percent lower in Japan compared to the U.S.

Exhibit 7

CAPITAL PRODUCTIVITY* – ELECTRIC UTILITIES
Indexed to U.S. (1993) = 100



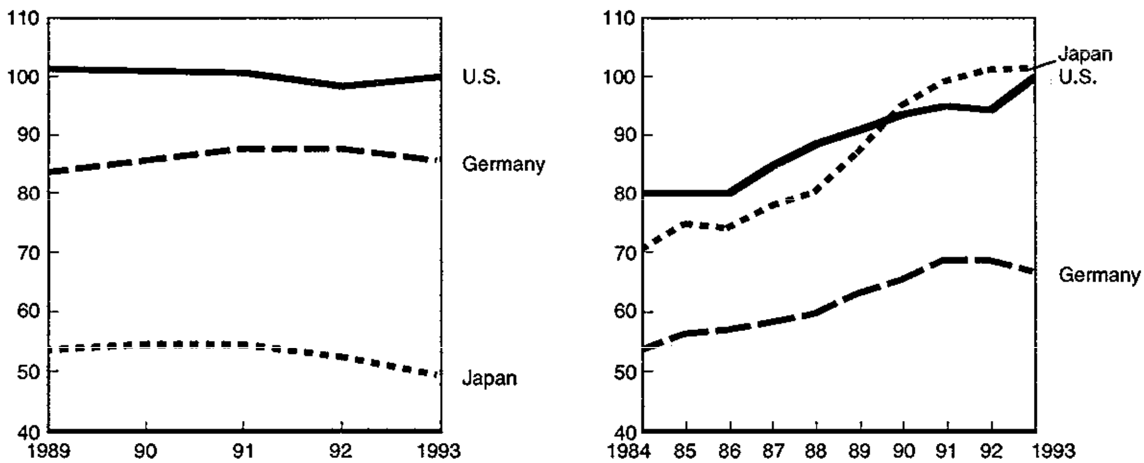
* kWh/capital services converted at electric utilities investment goods PPP
Source: EIA; EEI; Statistisches Bundesamt; Japanese Ministry of Finance; McKinsey analysis

Exhibit 8

TRENDS IN CAPITAL AND LABOR PRODUCTIVITY – ELECTRIC UTILITIES
Indexed to U.S. productivity (1993) = 100

Capital productivity
Based on 30-year service life

Labor productivity
Based on hours worked

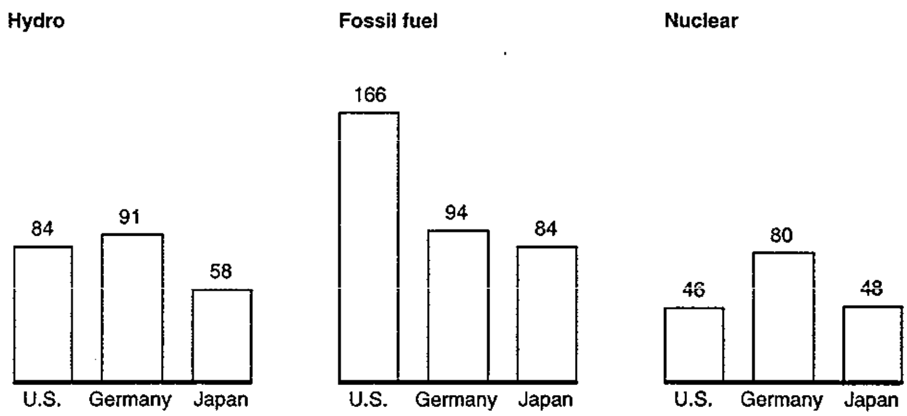


Source: EIA; EEI; Statistisches Bundesamt; Japanese Ministry of Finance; Japanese Ministry of Labor; McKinsey analysis

Exhibit 9

CAPITAL PRODUCTIVITY BY PLANT TYPE

Indexed to average U.S. productivity (1993) = 100



	Hydro U.S.	Hydro Germany	Hydro Japan	Fossil fuel U.S.	Fossil fuel Germany	Fossil fuel Japan	Nuclear U.S.	Nuclear Germany	Nuclear Japan
Percent of total capacity	10%	8	20	75	65	60	15	27	20

Source: EIA; EEI; Statistisches Bundesamt; Japanese Ministry of Finance; McKinsey analysis

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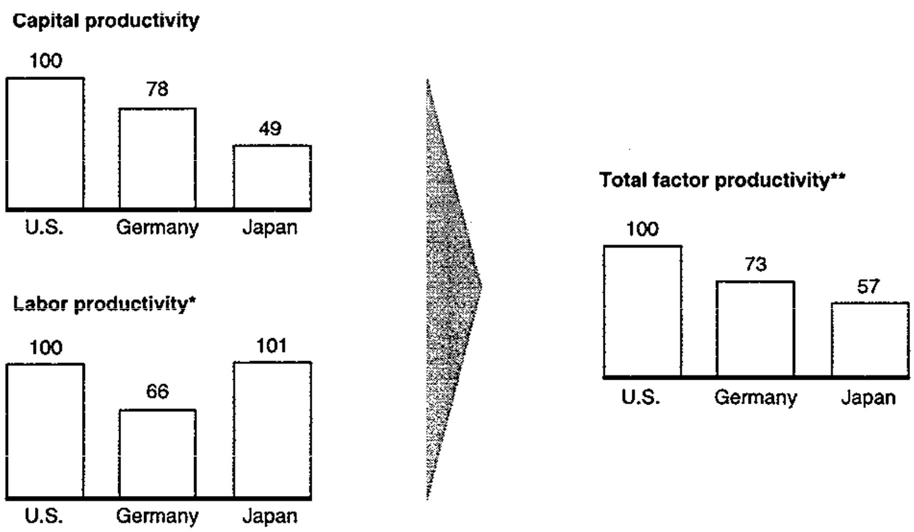
Exhibit 10

CAPITAL, LABOR, AND TOTAL FACTOR PRODUCTIVITY – ELECTRIC UTILITIES

Indexed to U.S. (1993) = 100



* Labor productivity = output in kWh/ hours worked

** TFP = Output / ($K^{\alpha} \cdot L^{(1-\alpha)}$); assumption of Cobb-Douglas production function, same α for all countries

Note: German labor productivity is not adjusted for the effect of a differentially lower degree of outsourcing, which could raise it up to approximately 75-80%

Source: EIA; EEI; Statistisches Bundesamt; Japanese Ministry of Finance; Japanese Ministry of Labor; McKinsey analysis

Exhibit 11

SUMMARY OF CAUSES OF DIFFERENCES IN CAPITAL PRODUCTIVITY – ELECTRIC UTILITIES

Components of differences

- Lower productivity primarily as a result of lower utilization of generation (Japan) and T&D assets (Germany, Japan)
- Lower productivity secondarily due to higher capital per capacity unit (Germany)

Managerial decisions

- Higher electricity prices lead to lower average demand (Germany, Japan)
- Higher demand volatility due to absence of load management (Japan)
- Overengineering/ goldplating drive up construction costs of plants

Industry dynamics

- With no pressure on prices or on financial performance managers do not have incentive to use their resources productively (Germany, Japan)

External factors affecting industry dynamics

- Regulation does not emphasize maintaining low pricing levels for consumers (Germany, Japan)
- Public institutions as owners of electric utilities do not focus as much on financial as on political goals (Germany)

Source: McKinsey analysis

Labor productivity demonstrated an upward trend in all three countries (see Exhibit 8) with Japan growing faster than the U.S. and Germany. Since the size of the workforce in all three countries has been virtually constant over this period, higher labor productivity growth in Japan is due to differentially higher increases of demand for electricity. We did not observe productivity growth of one factor at the expense of the other factor's productivity, as is indicated by the stability of the trends.

CAUSES OF DIFFERENCES IN CAPITAL PRODUCTIVITY

Higher capital productivity in the U.S. is largely attributable to better utilization of assets. Although electric utilities are regional monopolies in all three countries, different dynamics of the industry have led managers to differentially utilize their assets. Regulators' focus on maintaining low prices for consumers, combined with private investors' desire to earn high returns has pressured managers in the U.S. to use their resources more efficiently. Lower price levels have stimulated demand to improve T&D network utilization, and the use of flexible pricing schemes in conjunction with effective planning has improved utilization of generation assets as well (**Exhibit 11**).

Although the distribution of capital by hydro, fossil fuel or nuclear plants is considerably different, mix differences cannot explain performance gaps across countries. If we apply the U.S. fuel mix to Germany and Japan, we find no net impact on capital productivity; the relatively unproductive use of nuclear fuel in the U.S. is offset by high productivity in fossil fuel plants (Exhibit 9). While asset type differences affect company-to-company productivity comparisons within one country, fuel mix does not account for the gaps observed on the aggregate level.

In the following section we have broken down the differences in capital productivity into two major components, capacity utilization and capacity created with assets. We then explain how managerial decisions have influenced the overall results we observe. Finally, we show how the dynamics of the industry and external constraints have influenced managers in their decision making (**Exhibit 12**).

Components of differences in capital productivity

Differences in capital productivity levels across countries can be broken down into several components (**Exhibits 13 and 14**). The most important of these are asset management issues, which we separated into capacity utilization and amount of capacity created with installed assets (for definition see below). In Japan, almost the entire gap in capital productivity can be attributed to lower capacity utilization, while for Germany both of these factors are of equal importance.

Exhibit 12

SUMMARY OF CAUSALITY ANALYSIS – ELECTRIC UTILITIES

● Important in explaining capital productivity differences
○ Secondary in explaining capital productivity differences
x Not important

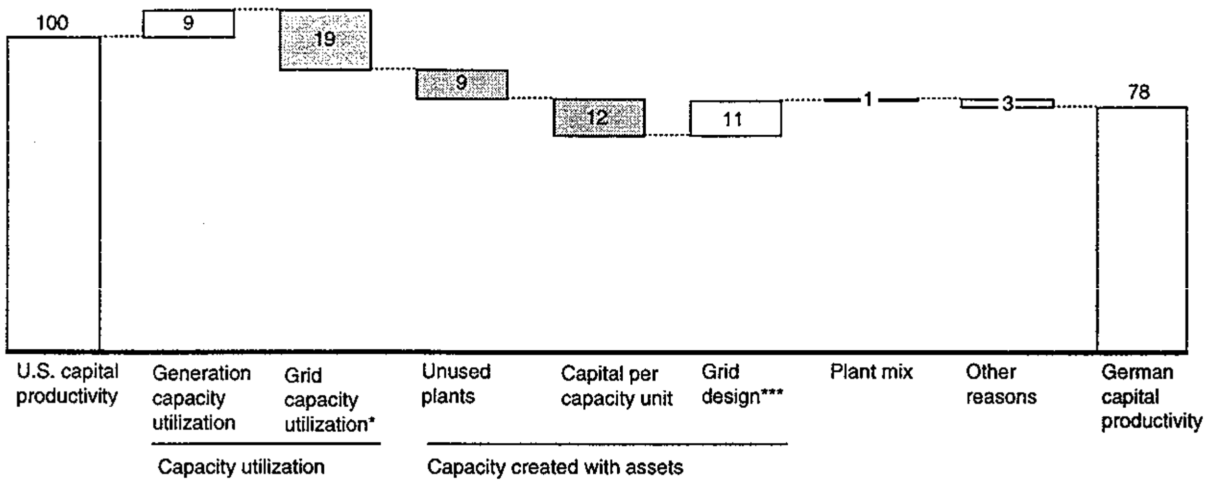
		U.S.-Germany	U.S.-Japan	Combined
IV. External factors affecting industry dynamics	**Macroeconomic environment**	x	○	○
	Product market factors			
	• Demand factors	x	○	○
	• Competition laws/enforcement	x	x	x
	• Monopoly regulation	●	●	●
	• Regulation/market interference	x	x	x
	Labor market factors			
	• Skills	x	x	x
	• Demographics	x	x	x
	• Rules/unionism	x	x	x
	Capital market factors			
	• Sources of funding/market for corporate control	x	x	x
	• Ownership/governance mechanisms	●	x	●
	Upstream and downstream market factors	x	x	x
III. Industry dynamics	**Product market**	N/A	N/A	N/A
	Labor market	x	x	x
	Capital market			
	• Alignment of goals with productivity	●	●	●
	• Ongoing improvement pressure	x	x	x
	• Forcing of exit	x	x	x
II. Managerial decisions	**Marketing**			
	• Product/product line management	x	x	x
	• Promotion/ demand stimulation/ pricing	●	●	●
	• Channel/ format selection	x	x	x
	Industry chain management	x	x	x
	Production technique			
	• Capital/labor mix	x	x	x
	• Technology	x	x	x
	• Scale	x	x	x
	Capital expenditure decision making			
	• Planning	●	○	●
	• Asset choice	●	x	●
	Operations effectiveness	○	○	○
I. Components of differences in productivity	**Capacity created with assets**	●	x	●
	Capacity utilization	●	●	●

Source: McKinsey analysis

Exhibit 13

SOURCES OF PRODUCTIVITY DIFFERENCES BETWEEN THE U.S. AND GERMANY

Indexed to U.S. (1993) = 100



* Assume German demand per capita for the U.S.

** Exact quantitative impact of goldplating cannot be isolated

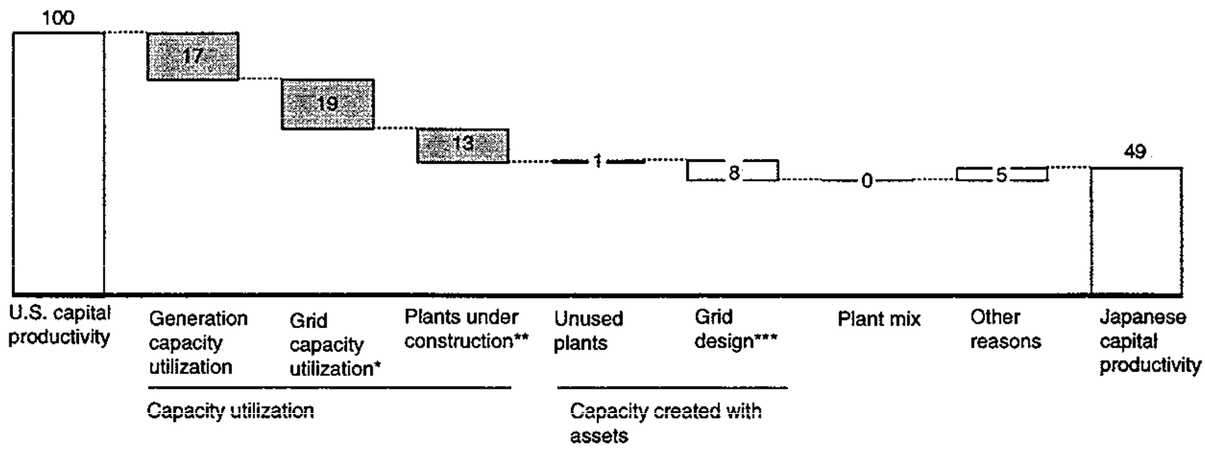
*** Assume German grid length per capita for the U.S. (includes grid design and density issues)

Source: McKinsey analysis

Exhibit 14

SOURCES OF PRODUCTIVITY DIFFERENCES BETWEEN THE U.S. AND JAPAN

Indexed to U.S. (1993) = 100



* Assume Japanese demand per capita for the U.S.

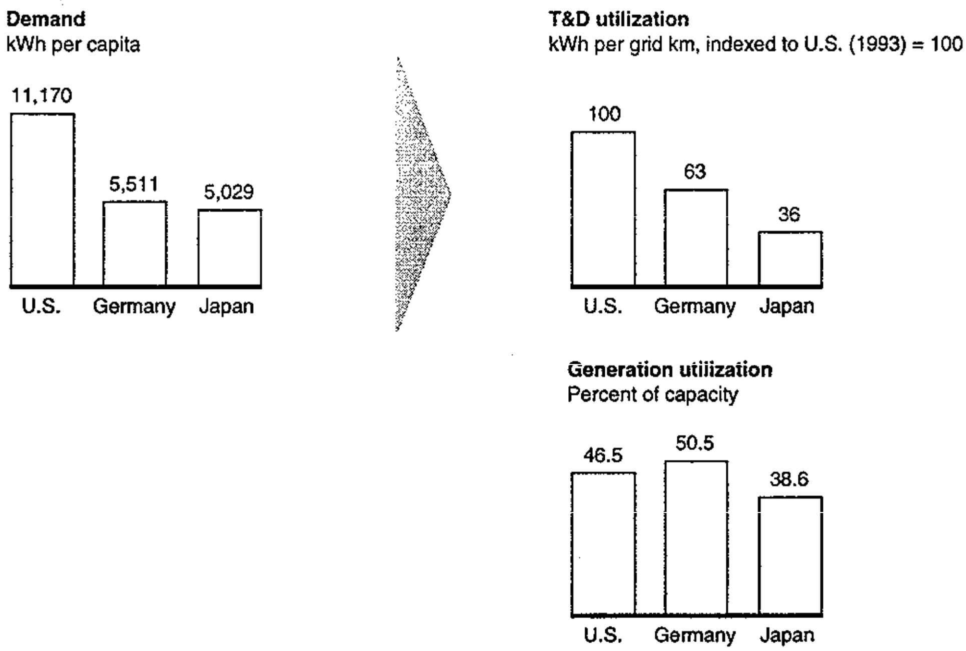
** Capital expenditure in the last 5 years has risen enormously in Japan compared to the U.S. and Germany, representing plants that are not yet providing electricity to the grid (if finished, these would impact utilization in a negative way)

*** Assume Japanese grid length per capita for the U.S. (includes grid design and density issues)

Source: McKinsey analysis

Exhibit 15

PER CAPITA DEMAND AND CAPACITY UTILIZATION 1993 – ELECTRIC UTILITIES



Source: EIA; EEI; Statistisches Bundesamt; Japanese Ministry of Finance; Lee Schipper; McKinsey analysis

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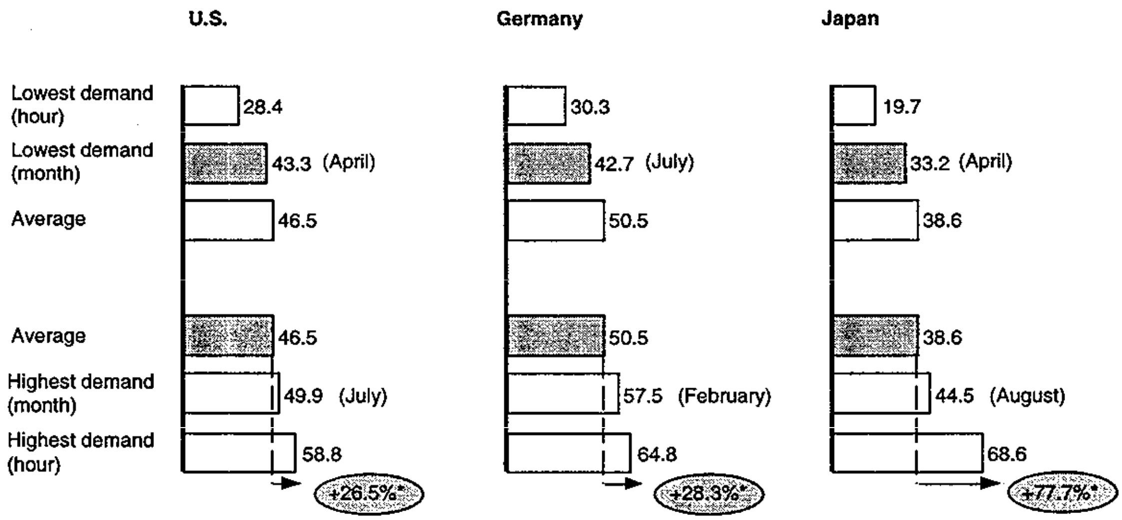
Exhibit 16

DEMAND STRUCTURE

Percent of capacity utilized



* Percent by which highest hourly demand exceeds average demand

Source: EEI; VDEW; Federation of Electric Power Companies (Japan); press articles; McKinsey analysis

¶ *Capacity utilization*. This refers to how well the physical capital (plants and the T&D system) that has actually been installed is utilized. Japan has significantly lower utilization of both generation and T&D assets, while Germany is below the U.S. only in terms of T&D grid utilization (**Exhibit 15**).

- *Grid capacity utilization*. Demand per capita is twice as high in the U.S. as it is in Germany and Japan. This directly increases utilization of the transmission and distribution network, the cost of which is largely fixed and independent of actual transmission volume. For both Germany and Japan, lower grid capacity utilization lowers capital productivity by 19 percentage points.

- *Generation capacity utilization*. Because generating capacity is built to meet peak demand needs, higher demand volatility lowers utilization by widening the difference from peak to average demand. The load curve is relatively flat in Germany and the U.S., where the highest hourly demand is less than 30 percent above average demand, while it is highly volatile in Japan, where peak demand exceeds the average by approximately 78 percent (**Exhibits 16 and 17**). This lowers average utilization considerably in Japan, decreasing productivity by 17 percentage points relative to the U.S. The main explanation for this phenomenon is the rapid growth of air conditioning systems (particularly inefficient room AC units) in Japan, which drove peak load up and average utilization down. The utilization of generating plants is the highest in Germany (see Exhibit 15), which is almost entirely attributable to management of demand volatility. The success of demand side management (DSM) programs in Germany was facilitated because electricity demand is winter peaking.

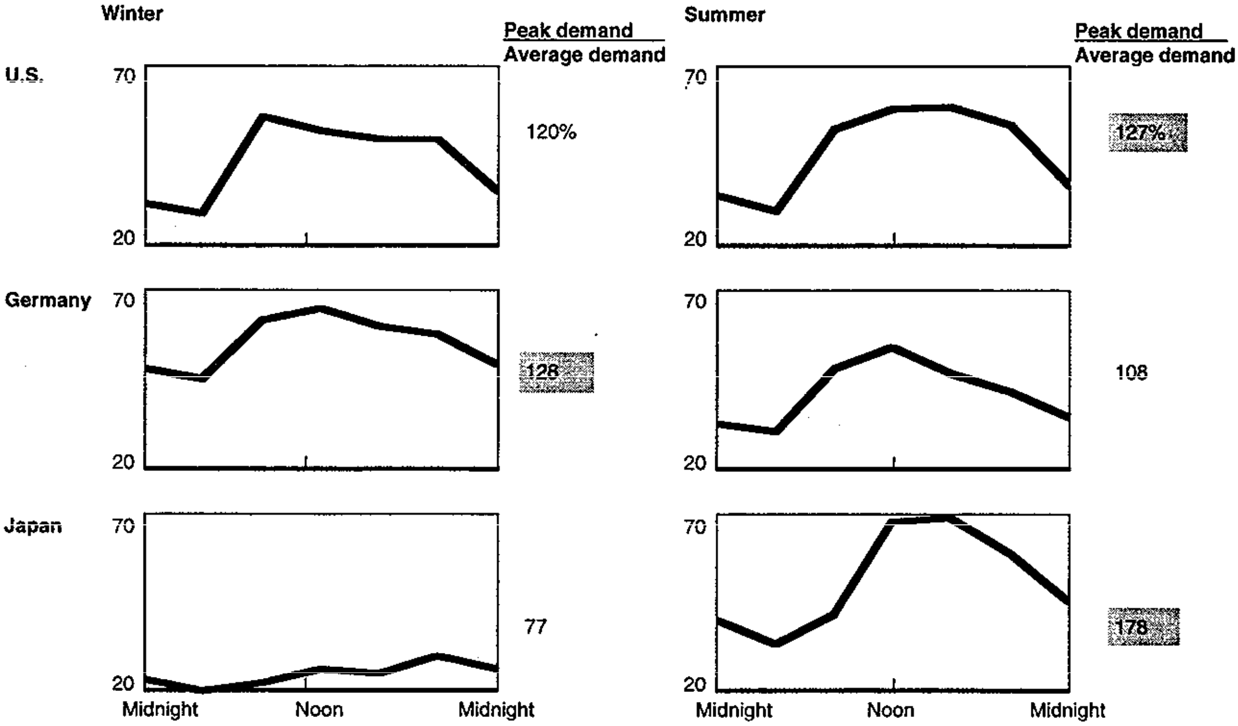
- *Plants under construction*. Japanese productivity is lowered considerably by the very high levels of capital expenditure in the last 5 years compared to the U.S. and Germany. This was in part due to high demand forecasts during the bubble years in Japan. These expenditures have gone into plants that are still under construction and therefore do not yet supply power to the grid. This reduces Japanese indexed productivity by an additional 13 percentage points.

¶ *Capacity created with assets*. A second component of productivity differences is the capital expenditure required to create an equivalent level of capacity. For Japan this accounts for less than 10 points of the 50 point difference with the U.S. In Germany, this factor in total explains approximately half of the gap with the U.S., although individual components of this factor work in opposite directions (Exhibits 13 and 14).

Exhibit 17

DEMAND STRUCTURE BY TIME OF DAY

Percent of capacity



Source: Japan Electric Association; McKinsey Utility Practice; EPRI; VDEW; EIA

- *Capital per capacity unit.* In Germany, more capital is employed for each unit of capacity than in the U.S. This can be partly attributed to "goldplating" of assets (the purchase of equipment with a higher degree of precision or standards than actually required to perform its task) and stricter environmental protection standards. In Germany, soundproofing and the esthetic fit of a plant into the landscape are closely monitored, driving capital expenditure further up. Although many of the environmental standards in Japan are comparable to those in Germany, the additional costs utilities have to bear still differ. This is due both to the fact that Japan does not depend as much on coal-fired plants as does Germany, where environmental cleanup devices are necessary, and to the fact that Japanese power plants are mostly located on the coast so that cooling towers are dispensable. Exhibit 13 shows that approximately half of the overall German capital productivity gap can be attributed to these factors.

- *Unused plants.* In the U.S., several small plants are currently shut down and are not supplying electricity to the grid. These constitute only approximately 1 percent of the capital stock. In Germany, however, the two biggest nuclear plants, Kalkar and Mülheim-Kärlich, are not operating due to pressure from environmentalist groups and account for roughly 10 percent of capital stock in generation. Because in Japan a Central Planning Agency oversees the capacity planning process, there are no unused plants.

- *Grid design.* Grid length per capita is almost twice as high in Japan as in Germany, with the U.S. in between. Although a clear reason for this phenomenon could not be isolated, there is evidence that the differences may be attributable to different population densities or simply a more efficient design of the T&D system in Germany and the U.S. This factor improves German physical productivity overall and especially in T&D, and hurts capital productivity in Japan.

¶ *Other factors.* Due mainly to different geography and demographics, the transmission and distribution losses vary across countries. These factors favor Japan given that it has the highest population density. Additionally, the quantity of electricity used during the generating process by power plants (own use) differs slightly across countries. The impact of these other factors, however, is minimal.

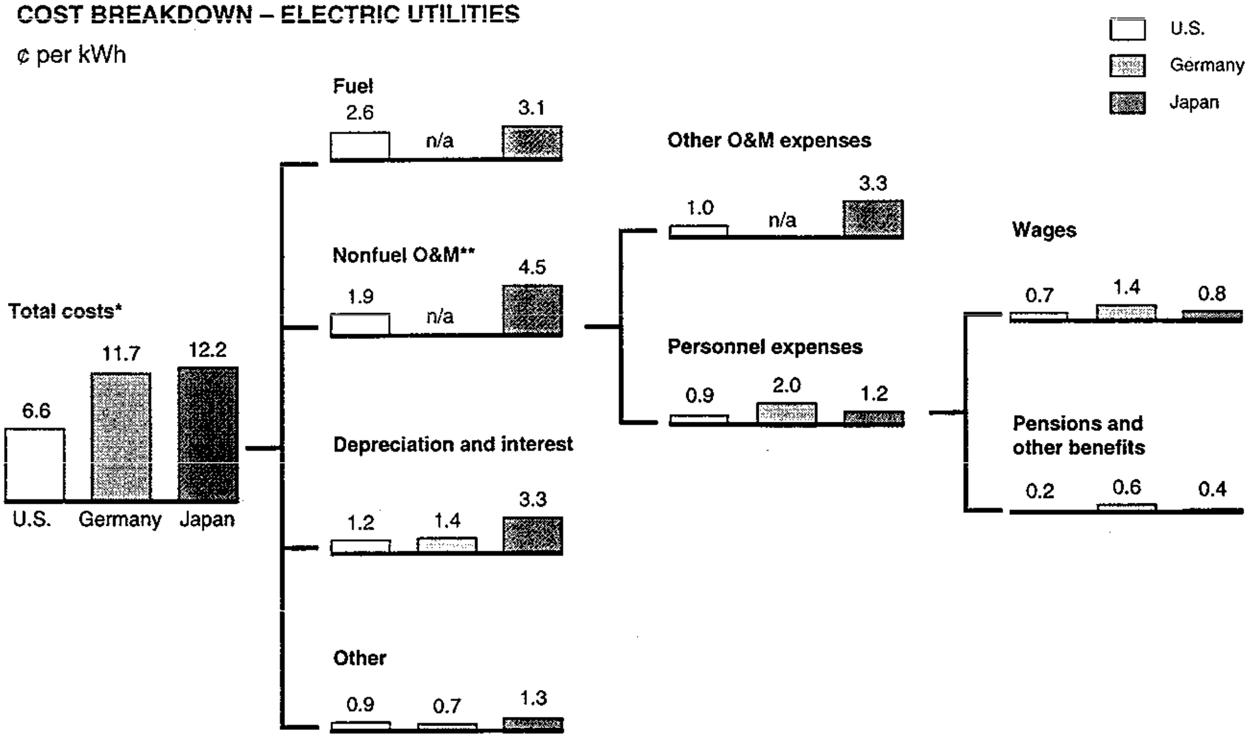
Managerial actions causing capital productivity differences

Most of the differences that we have observed in the previous section are the results of direct actions taken by management. Many of the cost components of electric utilities can be readily influenced by managerial activity.

Exhibit 18

COST BREAKDOWN – ELECTRIC UTILITIES

¢ per kWh



* Average of industrial and residential prices 1993 (converted at GDP PPP)

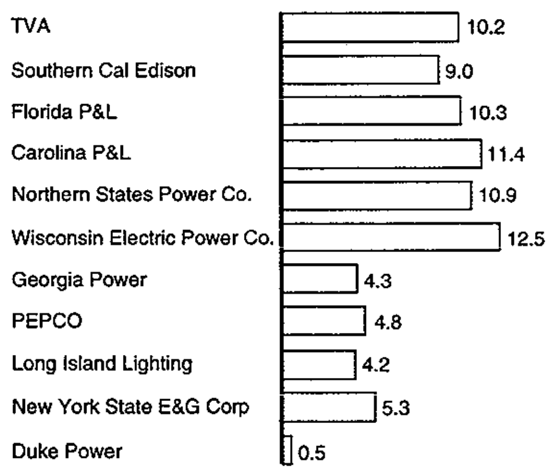
** Operation and maintenance

Source: UDI, EIA, Statistisches Bundesamt, Hoppenstedt, Japan Electric Association, McKinsey analysis

Exhibit 19

SUCCESSFUL DEMAND SIDE MANAGEMENT MEASURES IN THE U.S.

