

INTERNATIONAL COMPETITIVENESS
*LABOR PRODUCTIVITY LEADERSHIP AND
CONVERGENCE AMONG 14 OECD COUNTRIES*

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SUMMARY

From 1970 through 1991, the United States led other OECD countries in overall labor productivity, a key measure of national competitiveness. During this period, labor productivity in these countries converged, both towards the mean OECD labor productivity and the U.S. level of labor productivity. This suggests living standards among the OECD countries are becoming more alike. In the latter half of the period, the rate of convergence slowed.

The industrial components of aggregate labor productivity offer insight into the causes of this convergence slowdown. Although most industry groups continued to converge between 1982 and 1991, two key industry groups—(1) Manufacturing and (2) Finance, insurance and real estate and business services—did not. Growth in Japanese labor productivity created the divergence in Finance, insurance and real estate and business services. Strong manufacturing labor productivity growth in United States high-technology industries was a primary cause of the divergence in Manufacturing.

In 1991, the United States was among the labor productivity leaders in almost all manufacturing industries. It was, however, no longer the unequivocal labor productivity leader in these industries. Other countries had overtaken U.S. labor productivity in three of the nine industries and retained the lead in three other industries. Japan, for example, had a dominant lead in Chemicals and chemical petroleum, coal, rubber and plastic products. The United States, however, held a considerable lead in Fabricated metal products, machinery and equipment, which includes most key high-technology manufacturing industries.

The slowdown of OECD labor productivity convergence toward the U.S. level since 1982 is a sign of continued U.S. competitiveness. The results of this analysis of selected OECD countries at the aggregate and industry levels suggest that the pundits of the 1980s were too quick to point to the demise of the U.S. competitiveness. These results show that although the United States' overall labor productivity lead is not as overwhelming as it once was, the United States continues to lead in overall labor productivity and in labor productivity in many important individual industries. This is not to say that there are no reasons to watch U.S. labor productivity measures closely and explore the roots of labor productivity changes. The situation is, however, much more complicated and not necessarily as dire as some analysts suggested during the 1980s.

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International Competitiveness
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INTRODUCTION

After World War II, the United States had a substantial advantage in labor productivity over other industrialized countries. This advantage translated into much higher living standards for the average American citizen than for citizens in any other country. During the 1970s, this sizable lead over other countries began to narrow. Both U.S. output and productivity growth rates slowed. At the same time, growth rates sped up in other countries, particularly in Japan. By the early 1980s, Japan was experiencing robust growth, while the United States was experiencing slower growth and running persistent fiscal and trade deficits. Pundits speculated that the United States was on a downward course that would allow other countries to surpass it. In academic circles, these predictions brought forth considerable research into the extent and possible causes of the relative U.S. decline. One branch of this research took a detailed look at factors that give a nation's firms a competitive advantage in global markets. Another sought more aggregate measures of a nation's competitiveness relative to other countries. The following analysis outlines the main issues of this research and adopts an alternative approach that combines the two previous approaches by exploring the industrial components of the aggregate measures.

Some economists consider the idea of *national* competitiveness a vague, if not a meaningless concept. Ultimately, competitive advantage rests at the industry level. Rather than looking at aggregate measures of national competitiveness, many researchers examine firms and industries to determine what gives certain countries advantages in certain industries and what policies government can pursue or change to give their domestic industries a competitive edge.

Much of this research emphasizes manufacturing industries, in part because manufacturing output is more often traded in international markets than services output.¹ Manufacturing firms are more likely to be in direct competition with foreign firms—vying to develop the same technology, using similar processes, and selling to the same customers. Data for manufacturing industries are also more comprehensive and of better quality than data on other sectors of the economy, particularly services. Furthermore, many industries that fall into the services category have been, or are, heavily regulated (for example, health care, communications, and utilities). Additionally, the United States has recently deregulated or partially deregulated services such as airline transportation and communications. Some countries have also deregulated, but many have not. Thus, comparisons across countries have an even greater degree of ambiguity.

¹ The classic example is the inability to export haircuts. However, many services—such as financial services, computer services—are increasingly traded internationally. Despite large and growing surpluses in the nation's services account, service industries generated about the same share (roughly 23 percent) of overall U.S. trade activity in 1994 as they did in 1987. See U.S. Department of Commerce, *Service Industries And Economic Performance*, March, 1996, 26-27.