Peak load reduction 1984-1994
Percent



DSM measures taken to reduce peak load (selection)

- TOU (time-of-use) pricing schemes
- Financial incentives for customers to install energy-saving appliances (retrofit)
- Buy-back program of inefficient appliances
- Financial incentives for customers to do new construction in an energy-efficient way (insulation,...)
- Utility induced power cuts at peak hours for participating customers which are in turn rewarded with over all rates
- Close ties to State Energy Office which provides comprehensive energy audit
- Tailor-made efficiency improvement programs for aluminum swelters (electricity is roughly 25% of production cost) and other electricity-intensive industries

Source: EIA; American Council for an Energy-efficient Economy; press articles

¶ *Pricing*. Both in terms of overall price levels and the flexible pricing measures taken to manage demand better, the price of electricity is the main determinant of differences in utilization.

First, pricing levels for electricity are considerably higher in Germany and in Japan compared to the U.S. This adversely affects overall demand and therefore negatively influences utilization of fixed assets, primarily in T&D. Several attempts have been made in recent years to explain the per capita differences in electricity demand; publications by Lee Schipper et al. are the most advanced work to date on this subject. The authors found that most factors influencing demand per capita are indirectly attributable to the pricing levels in the three countries. Structural differences in demand such as the ownership of energy-saving appliances, differential use of air conditioning, and energy efficiency measures like the insulation of buildings are the major factors directly explaining observed demand differences. Higher prices make consumers more conscious of their use of electricity and affect long-term demand patterns and possibly short-term demand as well. Higher electricity prices are a function of higher costs, most of which can directly be controlled by management. Differential costs of fuel can not explain the big price gap, leaving other costs under management's influence as the major explanatory factors (**Exhibit 18**).

Second, managers can influence the shape of the load curve through demand side management programs. DSM can improve utilization of power plants through flexible pricing that encourages substitution of consumption during peak demand for consumption during valley demand. Because capacity has been built to accommodate current peaks, smoothing peaks allows utilities to satisfy growing consumption with existing capacity, increasing long-term utilization and reducing the need for more capital expenditures. Best-practice U.S. utilities, for example, have reduced their peak load by more than 10 percent (**Exhibit 19**), allowing them to utilize their plants better. One measure allowing this is interruptible service pricing, which lowers electricity prices to some customers in exchange for their acceptance of short interruptions in electricity supply during extreme hourly peaks. Germany practices a different DSM program, mainly by lowering prices for night consumption below those of daytime rates, shifting peak day consumption to the night. This shift is made possible by night storage heating, but because this is less energy efficient, the success of volatility reduction comes at the expense of higher overall energy consumption. Japanese managers, however, have only recently explored such DSM opportunities. Earlier adoption of these programs could have mitigated the rapid growth in peak demand and closed Japan's current gap in generation utilization (capacity utilization in Japanese power plants has dropped by 9 percentage points since 1987). Another aspect of DSM is load shifting by promoting energy efficiency in consumption. This factor would reduce short-term demand and utilization, but in the long run is not differentiating between the countries.

¶ *Planning.* As previously mentioned, two major nuclear power plants in Germany were shut down several years ago and are not supplying power. This factor accounts for 9 percentage points of difference in productivity between Germany and the U.S. In Japan, the government encourages utilities to spend more during economic downturns which in recent years has led to considerably higher capital expenditure levels relative to the long-term trend. Although this explains 13 percentage points of the difference, it is relatively not as important as in Germany, because the overall productivity gap in Japan is more than twice as big.

¶ *Asset choice.* Unlike in other countries, electric utilities in Germany do not use standardized equipment, which increases the amount of capital used to install each unit of capacity. The engineering departments of utilities typically set very high standards for equipment and therefore require custom turbines and generators and a high degree of redundancies from pumps and other machinery. The same is true for construction work. In an average German power plant there is plenty of evidence for this, as the walls are much thicker and the walkways and cable shafts are broader, etc.

¶ *Operations effectiveness.* In Japan, grid length per capita is by far the highest of the three countries. This can be influenced by management because design differences also contribute to the overall difference. Grid design hurts Japanese productivity moderately, but helps Germany in offsetting the distinct disadvantages from pricing, planning and goldplating.

Other factors help to differentiate individual utilities' performances within countries, but these do not explain differences on the aggregate level. Trade-offs between capital and labor are not an important factor either. Unlike a manufacturing assembly process, the bulk of the assets perform functions that could not be performed by labor.

External factors driving managerial actions

While the dynamics of competition have proved to be an important factor driving productivity differences in most of our case studies, they do not explain observed differences in this case, because electric utilities in all three countries are regional monopolies with little or no competition in the product market. (In the U.S., competition in generation started in the mid-1980s with the emergence of IPPs and is growing, encouraged by deregulatory efforts). The same holds true for the labor market. The factor that predominantly explains productivity differences is the pressure and incentives put on managers, which can cause a misalignment of their objectives with productivity. In all three countries it is managers' goal to maximize profits. Because in the U.S. managers operate

Exhibit 20

OVERVIEW OF PRICING REGULATION

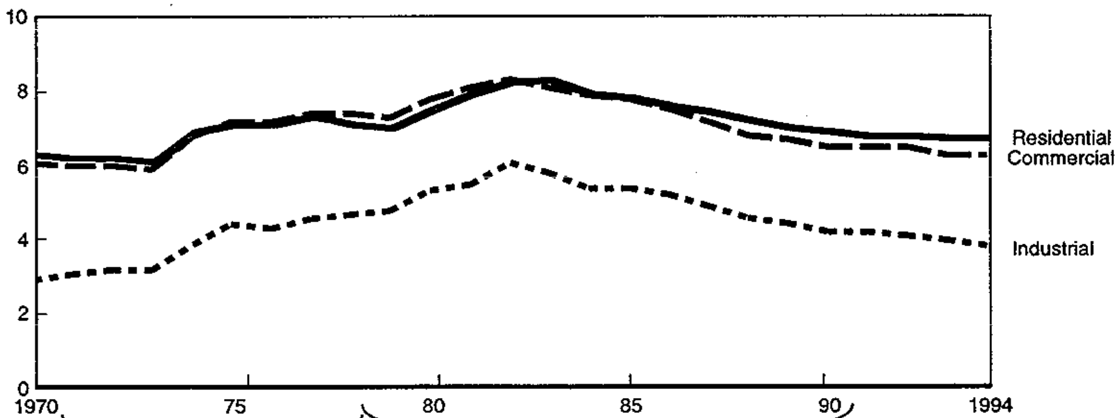
	U.S.	Germany	Japan
Regulators	• Wholesale prices regulated federally • Retail prices regulated by state public utility commission	• Wholesale prices regulated by antitrust agency • Retail prices regulated by economics ministry of the state on the basis of a federal decree (Bundestarifordnung Elektrizität)	• Regulated by MITI
Goals of regulation	• Mainly pricing (consumer protection) • Provide utilities with an *opportunity* to cover their costs and earn a fair return	• Security and steadiness of electricity supply • Price must be reasonable • Environmental protection	• Security of electricity supply • Price has to be reasonable
Relationship regulator-industry	• The IOUs do not have a link to the regulatory agencies	• Most utilities are owned by states and municipalities, which are closely linked to the regulatory agency through political interest	• Utilities are investor-owned, but are linked to MITI as utility investment is viewed as a fiscal policy means
Pricing policy	• Reasonable pricing enforced by careful cost benchmarking • Utilities must justify all cost positions, thorough examination of necessity of cost position	• Cost position of utilities not thoroughly examined – only benchmarked against other German utilities • No incentive for regulator to emphasize low prices	• Historically cost position not thoroughly examined; in recent years there has been a change to a "yardstick" regulation method aimed to guide real price declines

Source: Interviews; Schiffer: "Energiemarkt Bundesrepublik Deutschland"; MITI; Japan Electric Association

Exhibit 21

ELECTRICITY PRICES AND REGULATION – U.S.

Real prices, cents per kWh (U.S.$ 1987)



• Strict rate of return regulation (RORR)
• No incentive for cost efficiency

Goals not aligned with productivity

• RORR with prudence reviews (reasonableness of costs incurred)
• Only reasonable costs can be passed on to consumers

Goals partly aligned with productivity

• Partly move to performance-based regulation: ROE target of 11-13%, higher return is distributed evenly between customers and shareholders

Goals completely aligned with productivity

Source: EIA; Interviews; McKinsey analysis within price constraints, enhancing profitability requires managers to use their resources productively. In Germany and Japan, the absence of regulatory price pressure leads to higher spending and goldplating, which is detrimental to productivity. The misalignment of goals occurs for the following reasons:

¶ *Monopoly regulation.* Regulatory pressure on managers in the U.S. to keep prices low is the basic cause of higher utilization: first, lower prices stimulated demand as we have previously discussed and second, they pressured managers to use their resources productively.

All three countries have depended largely on a rate-of-return (ROR) regulation for utilities, which is designed to give the electric utility a fixed percentage return on capital investment (**Exhibit 20**). As a result, a utility will make a profit on any kind of investment regardless of the appropriateness of the expenditures incurred. This gives little or no incentive to the utility to manage its resources productively.

The critical difference in the implementation of this form of regulation was the U.S. regulatory agencies' focus on maintaining low prices for consumers. In the early 1980s, to counter upward price trends, the agencies established prudence reviews, requiring electric utilities to justify the capital expenditures incurred. This led to more cautious investment and contributed to declining electricity prices in real terms (**Exhibit 21**).

In Germany and Japan (before the inception of a "yardstick" or benchmarking method several years ago), all capital expenditures were included in the cost basis for electricity prices so that all expenditures could be recovered. Pricing has traditionally not been the focus of German and Japanese regulators who have been more concerned with the security and safety of electricity supply. As a result, there is no mechanism controlling the appropriateness of expenditures like the prudence review in the U.S. The managerial goal of profit maximization did not encourage managers to use their assets productively. In the context of the ROR regulation in the absence of price pressures, these goals were even detrimental to productivity because goldplating of assets or paying higher prices for equipment improved profits.

¶ *Ownership/governance mechanisms.* The three countries have different ownership structures. While the major U.S. electric utilities are investor-owned (approximately 80 percent of electricity sales), in Germany six of the Big Eight, as well as all the smaller local utilities, are publicly owned or controlled (**Exhibit 22**). Representatives of municipalities and states are on the board of basically every utility, and they often pressure the companies into expensive additional investment compared to other countries. This is because they pursue other goals such as security of employment in the industry, as evidenced by industry experts'

Exhibit 22

OWNERSHIP STRUCTURE AND VOTING RIGHTS IN GERMAN UTILITIES

Predominantly private sector-owned (shaded: Preussen Elektra, Bayernwerk)

	RWE	Preussen Elektra	EVS (Schwaben)	HEW (Hamburg)	VEW (Westfalen)	BEWAG (Berlin)	Bayernwerk	Badenwerk
Share-holders	• Allianz (12.8%) • 64 municipalities and municipal authorities (<50%) • Individuals	• Veba (100%)*	• 5 major municipal agencies in the region	• City of Hamburg (71.4%) • Individuals	• Allianz (<10%) • 2 major municipal agencies (>50%) • Individuals	• City of Berlin (50.8%) • Preussen Elektra (10%) • Elektrowerke GmbH (10%) • Individuals	• VIAG (97.1%)**	• 3 major municipal agencies (82%) • Individuals
Voting rights	• >50% public sector (20 votes per share)	• 100% private sector	• 100% public sector	• >70% public sector	• >50% public sector	• >50% public sector	• >70% private sector	• >80% public sector

* Veba: Allianz (12.1%), individuals

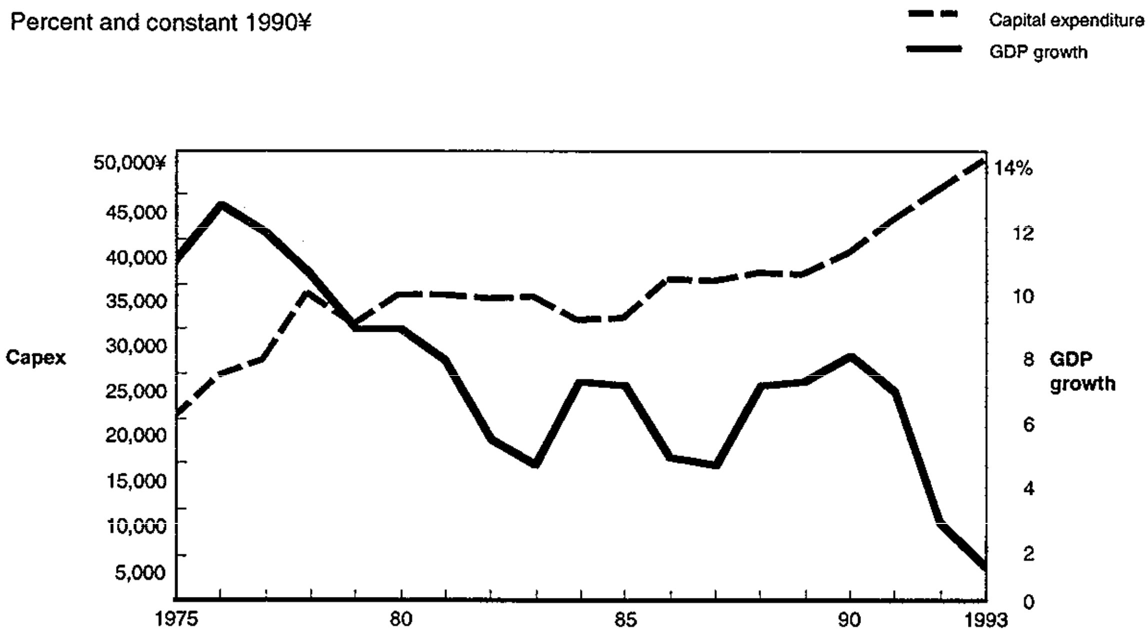
** VIAG: State of Bavaria (25.1%), Isar-Amperwerke (13%), individuals

Source: Germany's Top 500

Exhibit 23

GDP GROWTH RATE AND CAPITAL EXPENDITURE – JAPAN

Percent and constant 1990¥



Source: OECD; Japanese Ministry of Finance; McKinsey analysis

Exhibit 24

INVESTMENT GOODS PPP FOR ELECTRIC UTILITIES

Deviation from conceptually pure PPP

Factors should be controlled for by the PPP?

Factors actually controlled for by the PPP?	Yes	No
Yes	• Pure price for equal equipment or grid lines • Burying of cables instead of overhead wires	
No	• Environmental standards for generation	• Absolute number of machines • Goldplating of assets

	Generation	**T&D**
Germany (DM/U.S.$)	1.80	2.55
Japan (¥/U.S.$)	162	143

Source: EIA: Electric Plant Cost and Power Production Expenses 1991; Siemens KWU; UDI; Statistisches Bundesamt; Interviews; McKinsey analysis observations of comparatively high staff levels at German utilities. In the UK, for example, the electric utility industry was comparable to that in Germany before major deregulatory efforts were started, which led to the privatization of publicly owned utilities in 1990. Since then, employment in the industry has fallen by approximately one-third. Additionally, in some regions of Germany the owners are even concerned about employment in other industries, such as coal mining, and have assured that coal remains an important fuel source for electric utilities.

¶ *Factors of secondary importance for capital productivity differences.* Other factors have an indirect effect on productivity and cannot be directly influenced by management.

- *Demand factors.* Demand per capita differences have been identified as a major driver of utilization differences. While most of these differences can be attributed to pricing, other price-independent factors such as weather (e.g., the differential importance of air conditioning and heating) and infrastructure (much smaller housing units in Japan) play a role. Winters in Japan tend not to be as cold as in Germany and at least parts of the U.S., which leads to lower electricity demand for heating during these months.

- *Macroeconomic environment.* One important reason for high capital expenditures in recent years is the fact that the Japanese government has encouraged higher investment by electric utilities in times of recession. In Japan, the construction of power plants has been viewed much like a public infrastructure project. Due to the ROR regulation, utilities have had incentives to increase their investments and MITI, as the regulatory agency, has facilitated this process in times of economic downturn. Consequently, utility spending was considered an anticyclical fiscal policy stimulus to increase spending after the burst of the economic bubble. In fact, an inverse correlation between GDP growth and capital expenditure in the electric utility industry can be observed over time (**Exhibit 23**).

We have also evaluated how much these external factors preclude or constrain managers in Germany and Japan from achieving levels of productivity comparable to the U.S. We find that managers could close most of the productivity gap by taking actions that are under their control.

As shown in Exhibit 13, three factors accounted for the bulk of the 22 point gap between Germany and the U.S.: grid capacity utilization, unused plants and the capital per unit of capacity (goldplating). The goldplating of assets accounts for 12 index points of the gap, and is clearly a factor that managers control. Low grid capacity utilization, caused by higher prices and lower demand levels, is probably outside of managerial control. Given high levels of environmental pressures on utilities in Germany, it is not clear that managers would be allowed to stimulate greater demand, even if they wanted to. The unused plants are a gray area. Clearly external factors, over which managers had no say, forced closure of the plants. Nevertheless, given that capacity was sufficient even after closing the plants, bringing them on line would only serve to lower average capacity utilization. Because these were among the last plants to be built, it is not clear why managers planned this additional capacity, if it was not necessary. To reflect this uncertainty, we have bounded the managerial impact from 0 up to 9 points, the full effect of the unused plants. In total, we find that managerial actions can account for at a minimum 12, and as much as 21 points of the 22 point gap.

Similarly, Exhibit 14 shows that three factors account for Japan's 50 point gap with the U.S.: generation capacity utilization, plants under construction and grid utilization. The first two factors account for 30 points of the difference, and managers could have avoided this excess capacity through demand side management. As with Germany, the ability to increase grid utilization and close the remaining 20-point gap depends on societal trade-offs. For this reason, we believe that managers could close between 30 and 50 points of the productivity gap.

OUTLOOK AND IMPLICATIONS

Outlook

This case study has found operational capital productivity in electric utilities in Germany to be approximately 20 percent and in Japan roughly 50 percent lower than in the U.S. The gap can mainly be attributed to differences in the utilization of assets.

Until the early 1990s electric utilities had not been a particularly dynamic industry in any of the countries. This is changing, as several states in the U.S., the European Union and Japan have started deregulatory efforts to make generation, and to a certain extent distribution, of electricity more competitive. Japanese regulators realized that measures had to be taken in order to lower prices, recently switching to a "yardstick" method of regulation and introducing some forms of competition.

California, for example, has set a tight timetable for the implementation of deregulation and aims at giving all customers the ability to shop for the cheapest supply of electricity by 2003. All these efforts, in turn, have led to technology improvement and increasingly global sourcing, as witnessed by dramatically declining prices of electricity-generating equipment such as turbines in the last six years. Additionally, a wave of international expansion of electric utilities is underway as many major players in the U.S. are currently acquiring or forming joint ventures with power producers in Asia, while German utilities are focusing their efforts on Eastern Europe.

In the UK, where deregulation is most advanced, a spot pool for power coupled with a market for hedging instruments has resulted in a market price for electricity. Investment decisions reflect expectations about what this price is likely to be rather than being the result of regulatory proceedings. It is quite possible similar changes will be implemented in the countries we studied once deregulation advances further.

Implications

Due to the deregulatory efforts in all three countries, significant tasks lie ahead for both corporations and policymakers in order to guarantee a smooth transition from the current monopoly structure to a more competitive environment.

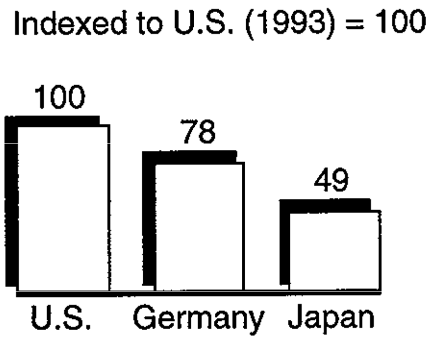
¶ *Implications for corporations*. As has been shown throughout this case, managers have numerous opportunities to improve performance. These opportunities will only increase as the industry's regulatory environment changes. For future success, managers will have to focus on using resources more productively than they do today.

The electric utility industry in countries where deregulation has already been completed offer valuable lessons for the U.S., Germany and Japan. The competitive element that has been introduced in the course of deregulation has greatly enhanced performance and customer satisfaction, but has also increased demands on corporations and managers. In a competitive environment, utility managers will lack the guidance of regulators. They will be required to make capacity and other decisions based on price and other market signals. They will also need to coordinate capacity decisions with their competitive bidding strategies in order to ensure demand matches capacity additions and to obtain a reasonable return on their investment.

To be successful, managers will especially have to source equipment globally, searching for lower costs from more competitive foreign supply markets. Additionally, management should seek knowledge transfer more aggressively. Both German and Japanese utilities clearly have much to learn from higher performing U.S. fossil fuel plants, while U.S. managers could learn from German nuclear plants. In addition, aggressive implementation of DSM programs in Japan, for example, should have an immediate impact on the load curve and Japanese productivity. Even within countries, productivity differences exist and managers should emulate methods followed by the most productive companies and plants.

¶ *Implications for policymakers*. Despite the deregulatory efforts being made in all three countries, some regulatory framework will have to remain in place. Regulators can have legitimate objectives different from enhancing productivity. Higher prices might be tolerated in order to keep electricity consumption at a low level if a high emphasis is put on the considerable economic and environmental costs of higher demand. In this context, however, policymakers have to guarantee that in altering the current rules, the right incentives for managers to use their resources productively be put in place. Additionally, current standards such as the lengthy approval processes in Germany have to be rigorously analyzed on the basis of costs and benefits. Concerning ownership, electric utilities should be privatized or, if the government chooses to keep the current ownership structure intact, sufficient steps should be taken to clearly separate the owners from the regulatory agencies.

ELECTRIC UTILITIES CASE STUDY SUMMARY



Cost-conscious, consumer-focused regulators and ownership pressure force U.S. electric utilities to keep prices and costs low. Resulting higher demand per capita and better asset utilization translate into big gaps in capital productivity.

Electric utilities were the most heavily regulated industry in our case sample. In all three countries studied regional monopolies were still in place, although efforts towards deregulation have begun. The large productivity differences show that even in heavily regulated monopolies productivity performance can vary enormously. From a productivity standpoint, how an industry is regulated is more important than the mere fact that it is regulated.

Utilization of assets accounts for the differences in productivity. Lower asset utilization, both of power generating assets as well as the transmission and distribution (T&D) network, explains all of the performance gap between the U.S. and Japan. Germany's lower T&D utilization also drives its performance below U.S. levels. In addition, German utilities tie up considerably more capital than their U.S. counterparts because there is a tendency to goldplate and overengineer their power plants.

Pricing differences lead to underutilization of assets in Germany and Japan. The price level of electricity drives per capita consumption and in Germany and Japan high prices have kept consumption at a comparatively low level. Lower demand reduces utilization of the fixed asset T&D network. Additionally, in Japan, managers have not used flexible pricing schemes or other demand management programs to reduce demand volatility, therefore leading to lower average utilization of generation assets and lower productivity.

Pricing, demand, utilization and productivity can all be traced to each country's regulatory and financial system. Both the way the electric utility industry is regulated and differential ownership structure are the underlying causes of productivity differences. Although rate of return regulation, which is prevalent in all three countries, gives managers no direct incentive to use their resources productively, U.S. regulators drive their industry to higher productivity by closely scrutinizing capital investment and ensuring that consumers pay low prices for electricity. In the U.S. the owners' desire for financial returns created additional pressure for managers to use resources well, while public ownership in Germany fails to create management incentives aligned with productivity.

Chapter 4: Synthesis of capital productivity findings

Each of the case studies in this report discusses cross-country productivity differences and the reasons for their existence. In this chapter we summarize our findings in the case studies, combine them with the aggregate results, and highlight the broader lessons. Key findings include:

¶ Case study results support the aggregate findings that capital productivity levels in Germany and Japan are two-thirds of U.S. levels. Differences result both from higher capacity utilization in the U.S. and from using fewer assets to create the same capacity. Results do differ from industry to industry: we have been very selective in our cases, and in a couple of industries Germany and Japan are equal to or ahead of the U.S.

¶ The U.S. achieves higher GDP per capita in the market sector by having a higher productivity level with all of its inputs, both capital and labor.

- High capital productivity does not come at the expense of labor productivity; in fact, industries and firms that are highly productive with one factor tend to be productive with both.
- This is true because the key managerial actions driving capital productivity – customer-oriented marketing and operations effectiveness – improve the productivity of both capital and labor.

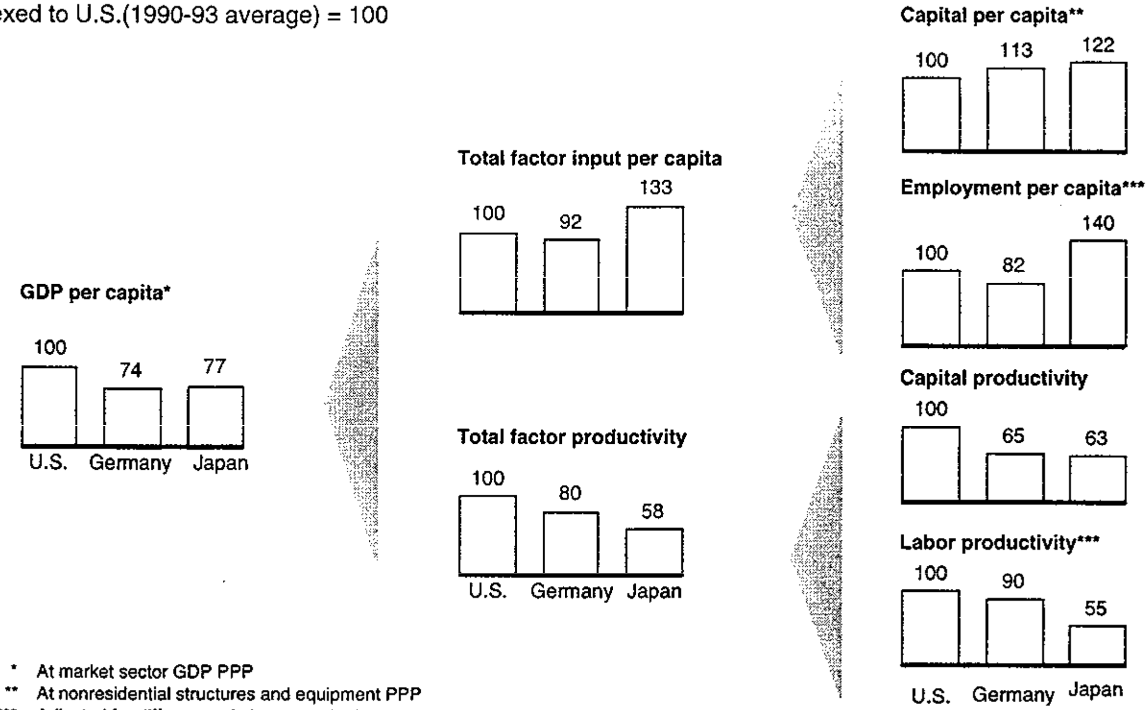
¶ Managers take different actions because they face different levels of competitive intensity in the product market and because the capital market gives different incentives. Product and capital market forces can complement each other in creating a beneficial cycle of innovation, improvement and creative destruction.

- Strong product market competition can spur productivity improvement by allowing new players to enter and the most productive players to grow. The capital market can reinforce this dynamic by giving managers a clear objective – financial performance – which is generally aligned with productivity.
- Despite regulatory and legal constraints, managers in Japan and Germany could close most of the productivity gap with the U.S. by changing things that are fully under their control. Some individual firms in these economies have already done so.

Exhibit 1

SOURCES OF DIFFERENCES IN MARKET SECTOR GDP PER CAPITA

Indexed to U.S.(1990-93 average) = 100



* At market sector GDP PPP

** At nonresidential structures and equipment PPP

*** Adjusted for differences in hours worked

Source: O'Mahony; Bureau of Economic Analysis; Statistisches Bundesamt; Economic Planning Agency; OECD; McKinsey analysis

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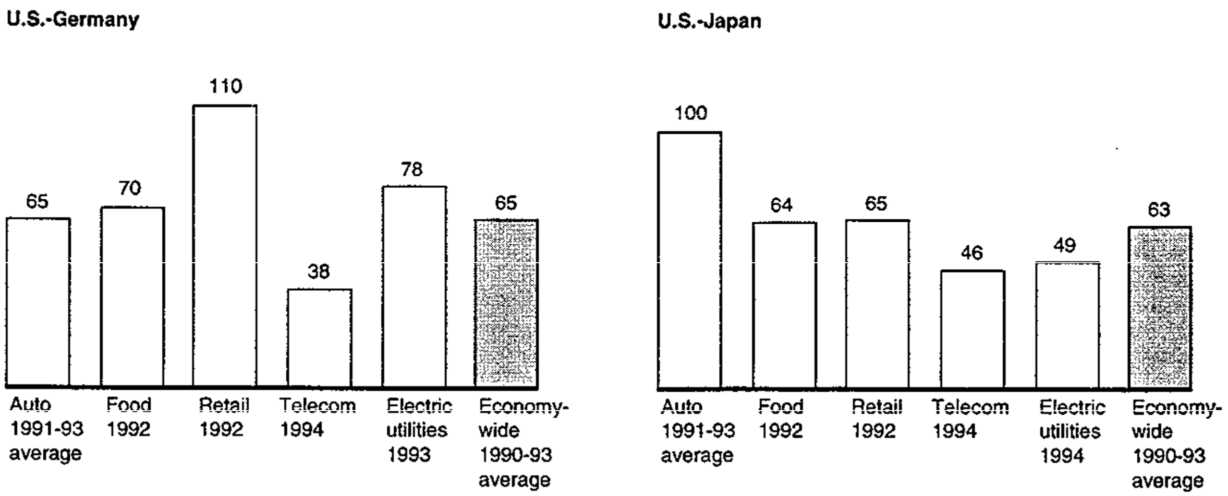
Exhibit 2

SUMMARY OF CAPITAL PRODUCTIVITY RESULTS*

Indexed to U.S. = 100



* For latest year in which data was available. Averages taken where there was significant volatility in results due to changes in the business cycle

Source: McKinsey analysis

¶ Managers in Germany and Japan could further improve financial performance by purchasing equipment from the best global sources. This could cut costs from 10 percent to as much as 60 percent.

We synthesize our findings in three sections: a summary of the results of the aggregate and case study analysis; an examination of the causes of the differences in productivity across case studies; and an evaluation of the differences in how capital is allocated in the three countries, including how capital-labor tradeoffs are made and how much is paid for capital goods.

SIGNIFICANT DIFFERENCES IN PRODUCTIVITY

GDP per capita is explained both by the level of inputs – labor and capital – and how productively these factors are used. **Exhibit 1** shows that in the market sector of the economy, the U.S. achieves higher GDP per capita primarily because it has higher productivity, and not because it has more inputs. German market sector GDP per capita is 75 percent of U.S. levels, and productivity differences explain about two-thirds of this gap. For Japan, low productivity offsets inputs of far more labor and capital than the two other countries, leaving Japan with a market sector GDP per capita similar to Germany's.

The differences in capital productivity are an important part of overall differences in total factor productivity, even though capital accounts for only one-third of all factor inputs. For Germany, low total factor productivity relative to the U.S. (80 percent) is primarily seen in low capital productivity. German output is less than the U.S., but people also work less, so labor productivity is close to U.S. levels. In contrast, Germany uses higher levels of capital to produce less output, and as a result capital productivity is two-thirds of U.S. levels.

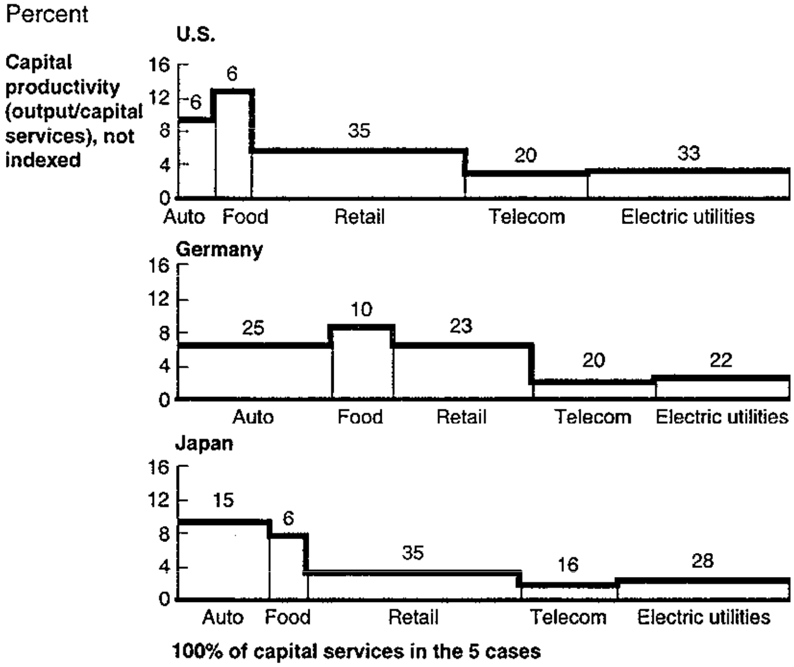
In contrast, Japan uses more capital and labor than the U.S., but generates less output. Both capital and labor productivity lag as a result.

Our case studies support the findings at the aggregate level. Capital productivity in the market sector for both Germany and Japan is just below two-thirds of U.S. levels. The case study results consistently show productivity in both countries to be much lower than U.S. levels, with two exceptions: retail in Germany (110) and auto in Japan (100) (**Exhibit 2**). We believe, however, that the German retail "model" is the result of efforts to optimize performance in the presence of a unique set of constraints. Our measure overstates German retail performance because we were unable to adjust for differences in the quality of service and convenience offered. The fact that this "model" is not being transported to other countries (unlike most other "best practice" ideas) supports this contention. Weighted average results of the case studies are still in line with our aggregate results, although we believe that the high German retail performance biases the average for the service sector in Germany (**Exhibit 3**).

Exhibit 3

CAPITAL PRODUCTIVITY AND DISTRIBUTION OF CAPITAL SERVICES ACROSS CASES

Percent



Weighted average results
Indexed to U.S. = 100

	Aggregate***	Cases
Japan		
• Manufacturing*	85	85
• Services**	48	64
Germany		
• Manufacturing*	78	64
• Services**	55	89

* Manufacturing = Auto, Food

** Services = Retail, Telecom, Electric Utilities

*** Estimated productivity using manufacturing and nonmanufacturing split of the market sector; Van Ark PPP for manufacturing used

Source: O'Mahony; Bureau of Economic Analysis; Economic Planning Agency; Statistisches Bundesamt; Van Ark; McKinsey analysis; see individual cases for sources of case measures

Exhibit 4

SUMMARY OF CAUSES OF DIFFERENCES IN CAPITAL PRODUCTIVITY

Differences in external factors...

Outside factors reduce (or create) barriers to entry and affect how competition takes place (e.g., regulation or macroeconomic factors such as high land prices)

Differences in ownership affect objectives defined for managers and willingness to cut off funding to inefficient players (e.g., government ownership, diversified conglomerates vs. stand-alone companies)

...create positive industry dynamics...

Open product market competition lets the productive players grow and creates improvement pressure on the unproductive ones

Capital market pressures
- Create a performance focus on goals that are consistent with productivity (e.g., financial performance)
- Force exit of low performers and facilitate/speed the change initiated by the product market

...that pressure managers to innovate or improve,...

- Excellence in marketing
  - Uses pricing to stimulate demand and increase utilization
  - Delivers products/services that are of high value to the customer
- Effectiveness in operations
  - Good process design lowers capital requirements or increases throughput speed
  - Better practices lower downtime (e.g., fast changeovers)
- Other practices (secondary importance)
  - Effective planning and avoidance of goldplating lowers capital expenditures
  - Management of industry chain lowers costs and lets firms stay close to the customer

...yielding higher productivity

Higher capital productivity driven by
- Higher capacity utilization
- More capacity created with a given level of assets

Source: McKinsey analysis

CAUSES OF DIFFERENCES IN CAPITAL PRODUCTIVITY

High productivity manifests itself in two forms: first and foremost, in capacity utilization, and secondly, in the amount of assets that are used to create a given level of capacity. We found that managers' actions, especially their marketing decisions and the effectiveness of their operational processes, directly affect performance on both of these variables.

We can more carefully account for the hierarchy of factors that cause differences in productivity at four levels: capacity and utilization, firm-level managerial decisions, industry-level dynamics, and economywide structural factors. We found that differences in performance arise because of the different pressures put on managers to innovate and improve performance (**Exhibit 4**).

Positive industry dynamics, forged by the interaction of product and capital market forces, can create pressure on managers that leads them to improve performance. By forcing focus on financial returns, the capital market creates a clear incentive for managers to use their resources productively. Open competition in the product market allows financially successful firms to enter and grow. The capital market facilitates further change by cutting off funding to the inefficient players.

External structural factors in each economy affect the intensity of these forces. The degree of product market competition is the result of external factors such as regulations that interfere with the market both by creating barriers to entry and by constraining how competition takes place. Differences in the capital markets, such as the identity of the owners and the functioning of the market for corporate control, also influence the dynamics by setting performance goals for managers and reallocating capital among firms.

As in the case studies, we evaluate causality in the four categories described above, and highlight the factors that are of primary and secondary importance in explaining the differences in productivity. **Exhibit 5** tabulates the results across the case studies and draws a summary evaluation of the relative importance of each factor. Chapter 1: Objectives and Approach has a description of our methodology for assessing causality and a Glossary of Terms appendix giving a detailed definition of what is included in each category.

Components of differences in capital productivity

To identify and quantify the sources of productivity differences more precisely for each industry, we broke down capital productivity into two discrete components: the level of capacity created with the assets employed and the extent to which this capacity is utilized. Both factors are almost equally important in explaining U.S.-Japan differences, while capacity utilization accounts for 70 percent of the productivity gap between the U.S. and Germany (**Exhibit 6**).

Exhibit 5

SUMMARY OF CAUSALITY ANALYSIS

● Important in explaining capital productivity differences

○ Secondary in explaining capital productivity differences

x Not important

		Auto	Food	Retail	Telecom	Electric utilities	Summary
IV. External factors affecting industry dynamics	**Macroeconomic environment**	○	x	●	x	○	○
	Product market factors						
	• Demand factors	x	○	x	x	○	x
	• Competition laws/enforcement	x	○	x	○	x	x
	• Monopoly regulation	x	x	x	●	●	●
	• Regulation/market interference	●	○	●	○	x	
	Labor market factors						
	• Skills	x	x	x	x	x	x
	• Demographics	●	x	x	x	x	x
	• Rules/unionism	○	○	x	x	x	x
	Capital market factors						
	• Sources of funding/market for corporate control	x	○	●	x	x	○
	• Ownership/governance mechanisms	x	●	○	●	●	●
	Upstream and downstream market factors	x	●	○	N/A	x	○
III. Industry dynamics (Level and nature of competition for customers, capital, and labor)	**Product market**	●	●	●	○	N/A	●
	Labor market	●	○	x	x	x	x
	Capital market						
	• Alignment of goals with productivity	○	●	●	●	●	●
	• Ongoing improvement pressure	x	x	x	x	x	x
	• Forcing of exit	x	●	●	x	x	○
II. Managerial decisions	**Marketing**	x	●	●	●	●	●
	Industry chain management	●	○	●	N/A	x	○
	Production technique	●	x	○	x	x	x
	Capital expenditure decision making	○	●	x	○	●	○
	Operations effectiveness	●	○	●	x	○	●
I. Components of differences in productivity	**Capacity created with assets**	●	○	●	○	●	●
	Capacity utilization	●	●	○	●	●	●

Source: McKinsey analysis

Exhibit 6

COMPONENTS OF DIFFERENCES IN CAPITAL PRODUCTIVITY – BY MAJOR SOURCE

Index point differences vs. U.S.

GE = Germany
JP = Japan

	Auto		Food		Retail		Telecom		Electric utilities		Weighted average*	
	GE	JP	GE	JP	GE	JP	GE	JP	GE	JP	GE	JP
Capacity utilization	20-30	(+10-20)	20-25	30-40	5	0	40-50	58	10-15	40-45	27	25
Capacity created with assets	5-15	10-20	5-10	0-10	(15)	35	10-20	+4	10-15	5-10	11	19
Total difference to explain in index points	**35**	**0**	**30**	**36**	**(10)**	**35**	**62**	**54**	**22**	**51**	**38**	**44**

Overall difference explained by factor Percent	**Japan**	**Germany**
Capacity utilization	55%	70
Capacity created with assets	45	30

* Excludes industries where there is no gap with the U.S. to explain (i.e., retail in Germany and auto in Japan) for weighted average

Note: Individual case studies provide additional detail on how we quantified the size of each component

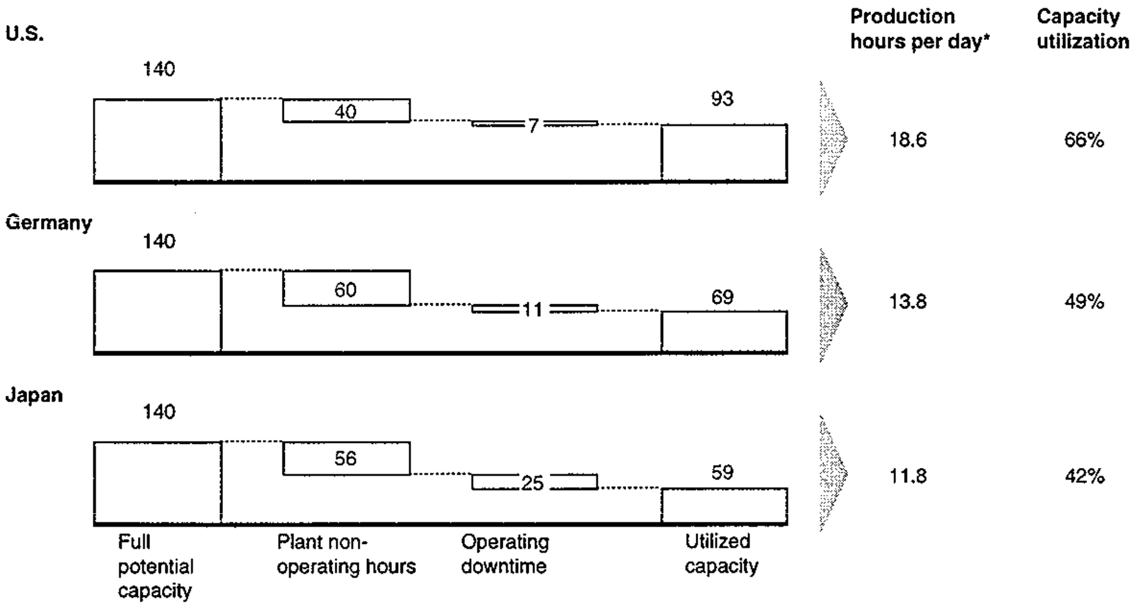
Source: McKinsey analysis

Exhibit 7

DAIRY INDUSTRY CAPACITY UTILIZATION

FOOD INDUSTRY EXAMPLE

In actual hours per week 1995



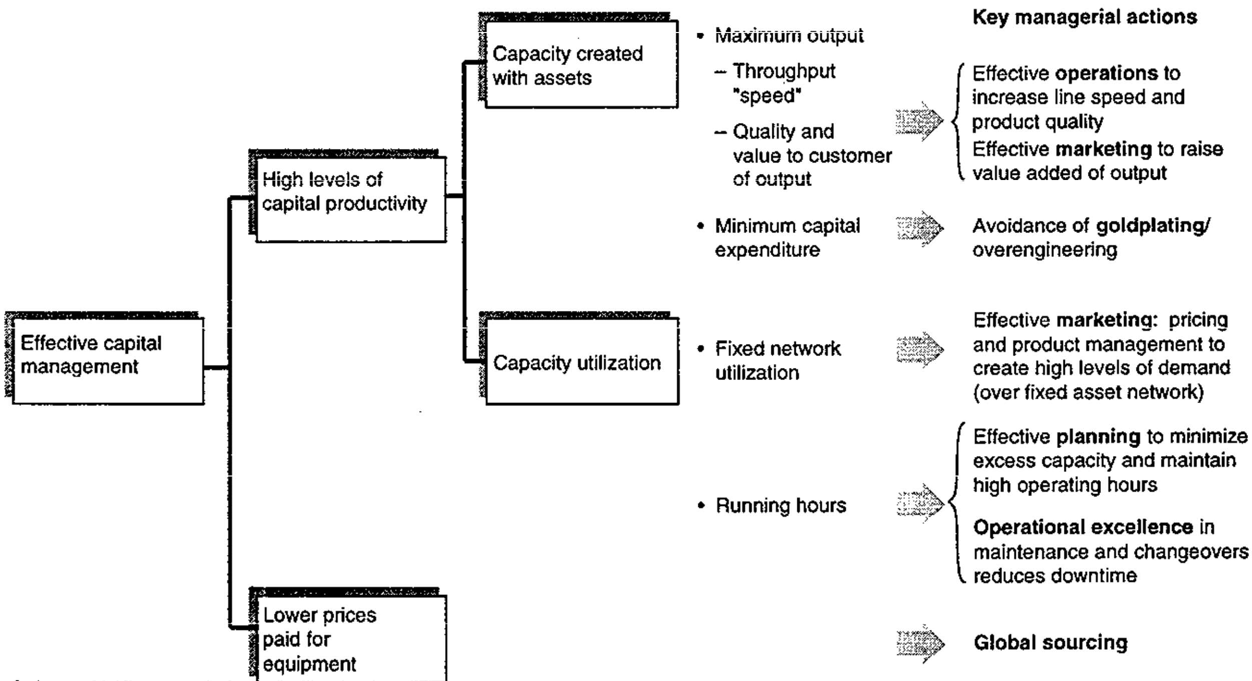
* Calculated based on 5 operating days per week

Note: Full capacity assumes 7 days a week, 20 hours a day (allocating 4 hours for clean up and maintenance), with no downtime or loss due to mismatches in process speeds

Source: Interviews; McKinsey analysis

Exhibit 8

SUMMARY OF CRITICAL FACTORS IN EXPLAINING DIFFERENCES IN PERFORMANCE ACROSS CASE STUDIES



Source: McKinsey analysis

¶ *Capacity created with assets.* This affects performance in one of two ways: using less capital to produce a given output or, conversely, operating the same assets more efficiently to generate more capacity. Both effects are seen in the lean production system in the auto case. Using simple machines lowers the capital requirements per line, while higher quality output and fewer defects increase net output per line. Maximizing the capacity created with assets was most critical in the retail case. In general, U.S. retailers achieve high capital productivity by offering more service than retailers in Germany and by increasing the value that they add for each good that they sell. German retailers, on the other hand, achieve comparable productivity just by minimizing capital input: they use much less floor space than do U.S. firms to generate comparable sales.

¶ *Capacity utilization.* The utilization of assets to create output is the single most important component of the observed productivity differences. Our interpretation of utilization depends on the industry. In our two manufacturing industries, utilization has two key components: operating hours of the plant and downtime associated with factors such as changeovers. Both components are important in explaining productivity differences in food (**Exhibit 7**) and auto. In telecom, the meaning is different: higher utilization comes from greater demand for use of the largely fixed asset network.

In some of our case studies, the subindustry mix is different across countries. Germany, for instance, has more nuclear power plants than the U.S., and Japan's seafood industry is a disproportionately larger part of its food processing industry. In no case, however, did the mix of subindustries affect the results for the overall industry studied. Generally, relative performance in comparable industries determined the overall results. This is clearly evident in the food case, in which the relative productivity rankings were similar across many different food categories such as bakery, meat and dairy. The results in the electric utility case, on the other hand, differed significantly by plant type. For instance, nuclear plants are far more capital productive in Germany than in the U.S., while the reverse is true for fossil fuel plants. These differences offset each other, however, and as a result, mix is an unimportant differentiator overall.

Managerial decisions

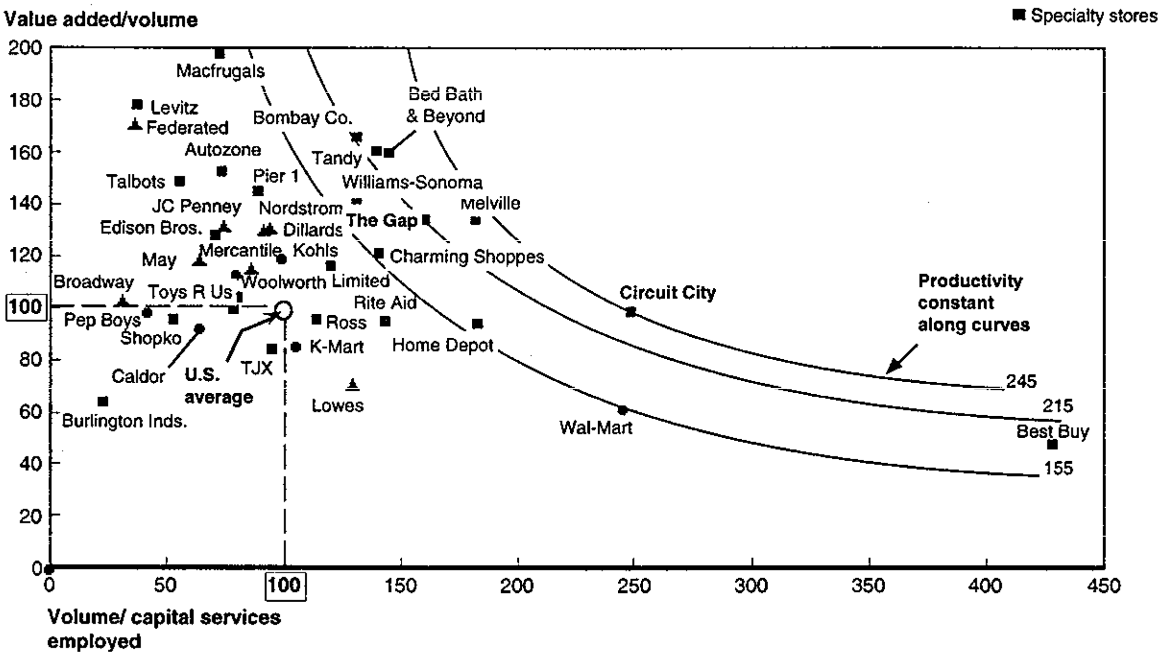
The relative productivity differences are the result of the different ways in which managers run their businesses in the three countries. The two most important management functions are marketing and operational effectiveness because they affect both capacity utilization and the capacity created with assets in important ways (**Exhibit 8**). While technical innovation has clearly been important for all three economies, differences in managers' effectiveness in applying technology

Exhibit 9

RETAIL EXAMPLE

U.S. RETAILER PROLIFERATION

Indexed to U.S. all format average (1992) = 100



* Volume, or throughput, as described in the text, is the number of baskets of goods sold; it is calculated as sales adjusted by the consumer goods PPP

Source: Compustat; McKinsey analysis

and organizing their businesses best explain differences in performance. We will assess each managerial factor separately.

¶ *Marketing*. We refer to marketing in its business context; that is, how a company understands the needs of its customers, develops and prices the appropriate products/services to meet those needs, and then determines the appropriate channel to reach its customers. In four out of five of our case studies, effective marketing was one of the most important factors in explaining capital productivity differences. Marketing, particularly via pricing and product-line management, affects capital productivity in three key ways.

- First, managers raised capacity utilization in the telecom and electric utilities industries both by increasing demand and dampening its volatility. In U.S. telecom, new product introductions, flat rate pricing, and low price levels relative to other goods and services stimulated higher levels of demand over the largely fixed asset base. This resulted in higher utilization. In electric utilities, innovative pricing structures, such as time-of-use pricing, have proved effective in both the U.S. and Germany in reducing demand at peak time periods. As a result, demand is less volatile and average capacity utilization rises.

- Second, effective product-line management can boost productivity by reducing the downtime associated with product-line changeovers. In the Japanese food industry, for example, extreme product proliferation lowers machine utilization. Manufacturers use product variety as a key variable on which to compete, with as much as 50 percent of one year's products (SKUs) not being offered the next year. In contrast, world-class manufacturers, including some in Japan, avoid this product churning through the use of market research which identifies consumer preferences and helps make better trade-offs between product variety/market coverage and plant utilization.

- Third, and most broadly, by segmenting the market and tailoring the product/service offering to meet the specific needs of a particular niche, a firm can increase the value added it generates relative to the assets employed. Such a process in the U.S. retail sector has created a wide variety of players each with it own mixture of value and volume: from upscale specialty stores (high value added, low sales volume) to steep discounters (low value added, very high sales volume) (**Exhibit 9**).

Because marketing actions affect consumer behavior, their impact on productivity often manifests itself only in the long run, as the telecom case shows. The high levels of call volume per capita in the U.S. are the result of a long history of pricing decisions and product introductions that encouraged people to incorporate the phone into their daily social and business interactions. We, therefore, attribute the demand (and productivity) differences not to variations in "culture," but to differences in behavior that have been primarily influenced by marketing.

¶ *Operational effectiveness.* The way in which firms organize and operate their plants, stores and networks is a critical factor in explaining productivity differences across countries. As we define it, operations affect productivity in several ways. Better practices improve utilization by lowering machine downtime. This is most evident in manufacturing industries like auto, in which downtime was an important driver of productivity levels. On average, Japanese producers, via lean manufacturing practices, set up faster during changeovers and stop machines for less time to fix process problems.

In addition, good operating practices increase the effective capacity of a line for an existing set of assets. Again, the auto case illustrates the point. Japanese manufacturers, via better design for manufacturability as well as their *kaizen* (continuous improvement) approach, simultaneously reduce the number of production steps and lower the defect rate. This yields higher net output per line both because less capital time must be devoted to rework and because consumers recognize, and will pay for, the resulting higher quality and reliability.

Finally, operational practices increase productivity by requiring less capital for each process step or function. The German retail industry, which generates much higher sales volume per square foot than its counterparts in both Japan and the U.S., is a good example.

Other managerial actions, such as capital expenditure decision making and industry chain management, were of secondary importance in explaining performance differences. These two factors affect our bilateral comparisons differently: decision making on capital expenditures is important in Germany and not in Japan, while the opposite is true for chain management.

¶ *Capital expenditure decision making*. In this category we consider how managers make decisions about how much capital to employ (planning) and what kind to put in place (asset choice).

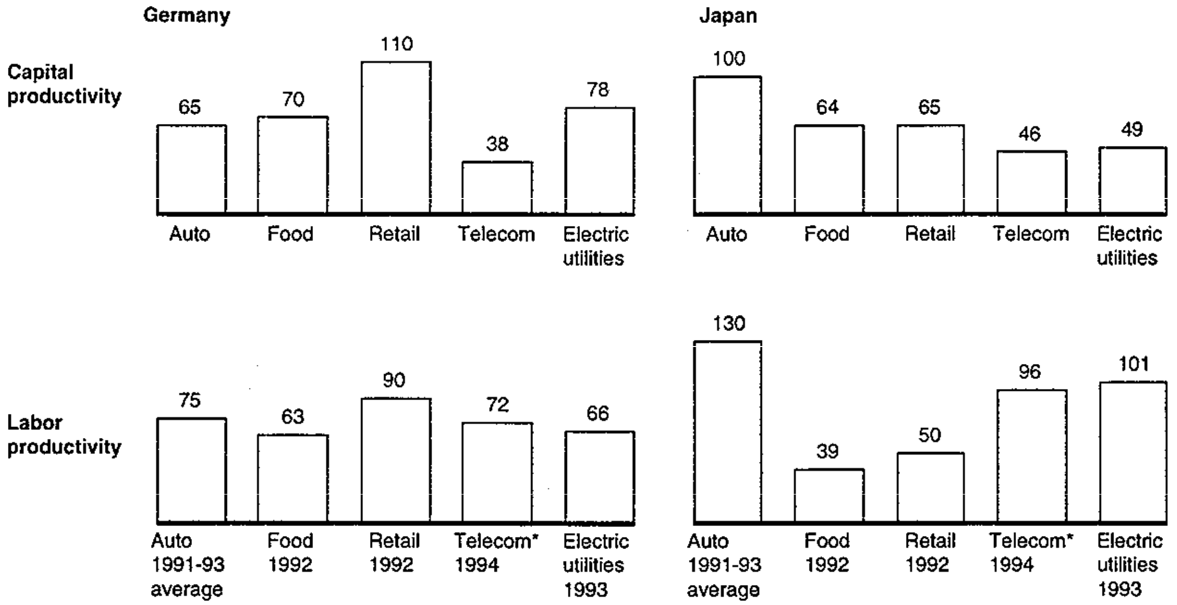
- *Planning* processes and the spending decisions made as a result have a direct effect on capacity utilization. These decisions can take the form of building new plants that are not necessary (utilities in Japan), not eliminating existing capacity that is underutilized (food in Germany) or failing to reconfigure assets to free up hidden capacity (telecom in Germany).

- *Goldplating* refers to spending additional capital on asset features or functions that cannot be justified by additional value for which

Exhibit 10

COMPARISON OF LABOR AND CAPITAL PRODUCTIVITY

Indexed to U.S. = 100



* Labor productivity measure in telecom represents a functional productivity measure where output is defined as lines maintained and calls completed

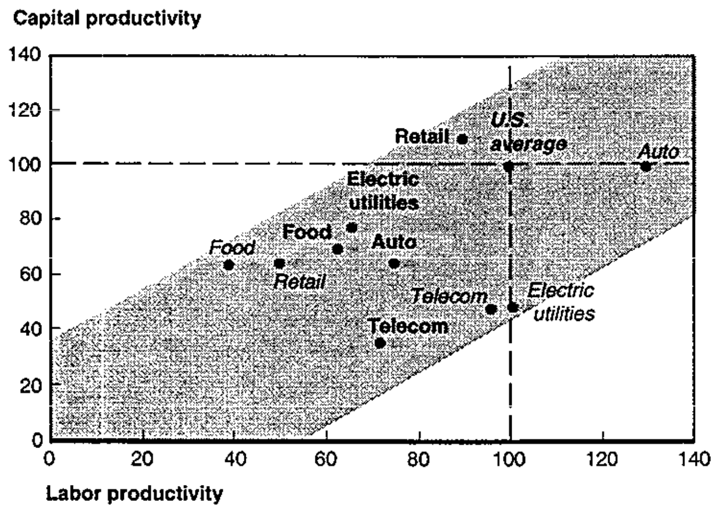
Source: McKinsey analysis

Exhibit 11

COMPARISON OF LABOR AND CAPITAL PRODUCTIVITY

Indexed to U.S. = 100

Bold = Germany
Italic = Japan



Source: McKinsey analysis

customers will pay. By definition, goldplating directly increases the amount of assets for a given level of capacity. In the auto industry, German producers sometimes "overengineer" their processes, building in higher levels of precision than tasks require. Examples also exist in the German telecom and utility industries. In one extreme case, cables are required to be able to withstand the full impact of being run over by a tank without losing their ability to function.

¶ *Industry chain management.* Integrating operations with downstream and upstream suppliers can improve the efficiency of the whole chain , yielding higher productivity for all participants. In retail, Wal-Mart has eliminated intermediaries, simultaneously reducing capital (and labor) costs, while creating better information flows that allow more effective merchandising. Burdened by Japan's multilayered distribution system, most Japanese retailers and manufacturers have proved less adept at managing the chain. The success of some Japanese firms in managing distribution shows, however, that it is possible.

The Japanese auto industry, on the other hand, has made the management of its suppliers a critical part of its lean production system, improving capital productivity. By pushing lean production techniques such as *kaizen* and just-in-time manufacturing to their suppliers, automakers have not only improved the efficiency of the parts business, but have also raised the productivity of assembly by lowering defect rates.

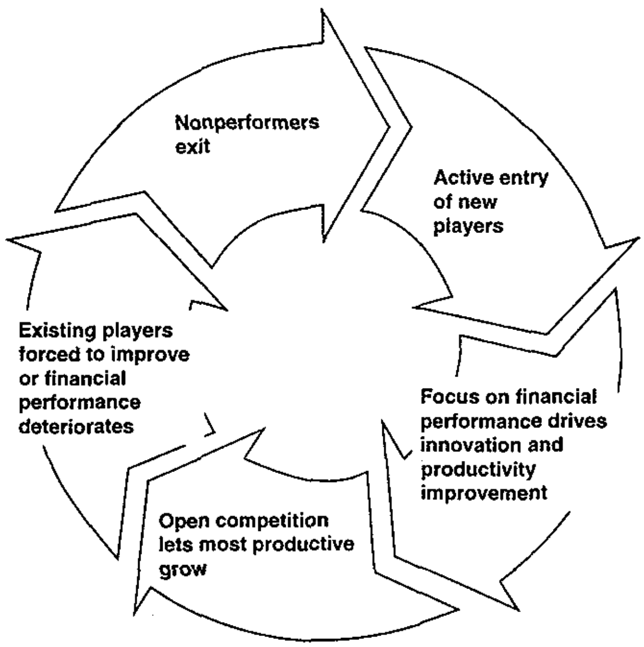
¶ *The choice of production technique*, suprisingly, was not a differentiating factor in most of the case studies. In most industries, firms had access to the same technology, used similar production processes, and had comparable scale. How managers organized their production and used the available technology to meet the needs of consumers best explained performance. Choice of production techniques emerged as important only in the auto industry, in which Japanese manufacturers in the late 1980s and early 1990s heavily substituted capital for labor via automation, significantly lowering capital productivity and offsetting other operational advantages. In all other cases, relative performance in terms of labor productivity is comparable to capital productivity (**Exhibits 10 and 11**). We will address this issue in greater detail in the section on capital and labor trade-offs on page 14.