Relating analysis of specific industries back to the concept of overall national competitiveness is not necessarily straightforward. Some researchers have sought approaches aimed at more aggregate comparisons of the competitive performance of different economies. The first step in this process is to arrive at a definition of what competitiveness in this context means. Although definitions vary, the general consensus is that a competitive nation is one that succeeds in international trade via high-technology and productivity, with accompanying high income and high wages (Dollar and Wolff, 1993).

An often cited measure of these elements is a country's trade balance, the difference between a country's imports and exports. Trade balances are, however, heavily influenced by macroeconomic factors, such as changes in the exchange rate and business cycles. A depreciation of the dollar can improve the U.S. trade balance by making U.S. exports less expensive in foreign markets and making imports more expensive in U.S. markets. The cost of this policy, however, is to lower U.S. living standards by reducing the value of U.S. work in terms of foreign goods. Similarly, a recession in the United States would improve the trade balance, but only by reducing the incomes (and thus living standards) in the United States (Dertouzos, Lester, and Solow, 1989).

Achieving a rising standard of living depends on maintaining an increasing level of productivity. Observers who have compared labor productivity across countries in recent decades have been especially interested in labor productivity convergence.² Convergence theory suggests that over time the economies of the world will become more alike in terms of productivity and living standards. Since the United States has been, and continues to be, the productivity leader, convergence theory suggests that U.S. labor productivity must decrease relative to that in other countries by either a slowdown of U.S. growth or relatively faster growth in other countries.

Empirical evidence of *all* economies converging is mixed. Early research found little evidence of convergence. More recent studies find evidence of convergence across all economies when analysts control for factors such as investment, trade orientation, and education (Dollar and Wolff, 1993). Although the evidence of convergence across all economies is mixed, there is evidence that labor productivity levels of a group of *industrialized* economies are converging.³

Researchers are, of course, not limited to looking at either industry or aggregate measures of national competitiveness. Most combine the two approaches to some extent. One

² See Abramovitz (1986) and Baumol (1986) for early analyses of productivity convergence.

³ The mechanics of convergence are not entirely clear. One key theory is that technological backwardness is an advantage that may fuel catch up and eventual convergence of labor productivity. Specifically, the advanced industrialized countries spend a considerable amount of money creating technological advances. Backward countries invest in the technologies at a much later stage in the process—after the technologies are well advanced. Thus, the backward countries catch up to the technological leader in one big leap without spending money on R&D, interim technology, or interim technological infrastructure (Abramovitz, 1986). There are, of course, many potential impediments to this process. The technology development effort itself generates certain advantages in implementing the technology. Furthermore, backward countries may not have the necessary infrastructure (for example, an educated labor force, financial markets) to take advantage fully of the new technologies. In any event, in examining national competitiveness most researchers focus on convergence among industrialized countries where infrastructure is less of an issue.

recent study (Dollar & Wolff, 1993) took a close look at the relationship between industry and the aggregate measures by examining the industrial components of labor productivity convergence. The present analysis uses updated data to take a second look at these measures to examine how the industry level labor productivity convergence trends of the 1970s and early 80s developed through the early 1990s.

The analysis is divided into three sections. The first describes the data. The second examines the trends in labor productivity leadership and convergence across industry groups for selected OECD countries. The third takes a detailed look at leadership and labor productivity convergence in manufacturing industries.

DATA

This analysis uses OECD's International Sectoral Database (1994 Edition), which covers fourteen OECD countries: the United States; Canada; Japan; Germany; France; Italy; the United Kingdom; Australia; the Netherlands; Belgium; Denmark; Norway; Sweden; and Finland.⁴ Data are relatively complete from 1970 through 1991.⁵

Labor productivity is calculated using U.S. dollar equivalencies of gross product originating by industry in 1985 prices. The data are adjusted using a purchasing power parity price index. Total employment is used to measure labor input. Labor productivity is calculated for the countries as a whole and for ten industry groups: Agriculture, hunting, forestry and fishing (1); Mining and quarrying (2); Manufacturing (3); Electricity gas and water (4); Construction (5); Wholesale and retail trade, restaurants and hotels (6); Transportation, storage and communication (7); Finance, insurance, and real estate, and business services (8); Community, social, and personal services (9); and Producers of government services.