Industry dynamics

In a competitive market the interaction of product and capital market forces creates a self-reinforcing process that pressures managers to innovate or improve performance. Ideally, the process works as described in **Exhibit 12** on the next page. The extent to which this process is able to function largely explains the differences in productivity that we see across countries.

Exhibit 12

POSITIVE INDUSTRY DYNAMICS FUELED BY COMPLEMENTARY PRODUCT AND CAPITAL MARKET FORCES



Potential weak links in the virtuous circle

- Product market factors
  - Barriers to entry preclude introduction of new innovative players and permit oligopolistic behavior
  - Constraints on competition limit the growth of high performers and remove improvement pressure from incumbents
- Capital market factors
  - Lack of clear performance focus does not create motivation to improve
  - Barriers to exit, e.g., unwillingness to cut off inefficient players, produces overcapacity, and reduces improvement imperative

This beneficial cycle of performance improvement is evident in the U.S. retail and food processing industries and is the underlying cause for high productivity levels. In these relatively fragmented industries, complementary product and capital market forces boosted productivity by allowing consolidation to occur (food) and by allowing innovation to spread rapidly (retail).

The auto industry demonstrates the importance of product market competition at the international level. Intense competition in the Japanese market fueled the diffusion of Toyota's innovative production system. U.S. and German producers were slow to adopt these practices until faced with the threat of the Japanese producers themselves.

We also found large performance differences in the case of regulated monopolies that lack this competitive dynamic. Significant productivity differences in electric utilities and telecom are largely explained by differences in performance pressure exerted via both the capital markets and the way prices are regulated.

Taking all of the case studies together, two factors in this self-reinforcing process emerge as most important in explaining the differences in managerial decisions: 1) the intensity and the nature of competition in the product market, and 2) differences in managerial goals and the degree to which they are aligned with productivity. The varying extent to which the capital market cuts off funding to inefficient players also causes productivity differentials (refer to Exhibit 5).

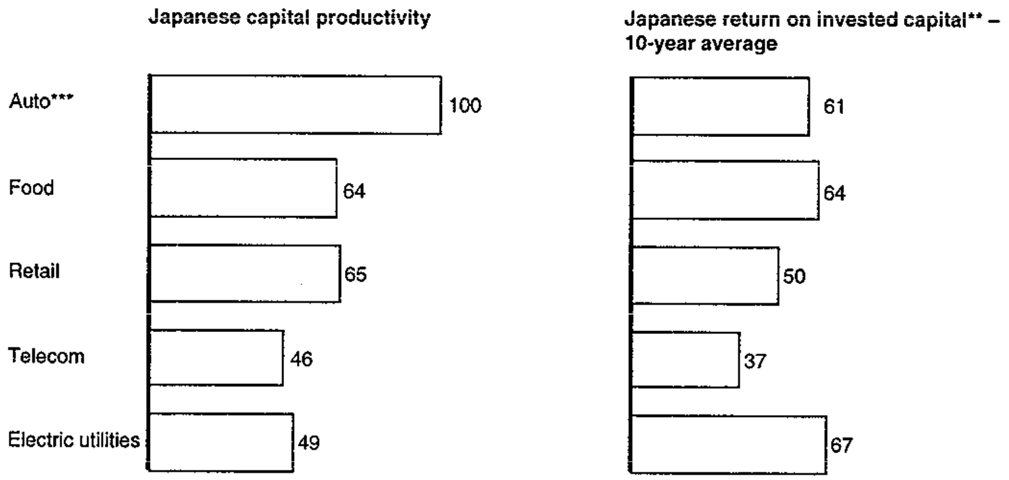
¶ *Product market dynamics*. In each of the nonmonopoly industries, the intensity and the nature of competition in the product market was critical in explaining performance. The most dramatic example is the retail industry, which shows a dynamic of creative destruction. In the U.S. market, many of the most productive players today are relatively new ones that have grown quickly. Unproductive players and formats have largely been eliminated from the market. Less dynamism marks the German and especially the Japanese markets. The food case also highlights the importance of forcing out inefficient players. Open competition in the U.S. forced consolidation of the industry, which improved industrywide utilization. Lower levels of competition have prevented this from happening to any significant degree in Japan, and initially slowed the process in Germany.

The auto case illustrates another way that competition drives performance: by forcing existing players to improve. High capital intensity and scale requirements in the assembly part of the industry create high barriers to entry and exit. In this example, productivity has improved because other manufacturers have adopted Toyota's lean production methods. The more rapid adoption of these methods in the U.S. and faster productivity growth relative to Germany can be explained largely by the fact that U.S. firms were exposed to the competitive threat posed by Japanese producers both much earlier and to a much greater degree.

Exhibit 13

COMPARISON OF CAPITAL PRODUCTIVITY AND FINANCIAL PERFORMANCE – U.S.-JAPAN*

Indexed to U.S. = 100



* Germany not included in comparison because of data limitations

** Capital productivity measures calculated for the entire industry; ROIC measures estimated from the companies in the industry for which financial information is available

*** Financial performance results distorted by differing impact of financing subsidiaries across firms

Source: Compustat; Global Vantage; Stern Stewart; McKinsey analysis

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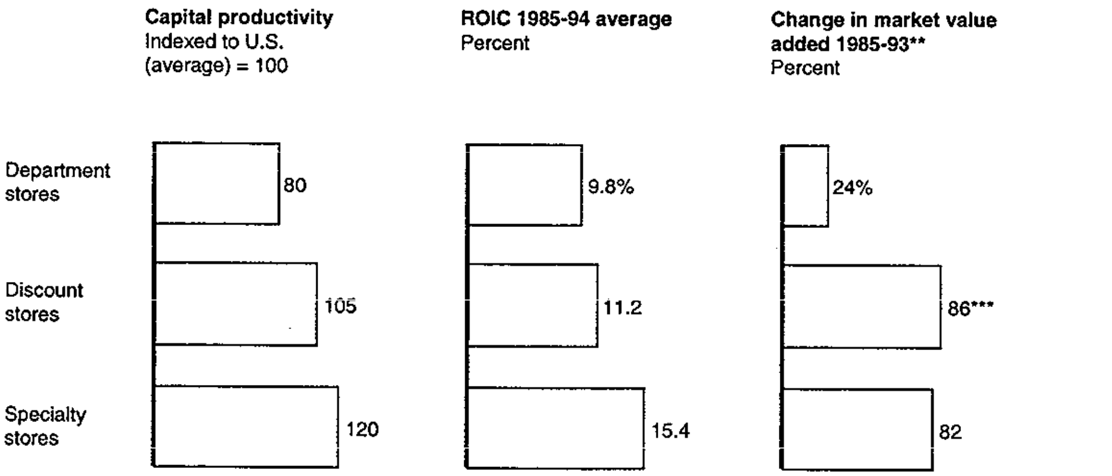
Exhibit 14

U.S. RETAIL CAPITAL PRODUCTIVITY AND FINANCIAL PERFORMANCE* 1992



* Average of publicly traded companies

** Defined as the change in market value less the change in invested capital, standardized to the average invested capital in the time period

*** Limited historical data makes the sample set quite small for this calculation. Wal-Mart's high performance raises this measure disproportionately

Source: Compustat; Stern Stewart; McKinsey analysis

¶ *Capital market dynamics*. The intervention of capital market forces can affect industry dynamics by pressuring managers to perform and by reallocating capital among players based on performance.

- *Alignment of managerial goals with productivity*. In cases with significant differences in productivity, we observed wide differences in the basic objectives of managers across countries. Not surprisingly, low productivity resulted when basic managerial goals, for example sales growth, did not focus managers' attention on how productively they were using their assets.

  Of course, having productivity itself as a primary goal would be extremely effective. The lean production system of Japanese auto producers illustrates the benefits of such an approach. However, we did not observe any other such examples. We did find that a focus on financial performance, especially prevalent among U.S. firms, did create a clear performance objective that was generally aligned with productivity.

  Intuitively, in a competitive market many of the actions taken by managers to improve financial returns should also improve capital productivity. Raising capacity utilization and reducing the amount of "goldplating" are obvious examples. Our empirical findings support this contention that financial performance is correlated with capital productivity in competitive markets. In most of our cases, we see that the difference in financial returns between the U.S. and Japan is very similar to the gap in productivity performance (**Exhibit 13**). Even within one sector in the same country, U.S. retailing, there is a high correlation between capital productivity and financial return, as evidenced by more productive formats earning higher returns and creating more shareholder value (**Exhibit 14**). This suggests that firms' focus on financial goals provides a clear performance metric that creates the incentive to use resources productively. More profits come from increasing productivity, and in the long run, an objective of profit maximization results in higher productivity.

  This correlation is clearly not perfect. For instance, product markets with low competitive intensity can create distortions. An example is monopolies such as Deutsche Telekom which has low productivity but high profitability. Restraints on competition like trade protection in the mid-1980s in the U.S. auto industry, which allowed the industry to earn profits despite low productivity, can have a similar effect. The capital market itself can also introduce distortions, as evidenced by the impact of the bubble economy in Japan, which distracted retailers' attention away from operational performance. In spite of these distortions, we believe that this link between productivity and financial performance holds for the economy as a whole. We will discuss this in more detail in the next chapter.

In monopoly situations, regulation and capital markets can impose other conditions, such as price pressure, that create the incentive to improve productivity, as happened in the telecom and electric utility industries in the U.S. The state-owned monopolies in Germany and Japan were able to maintain high price levels, and were under little pressure to use resources efficiently. The objectives of managers in these industries in both Japan and Germany were not aligned with productivity.

- *Forcing exit.* The capital market plays another important role in the evolution of industries by cutting off funding to inefficient players and thus forcing restructuring or exit. We have ascribed secondary importance to this factor because the capital market only acts after the poor performance in the product markets has already destroyed much of the economic value of a business. In both the food and retail cases, a greater willingness to "let firms die" expedited the "entry and exit" dynamic described above. This restructuring occurred in two ways: a higher degree of bankruptcies and greater mergers and acquisitions activity in the U.S.

- *Ongoing performance pressure.* Notably, capital market pressure on "subpar" performers did not appear to be a differentiating factor in our cases. In many cases, corporate governance failed to apply pressure effectively until firms were close to running out of cash. In the retail case, we saw examples in all three countries in which firms were allowed to continue earning well below their cost of capital for long periods of time without dramatic intervention. This resulted in significant value destruction. Although we did not see evidence of the impact of this pressure, it is hard to reach definitive conclusions because it is difficult to observe cases where subtle governance actions had a positive impact. It is also hard to evaluate the impact that the implicit threat of a takeover had on managers.

¶ *Labor market dynamics.* The availability and cost of labor were not generally important factors in most cases. However, in the Japanese auto industry, a perceived scarcity of labor in Japan precipitated overinvestment in automation. Labor costs also had influence in the food and auto cases, raising the premium required for third-shift work, primarily in Germany. This is of lesser importance in these case studies, however, because it is one of several factors that contribute to lower capacity utilization.

Exhibit 15

IMPACT OF EXTERNAL FACTORS ON INDUSTRY DYNAMICS

▒ = Primary importance

	Competition laws/enforcement	Regulation/ market interference	Monopoly regulation	Ownership/ governance mechanisms	Sources of funding/market for corporate control	Macroeconomic environment	Upstream and downstream market factors
Product market	• Promotes competition/ prevents anti-competitive behavior (F)	• Creates barrier to entry, e.g., zoning (A,F,R) • Limit strategic degrees of freedom (R)				• High land costs create entry barrier (R)	• Complexity of distribution system in Japan creates barrier to entry (R,F)
Capital market							
• Alignment of goals with productivity		• Trade protection (as well as other effects that distort competition) permits non-productive players to earn high profits (A)	• Can create right incentives (e.g., price caps and controls) to use resources productively (T,U)	• Conflict of interest when government owner = regulator (T,U) • Owner/ managers may have other goals (e.g., preservation of market share)		Bubble economy distorted focus from operations (R)	
• Forcing of exit				• Varying ownership forms may continue supporting underperformers or preclude takeovers (cross-subsidization within conglomerates (R), cooperatives (F), private ownership (F,R))	• Prevalence of bank financing (R,F) • Prevalence of M&A facilitates restructuring (R,F)	• Affects capital allocation decisions – Availability – Perception of cost (A)	

Note: Letters in parentheses refer to the case study that evidences this point; A=Auto, F=Food, R=Retail, T=Telecom, U=Electric utilities
Source: McKinsey analysis

External factors

External factors, like regulation or the macroeconomic environment, are a critical part of the causality story because they shape the industry dynamics which in turn drive productivity. We do not believe that managers in one country are any more skilled, or have acted more rationally, than in another. Rather, they have responded to the pressures and incentives placed upon them. In this context, the "indirect" role of the external factors assumes critical importance, because they shape the industry dynamics that explain why managers act the way they do.

Exhibit 15 summarizes how external factors have influenced industry dynamics. Two factors are particularly important: regulation and ownership.

¶ *Regulation/market interference.* Regulation critically influences the product market by limiting competitive intensity and affecting the nature of competition.

Regulation creates barriers to entry, limiting the transfer of best practice as well as reducing performance pressure. For instance, zoning regulations and licensing practices limit market entry in the retail sector in Japan, protecting inefficient mom-and-pop stores. In the auto industry, trade protection prevented highly productive Japanese manufacturers from making further inroads in the U.S. and European markets.

Regulation also limits the options that managers have in setting strategy. For example, zoning regulations in Japan more severely restrict managerial choice in location decisions. By limiting the amount of competition, these regulations can also have a second-order effect of distorting the correlation between productivity and financial performance. The VRAs employed in the U.S. to restrain Japanese auto imports provided a short-term window for U.S. manufacturers to raise prices, boosting profitability, but not productivity.

¶ *Monopoly regulation.* Effective regulation creates incentives for managers to use their resources productively. In the U.S. telecom and electric utility industries, this took the form of tight price control, which had two effects: 1) rate-of-return regulation with prudence reviews forced managers to justify cost increases under great scrutiny, and 2) price cap regulation created the incentive to be more productive because owners can keep productivity gains as profit. In both Germany and Japan, regulators did not focus on price. In the case of private ownership, rate-of-return regulation without price controls actually creates an incentive to waste resources. The more managers spend, the more they are allowed to charge. We discuss this in the context of government ownership in the next section.

¶ *Ownership/governance mechanisms.* In our judgment, ownership is the most important factor in explaining why managerial goals may not be aligned with productivity and why inefficient players do not disappear. The clearest example is government ownership, as seen in the utility and telecom industries. In telecom in Germany, for instance, the government, as both owner and regulator, had many competing objectives – universal service for consumers, high quality and technological excellence, profits to subsidize the postal system – that created no clear objective function for managers and provided little direct pressure on them to use resources productively.

Yet private owners have widely varying goals as well. Some focus on goals such as stability and prestige that do not encourage the productive use of assets. Different ownership structures also affect the likelihood and pace of restructuring. We see evidence in several areas: Japanese retail conglomerates cross-subsidizing underperformers, cooperative ownership in the German food industry slowing industry consolidation, and privately held share ownership in the German retail industry slowing the pace of industry restructuring via mergers and acquisitions (M&A).

Other factors may have been important in individual industries, but their impact across all of the case studies is of secondary importance.

¶ *Macroeconomic environment.* The impact of the "bubble economy" in Japan emerged in several of the cases studies, affecting industry dynamics in three distinct ways. First, the high cost of land created by the bubble created artificial barriers to entry in the retail industry. Second, the bubble affected the level of capital spending by distorting the perceived cost and the availability of capital. Overautomation in the Japanese auto industry was done in part because capital was readily available and perceived to be almost costless. This contrasts sharply to the early days of the industry, in which scarce capital forced manufacturers to use existing assets extremely productively. Third, as discussed, retailer focus on speculative land acquisition in Japan distracted their attention from operations.

¶ *Sources of funding/market for corporate control.* Differences in this factor, along with ownership issues, are the reason that capital market players are sometimes less willing to cut off inefficient players. In Germany and Japan, there is a greater reliance on bank lending as a source of capital. Banks, which may have long-term relationships and significant loans at risk, are more willing to continue providing funds to a less efficient firm as long as it can meet interest payments. This effect is diminished in the U.S., where easily tradable securities are the primary source of financing. In addition, higher levels of mergers and acquisitions in the U.S., due both to legal differences as well as the "sophistication" of the M&A industry, forced restructuring in some cases. This appears to matter in consolidating industries with excess capacity like food as well as in inefficient segments of a market, like department stores in retail.

New entrant financing, via the venture capital industry for example, did not appear to be differentially important in our cases studies. However, it is hard to draw conclusions because our sample did not include industries like biotechnology or software where start-up capital may be especially important.

¶ *Upstream and downstream market factors.* The success of some Japanese firms in establishing an efficient distribution system demonstrates that the complexity of the Japanese distribution system is not entirely insurmountable. Nonetheless, distribution chain dynamics were one more factor that shaped differing levels of product market competition. In the food and retail industries in Germany and Japan, the complicated distribution system serves as a barrier to entry, especially for foreign producers. This is particularly true in food, in which manufacturers face complexity in both the supply of their raw materials from farms, and in the distribution of their product.

Other factors that are often cited in the business and economics literature or the popular press did not play important roles in differentiating performance levels.

¶ *Demand differences.* In only two cases did this factor have any impact. In utilities, structural differences such as weather patterns and the size of houses, had some impact on both demand levels and volatility, and therefore utilization. In the Japanese food industry, perceived customer requirements for freshness and variety affect productivity. But on close examination, these "tastes" prove to have been shaped by the manufacturers' behavior. They are not immutable "cultural" differences, as the high performance and lower product variety of Japanese food processors like Ezaki Glico demonstrate. In both cases we rated these factors as having only secondary importance.

¶ *External labor market factors.* As discussed earlier, the demographics of labor supply in Japan created a perception of an impending labor shortage and fueled automakers' decisions to invest heavily in automation. But, in no other industry did labor demographics emerge as an issue. We also found no evidence to suggest that differences in labor skills were important in explaining productivity differentials.

We also evaluated how these external factors preclude or constrain managers from reaching best practice productivity levels. To do this we made judgments about the direct impact of external factors on the specific components of productivity that we quantified in the case studies. We classified the specific differences in three different categories. First, in some cases external factors directly affected productivity and represent a clear obstacle that managers could not overcome. The requirement to put telecom cables underground in Germany are a clear example. Second, on the other extreme, there were some factors that managers clearly could control directly. Reducing levels of goldplating is an obvious example. Third, there was a gray area between these two extremes, in

Exhibit 16

COMPONENTS OF DIFFERENCES IN CAPITAL PRODUCTIVITY – STRUCTURAL VS. MANAGEMENT-CONTROLLED ACTIONS

Index point differences vs. U.S.

	Auto		Food		Retail		Telecom		Electric utilities		Weighted average	
	GE	JP	GE	JP	GE	JP	GE	JP	GE	JP	GE*	JP*
Decisions controllable by managers	15-35	0	15-30	25-30	(10-15)	25	50	54	12-22	30-50	22-33	33-40
Structural factors	0-20	0	0-15	5-10	3-5	9-12	10	0	0-10	0-20	5-16	4-11
• Laws and regulations that preclude managers from achieving higher productivity)					Store opening hours (3-5)	Large scale retail and zoning laws limit format evolution (9-12)	Underground cable requirement (10)		Pricing due to environ-mental goals	Pricing due to environ-mental goals		
• External factors that constrain or present hurdles for managers	Labor laws (0-20)		Labor laws (0-15)	Higher distribution costs (5-10)					Unused plants (0-10)			
Total difference to explain in index points	**35**	**0**	**30**	**36**	**(10)**	**35**	**62**	**54**	**22**	**51**	**38**	**44**

Overall difference explained by factor Percent	**Germany**	**Japan**
Managerial decisions	60-90%	70-90
Structural constraints	10-40	10-30

* Excludes industries where there is no gap with the U.S. to explain (i.e., retail in Germany and auto in Japan) from weighted average

Note: Extreme range shown in some cases to reflect most conservative assumptions possible; estimates made by factoring capital productivity differences into specific subcomponents, e.g., capacity utilization, and using judgment and perspectives from industry experts to determine the basic cause of each part of the factoring. See case studies for more detailed explanation of estimates

Source: McKinsey analysis

which external factors appeared to create greater hurdles for managers, making it more difficult for them to raise productivity. For instance, high third-shift wage premiums in Germany lower the economic feasibility of raising utilization with around-the-clock operations, and the fragmentation of upstream and downstream markets in Japan raises logistics costs for food processors.

In these cases, we assessed the extent to which these "hurdles" could be overcome by managers, based largely on whether or not individual firms in each economy had overcome these constraints. If we could not make this determination, we used the full range of the impact of that specific factor to indicate our uncertainty. Our result then is a quantification that represents both a "minimum" as well as an upper bound of how much of the productivity gaps managers could close in their current environment.

On average across the case studies, we judge that much less than half of the productivity difference is attributable to exogenous factors that directly affect productivity (**Exhibit 16**). This implies that managers in Japan and Germany could achieve performance close to U.S. levels by changing things that are already under their control.

DIFFERENCES IN CAPITAL ALLOCATION

Beyond our straightforward "accounting" of the causes of productivity differences, our analysis has highlighted important differences in how capital is allocated in Germany, Japan and the U.S. Capital and labor are employed in different proportions, with Germany being the most, and Japan the least, capital intensive. The U.S. has a more decentralized "outsider-oriented" capital allocation process that is alleged to be too short term oriented. Finally, the forces affecting capital productivity also affect the relative prices paid for capital goods and thus influence financial performance. We look at each dimension in turn.

Capital and labor trade-off

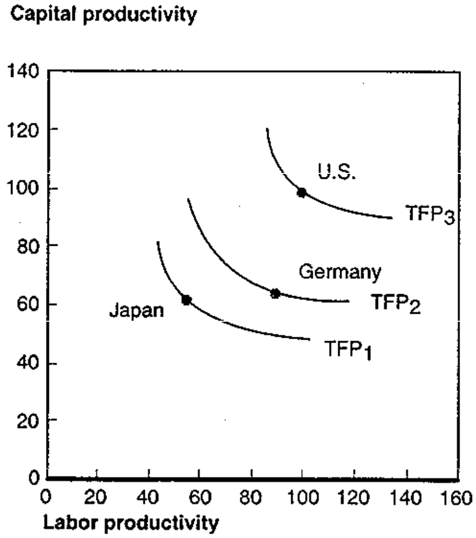
While capital intensity has risen over time in all three countries, Germany has significantly more capital per worker than the U.S., and Japan has slightly less than the U.S. These differences might reflect different trade-offs between capital and labor, with the associated trade-offs between capital and labor productivities, to achieve the highest possible output for a given total input level. As **Exhibit 17** on the next page shows, this is not the case. Higher capital productivity did not come at the expense of lower labor productivity. The U.S. has higher capital productivity as well as higher labor productivity than Germany and Japan, and Japan has lower labor productivity as well as lower capital productivity than Germany and the U.S.

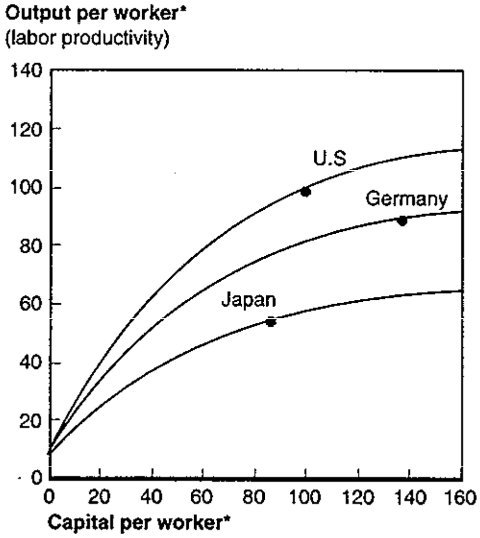
The right part of Exhibit 17 shows the same results, now in terms of output per worker and capital per worker. As shown in Chapter 2, this chart demonstrates

Exhibit 17

MARKET SECTOR CAPITAL-LABOR TRADEOFF

Indexed to U.S. (1990-93 average) = 100





* Adjusted for differences in hours worked

Source: McKinsey analysis

Exhibit 18

EFFECTS OF LEAN PRODUCTION TECHNIQUES ON CAPITAL AND LABOR PRODUCTIVITY IN AUTO

	Factor	Impact on quantity of: Output	Capital	Labor	Capital productivity	Labor productivity
Operations effectiveness	• Continuous improvement and flexibility of production process	↑ Reduced downtime due to less line stoppages and shorter changeovers **increases output per unit time**		↓ New ideas to reduce workload of each task constantly implemented	↑	↑
	• Flexible organization of maintenance function	↑ Fewer and shorter stoppages due to better maintenance **increases output per unit time**		↓ Less need for maintenance specialists when line workers do own maintenance	↑	↑
	• Design for manufacturability	↑ Higher quality and **reduced rework** time due to fewer defects	↓ Fewer different steps require **fewer machines** and tools	↓ Fewer different steps require less labor	↑	↑
Industry chain management	• Continual pressure and assistance from OEMs to suppliers	↑ Above practices pushed down to supplier base	↓ Above practices pushed down to supplier base	↓ Above practices pushed down to supplier base	↑	↑
	• Longer-term, sometimes exclusive relationships		↓ Sharing of volume forecasts with suppliers and consolidation of production allows better capacity		↑	

Source: McKinsey analysis

that the U.S. is able to create more output than Germany at any level of capital per worker, and Germany more than Japan. Germany and Japan cannot make up for overall productivity lower than the U.S. simply by adding more capital.

Our industry case studies confirm these aggregate level findings and demonstrate that many of the managerial actions that drive capital productivity also drive labor productivity. Because many practices have such a joint effect or at least require no trade-off, it is not surprising that we observe the high correlation in cross-country results between labor and capital productivity performance.

There are two primary ways to get this double benefit. First, some practices primarily raise output and have little effect on the required labor or capital. As **Exhibit 18** shows for the auto industry, practices that reduce downtime increase output for a given set of workers and capital. Retailers raising value added by tailoring their services to specific customer segments are another example. Second, some practices have the simultaneous effect of reducing capital and labor requirements. For instance, design for manufacturability reduces the number of different steps in the auto assembly process, so fewer worker hours and less capital services are required per car.

The prevalence of practices with dual benefits helps explain why total factor productivity in the U.S. is higher. In addition, the management of capital specifically is important, particularly in explaining German performance. Goldplated or underutilized equipment in Germany raises the capital intensity but does not improve labor productivity. Amassing more capital, without changing managerial practices, does not improve productivity.

Short-term and long-term capital allocation

Differences in the capital allocation systems between the U.S. on the one hand, and Germany and Japan on the other, have been discussed both in the academic literature and in the popular press. Taken together, the differences are sometimes lumped together as the U.S./UK-style "outsider" model as opposed to the "insider" model prevalent in Germany and Japan. **Exhibit 19** summarizes some of these differences. A wide variety of opinions exist on the benefits of the different systems, and the debate is quite heated.

An overarching theme in this debate is the time horizons of the different systems and their impact on economic performance. One argument often seen in the business press claims that the U.S. capital allocation system is too focused on short-term financial performance and that long-term U.S. economic performance suffers as a result. We tested this "conventional wisdom" by assessing whether reported differences in the capital allocation system played a differentially important role in productivity performance in the industries we studied.

In most cases we found that this conventional wisdom was either wrong or we could not find evidence to substantiate the relevance of the length of the

Exhibit 19

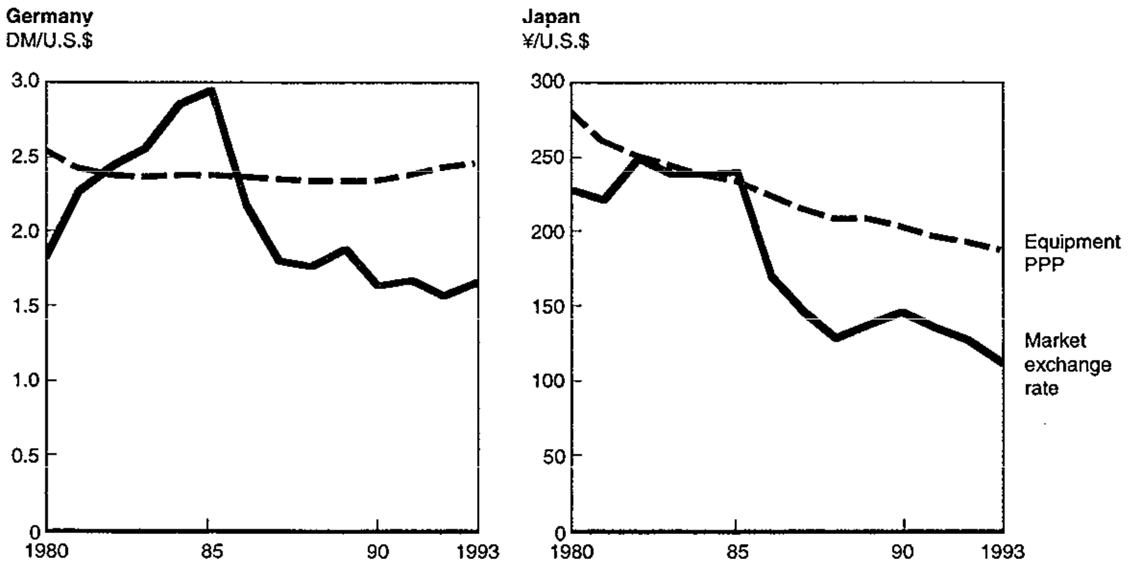
NATIONAL DIFFERENCES IN THE PREDOMINANT EXTERNAL CAPITAL MARKET STRUCTURE

	U.S.	Japan	Germany
Pattern of share ownership and agent relationships	Institutional agents (55%+) Individuals (less than 35%)	Institutional owners (40%) Corporate owners (30%)	Corporate owners (41%) Institutional owners who may also act as agents (27%)
Owner/agent goals	Fragmented stakes Transient owners Transaction driven	Large stakes Permanent owners Relationship driven	Large stakes Permanent owners Relationship driven
Monitoring and valuation methods	Index funds/ value proxies/ event forecasting	Inside information	Inside information
Owner/agent influence on management	Proxy voting Sell shares Corporate takeovers	Direct contact with and influence over management	Active board membership Direct contact with and influence on management Strong informal networks

Source: U.S. Council on Competitiveness in conjunction with Harvard Business School, *Capital Choices: Changing the Way America Invests in Industry,*

Exhibit 20

COMPARISON OF MARKET EXCHANGE RATE AND EQUIPMENT PPP*



* Using 1993 OECD PPPs combined with national capital goods deflators for earlier years

Source: OECD; Statistical Abstract of U.S.; Japan Statistical Yearbook; McKinsey analysis planning horizon for economic performance. Generally, we found the contention that the short-term and financially-oriented nature of the U.S. capital allocation system undermines economic performance to be inconsistent with the high productivity levels achieved in the U.S. We also found that a purported "long-term" perspective does not necessarily lead to the most productive investments, as evidenced in the telecom case study. Industry analysts cite Germany's significant investment in an ISDN network and Japan's aborted program to "bring fiber to the home," both of which were introduced as long-term infrastructural investments, as technological goldplating that was divorced from what consumers needed and what they were willing to pay.

We also found to be misleading the common view that firms' excessive concentration on their own financial performance impairs economic performance for the country as a whole. As discussed earlier, by focusing on financial results, firms have a clear performance objective that in most cases leads to higher productivity levels. This objective was a critical factor in explaining productivity differences in our cases. Finally, we found no evidence to suggest that long-term financial performance has been traded off for short-term gains. The next chapter will demonstrate that over the last two decades financial returns have been markedly higher in the U.S. than in the other two countries.

Cost of investment goods

In our measures of physical capital productivity, we remove the effects of pure price differences in the cost of investment goods. While this helps isolate purely operational differences, it takes existing investment goods prices as a given. In fact, we believe there are substantial opportunities for corporations in Germany and Japan to pay less for their equipment, and either reduce their capital budgets or get more for their money, thereby improving financial performance.

In 1993, the general equipment PPPs were 2.44 DM/U.S.$ for Germany and 185¥/U.S.$ for Japan, while market exchange rates were 1.65 DM/U.S.$ and 111¥/U.S.$, respectively. These imply that prices paid for equipment were on average 48 percent and 67 percent higher than the market exchange rates in Germany and Japan, respectively. In each case, we investigated purchasing practices and prevailing prices in order to confirm the appropriateness of using the investment goods PPPs from the OECD. Although it was usually not possible to obtain sufficient data to construct our own industry-specific PPPs, we concluded that the OECD PPPs approximate the differences across markets. Because most equipment should, in principle, be tradable across all three countries, these results are striking. **Exhibit 20** shows that the relative prices for equipment have been above market exchange rates since the mid-1980s.

There are two potential explanations for these wide price differences. Companies could be paying unnecessarily high prices as a result of implicit or explicit purchasing criteria other than low price. Alternatively, companies could be making reasonable decisions, but there are barriers to buying at the lowest global price. These might include explicit trade restrictions, prohibitive

Exhibit 21

MANAGERIAL IMPACT ON INVESTMENT GOODS PRICES RELATIVE TO U.S.

● Important
○ Secondary importance
x Not important

	Auto		Food		Retail		Telecom		Electric utilities	
Are price differences in equipment important?	Yes		Yes		No (mostly structures)		Yes		Yes (less so for Germany)	
	Germany	**Japan**	**Germany**	**Japan**	**Germany**	**Japan**	**Germany**	**Japan**	**Germany**	**Japan**
Local preferences	●	●	○	○	x	x	●	●	○	●
Barriers to sourcing globally for lowest cost	○	○	●	●	x	x	x	x	x	x
Sourcing from other than lowest cost alternative	○	●	○	○	x	x	●	●	○	●
Potential opportunity to reduce equipment prices	10-20%	10-30%	10-15%	10-15%	N/A	N/A	40-60%	10-30%	10-12%	20-25%

Source: OECD; Interviews; McKinsey analysis

Source: McKinsey analysis

better capacity

transportation or logistical costs (either for the original purchase or for subsequent parts and servicing), or imposed equipment standards that add costs differentially in one market.

We evaluated these alternatives in each case largely through interviews with industry experts. The findings are summarized in **Exhibit 21.** Both Japan and Germany appear to harbor managerial biases toward locally-produced equipment. What's more, these biases are often not justified by barriers to global sourcing. Instead, we found examples where managers are either unaware of lower cost alternatives or are willing to pay more due to long-time relationships with local suppliers.

An example is at Deutsche Telekom in Germany, where insistence on overly precise specifications creates an unnecessary bias toward local suppliers, whose prices are sometimes 60 percent over the going international rate. In auto, German manufacturers have recognized the opportunity to reduce costs and have moved to more global sourcing in the last several years, but there is room to improve.

In most cases, the differences in external forces that drive cross-country productivity differences also allow these buying practices to persist. For example, if a regulatory scheme (as in telecom or utilities) or muted competition (as in auto in Germany until quite recently) allows companies to pass on higher costs to consumers, then producers have less incentive to seek low-priced suppliers. As a result, local suppliers are under less pressure to reduce prices to globally competitive levels.

There are cases where barriers do justify local buying at apparently higher prices. For example, in food processing in Japan, we found that at least some of the local price premium was offset by subsequent cost savings due to local servicing and parts availability. In auto, required safety standards add about 10 percent to the average cost of machinery used in Germany, even if imported. In telecom in Germany, there appear to be few such mitigating factors.

After examining the impact of barriers and managerial preferences, we believe substantial opportunities exist for Japanese and German companies to cut their equipment expenditures. Our rough estimates of the opportunity to reduce equipment costs vary from as low as 10 percent in the food industry to as much as 60 percent in German telecom.

Chapter 5: Capital productivity and financial performance

The word "capital" has a dual meaning: it refers to physical capital (e.g., machinery and structures) as well as financial capital (e.g., stocks and bonds) that are claims on the income of physical capital. In this chapter, we draw the link between the performance associated with each of the two. We construct a measure of financial performance of the entire corporate business sector and relate it to the market sector capital productivity of Germany, Japan and the United States.

We give attention to the link between physical capital productivity and financial performance measures for two important reasons. The first reason is on the micro level. Capital productivity per se is not a measure commonly used in business analysis. This is in sharp contrast to financial returns, which are among the signals to which business reacts most sensitively. Our analysis shows that physical capital productivity is reflected in financial capital performance. Thus, whenever financial returns are a performance goal, firms have the incentive to use their capital productively.

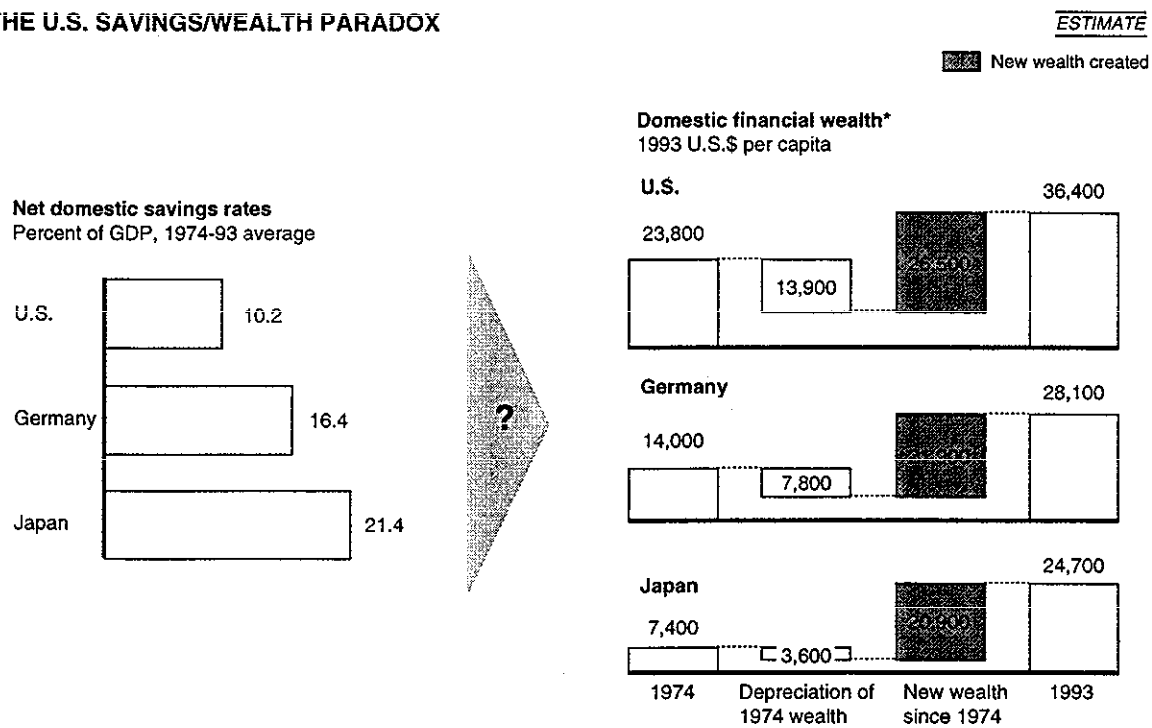
The second reason is on the macro level. We observe the puzzling fact that during the last two decades saving was very low in the U.S., yet the U.S. has created more new wealth than the other countries (**Exhibit 1**). Our analysis helps solve this paradox by showing that the smaller U.S. savings generated more capital income than in Germany and Japan. This was due to the high financial returns in the U.S., which were, in turn, driven by high physical capital productivity.

We computed a static and a dynamic measure of aggregate financial performance. For both measures, we find consistently higher rates of return in the U.S. than in Germany. For the 20 years between 1974 and 1993, the annualized aggregate rate of return (our dynamic measure) was 9.1 percent in the U.S. compared to 7.4 percent in Germany.

U.S. rates of return also exceeded Japanese returns on average. For the 1974 to 1993 period, Japanese returns were 7.1 percent. However, the underdeveloped stage of the Japanese capital market in the early 1970s and the Japanese "bubble" in the late 1980s make a U.S.-Japan comparison more complicated: Japanese rates of return were very high during the early 1970s and during the bubble period, but much lower at other times. The extent of the gap between the Japanese and U.S. rate-of-return estimate is therefore subject to greater variance. However, in all time periods that we think are meaningfully comparable, the U.S. has had a higher rate of return than Japan.

Exhibit 1

THE U.S. SAVINGS/WEALTH PARADOX



* Household net financial wealth invested in domestic business at GDP-PPP

Source: Federal Reserve Flow of Funds; Deutsche Bundesbank; Economic Planning Agency; OECD National Accounts; McKinsey analysis

The rate-of-return differentials generate significant differences in the income to capital, which in turn accumulate to substantial differences in wealth, if reinvested. Starting with the same initial investment in 1974, a German investor would end up in 1993 with only 73 percent of the wealth a U.S. investor would accumulate, while a Japanese investor would only obtain 70 percent of the U.S. wealth level.

In the following section, we define our measures of aggregate financial performance. We then demonstrate the link between aggregate financial performance and physical capital productivity. Finally, we offer an explanation of the U.S. savings and wealth paradox.

MEASURES OF FINANCIAL PERFORMANCE

We have not found aggregate measures of the financial performance of the entire corporate business sector of the economy in the literature. Rates of return are, of course, published for public companies.[1] However, public companies are only little more than half of the business sector in the U.S., and even less (about a third) in Germany and Japan (see below). We want to construct a measure that goes beyond traditional measures such as return on equity (ROE) in three respects. We want to: 1) include the return on debt in addition to equity, 2) include as much of the business sector as possible, not only public corporations, and 3) measure the rate of return over more than a single period, capturing the relation between all funds invested in business and all capital income generated by business during a given time span (referred to as "time window").

We compute two measures of financial performance. Our static measure of return is the share of national income that goes to capital in a given year divided by the capital stock in this year. Because the national income accounts include only income from production, we refer to this measure as *production return.*

Conceptually, the appropriate measure of the financial rate of return is the standard *internal rate of return* (IRR). This is our second, dynamic measure, based on flow of funds data and estimates of appreciation. The aggregate IRR relates all payouts to the investor (mainly the household sector) during a given period to the initial investment (debt and equity) plus any additional investments during the period. The aggregate IRR is a dynamic and market-based measure both because it includes expected income through appreciation and because it spans several years. We call the period under consideration a "time window" to convey that this period is only a segment in the long-run growth process of an economy.

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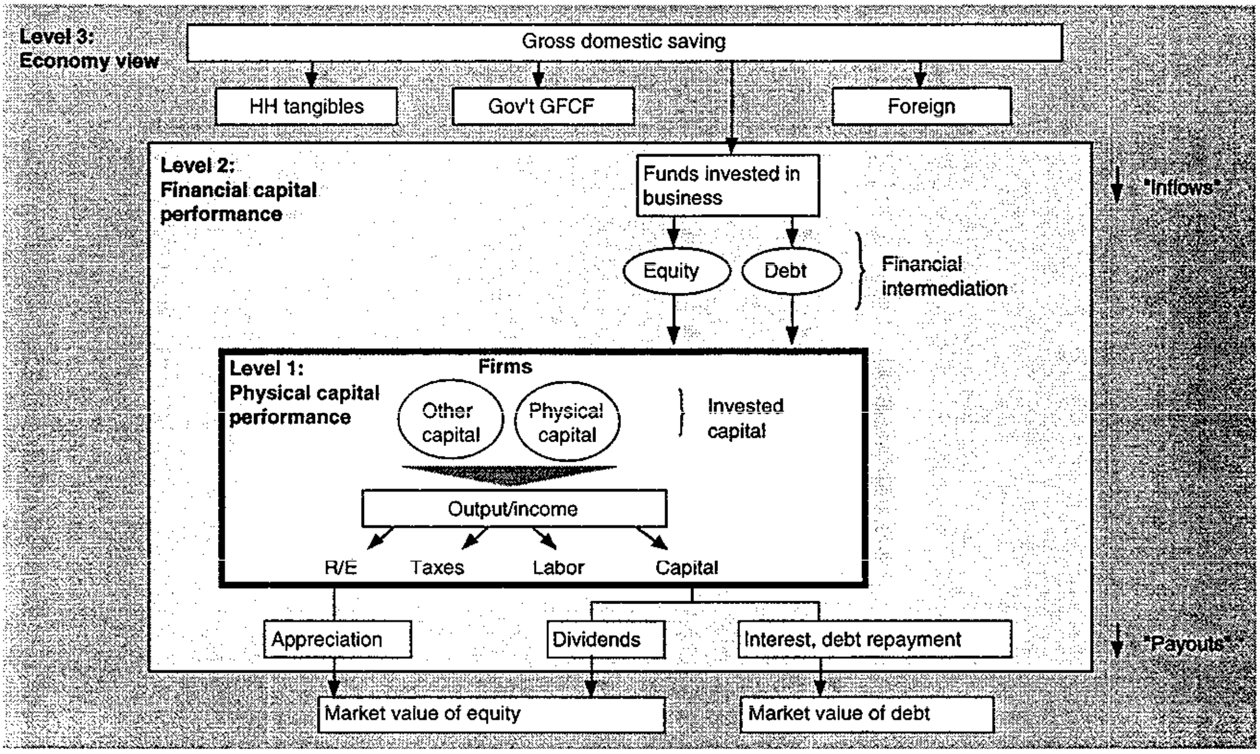
1 Brainard, Shoven and Weiss, The Financial Valuation of the Return to Capital, Brookings Papers on Economic Activity, 2:1980, p.453-511, measure the aggregate rate of return of U.S. public firms, 1958-1977.

Exhibit 2

SYSTEM VIEW OF CAPITAL PRODUCTIVITY



This view of financial performance treats the business sector as a black box which receives inflows from, and generates payouts to, the owners of capital (**Exhibit 2**). The business sector receives funds ("inflows") mainly from households (plus government and foreign sources). Inside the black box, enterprises generate income in the production process and distribute it to labor, capital and taxes. We analyzed this earlier in this study at the aggregate level and in the industry case studies. An enterprise may also retain part or all of its earnings and invest them in its own business or in other enterprises (e.g., via crossholdings) rather than paying it out to the owners. These intrabusiness investments will be reflected in appreciation and may eventually materialize as higher dividends. Financial flows that relate to crossholdings cancel each other out within the corporate sector. Buybacks of stocks are counted as negative inflows. Capital income ("payouts") therefore include interest, dividends and capital gains (appreciation) in order to reflect retained earnings and expected future payouts.

Both measures of financial return take the perspective of a domestic investor. Foreign exchange rate fluctuations complicate international rate-of-return comparisons. The measures are taken after corporate and before personal income taxes are subtracted, and they are not risk adjusted. Precise definitions and descriptions of inflow and payout time series are in the appendix. Both measures have serious shortcomings. The static production return excludes capital gains, a major component of capital income. Appreciation, although included in the dynamic measure, is subject to many measurement problems. Because appreciation is so volatile, the dynamic measure is sensitive to the time period chosen. In spite of these limitations, the similarity of the results from both measures strengthens our findings.

RESULTS

Rates of return in the U.S. are consistently higher than in Germany. This holds for both measures of financial performance and for all time periods between 1974 and 1993. If averaged for the entire 1974 to 1993 period, the U.S. rates of return were also higher than those in Japan. The international differences among the rates of return can accumulate to substantial differences in wealth.

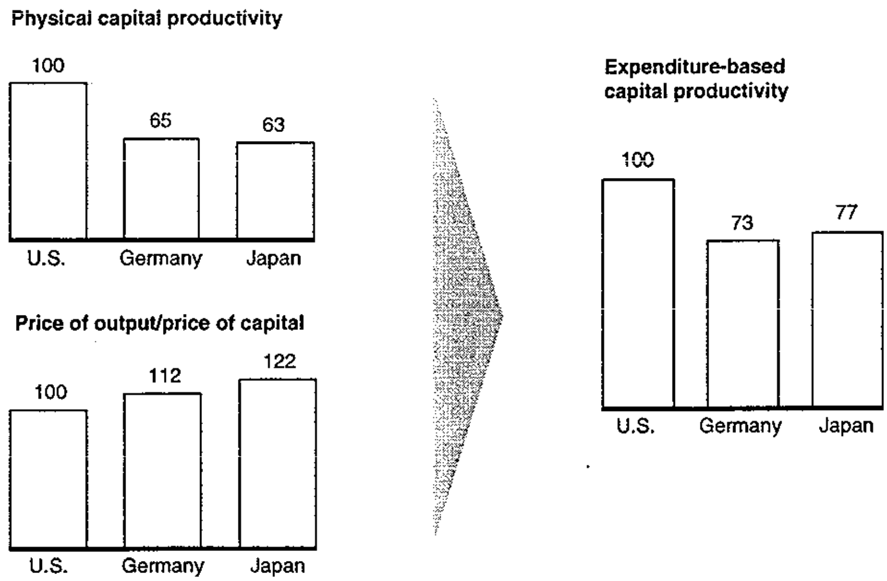
Production return

Physical capital (machines and plants) in an economy generates physical output (standardized baskets of goods and services) in proportion to physical capital productivity. This first measure of capital productivity was the focus of our aggregate analysis as well as our industry cases. However, an investor is not so much concerned with the physical volume of goods and services sold but with the revenue generated, and not so much with the physical number of machines and plants bought but with the capital expenditures. We express this in a second measure of aggregate capital productivity, called "expenditure-based capital

Exhibit 3

EXPENDITURE-BASED CAPITAL PRODUCTIVITY

Indexed to U.S. (1990-93 average) = 100



Source: O'Mahony; Bureau of Economic Analysis; Statistisches Bundesamt; Economic Planning Agency; OECD; McKinsey analysis

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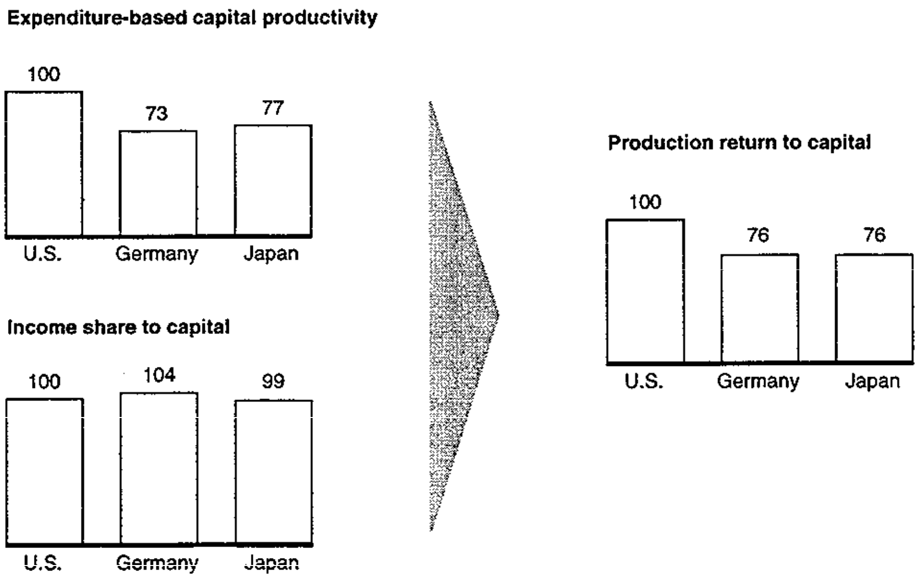
Exhibit 4

PRODUCTION RETURN TO CAPITAL

Indexed to U.S. (1990-93 average) = 100



Source: O'Mahony; Bureau of Economic Analysis; Statistisches Bundesamt; Economic Planning Agency; OECD; McKinsey analysis

productivity," which is the ratio of revenues to capital expenditures, both measured in domestic currency.

Expenditure-based capital productivity is determined by physical capital productivity and the relative price of output goods to capital goods (**Exhibit 3**). Because output prices are substantially higher in Germany and Japan than in the U.S. relative to investment goods prices, international capital productivity differences across the three countries are smaller when using expenditures rather than physical units. Nevertheless, significant differences remain; market sector expenditure-based capital productivity levels are 27 percent lower in Germany and 23 percent lower in Japan than in the U.S.

The income generated from production is distributed to labor, capital and taxes as was depicted in our overall view of financial performance (Exhibit 2). The production return to capital is therefore the expenditure-based capital productivity multiplied by capital's share of national income. Because capital's income share averaged from 1990 to 1993 is approximately the same in the three countries, the production return is very similar to expenditure-based capital productivity (**Exhibit 4**). Average production return to capital from 1990 to 1993 is roughly 25 percent lower in both Germany and Japan than in the U.S., largely driven by the differences in physical capital productivity (**Exhibit 5**).

The difference between the German and U.S. rates of production return has been very stable over time (**Exhibit 6**). A comparison between the historical trends of physical capital productivity and the rate of production return shows the strong correlation between physical and financial performance between Germany and the U.S.

The picture is more complicated in the U.S.-Japan comparison. Although the shares of income to capital have strikingly converged, Japan had a much higher capital share in the 1970s (**Exhibit 7**). Capital's share of income in Japan then fell continuously until it reached German and U.S. levels in the late 1980s. The historical trend in capital's share dominated physical capital productivity differences during the Japanese fast growth period in the 1970s and early 1980s and yielded high production returns in spite of low capital productivity, as is typical for a not yet fully developed financial system (**Exhibit 8**). The U.S.-Japan comparison becomes more meaningful after the mid-1980s, when both countries had comparable financial systems. Physical and financial performance in Japan and in the U.S. are then similarly correlated as in the U.S.-German comparison.

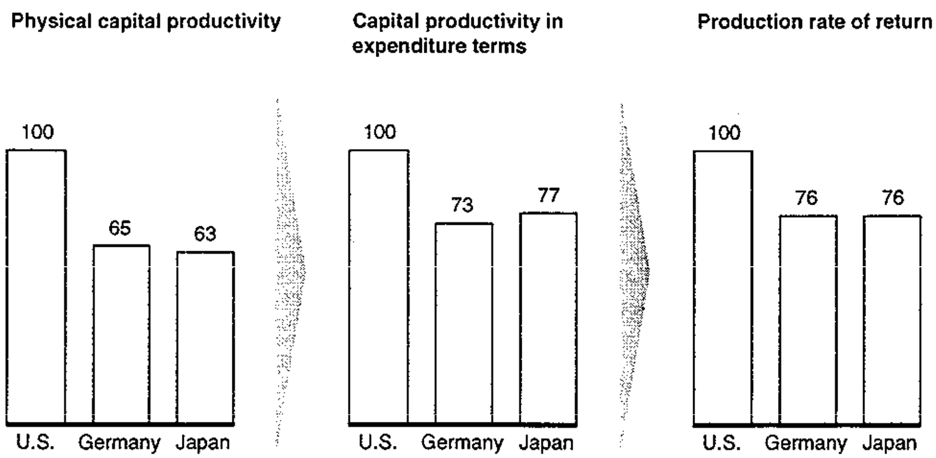
The aggregate IRR

The production return to capital is a static measure as it relates 1 year's capital income to that year's capital input. Moreover, capital's share of national income excludes income generated by appreciation, failing to capture expected future income from current capital. In contrast, our aggregate IRR measure is a dynamic measure because it includes appreciation and covers several years.

Exhibit 5

LINK BETWEEN CAPITAL PRODUCTIVITY AND THE PRODUCTION RATE OF RETURN

Indexed to U.S. (1990-93 averages) = 100

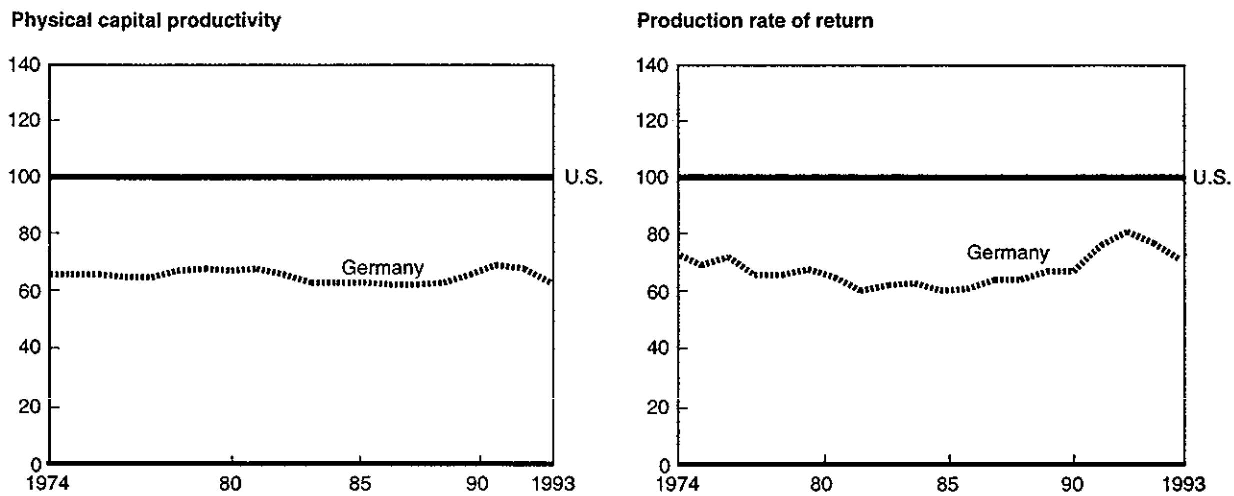


Source: McKinsey analysis

Exhibit 6

CAPITAL PRODUCTIVITY AND PRODUCTION RATE OF RETURN – U.S. AND GERMANY

Indexed to U.S. = 100

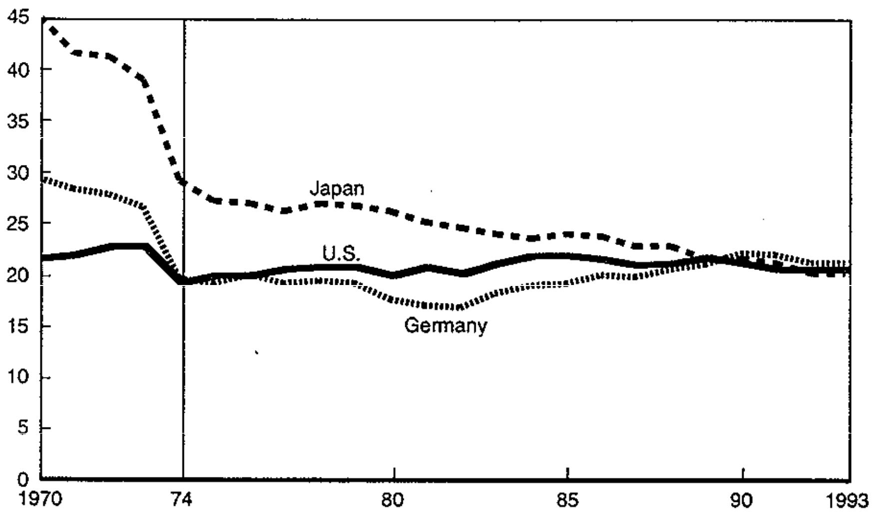


Source: OECD National Accounts; McKinsey analysis

Exhibit 7

INCOME SHARE TO CAPITAL* – HISTORICAL TRENDS 1970-93

Percent



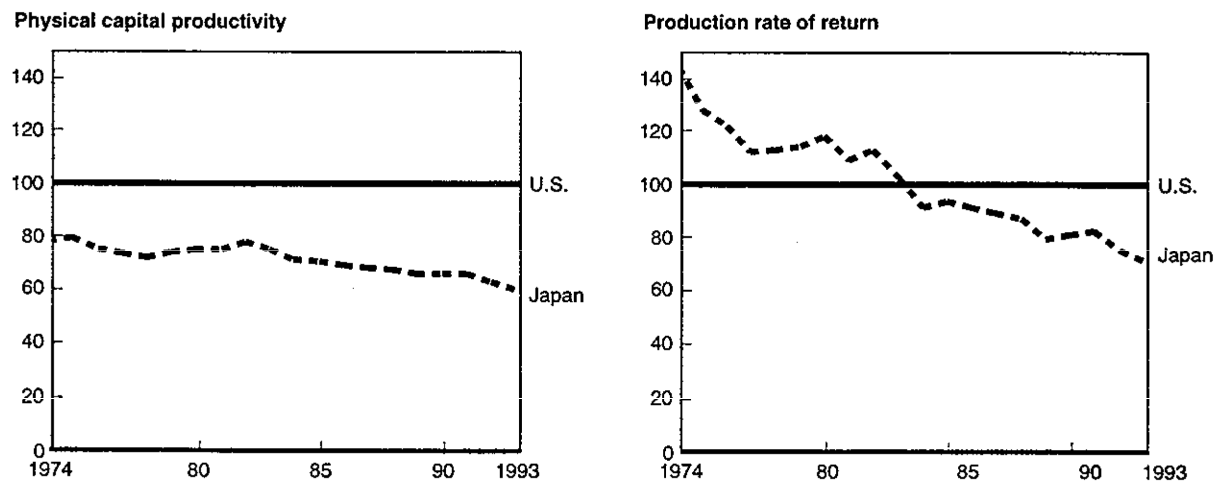
* Capital income, net of depreciation (capital services), and net of corporate taxes, divided by GDP

Source: OECD National Accounts; McKinsey analysis

Exhibit 8

CAPITAL PRODUCTIVITY AND PRODUCTION RATE OF RETURN – U.S. AND JAPAN

Indexed to U.S. = 100

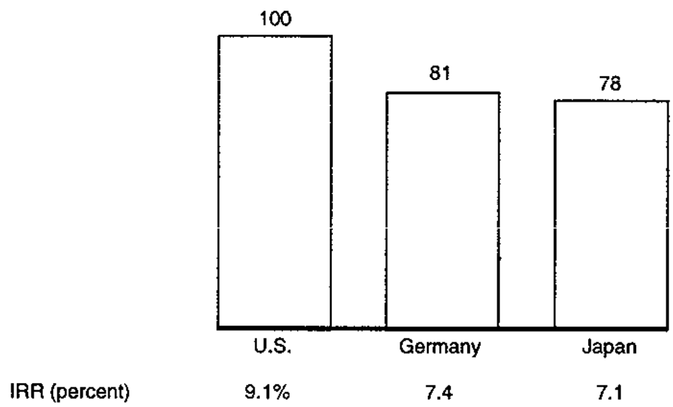


Source: OECD National Accounts; McKinsey analysis

Exhibit 9

AGGREGATE INTERNAL RATE OF RETURN

20-year window 1974-93, indexed to U.S. = 100



Source: OECD National Accounts; McKinsey analysis

Applying the IRR definition to the inflows and payouts described in the methodology section yields our estimates of the long-run aggregate pre-tax internal rate of return in the corporate sector. For the 20-year time period between 1974 and 1993, the aggregate IRR was 9.1 percent in the U.S., 7.4 percent in Germany, and 7.1 percent in Japan (**Exhibit 9**). This translates into a German rate of return 81 percent of U.S. levels, and a Japanese rate of return 78 percent of the U.S.