Separate calculations have been made for the following manufacturing industries: Food, beverages and tobacco (31); Textile, wearing apparel, and leather industries (32); Wood, and wood products, including furniture (33); Paper and paper products, printing and publishing (34); Chemicals and chemical petroleum, coal, rubber, and plastic products (35); Non-metallic mineral products, except products of petroleum and coal (36); Basic metal industries (37); Fabricated metal products, machinery and equipment (38); and Other manufacturing industries (39).

⁴ German data refer to the former West Germany.

⁵ Mining and quarrying (2) no data for UK, Italy and Belgium; Manufacturing (3) no data for Belgium 1991; Electricity gas and water (4); no data for Belgium 1991; Wholesale and retail trade, restaurants and hotels (6) no data for Japan and Australia, no data for Netherlands 1970-1984; Transportation, storage and communication (7) no data for Netherlands 1970-1984; Finance, insurance, and real estate, and business services (8) no data for UK, Italy, Germany, Belgium; Community, social, and personal services (9) no data for Netherlands 1970-1984.

Food beverages and tobacco (31) no data for Australia; Textile, wearing apparel, and leather industries (32) no data for Australia; Wood, and wood products, including furniture (33) no data for UK, Netherlands, Japan, Belgium, Australia.; Paper and paper products, printing and publishing (35) no data for Australia; Chemicals and chemical petroleum, coal, rubber, and plastic products (35) no data for Australia. No data Netherlands 1970-1979. No data for Belgium 1991; Non-metallic mineral products, except products of petroleum and coal (36) no data for Norway and Australia, no data for Netherlands 1970-1979; Basic metal industries (37) no data for Australia; and Fabricated metal products, machinery and equipment (38) no data for Australia. No data for Netherlands 1970-1979. Other Manufacturing (39) no data for Norway. No data for Netherlands 1970-1979, No data for Belgium 1991.

International Standard Industrial Classification (ISIC) number in parentheses. Throughout this analysis the terms "industry group" and "industry" are used to describe the ISIC categories "major division" and "division."

LABOR PRODUCTIVITY LEADERSHIP AND CONVERGENCE

From 1970 to 1991, the United States had the highest labor productivity of the fourteen OECD countries in this study (Table 1). U.S. leadership, however, declined somewhat over the period. In 1970, the United States had a dominating labor productivity lead over the other OECD countries. The United States led in all industry groups except Mining and quarrying (1); Electricity gas and water (4); and Community, social, and personal services (9), and was among the top three in all industry groups, except Community, social, and personal services (9).

By 1991, there had been a fall-off in U.S. labor productivity performance relative to the other OECD countries. Although the United States still led in aggregate labor productivity, by 1991 the United States held the lead position in only four of the industry groups: Manufacturing (3); Wholesale and retail trade, restaurants and hotels (6); Transportation storage and communication (7); and Producers of government services. The United States, however, remained in the top three in all but two of the industry groups: Mining and quarrying (2) and Community, social, and personal services (9).

Table 1 shows that no single country replaced the United States in the cases where we lost our leadership position. The Netherlands moved into the top slot in Agriculture, hunting, forestry, and fishing (1). Japan moved to the lead in Finance, insurance and real estate and business services (8). Canada took the top spot in Construction (5).⁶ Italy retained first place in Electricity, gas and water (4)⁷ as did the Netherlands in Mining and quarrying (2).

These leadership changes occurred during a period of general convergence of aggregate labor productivity among OECD countries. Dollar and Wolff (1993), using OECD data through 1985 found labor productivity convergence in the aggregate and across industry groups. Similarly, the present study, using an updated version of the same data set, finds aggregate convergence of the 14 countries through 1991 (the last year of relatively complete data) (Figure 1). For the total of all industries plus government services, the *coefficient of variation*, which measures variation of national labor productivity from the OECD average, decreased at a faster rate from 1970 to 1982 than from 1982 to 1991

⁶ Ultimately, it is firms and not countries that are in direct competition. Although countries are clearly different in their size and resources, an internationally competitive company may be based in a small country.

⁷ Italian data for electricity, gas and water also includes petroleum refining. It is not clear that Italy would retain productivity leadership in this industry without this addition because labor productivity in petroleum refining tends to exceed that in electricity, gas and water.

(Figure 1).⁸ The explanation for this slowdown in convergence lies in changes at the industry level (Table 2).

**Table 1:
Top three OECD Countries in Labor Productivity by Industry**

| ISIC division | ISIC sector description | 1970 | 1982 | 1991 |
|---------------|---|--|---|--|
| . | TOTAL | United States Canada Australia | United States Netherlands Belgium | United States Netherlands France |
| 1 | Agriculture, Hunting, Forestry and Fishing | United States Canada Australia | United States Netherlands Belgium | Netherlands United States Belgium |
| 2 | Mining and Quarrying | Netherlands United States Canada | Netherlands Norway Denmark | Netherlands Norway Denmark |
| 3 | Manufacturing | United States Canada Australia | United States Belgium France | United States Belgium ¹ Italy |
| 4 | Electricity, gas and water | Italy United States Japan | Italy United States Japan | Italy Japan United States |
| 5 | Construction | United States United Kingdom Canada | Canada United States Australia | Canada Belgium United States |
| 6 | Wholesale and retail trade, restaurants and hotels | United States Belgium Italy | Belgium United States Italy | United States France Denmark |
| 7 | Transportation storage and communication | United States Belgium Denmark | United States France Belgium | United States Belgium France |
| 8 | Finance, insurance and real estate and business services | United States Netherlands France | Japan United States France | Japan France United States |
| 9 | Community, social, and personal services | Italy Belgium Germany | Italy Belgium Germany | Italy Germany Belgium |
| . | Producers of government services | United States Australia Netherlands | United States Japan Netherlands | United States Japan Netherlands |

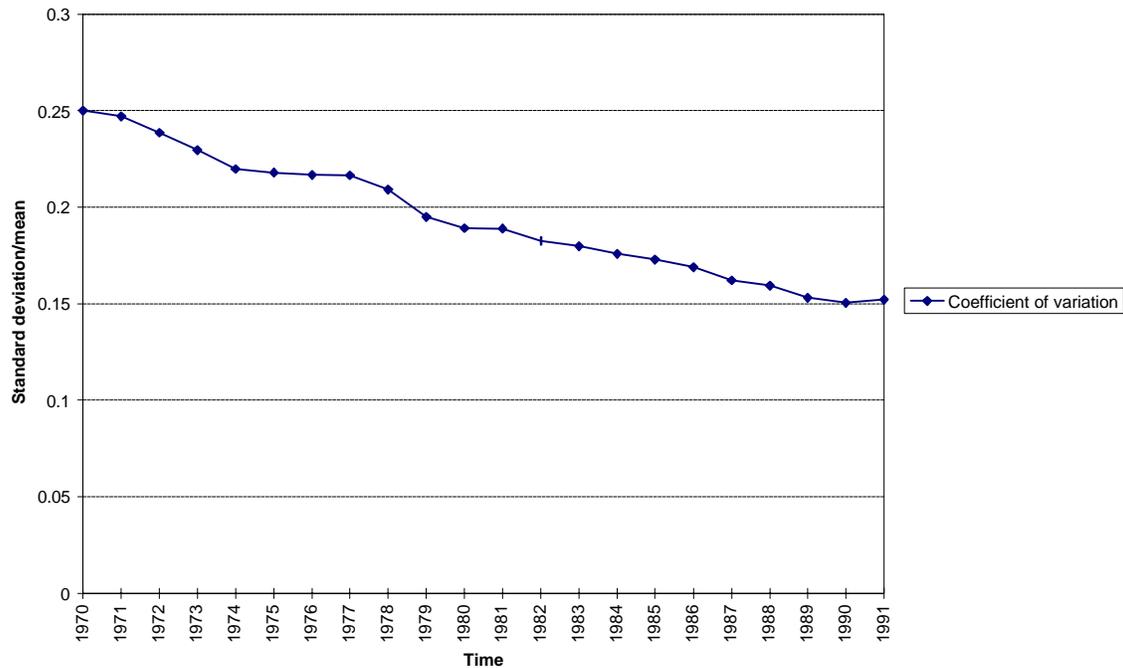
¹ The 2nd place for Belgium is an estimate. There are no 1991 data for Belgium, which held the number two position in 1990.