Rates of return have not been constant over time. This can be seen by computing IRR estimates for shorter time windows that "move" through the 1970 to 1993 period (**Exhibit 10**). While the relatively higher return of the U.S. corporate sector holds for the U.S.-German comparison throughout the 1970 to 1993 period, the U.S.-Japan comparison is sensitive to the choice of the time window. First, as already mentioned, the financial system in Japan was not as well developed in the early 1970s as in the U.S. This led to relatively high Japanese returns in the early 1970s and renders an inclusion of the early 1970s in a U.S.-Japan comparison questionable. Second, the very large change in stock market performance when the Japanese "bubble" grew and burst makes the end point of the time window a critical issue in the comparisons with Japan.

We investigated this sensitivity in great detail; results are presented in the appendix. **Exhibit 11** shows the highest and the lowest estimate of a selection of window periods that we think are meaningfully comparable. It shows that our general conclusion of a superior financial performance of the U.S. corporate sector holds up.

While the differences among the rates of return might appear small at first, they reflect the order of magnitude that can be expected from differences in capital productivity, and they compound to significant differences in wealth. The relationship to capital productivity is addressed in the following section. In this section, we present two examples to help visualize the compounding effect:

(1) A once-and-for-all investment, equal in all three countries (**Exhibit 12**)

(2) An annual flow of savings, equal in all three countries (**Exhibit 13**).

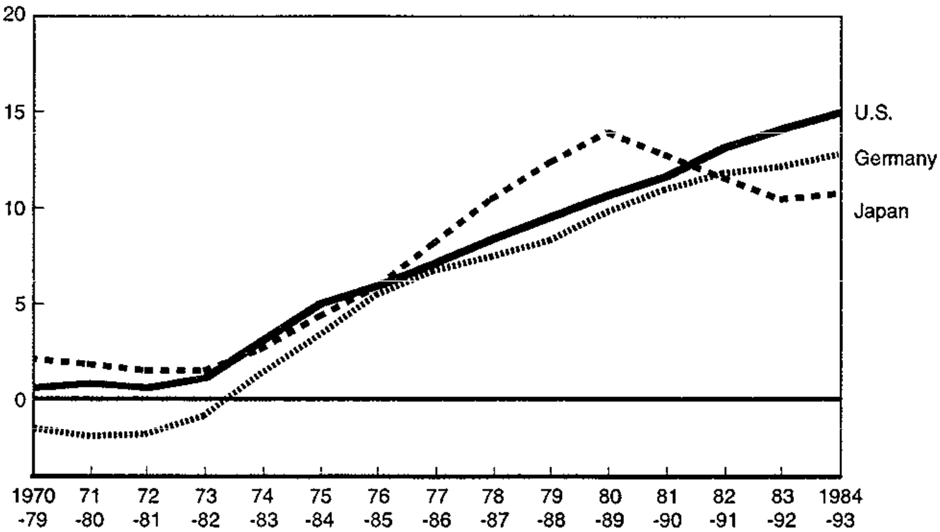
If $1,000 had been invested in 1974 in the corporate sector of each of these countries, a U.S. investor would have ended up with $5,666 in 1993. In contrast, a German investor would have accumulated only $4,139, corresponding to 73 percent of the U.S. investor, and a Japanese investor only $3,957, corresponding to 70 percent of the U.S. investor (Exhibit 12). Put another way, a German or a Japanese investor must invest about 30 percent more than a U.S. investor in order to arrive at the same wealth over a 20-year period. Twenty years is about the average service life of a piece of capital. The differences in accumulated returns, therefore, correspond closely to the expected differences in income generated by a typical piece of capital.

A second way to gauge how important differences in the rate of return are in the process of wealth creation is to look at savings (Exhibit 13). A U.S. household that saves $1,000 each year from 1974 through 1993, e.g., in a pension fund that

Exhibit 10

AGGREGATE INTERNAL RATE OF RETURN

10-year windows, percent

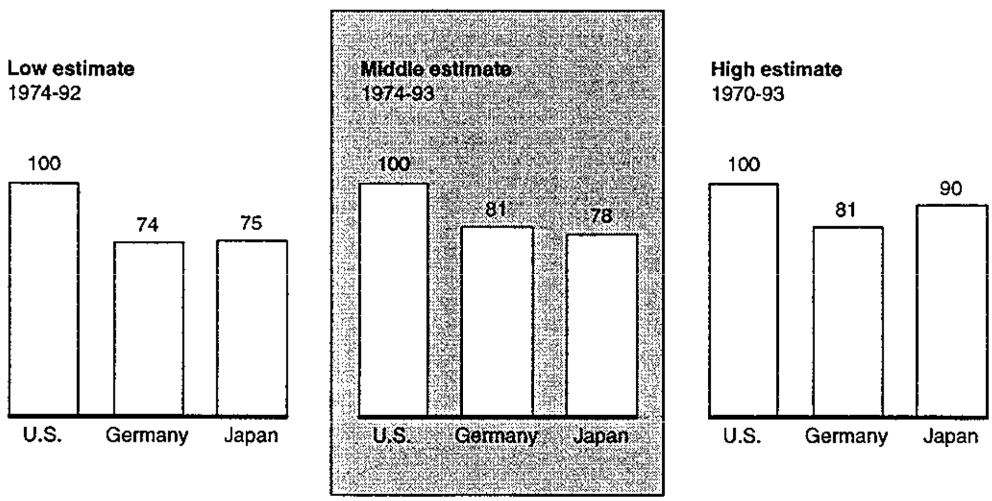


Source: McKinsey analysis

Exhibit 11

AGGREGATE INTERNAL RATE OF RETURN – ALTERNATE ESTIMATES

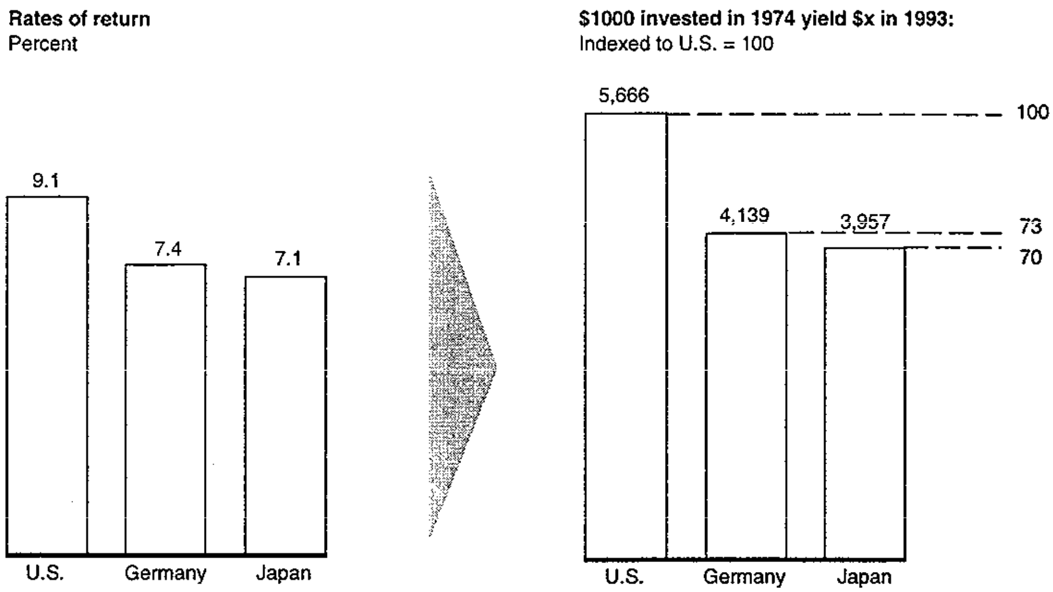
10-year windows, indexed to U.S. = 100



Source: McKinsey analysis

Exhibit 12

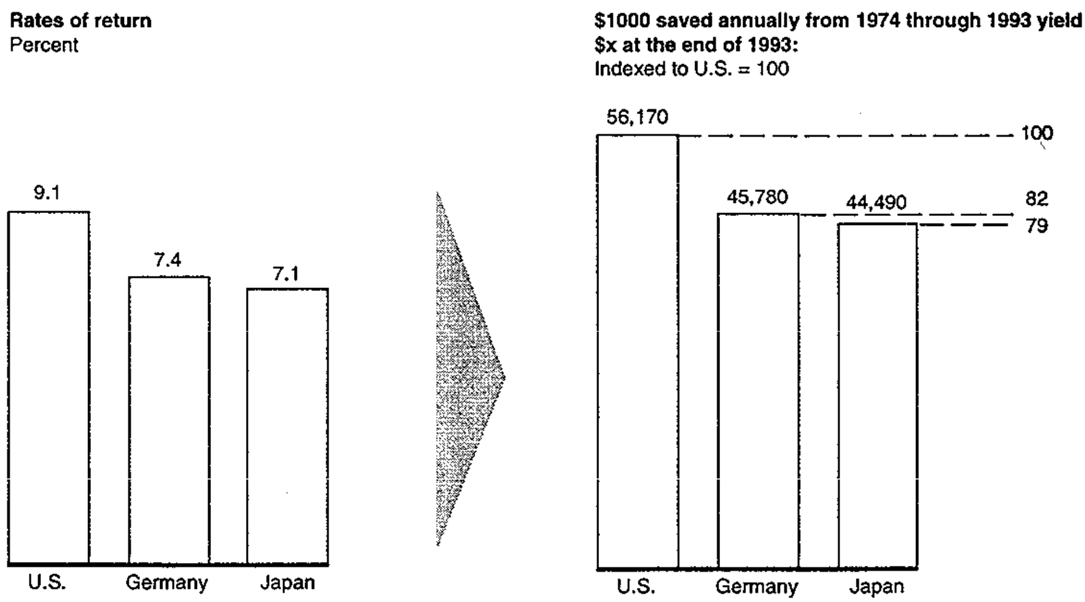
RATES OF RETURN AND ACCUMULATION OF CAPITAL



Source: McKinsey analysis

Exhibit 13

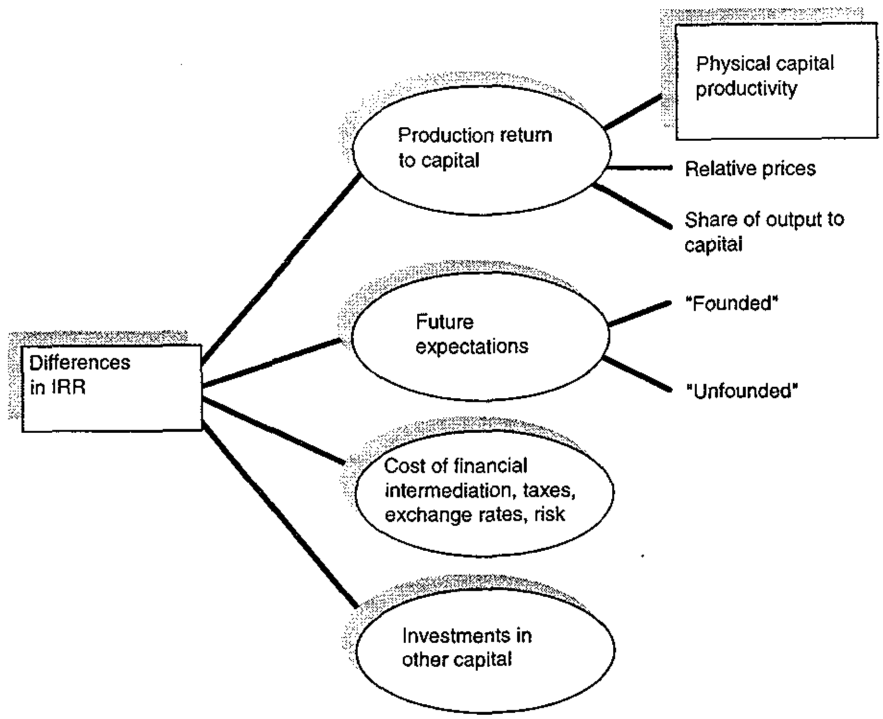
RATES OF RETURN AND PENSION WEALTH



Source: McKinsey analysis

Exhibit 14

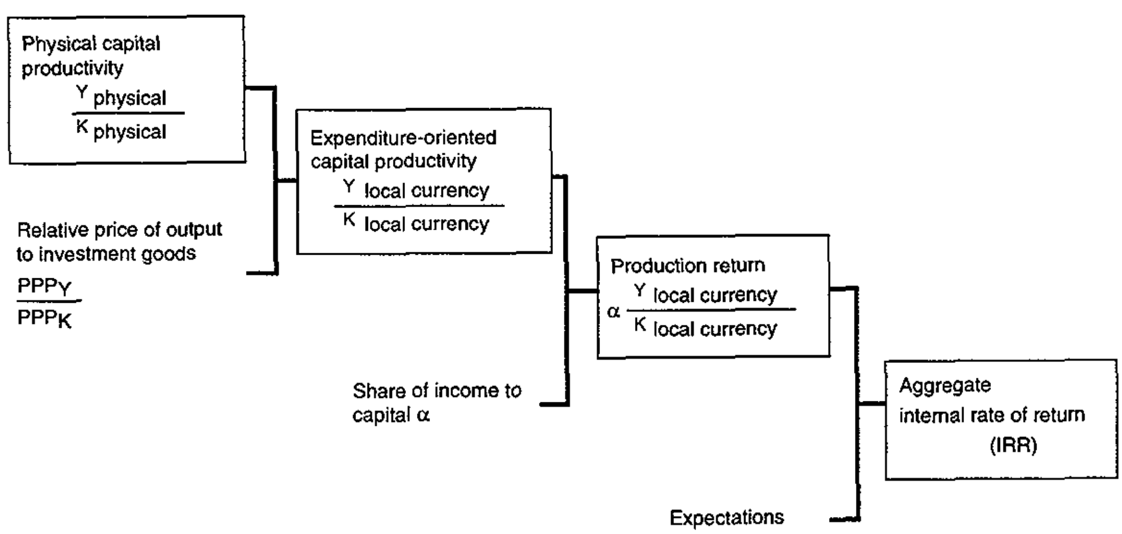
FACTORS ACCOUNTING FOR DIFFERENCES IN AGGREGATE IRR



Source: McKinsey analysis

Exhibit 15

CAPITAL PRODUCTIVITY AND RETURN MEASURES



invests in the U.S. corporate sector, will have $56,170 by 1993. The corresponding German household, which saves in a German pension fund, would have only $45,780 by 1993, and a Japanese household only $44,490. In order to offset the differences in the rate of return of these pension funds and to arrive at the same wealth over a 20-year period, the German household must save $1,230 each year, and a Japanese household $1,260. As funded pension schemes become more prevalent, this computation shows the importance of the rate of financial return in generating pension income.

THE LINK BETWEEN THE AGGREGATE IRR AND CAPITAL PRODUCTIVITY

Differences in the aggregate IRR among Germany, Japan and the U.S. are in the long run dominated by international differences in physical capital productivity.

Several factors may account for cross-national differences in the aggregate IRR (**Exhibit 14**). Some factors are real in nature – most importantly capital productivity – while other factors are financial. We consider each in turn.

Physical capital productivity

Financial performance is determined by physical capital productivity and other factors such as relative prices, income share to capital and expectations (**Exhibit 15**). Mainly because of the volatility of expectations, this link between the IRR and capital productivity may only hold in the long run.

Expectations affect appreciation. The IRR includes appreciation and is thus subject to the volatility of the stock market, whereas physical productivity is measured in terms of GDP and capital services, both of which are much slower moving time series. To the extent that appreciation captures future profitability, this will eventually be reflected in the national income and product accounts, and thus increase capital income and capital productivity. False expectations, however, such as a bubble, will by definition have no relation to long-run income streams. While false expectations destroy the short-run correlation, they are likely to average out over longer periods of time.

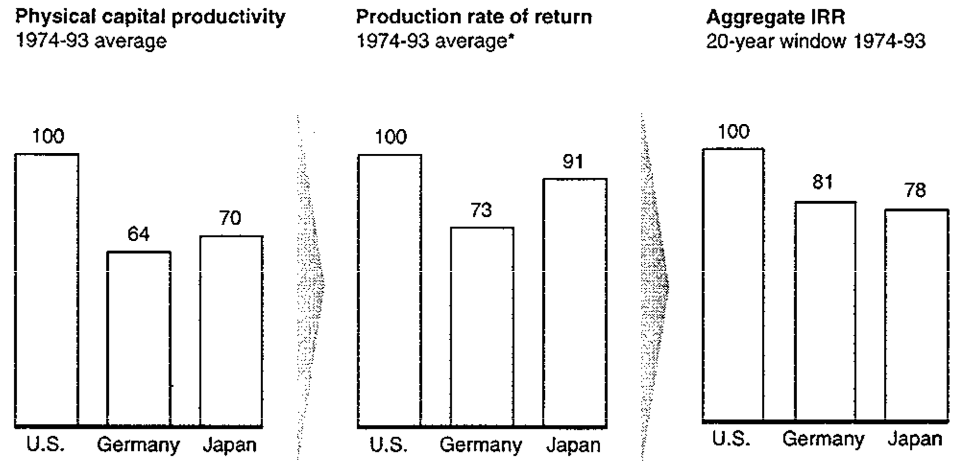
Therefore, we would expect discrepancies between the short-run time patterns of financial performance and physical capital productivity. In order to draw inferences about the long-run similarity between IRR and capital productivity from their time patterns, we compare IRRs computed for long time windows with measures of physical capital productivity averaged over the same extended time period.

Physical capital productivity, averaged over the years between 1974 and 1993, has Germany and Japan substantially lower than the U.S. (**Exhibit 16**). Germany's capital productivity is only 64 percent of U.S. levels, and Japan's is

Exhibit 16

LINK BETWEEN CAPITAL PRODUCTIVITY AND AGGREGATE IRR

Indexed to U.S. = 100



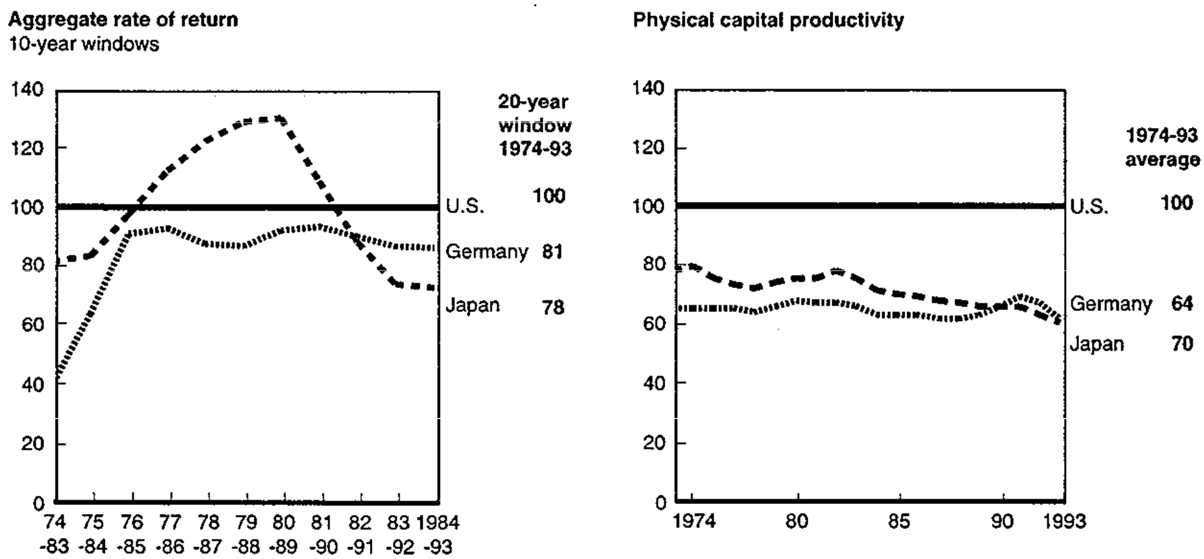
* Weighted by capital stock

Source: McKinsey analysis

Exhibit 17

AGGREGATE IRR AND CAPITAL PRODUCTIVITY

Indexed to U.S. = 100



Source: McKinsey analysis

70 percent. Average production returns display a similar pattern, and this corresponds in turn closely to the lower aggregate IRRs for the same time window.

Exhibit 17 compares the time pattern of the IRR with that of capital productivity. The IRR figures are 10-year IRRs, computed over successively shifting 10-year time windows, starting from 1974 to 1983 and ending in 1984 to 1993. Capital productivity is year-by-year physical capital productivity for the corresponding time period. For easier comparison, both time series are indexed to the U.S.

Germany consistently has a lower financial return than the U.S. At the same time, German capital productivity is always below U.S. levels. This correlation corresponds closely to the correlation between physical productivity and the production rate of return.

The historical pattern for Japan is complicated by the bubble. Japan starts with a lower IRR in the 1974 to 1983 period, corresponding to Japan's low capital productivity relative to the U.S. Later time windows are increasingly characterized by the large bubble effect. The Japanese bubble drives the 10-year IRR significantly above the U.S. level in the windows that include the peak bubble boom years between 1987 and 1989, and destroys the correlation of the 10-year IRR with physical capital productivity during those years. After the bubble burst, the Japanese IRR returns to levels roughly corresponding to its capital productivity. It is important to note that the average return for the 1974 to 1993 period was lower in Japan than in the U.S., which corresponds to the lower average physical capital productivity throughout the 1974 to 1993 period. Thus, once we take averages covering not only the bubble boom but also major parts of the "burst" of the bubble, we observe a close correlation between financial and physical performance also in Japan.

Future expectations

As we mention above, expectations about future income flows could potentially affect international return differences. Our measure of the aggregate internal rate of return is dependent on these expectations because it includes *appreciation of equity* as the largest component of payouts to capital owners. As shown in the appendix, capital gains in the stock market and among companies not publicly traded account for more than half of the payouts on average over the 1970 to 1993 period.

Appreciation and the physical production process are related to each other only in the long run and only to the extent that anticipated earnings actually materialize. For Japan, this is clearly visible in the bubble. To a lesser extent, this also characterizes the U.S. time series. The period before 1975 was dominated by high inflation and low profit expectations and is considered a period when the stock market was "undershooting" actual profits, while the early 1990s featured a booming stock market, possibly "overshooting" in anticipation of tax cuts and lower U.S. budget deficits.

Expectations pertaining to gains or losses after our time window that ended in 1993 are the weakest point in our IRR analysis. As we have stressed before, this is most relevant for Japan.

Investment in other capital

The link between average capital productivity and the production return may be weakened if there are important factors of production other than capital and labor whose returns are not correctly captured in the division of income between capital and labor. Such factors are, for example, human capital as well as research and development (R&D). As we argued in Chapter 1: Objectives and Approach, we do not believe that consideration of these factors weakens this link.

This does not imply that human capital and R&D are not important. It only means that their contribution to production at an aggregate level as well as their share in national income is well captured by the production contributions and income shares of labor and capital. While differences in human capital and R&D affect the rates of return to capital, we capture them as causal factors through their impact on labor and capital productivity.

Cost of financial intermediation

Rates of return may differ across countries because the financial systems have different costs associated with the financial system. As a first order effect, the transaction costs of the entire financial system lower the rate of wealth creation as resources are devoted to intermediation and the maintenance of securities markets rather than being invested in business. Intermediation costs also drive a wedge between lending and borrowing rates, raising interest rates for a borrower and lowering rates of return for the lender. Since households are fairly interest-inelastic, they are likely to carry most of the intermediation costs. Since we measure the IRR at the boundary of the business (i.e., as payouts from business relative to inflows received by business) rather than at the door of the household (i.e., capital income received and consumption given up by households), it is unlikely that differential costs of financial intermediation affect our IRR measures.

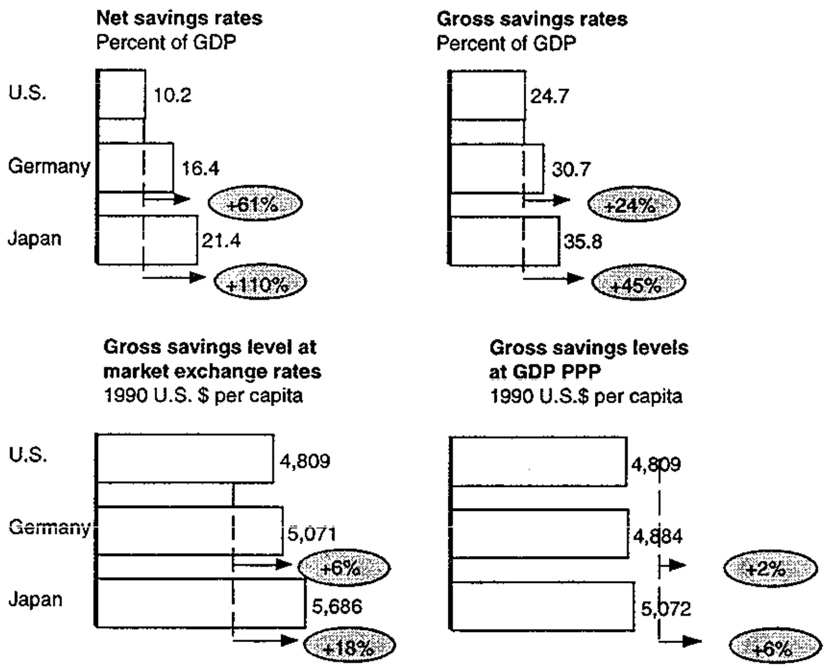
Differences in the cost of intermediation, although not reflected in our IRR, will obviously affect returns to savers. Unfortunately, data limitations make the calculation of this figure impossible.

Taxes, exchange rates and risk

As mentioned before, our measure of the aggregate internal rate of return is after corporate, but before personal taxes. Therefore, it does not include the effects of different capital income taxation, and it is based on inflows and payouts valued

Exhibit 18

DOMESTIC SAVINGS RATES AND INVESTMENT LEVELS 1974-93 AVERAGE



Source: McKinsey analysis

in domestic currency. Statutory taxes on capital income are higher in Germany and in Japan than in the U.S. However, exemptions and exclusions can also be higher in these two countries, depending on the specific circumstances. The computation of an internationally consistent effective tax rate for average investors in each of the three countries is not within the scope of this project. Because effective tax rates are much closer to each other than the highest marginal income tax rates,[2] we do not believe that different tax rates explain the differences in the IRR.

Exchange rates have not only fluctuated, but the German mark and even more so the Japanese yen have appreciated substantially against the dollar in the period from 1974 through 1993. The annualized rate of appreciation of the mark was 2.4 percent, and of the yen 5.0 percent. If a German or Japanese investor had invested in the U.S., the higher rates of return would have been more than offset by currency losses. However, most investment in each of the three countries was actually financed by domestic savings for which our IRR measure applies.

Finally, our IRR measure is not risk adjusted. Different rates of return may reflect higher endemic risk in one country than in another country.

THE AGGREGATE IRR AND THE U.S. SAVINGS/WEALTH PARADOX

Higher financial returns, largely driven by higher capital productivity, are the key in solving the U.S. savings and wealth paradox – the apparent contradiction between low savings rates and high new wealth creation in the U.S. (Exhibit 1). First, U.S. savings invested in the business sector have actually not been as dramatically low (relative to the other two countries) as popular wisdom suggests, once savings are measured on a per capita basis and evaluated at purchasing power. Second, and more importantly, higher capital productivity in the U.S. created higher financial returns to investments, thereby more than offsetting lower savings in the U.S.

Domestic savings rates and investment levels

Commonly published net domestic savings rates feature the well-known very large differences among Germany, Japan and the U.S. (**Exhibit 18**). Germany's *net* domestic savings rate has been more than 60 percent higher than that of the U.S., and Japan's more than double during the 1974 to 1993 time period. More recently, differences were even higher. Net savings rates are frequently quoted because they relate to the growth of an economy. However, for our purposes, it is more appropriate to look at gross rather than at net, and at levels rather than at rates.

---

2 The highest marginal income rates in 1993 were 54.8 percent in Germany, 65 percent in Japan, and 46.2 percent in the U.S.