Note: See footnote 5 on data availability.

Source: OECD Sectoral Database (1994 Edition).

⁸ The coefficient of variation is the standard deviation of OECD labor productivity divided by the mean OECD labor productivity. The value of the coefficient of variation approaches zero as the labor productivity converges on the mean .

**Figure 1:
Convergence on Total Average Labor Productivity
Among 14 OECD Countries**



Source: OECD Sectoral Database (1994 Edition).

**Table 2:
Convergence on OECD Average Labor Productivity by Industry**

| ISIC division | ISIC sector description | Coefficient of Variation | | |
|---------------|---|--------------------------|--------------|--------------|
| | | 1970 | 1982 | 1991 |
| . | TOTAL | 0.250 | 0.183 | 0.152 |
| 1 | Agriculture, hunting, forestry and fishing | 0.455 | 0.350 | 0.344 |
| 2 | Mining and quarrying | 2.247 | 1.866 | 1.318 |
| 3 | Manufacturing | 0.212 | 0.182 | 0.208 |
| 4 | Electricity, gas and water | 0.633 | 0.464 | 0.382 |
| 5 | Construction | 0.363 | 0.220 | 0.170 |
| 6 | Wholesale and retail trade, restaurants and hotels | 0.246 | 0.260 | 0.235 |
| 7 | Transportation storage and communication | 0.359 | 0.302 | 0.257 |
| 8 | Finance, insurance and real estate and business services | 0.184 | 0.198 | 0.269 |
| 9 | Community, social, and personal services | 0.539 | 0.462 | 0.399 |
| . | Producers of government services | 0.229 | 0.233 | 0.251 |

Note: Calculations made for all countries for which data are available; see footnote 5.

Divergence from one period to the next shown in bold.

Source: OECD Sectoral Database (1994 Edition).

Although, the majority of the industrial groups also showed convergence toward the OECD average, a number of industry groups diverged. Wholesale and retail trade, restaurants and hotels (6) diverged from 1970 to 1982.⁹ Manufacturing (3) diverged from 1982 to 1991. Finance, insurance and real estate and business services (8) and Producers of government services diverged over the whole period.¹⁰

Government services are not subject to market forces and these services are not traded in the same sense that other goods and services are traded, thus there is no reliable means of interpreting labor productivity divergence in this category.¹¹ The results in Manufacturing (3) and Finance, insurance and real estate, and business services (8) are, however, particularly interesting. The coefficient of variation suggests that after 1982 labor productivity among the OECD countries diverged in these industries, rather than continuing along a convergence trend. The measure does not, however, offer any information about the relative position of the United States among the OECD countries.

An alternative measure of convergence, the *relative productivity* of the follower countries to the labor productivity leader, offers some insight into the relative position of the United States in a number of key industry groups (Table 3).¹² Table 3, Row 1, shows aggregate convergence on the U.S. labor productivity among OECD countries. At the industrial group level, the relative labor productivity measure also shows divergence in Manufacturing (3), and in Finance, insurance and real estate and business services (7) since 1982.¹³

The divergence in Finance, insurance and real estate and business services (7) suggests that the labor productivity gap between some OECD countries and Japan is increasing. This is borne out by Figure 2—a comparison of individual country labor productivity levels. The figure shows Japan pulling ahead of other OECD countries in labor

⁹ The wholesale and retail trade segment converged throughout the entire period while the hotel and restaurant segment diverged throughout the entire period.

¹⁰ There are no data available in this industry for Germany, Great Britain, Italy or Belgium. There are data available for the Finance and insurance sector that omits Japan and Australia. There are also data available for the Real estate and business services sector that omits Japan, Germany, Italy, Great Britain, Australia, and Belgium. Both of these sectors show convergence from 1970 to 1982 followed by divergence until 1991; the divergence in Real estate and business services is negligible. The U.S. was the productivity leader throughout the period in Real estate and business services. In Finance and insurance, the U.S. ranked sixth in 1970 but fell to eighth place by 1982 and continued to rank eighth in 1991.

¹¹ The same pattern occurs when Production of government services is excluded from the calculation of the aggregate coefficient of variation.

¹² The relative productivity measure is the average labor productivity of follower countries divided by the leader's labor productivity. The value of this measure increases as the followers converge on the leader.

¹³ Note that the two convergence measures need not correspond to one another. If, for example, the lead country is pulling away from the pack and the follower countries are simultaneously converging on the labor productivity of the number two country, the coefficient of variation will show convergence, while the relative productivity measure will show divergence. This occurred in the Communications (72) (a component of Transport storage and communication (7)—not shown), where relative labor productivity shows divergence from 1982 to 1991, while the coefficient of variation shows convergence. The United States pulled away from the rest of the industry, but the other countries converged on the second-ranked nation sufficiently for the coefficient of variation to show convergence. In Finance, insurance and real estate and business services (8) the coefficient of variation shows divergence from 1970 to 1982 where as the relative productivity measure shows convergence from 1970 to 1982; both measures show divergence from 1982 to 1991.

productivity. The United States, which had the highest labor productivity in 1970, has drifted downward toward the mean.

**Table 3:
Convergence on Labor Productivity Leader by Industry**

| ISIC division | ISIC sector description | 1970 | | 1982 | | 1991 | |
|---------------|---|----------------------|----------------|----------------------|----------------|----------------------|----------------|
| | | Leader | Relative Prod. | Leader | Relative Prod. | Leader | Relative Prod. |
| . | TOTAL | United States | 0.568 | United States | 0.695 | United States | 0.747 |
| 1 | Agriculture, Hunting, Forestry and Fishing | United States | 0.428 | United States | 0.596 | Netherlands | 0.604 |
| 2 | Mining and Quarrying | Netherlands | 0.043 | Netherlands | 0.072 | Netherlands | 0.188 |
| 3 | Manufacturing | United States | 0.652 | United States | 0.733 | United States | 0.677 |
| 4 | Electricity, gas and water | Italy | 0.332 | Italy | 0.440 | Italy | 0.554 |
| 5 | Construction | United States | 0.439 | Canada | 0.671 | Canada | 0.764 |
| 6 | Wholesale and retail trade, restaurants and hotels | United States | 0.666 | Belgium | 0.721 | United States | 0.769 |
| 7 | Transportation storage and communication | United States | 0.473 | United States | 0.492 | United States | 0.547 |
| 8 | Finance, insurance and real estate and business services | United States | 0.671 | Japan | 0.768 | Japan | 0.566 |
| 9 | Community, social, and personal services | Italy | 0.379 | Italy | 0.438 | Italy | 0.543 |
| . | Producers of government services | United States | 0.684 | United States | 0.678 | United States | 0.705 |

Note: Calculations made for all countries for which data are available; see footnote 5. Divergence from one period to the next shown in bold.

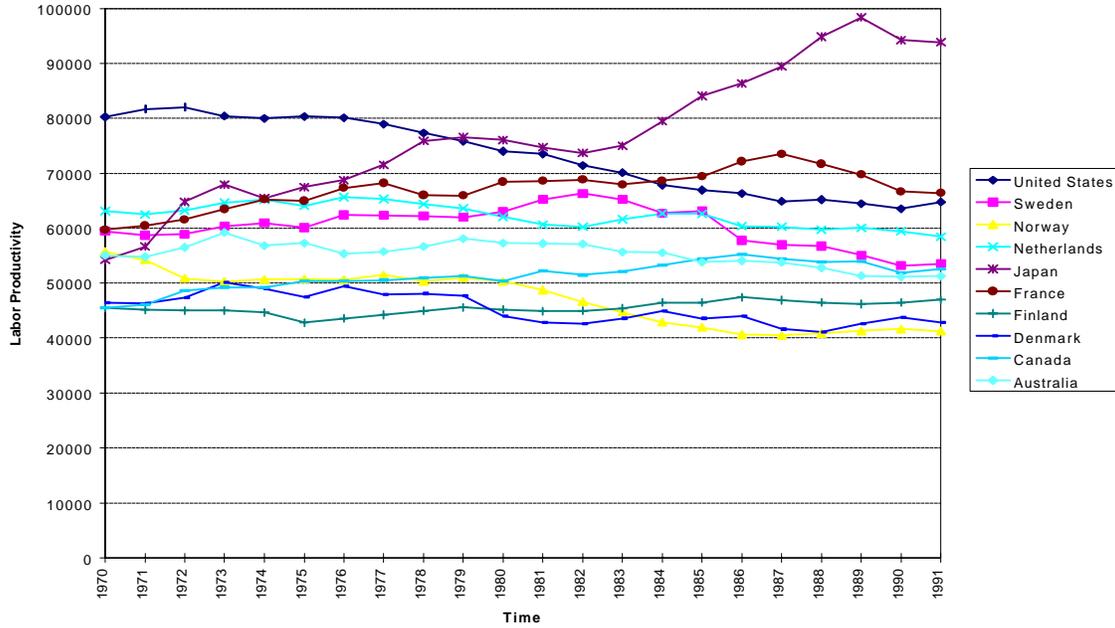
Source: OECD Sectoral Database (1994 Edition).