Exhibit 19

SOURCES AND USES OF GROSS SAVINGS*

Percent

Sources

	U.S.	Germany	Japan
Households**	53.9	63.0	38.9
+ Businesses	59.4	33.3	38.7
+ Government	-13.3	3.7	22.4

= Gross domestic saving**

Uses

	U.S.	Germany	Japan
Household tangible assets**	44.4	36.3	19.9
+ Government GFCF***	7.7	7.1	15.1
+ Net international outflows	-4.3	5.5	6.8
+ Business GFCF	52.2	51.1	58.2

* Shares as average percentages 1990-93

** Includes household durables

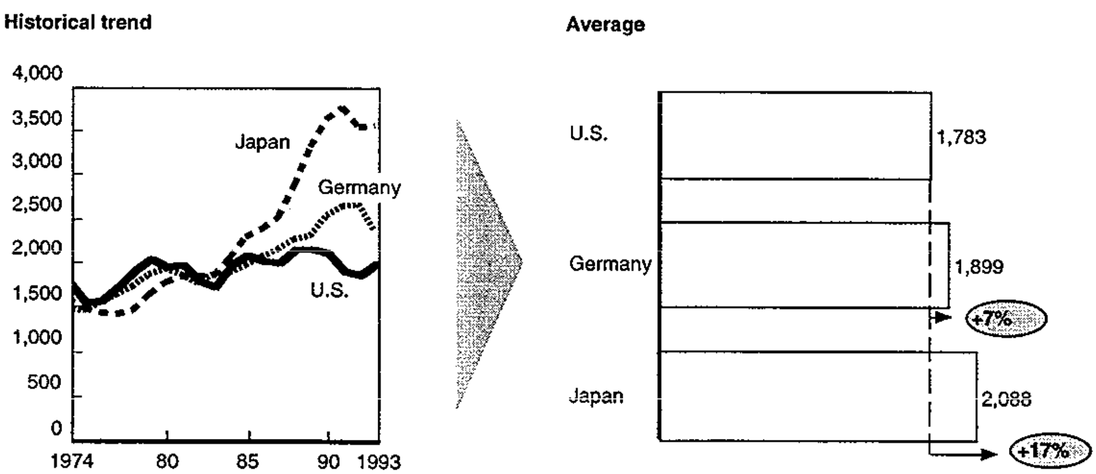
*** Gross fixed capital formation

Source: OECD National Accounts; McKinsey analysis

Exhibit 20

MARKET SECTOR GROSS BUSINESS INVESTMENT LEVELS 1974-93

1990 U.S.$ per capita*



* Converted using 1993 market sector nonresidential buildings PPPs and general machinery PPP

Source: O'Mahony; OECD; McKinsey analysis

Gross saving relates to gross investment, consisting of net additions *and* replacements. Both kinds of capital, not only capital added by net investment, create capital income which is used to maintain and increase current levels of wealth. Therefore, all new capital (gross investment) enters the computation of the rate of return on capital. The rate of return on new capital is then, in turn, related to new wealth creation, which is at the heart of the U.S. savings/wealth paradox. Because we want to link savings and investment to *per capita* wealth creation (Exhibit 1) and the standard of living, we use per capita levels of savings and investment rather than savings and investment rates.

Gross domestic savings rates in Germany and Japan have still been higher than in the U.S., but the differences have been smaller than for net savings rates. Because GDP per capita has been higher in the U.S., and because the purchasing power of savings differs across the three countries, savings *levels* have even been less different than savings *rates*. Converted at historical exchange rates, gross saving levels in Germany were 6 percent higher than in the U.S., and in Japan, 18 percent higher. Once converted at purchasing power parities to assess how much goods and services the savings can actually purchase, gross savings per capita has been 6 percent higher in Japan compared to the U.S., and 2 percent higher in Germany.

Gross savings originate in the household and business sectors. In Japan, the government also contributes to gross savings, while the government absorbs savings in the U.S. The largest share of the uses of these savings is business gross fixed capital formation, which enters the production process in the business sector (**Exhibit 19**). The remaining savings are channeled to various types of gross-fixed capital formation, such as government roads, buildings and bridges, household residential buildings and consumer durables.

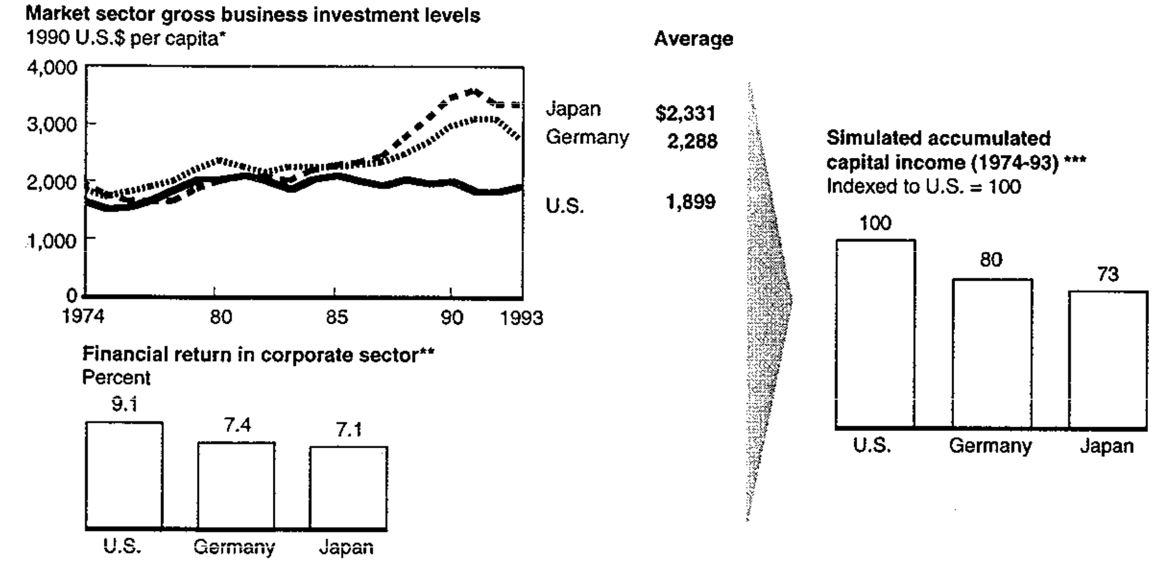
Exhibit 20 shows the resulting gross business investment levels for the market sector, now converted at the 1993 gross fixed capital formation PPPs in order to assess how much structures and equipment have been purchased. Over the entire 1974 to 1993 period, Germany has invested some 7 percent more in business per capita than the U.S., and Japan about 17 percent more. Part of this investment was used to replace worn capital, the remainder contributed to capital stock growth (see **Box** on "Net investment and depreciation"). More recently, German and Japanese per capita investment levels have been higher than this long-run average, due to unification in Germany and the bubble in Japan.

Aggregate IRR and accumulated capital income

The first part of the solution of the U.S. savings and wealth paradox – that business investment levels have been less different than saving rates might suggest – does not fully resolve the paradox. The second, and most important, part is the translation of these investments into wealth through the rate of return. In order to understand what is behind the higher creation of new wealth, we simulated the accumulation of capital income based on historical investment

Exhibit 21

ACCUMULATED CAPITAL INCOME IN THE MARKET SECTOR 1974-93



* At GDP PPP

** Calculated as the real internal rate of return to all investments (debt and equity) in the corporate sector over the time period from 1974-93. The measure includes both income and appreciation returns and is post corporate tax and preindividual income tax

*** This represents a simulation that compounds and sums annual investment levels at each country's financial return until 1993. This capital income has been partly consumed and partly reinvested

Source: O'Mahony; Bureau of Economic Analysis; Statistisches Bundesamt; Economic Planning Agency; OECD; McKinsey analysis

data and our estimated rates of return. Our result is depicted in **Exhibit 21**: the investment levels.

Per capita gross business investment in the market sector, converted at GDP PPP[3], 1974 to 1993 averaged $1,899 in the U.S., $2,331 in Japan, and $2,288 in Germany. (Investments levels in the three countries were almost the same through 1985 and diverged more recently.) We compounded the historical investment levels by each country's IRR to compute accumulated capital income. In spite of the higher average investment in Germany and Japan, our simulation yields an accumulated capital income in Germany that is only 80 percent of the U.S. level by the year 1993. In Japan, accumulated capital income is 73 percent of the U.S. accumulation.

The differences are close to the creation of new wealth depicted in Exhibit 1. In Germany, new wealth creation between 1974 and 1993 was 83 percent of U.S. levels, in Japan 79 percent.

Our simulation cannot fully account for the new wealth creation depicted in Exhibit 1. Available data do not permit us to make a tight connection between capital income and new wealth creation. Accumulated capital income is only partially reinvested in domestic businesses. Other parts of capital income were used for consumption or investment in other than domestic businesses (e.g., tangible household wealth, foreign businesses or government). This "leakage" reduces the amount of new wealth creation in the business sector.

SUMMARY

Over the 1974 to 1993 period, U.S. financial performance was significantly higher than in Germany, and on average higher than in Japan. The international differences in financial performance closely mirror international differences in physical capital productivity. Our findings are significant and stable for the U.S.-German comparison, while the high income share to capital in the early 1970s and the Japanese bubble at the end of the 1980s make the U.S.-Japan comparison subject to higher variance. However, in all time periods that we think are meaningfully comparable, the U.S. has a higher rate of return than Japan.

Our results suggest that the higher capital productivity in the U.S. is the most important cause of the higher financial performance of the U.S. during the recent decades. On the macroeconomic level, higher financial performance has permitted the U.S. to save and invest less, and still generate more capital income than Germany and Japan.

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[3] We use GDP PPP here rather than investment related PPPs as in Exhibit 20 because we want to compare total investor purchasing power foregone for investment and total purchasing power of capital income generated.

NET INVESTMENT AND DEPRECIATION

Gross investment consists of net investment (growth of the capital stock) and depreciation (replacement of worn capital). Both net and replacement investment generate income to capital as measured by our financial return measures.

In the U.S., a relatively large share of gross investment was used to replace depreciated capital. In contrast to the national accounting figures, we standardized depreciation to be internationally comparable according to the description in Box 3 ("Market Capital Services") of Chapter 2: Aggregate Capital Productivity. **Exhibit 22** shows the relatively high level of standardized depreciation in the U.S. and Germany, with Japan only recently approaching similar levels, reflecting the fact that plants and equipment were installed more recently than in the U.S., and that Germany has a substantially higher proportion of structures relative to equipment than the other two countries.

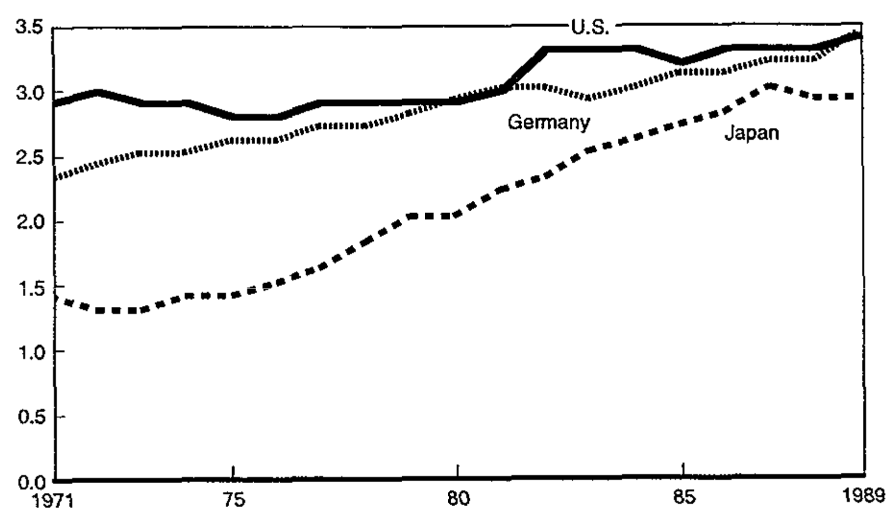
Net additions to the capital stock result from what is left of gross business investment after depreciated capital has been replaced. Due to the differences in depreciation, differences in net business investment between the U.S. and the other two countries have been larger than the differences in gross business investment.

This ranking has remained more or less the same since 1970. Until the mid-1980s, businesses in the three countries installed approximately the same amount of gross fixed capital per capita. After this point in time, however, both Germany and especially Japan increased their investment levels, while the U.S. did not. The increase was particularly dramatic in Japan, reflecting the high expectations during the bubble period, and significant in Germany, reflecting the post-reunification boom in West Germany. Most recently, both German and Japanese net business investments have returned to lower levels, much closer to U.S. levels, which have experienced a slight upturn.

Exhibit 22

DEPRECIATION* RELATIVE TO CAPITAL STOCK IN THE PRIVATE SECTOR

Percent



* Sudden death depreciation

Source: O'Mahony; System of National Accounts (OECD); U.S. National Income and Product Accounts; Japan National Accounts; Statistisches Bundesamt; Deutsche Bundesbank

Appendix: financial performance

This appendix describes in more detail the construction of our measures of financial performance and the underlying data, and it reports on the extensive sensitivity tests that we performed to strengthen our confidence in the aggregate IRR estimates.

MEASURES OF FINANCIAL PERFORMANCE

We used two measures of financial performance: the production return, a static measure, and the aggregate internal rate of return, a dynamic measure.

Definition of the production return

The production return to capital is the share of national income that goes to capital divided by the capital stock. It is directly derived from our measure of physical capital productivity. The link from average capital productivity to the production return to capital (continued also to our dynamic measure of financial performance) was shown in Exhibit 1 (see also Box 6 on "Productivity Measures" in the Objectives and Approach chapter). We first multiply average capital productivity by the price ratio of output to capital goods.[1] This transforms physical capital productivity, where both numerator and denominator are measured in physical units, into expenditure-based capital productivity, where numerator and denominator are now measured in local currency units. Multiplying this measure by the net share of national income that goes to capital yields the production return to capital. "Net share" refers to the share of capital's income net of depreciation and net of corporate taxes, but before personal taxes on capital income have been taken out.

The production return to capital is a static measure since it relates one year's capital income to that year's capital stock, and capital income consists only of dividends and interest. The measure misses income generated by appreciation, which captures expected future income from current capital.

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1 In order to arrive at a percentage return measure, we use stock rather than service-based capital productivity.

Box A1

DEFINITION OF THE AGGREGATE IRR

To understand the IRR concept, it is helpful to first derive a 1-year IRR from the conventional rate of return. We then extend this definition to periods longer than 1 year.

If the time window is only 1 year, the IRR relates the payouts to the investor at the end of the year to the amount invested into the business at the beginning of the year:

$$\text{IRR} = \frac{\text{capital income}}{\text{initial investment}} \quad \text{or} \quad 1+\text{IRR} = \frac{\text{capital income + repayment of principal}}{\text{initial investment}}$$

The initial investment (denoted below as I_0) includes debt and equity. Payouts at the end of the year include capital income (denoted as P_t in year t) and the repayment of the principal (denoted as R_1). Capital income consists of interest, dividends and the appreciation of equity. Because appreciation of equity is counted as a payout, repayment of principal equals the book value of assets still in place which in turn equals the nominal amount of debt and equity that was initially invested in business (R_1=I_0). With this notation, the above equations can also be written as:

$$I_0 = 1/(1+\text{IRR}) *(P_1+R_1) \qquad \text{where } R_1=I_0$$

Inflows and payouts are depicted graphically in Exhibit A1. Negative numbers denote investments and positive numbers denote payouts.

Because of volatile appreciation, the 1-year measure has the disadvantage of varying substantially, making international comparisons difficult. We, therefore, generalize the measure to longer time windows consisting of several years.

In a time window of 2 years, additional funds may be invested into business at the beginning of the second year (new issue of debt and equity, equal to the net lending of the business sector, denoted by I_1); there will be two flows of capital income, P_1 and P_2; and repayment includes the initial stock as well as any net additions to debt and equity at the beginning of the second year.

The 2-year rate of return now computes as the solution of:

$$I_0 = 1/(1+\text{IRR}) *(P_1-I_1) + 1/(1+\text{IRR})^2 *(P_2+R_2) \qquad \text{where } R_2=I_0+I_1$$

This equation can be generalized for a time window of T years. The multiyear internal rate of return is then determined by:

$$I_0 = \sum_{t=1}^{T-1} 1/(1+r)^t *(P_t-I_t) \ + \ 1/(1+r)^T *(P_T+R_T) \qquad \text{where } R_T = \sum_{t=0}^{T-1} I_t$$

Exhibit A1 shows the corresponding inflows and payouts graphically.

Definition of the aggregate IRR

Our second measure of financial performance, the aggregate IRR, relates all payouts to the investor (mainly the household sector) during a given period to the initial investment plus any additional investments during the period. The aggregate IRR is a dynamic measure both because it includes expected income through appreciation and because it spans several years. We call the period under consideration a "time window" to express that this period is only a segment in the long-run growth process of an economy.

Inflows include all investments before and during the time window. At the beginning of the time window, the initial investment consists of all debt and equity of the business sector. During the time window, additional investments occur and materialize as increases in the liabilities of the business sector.

Payouts include capital income (after corporate but before personal taxes) during the time window and repayment of principal at the end of the time window. Capital income consists of interest, dividends and the appreciation of equity. Because appreciation of equity is counted as a payout, repayment of principal equals the book value of assets still in place, which in turn equals the nominal amount of debt and equity that was cumulatively invested in business before and during the time window.

For the IRR computation, we used deflated figures to take out inflation when adding annual payouts and subtracting annual inflows. This annual balance between payouts and inflows is discounted by the internal rate of return. Adding these weighted annual balances over time yields the present discounted value of all business investments before and during the time window. We then calculated the aggregate IRR in standard fashion as the internal rate of return that sets this present discounted value to zero. A formal derivation of the aggregate IRR is presented in **Box A1** ("Definition of the Aggregate IRR") together with a graphic exposition of the inflows and payouts in **Exhibit A1**.

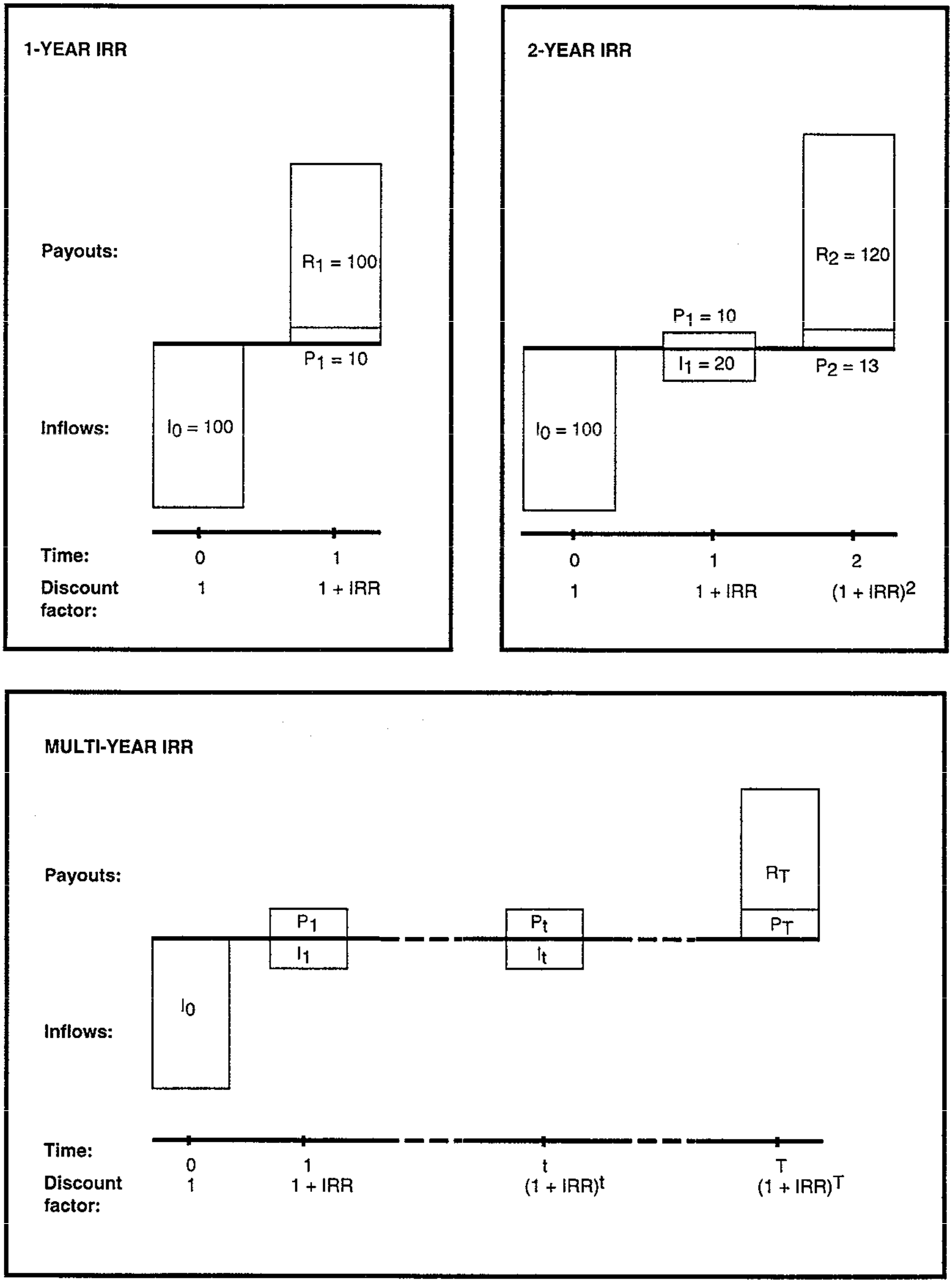
The annual balances implicitly include earnings that are retained. By considering all payouts during the window period (including appreciation), and by including the "residual value" of outstanding principal as a payout at the end of the time window, retained earnings are accounted for in our IRR computation.

We restricted our analysis of the aggregate IRR to the corporate sector because there is no clear distinction between unincorporated businesses and the households owning them, making it impossible to properly identify inflows and payouts. The corporate sector comprises 71 percent of business activity in the U.S., 62 percent in Germany and 73 percent in Japan (**Exhibit A2**).

We defined inflows to business as "net lending" of the business sector in the OECD National Accounts. Net lending refers to the incurrence of liabilities minus the acquisition of financial assets by the corporate sector. New financial assets and new liabilities include new debt as well as new equity. The actual numbers are drawn from national flow of funds data which also provided data

Exhibit A1

DEFINITION OF IRR

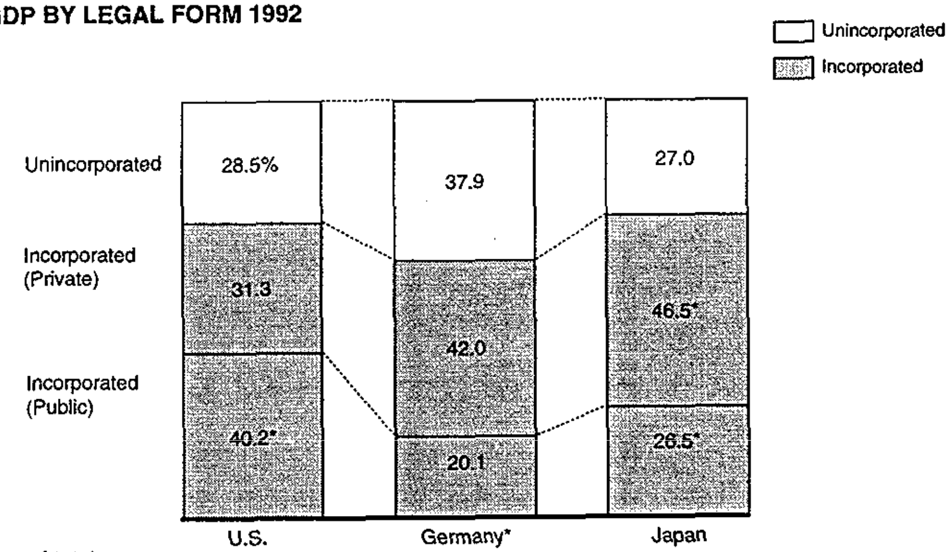


Note: I = Inflows, P = Payouts, R = Repayment of principal

Exhibit A2

MARKET GDP BY LEGAL FORM 1992

Percent



Percent of total corporate sector	U.S.	Germany*	Japan
• Privately held	43.8	67.6	63.7
• Publicly listed	56.2	32.4	36.3

* Percent of sales

Source: OECD National Accounts; Statistisches Bundesamt

Box A2

MEASUREMENT OF INFLOWS AND PAYOUTS

Interest and dividends paid out by the corporate sector are reported in the OECD National Accounts and are internationally comparable (SNA standard, derived from national income and product account data). Annual inflows – the net issue of new debt and equity to incorporated businesses – are reported in the same source (based on national flow of funds data). The inflows are defined as incurrence of liabilities (debt and equity) of the corporate sector minus acquisition of assets (debt and equity) by the corporate sector.

The two items which are harder to measure are the stock of debt and equity, and the payouts in the form of appreciation. There is no source of internationally comparable data on the stock of corporate debt and equity. We, therefore, use the respective national accounts (U.S. – Flow of Funds; Germany – Deutsche Bundesbank; Japan – Economic Planning Agency) for the initial 1970 stock. In order to construct an internally consistent data base, we then add the annual net inflows (i.e., net lending of incorporated enterprises) from the OECD National Accounts to compute the stocks from 1971 to 1993 analogous to the perpetual inventory method. We explore the sensitivity to the choice of initial year, 1970, in this appendix.

Appreciation for public companies is taken from stock market indices (U.S. – Standard and Poor's 500; Germany – DZ-Index of all publicly listed companies; Japan – Index of all Section 1 companies listed on the Tokyo Stock Exchange). However, there are no representative data on the appreciation of private firms. In order to compute the appreciation of *all* incorporated companies, we multiply the dividends of the entire corporate sector with the ratio of appreciation to dividends of public firms. This relies on the assumption that the rate of appreciation and their relation to dividends is the same in the entire corporate sector and does not vary systematically between public and private companies. We explore the sensitivity of our results to this assumption by varying the ratio between private and public appreciation rate.

We investigate the time period between 1970 and 1993. There is no more recent internationally consistent data available, and Japanese flow of funds data are not available before 1970.

All computations are performed in real terms. Although this deviates from standard business practice in computing rates of return, this is necessary to obtain results which are comparable across time and countries. We convert all figures into 1990 dollars by first applying each country's GDP deflator and then the GDP purchasing power parity as reported by the OECD. The IRR computation does not depend on the choice of a currency conversion factor. Conversion of the figures into dollars is done only for easier comparison of the absolute financial flows.

on the initial stock of debt and equity. Details of the data construction are provided in **Box A2** ("Measurement of Inflows and Payouts").

External inflows to the corporate sector are shown in **Exhibit A3**. Per capita net inflows are substantially higher in Germany and Japan as compared to the U.S. Although net inflows fluctuated significantly, they were on average more than three times higher in Germany and more than four times higher in Japan.

Internationally comparable data on interest and dividends paid out by the corporate sector are taken from the OECD National Accounts. Appreciation is harder to measure. For public companies, stock market indices are readily available. However, because there is no representative data on the appreciation of private firms, we multiplied the dividends of the entire corporate sector with the ratio of appreciation to dividends of public firms in order to compute the appreciation of *all* incorporated companies. This computation relies on the assumption that the relationship between the rates of appreciation and dividends is the same in the entire corporate sector and does not vary systematically between public and private companies. Sensitivity analyses are provided below.

The large differences in per capita net inflows are associated with smaller differences in the payouts (**Exhibit A4**). Per capita payouts are more than 40 percent higher in Germany and more than 25 percent higher in Japan as in the U.S. Because equity is a much smaller proportion of funds invested in business in Germany and Japan, the share of payouts in the form of interest is larger in those two countries than in the U.S. Correspondingly, dividends in the U.S. have been larger than interest payouts for essentially the entire time from 1970 to 1993. Payouts are dominated by the widely fluctuating appreciation of equity (**Exhibit A5**). Appreciation was particularly high in Japan during the bubble period, making any financial performance measure including appreciation around the bubble years sensitive to the time period chosen.

SENSITIVITY OF THE AGGREGATE IRR

We performed two kinds of sensitivity analyses of the aggregate IRR. We applied several variations of the definition of inflows and payouts, and we investigated the impact of different choices of the window period.

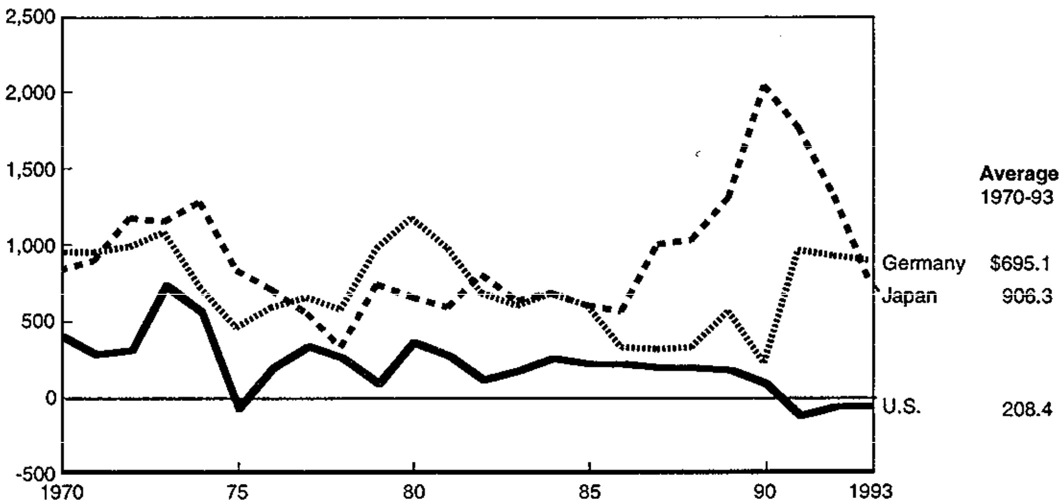
Appreciation of private enterprises

The numbers reported in the aggregate IRR were computed by extrapolating the appreciation of public companies to the corporations not traded on the stock market. It is not obvious whether the equity of private companies actually has a higher or a lower rate of appreciation than that of public companies. It may be lower because private companies do not feel the pressures of stock market performance like traded corporations. It may be higher because private firms are performing so well that they do not need to go public to raise funds.

Exhibit A3

INFLOWS PER CAPITA*

1990 U.S.$



* At GDP PPP

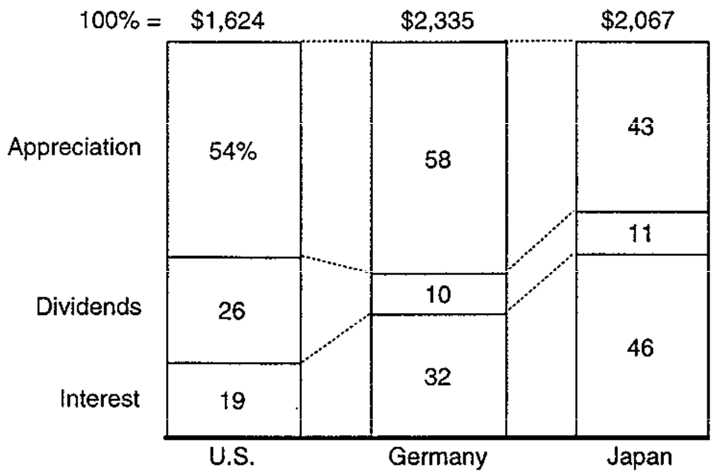
Note: Negative inflows represent stock buybacks

Source: McKinsey analysis

Exhibit A4

LONG-RUN AVERAGE PAYOUT COMPOSITION 1970-93

1990 U.S.$ per capita, percent



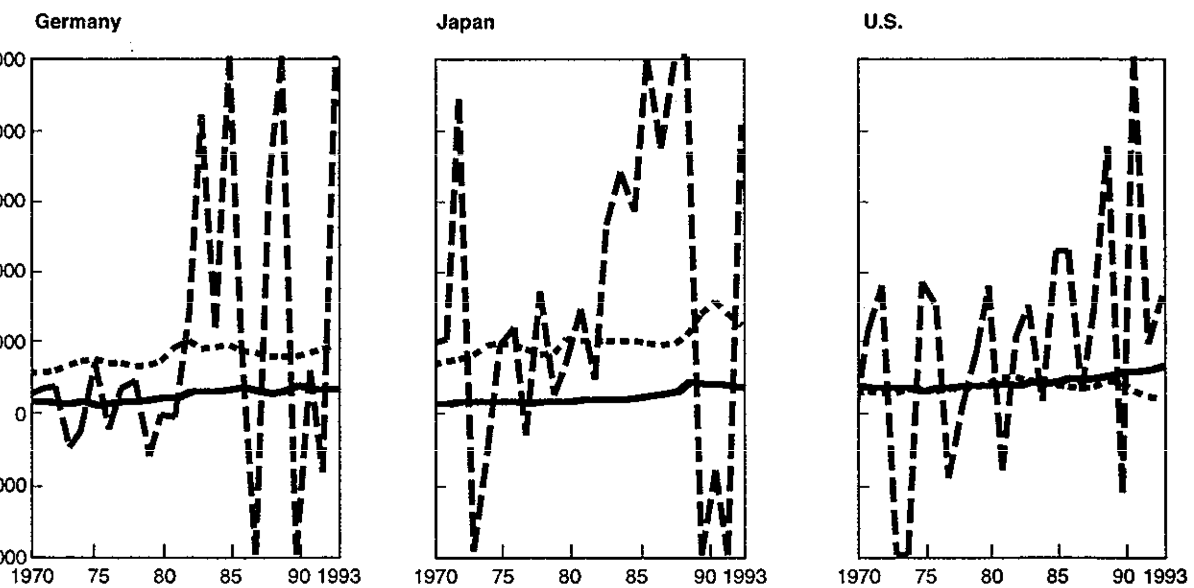
Source: McKinsey analysis

Exhibit A5

DIVIDENDS, APPRECIATION, INTEREST PER CAPITA

1990 U.S.$

Dividends
Appreciation
Interest



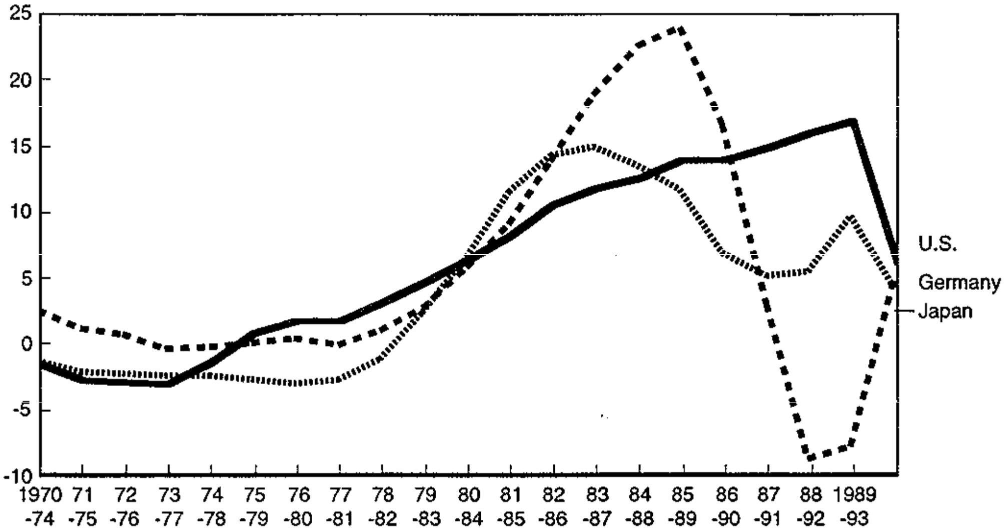
* At GDP PPP

Source: OECD National Accounts (financial accounts); McKinsey analysis

Exhibit A6

AGGREGATE INTERNAL RATE OF RETURN

5-year windows, percent

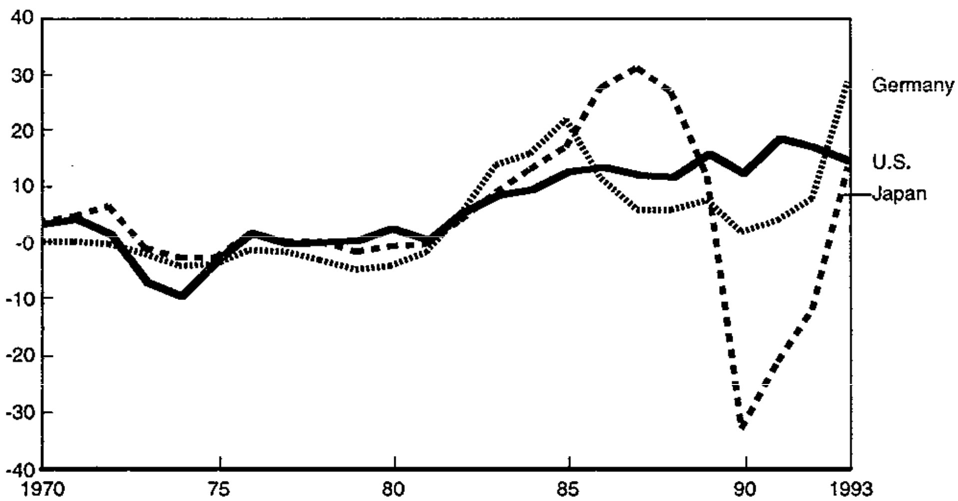


Source: McKinsey analysis

Exhibit A7

AGGREGATE INTERNAL RATE OF RETURN

1-year windows, percent



Source: McKinsey analysis

If private firms performed worse than public firms, the IRR difference would become larger. This is because the share of private firms is substantially larger in Germany (67.6 percent) and Japan (63.7 percent) compared to the U.S. (43.8 percent) as we saw in Exhibit A2. Lowering the appreciation of private companies, therefore, reduces the average appreciation more in Germany and Japan than in the U.S.

If private firms performed better than public firms, the IRR results could qualitatively change. However, private firms would have to perform much better than public firms to offset the IRR differences between Germany and Japan on one side and the U.S. on the other side. To equalize the IRRs, private firms would have to appreciate more than two times as fast as public firms. This appears rather unlikely.

Dividends in Japan

The German and U.S. IRR computations yield approximately the same results whether we used "dividends received by the household sector" or "dividends paid out by corporations" (as reported in the OECD National Accounts). This is not the case for the Japanese IRR. Dividends paid out by corporations are extremely small, partially due to the fact that dividends are distributed via financial corporations in Japan. We used "dividends received by the household sector" in our IRR computation. Therefore, we have most likely overestimated the Japanese IRR because some of these dividends were generated outside the nonfinancial business sector.

Window length and time

The general time pattern of the IRR, depicted in Exhibit 10 using successively shifting 10-year time windows, does not depend on this specific choice. To see this we computed finer 5-year windows as well as the conventional 1-year rate of return, computed according to the equations in Box A1 **(Exhibits A6 and A7)**. The exhibits show the bubble in Japan, the secular rise in stock market performance in the U.S., and the German stock market boom around 1985 and another spike in 1993 more clearly than the smoothed results in Exhibit 10. However, it shows the same secular trend as depicted in the 10-year windows. Most notably, the period before 1982 had rather low returns, while the last decade had high returns in all three countries.

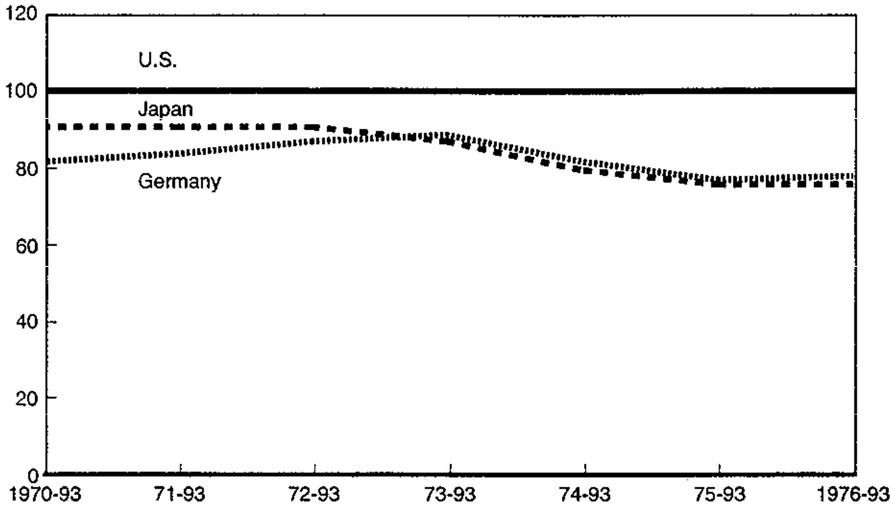
Beginning of window period

In the early 1970s, the financial systems of all three countries were not as well developed as they are now, particularly so in Japan. This showed up in the very high capital share in Japan (see Exhibit 7). **Exhibit A8** demonstrates that the early 1970s show a distinctly different pattern of the Japanese IRR than after

Exhibit A8

AGGREGATE IRR-SENSITIVITY TO BEGINNING OF PERIOD

Indexed to U.S. = 100

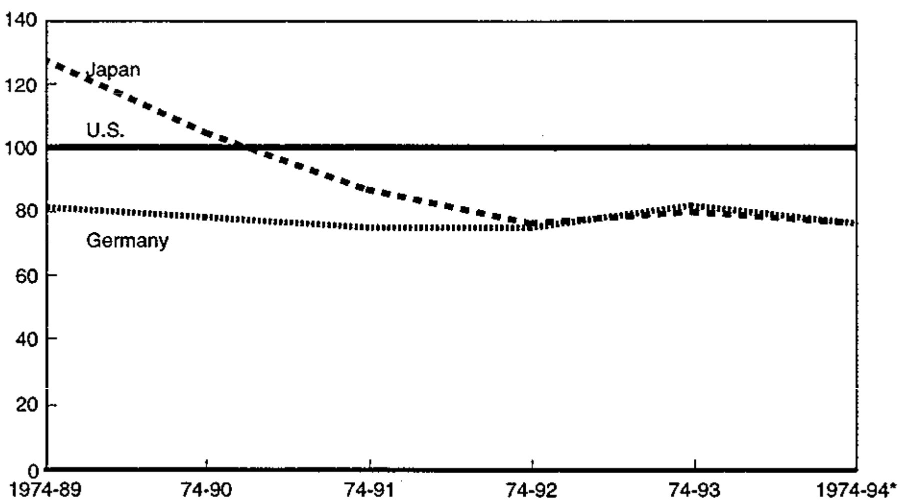


Source: McKinsey analysis

Exhibit A9

AGGREGATE IRR-SENSITIVITY TO END OF PERIOD

Indexed to U.S. = 100



* Estimated

Source: McKinsey analysis

1973. Most importantly, Exhibit A8 shows that our 20-year time period from 1974 to 1993 is a middle estimate representative for the general pattern after 1973.

End of window period

The Japanese IRR also depends on the extent to which the Japanese "bubble" boom and burst are captured at the end of the time window. When the boom is included, but the burst excluded, the Japanese IRR exceeds the IRR in the U.S. Once we include 2 or more years after the bubble burst in 1989, the U.S. IRR is higher **(Exhibit A9)**. This exhibit shows that our choice of 1993 as an ending year yields the same result as one year earlier or 1 year later.

Data for 1995 is not yet available. We, therefore, cannot estimate a more recent IRR. However, the difference in the stock market performance between the U.S. and the other two countries has accelerated after 1994, such that the IRR differences are likely to be larger when 1995 is included in our IRR computation **(Exhibit A10)**.

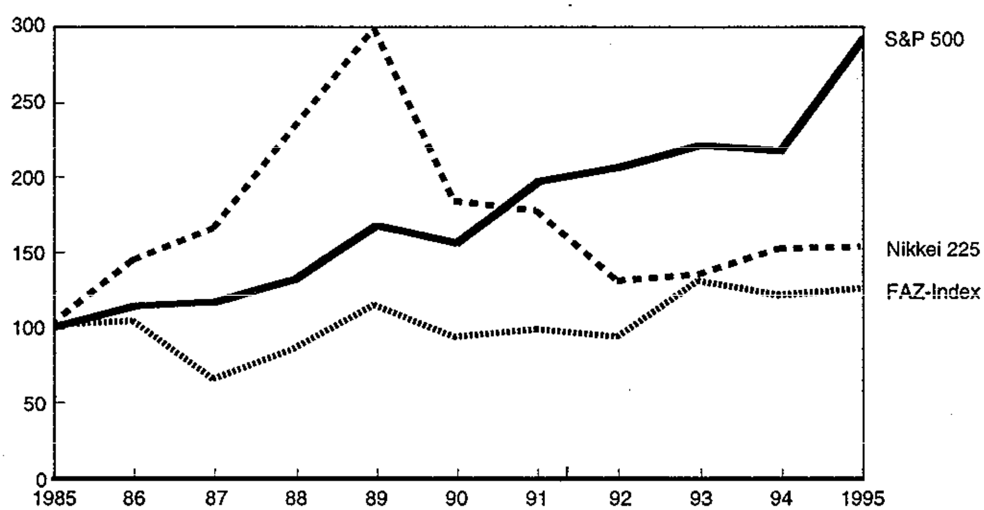
Shift of window period

When we hold the length of the window constant at 20 years and move the window through time, the effects of the Japanese high returns in the early 1970s and the Japanese bubble in the late 1980s compound **(Exhibit A11)**. However, shifting our preferred window period 1 year forward or 1 year backward yields very similar results.

Exhibit A10

STOCK MARKET PERFORMANCE 1985-95

Standardized to 1985 = 100

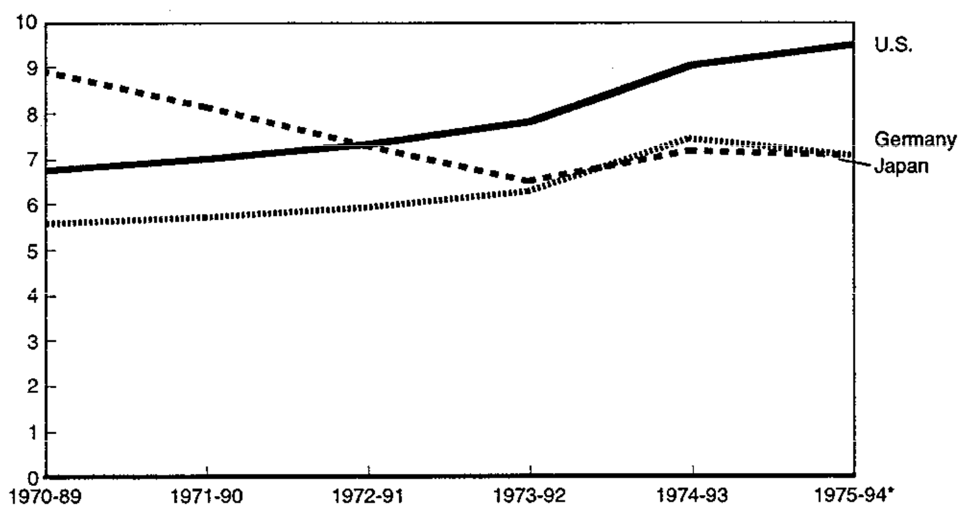


Source: McKinsey analysis

Exhibit A11

AGGREGATE IRR-SENSITIVITY TO SHIFT IN WINDOW PERIOD

20-year windows, percent



* Estimate

Source: McKinsey analysis

Chapter 6: Implications

As we have shown, capital productivity is important as a means to increase national income and living standards and to raise financial returns both of individual companies and of the aggregate corporate sector. This chapter summarizes the opportunities for firms, investors and policymakers to improve capital productivity.

The aggregate and case study results all demonstrate that the variation in productivity performance is wide between the U.S., Germany, and Japan, and also as most cases show, within each country. As discussed in the synthesis, managers in less productive firms could on their own raise productivity because in most cases external constraints are not preventing improvement action. At the same time, however, policymakers do influence the environment in which managers pursue their goals, and therefore can have important indirect and, in some cases, direct effects on productivity improvement in their nation. Most importantly, if the market environment is allowed to put more pressure on managers, they are more likely to act. Even the U.S., despite higher productivity levels, is not at its peak performance potential, especially given the wide variance of performance across companies.

IMPLICATIONS FOR FIRMS AND INVESTORS

Our case study results show that most of the productivity differences between the three countries we studied can be explained by controllable decisions at the firm level. In none of our cases did formal external constraints such as laws and standards simply prevent any improvement by managers. Of course, we do recognize that such improvement cannot happen overnight in many cases. In some instances, managers will have to fundamentally change their traditional practices and relationships with workers, suppliers or customers. Furthermore, because capital is long-lived, improvements involving changing the type or amount of capital used will take time.

The existence of wide productivity differences which managers can influence presents firms and their investors with both large opportunities and threats – opportunities because less productive firms have substantial room to improve and high productivity firms have an advantage that they can use to grow, and threats because low productivity firms are at risk of becoming the competitive victims of other firms if they themselves do not improve. Firms should respond by taking the following actions:

¶ *Establish clear performance goals.* As a starting point, owners and managers need to have clear goals for their firm. These should be measurable and manageable. We found examples where no clear goal or too many competing goals led to failure on many dimensions. This was most evident among Japanese retailers and in telecom in Germany. If financial return is among a firm's goals, then clearly managers should care about capital productivity. As discussed in the synthesis and the financial return sections, we observe a significant link at the company, industry and aggregate level between capital productivity and financial performance. We recognize that in monopoly and oligopoly situations there are instances where operational productivity and profits may be at odds, but even in these situations managers can generally improve profitability by using their capital resources more productively.

Simply monitoring relative financial success is often not sufficient. In the short run, financial success may be achieved despite lower productivity due to market distortions and barriers to competition or due to cyclical fluctuations. The best examples are the U.S. auto industry in the mid-1980s and the German auto industry in the late 1980s and early 1990s, when companies made profits with the help of trade barriers and demand booms. At some point an up-cycle must come to an end and, eventually, many market barriers will also come down as global competition increases. Our cases have demonstrated examples of firms being caught off-guard by competitive threats or deregulation. This happened in the U.S. auto industry in the 1980s and is now happening in German telecom. Although moves toward higher productivity tend to occur faster under such circumstances, crisis is obviously not desirable to firms.

In order to better understand where firms stand and how much opportunity they have, firms need to watch operational performance indicators (ideally, productivity itself) as well as financial ones. To be complete, financial performance measures should account for capital employed to generate output. Watching sales or profits alone is not sufficient; return on capital or economic profit (which subtracts the cost of capital) should be monitored. At the operational level, firms should seek to benchmark themselves against world – not just local – best practice in their industry. Then they will know their relative position when competition with best practice takes place in earnest either through trade or in the local market if an existing competitor or new entrant adopts best practice. If this comparison reveals a serious disadvantage, firms can start improving sooner rather than later. If it reveals a lead, then opportunities abound to leverage that advantage.

¶ *Pursue global opportunities*. Once firms know where they stand, they should pursue various global opportunities. For productivity leaders this means exploiting their advantage, for followers it means learning from global best.

- *Exploiting an advantage*. Best practice firms from the most productive national industries can better leverage their existing advantage. A productivity lead should translate into a trade advantage (if the product is tradable, of course). In addition to trade, and especially if trade barriers are high, the best firms have an opportunity to transplant their high productivity systems to countries with lower average productivity. Options for entry include greenfield investment, outright acquisition of a local firm, or a joint venture. The best examples of both trade and transplants are in auto, the most global industry we studied, where Japanese producers first increased exports and now focus more on transplant production in the U.S. and Europe.

  The barriers to exploiting a productivity advantage in these ways are falling. While tastes across countries are not uniform, there are numerous examples in auto, food and retail of companies successfully adapting their products to foreign consumers. Furthermore, our causality analysis revealed that neither local labor skills nor local availability of technology were differentiating factors which would prevent establishing productive firms in any of these countries. Thus, the main limits to either foreign direct investment or trade are national regulations in the receiving country. Yet, in many cases these barriers are already surmountable, and in other cases they are coming down.

- *Learning from best practice*. Productivity followers should make more attempts to learn from global best practice. Fortunately, as described above, local factors such as demand preferences and labor skills are not major barriers to importing best practice. The most prominent example of this is how in the auto industry, Japanese transplants, Ford and now Chrysler have successfully adapted many features of the lean production system to the U.S. The American auto firms have learned much from their plant joint ventures with a number of the Japanese producers. A considerable amount can be learned even by outsiders if they make a concerted effort to look closely at publicly available information. For example, the demand stimulating effect of lower U.S. prices in both telecom and utilities offers clear lessons to the Japanese and German companies in these industries.

  Not only are there substantial opportunities that should be pursued, but many less productive firms also have little choice. The external market barriers that have isolated them from competitive pressure are often being torn down, and best practice players are taking advantage of this. Among our cases, competitive pressure is most likely to increase in retail and telecom in Japan, and in auto, telecom and food processing in Germany. Change in the capital market may have less immediate impact than that in the product market, but over the long term there is a trend toward greater capital mobility. This will facilitate more cross-border investment by competitors. In addition, as investors become more aware of and are offered more investment alternatives, they are more likely to cut off funding to low performers.

¶ *Improve management.* Given that both the threat and the opportunity to improve productivity exists, our findings indicate which practices will help most. These can be grouped into raising the productivity of existing capital and carefully managing the investment of new capital.

- *Raising productivity of existing capital.* This includes increasing utilization of existing capacity and increasing the value received for output. As discussed in the synthesis chapter, the two categories of general management actions accounting for the most difference across our cases were marketing and operations effectiveness. Improvements on these dimensions often benefit both capital and labor productivity, and so are particularly important. Higher utilization can be achieved through both marketing and operations. Examples of marketing actions include increasing real demand for phone usage in telecom, and better managing product proliferation and freshness in food to minimize changeover downtime. Examples of operations effectiveness include devising faster changeover procedures and better maintenance practices in auto. Increasing value received for output mainly involves marketing actions, such as improving segmentation of customers and tailoring to their needs in retailing, but also can involve operational activities such as defect reduction and quality improvement in auto.

- *Managing investments of new capital* can be grouped into three categories. First, a firm's demand for new capital can be managed down by, for example, identifying and unlocking already existing hidden excess capacity. We saw success on this dimension in the U.S. telecom industry. Reducing the volatility of demand, such as for electricity generation, can also reduce required investments to meet new peak volume. Second, firms should explore lower cost alternatives to the acquisition of new capital. Examples of this include increasing reuse of old equipment, such as in the auto industry by designing new cars to use existing parts and platforms, and outsourcing production or capacity sharing to meet new demand.

  Third, once the basic decision to invest has been made, more attention should be paid to choosing the appropriate structures and equipment to purchase. This means matching capital used more closely to real customer needs and sourcing globally where possible. By focusing on what customers both want and are willing to pay for, firms can avoid excess investment and prevent goldplating in their equipment choice. An example of excessive investment is the program for "bringing fiber to the home" in telecom in Japan. The industry has backed off from this recently, after recognizing that the costly program far exceeded customer needs. Both this and goldplating are symptoms of an engineering-driven rather than a customer-driven approach. These kinds of improvement opportunities were found to be especially important for German firms and in the regulated industries.

Sourcing equipment globally can result in substantial cost savings. We recognize that using local sources has logistical advantages and that there are switching costs to changing suppliers. However, for firms operating in Japan and Germany, strong currencies make more globally focused sourcing particularly attractive now and increasingly necessary. Many firms have recently recognized this, but there is still room for improvement. In the German auto industry, for example, much more attention is being paid to sourcing costs now than just a few years ago.

¶ *Increase investor pressure.* The opportunities to improve apply to managers, owners and investors alike. For owners and investors, our study highlights that persistently low capital productivity has a high cost in terms of returns. While it is tempting to conclude from our comparisons of national rates of return that German and Japanese investors should simply move their money to the U.S., this does not follow from our analysis. We have measured a pretax domestic return to domestic investors only. As discussed in the Capital Productivity and Financial Performance chapter, analysis of exchange rate movements over the last two decades shows that, for Japanese and German investors, the differences in returns would have been more than offset by the strengthening of the yen and the mark relative to the dollar. However, lower returns do indicate lost opportunities within the countries.

There are two ways investors can improve their returns: by moving investments from low to high performing companies or by actively demanding higher performance from existing investments. While these seem obvious, it was surprising in our case studies how often capital providers did neither. Once investors do invest in a company, there are two clear implications for them:

- *Staying informed.* Corporate boards should insist that managers provide clear operational, not just financial, information. Ideally, the operational measures would include benchmarks against global best practice firms. For financial information, investors should press for clearer reporting requirements so they can be sure they are getting the full story. As an example, in conducting our analyses we had great difficulty assessing relative financial performance of companies in our cases due to lack of standardization and lack of transparency, especially in German reporting.

- *Taking action*. When company information reveals serious performance lags, greater pressure should be applied on managers to change their behavior. The ultimate sanction investors have is to remove management. In our cases, we saw multiple examples of corporate governance failing to force real change until or unless a firm's performance had already substantially deteriorated. While we have not proposed a new corporate governance structure, our results do suggest that the different models in the three countries each have weaknesses which need attention from owners and investors.

IMPLICATIONS FOR POLICYMAKERS

Although firms should be able to improve productivity on their own, outside factors are important because they determine the amount of performance pressure on managers to seek higher productivity. Because these external factors are frequently determined or influenced by policymakers, in this section we focus on policies that could be used to increase competition and hence, raise productivity.

We recognize that policymakers and voters may be concerned about possible trade-offs. Policies (especially regulations and standards) can directly affect productivity. Such policies include promoting safety, the environment and aesthetics. These standards, such as ones requiring putting telecom and utilities cable underground in Germany, represent societal trade-offs that each country makes for itself. Changing policies such as trade protection will always have short-term negative consequences for some group; however, the high cost of such policies in terms of productivity should not be underestimated.

External factors are important in setting up a performance dynamic of creative destruction that pressures managers to innovate and improve or else lose profitability. This process is driven by product markets that are vigorously competitive and by capital markets that both establish high financial returns as the performance objective and force the exit of inefficient firms. We found that these dynamics, in turn, are influenced most by factors that policymakers can affect: product market regulations and ownership (especially public versus private ownership).

¶ *Encourage product market competition.* We found that regulations that affect the nature and intensity of competition have an important impact on productivity because they influence managerial decisions. Changing these regulations can help to ensure the high level of competitive intensity that pressures managers to use resources productively.

- *Lower barriers to entry.* High barriers impede the entry and expansion of global best practice companies and reduce performance pressure on incumbents to improve. Many of these barriers can be directly influenced by policy. Specific potential policy actions include the elimination of trade protection (e.g., VRA in automobiles in Europe) and the re-evaluation of zoning regulations to ensure that they do not unnecessarily cause direct and indirect negative effects on productivity. A direct effect of zoning is to distort the allocation of land and hence, the mix of businesses and industries that exist in a given region. For example, zoning directly prevented the entry of new, more productive retailing formats in Japan to protect mom-and-pop stores, lowering industry productivity. In addition, zoning had an indirect effect on retailing productivity in Japan and Germany: it raised land prices, increased start-up costs and thereby limited market entry and hence competition. To the extent that government policies on zoning drive these land prices, policymakers should assess the benefits of zoning laws against these hidden costs.

  Policymakers should encourage foreign direct investment by global best practice companies. Transplants by global best practice firms raise productivity by putting competitive pressure on domestic producers and transferring knowledge of best practice to domestic producers through the natural movement of personnel. This also has a direct impact because adding high productivity transplant production raises average domestic productivity.

- *Abolish oligopolies and limit anticompetitive behavior.* Policymakers should remain vigilant in the enforcement of antitrust laws to prevent tacit collusion to raise prices and restrict competition, all of which lower consumer welfare and productivity (e.g., food processing in Germany). In addition, oligopolies or oligopoly-like arrangements can negatively affect the productivity in up or down-stream industries.

¶ *Incorporate price pressure mechanisms in monopoly regulation.* In monopoly situations, it is especially important to give managers incentives to use resources productively. We found that effective incentives took the form of tight price control in the regulation of both the telecom and utilities industries. Ideally, the regulation should explicitly build in incentives for productivity improvement, as is the case of price cap regulation or prudence reviews. Rate-of-return regulations should be accompanied by tight price controls; otherwise, such regulations may actually create incentives to be wasteful in the use of resources, because investors can earn higher profits by spending more capital. In both cases, benchmarking against other players in the industry on a global basis provides a straightforward way for regulators to establish clear performance guidelines.

¶ *Allow the capital market to exert pressure on managers and to discipline poor performers.* Insofar as policymakers influence the regulations and standards that govern the capital market, they can improve their country's capital productivity by helping managers and investors measure performance better and by allowing the capital markets to cut off funding to poor performers.

- *Change financial accounting regulations to better reveal performance.* Greater transparency in financial reporting will allow investors to more easily observe and measure financial results, recognize sub-par performance earlier, and separate the data of different business units within large conglomerates. At present, for example, German reporting allows profits and losses to be shifted in and out of reserves and provision accounts in a more discretionary way than in the U.S. The potentially dramatic effect of this was illustrated when Daimler-Benz became the first German company to reconcile its German accounts with accounts under U.S. standards. According to its 1994 annual report, a 1993 net income of 615 million DM under German standards translated into a 1.8 billion DM loss under U.S. standards. Reserve accounting and valuation technique accounted for most of the difference.

- *Allow the capital market to force restructuring or exit on poor performers.* Policymakers should recognize that the process of "creative destruction" frees scarce resources for better uses. Therefore, policymakers should resist the temptation to slow this process either through informal pressure or any new laws which hinder the ability of the capital market to cut off funds to sub-par performers and force restructuring or exit.

¶ *Reduce extent of state ownership.* The alignment of goals with productivity is critical in explaining capital productivity differences. These goals are often directly influenced by the ownership of the corporation (e.g., cross-holding and conglomerates in retailing and state ownership in telecom, utilities). Although policymakers can do little to control the lines of business that corporations enter (with the exception of antitrust issues), they can affect the productivity of those that are state-owned through appropriate regulation.

- *Privatize.* Public ownership of corporations almost always generates multiple – and often conflicting – objectives for the managers of these organizations. These conflicting management goals, in conjunction with the lower amount of pressure placed on managers, make low productivity highly likely in state-owned enterprises.

- *Separate regulators from operators.* To the extent that government ownership remains, it is important to separate regulators from operators. This separation is needed because of conflicting objectives: regulators should be concerned with the welfare of customers, whereas operators are concerned with higher profits.