Both convergence measures indicate that from 1982 to 1991 Manufacturing (3) was not converging. The labor productivity leader, the United States, pulled further ahead of the OECD average. Figure 3, which shows manufacturing labor productivity levels for the individual OECD countries indicates that this is indeed what occurred.

Figure 3, however, also shows that manufacturing labor productivity in a number of countries is growing faster than in the United States. Thus, although, the United States leads in Manufacturing (3) labor productivity and has solid labor productivity growth, other countries have very strong manufacturing sectors as well.¹⁴ The next section examines the industry components of manufacturing to gain a more complete picture of the roots of manufacturing labor productivity divergence.

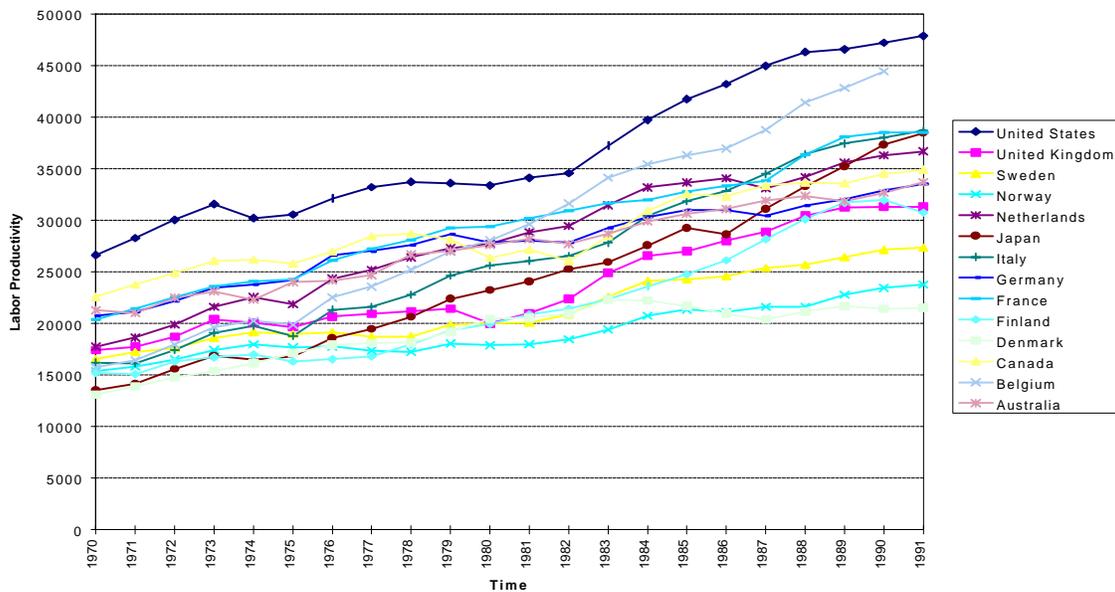
¹⁴ Bureau of Labor Statistics (1996) data indicate that this trend has continued through 1995. Japan had the highest percent increase in manufacturing labor productivity between 1994 and 1995. Italy was second. United States tied with Sweden for third. Germany and Italy followed closely.

**Figure 2:
Labor Productivity, 1970-1991
Finance, insurance and real estate and business services**



Source: OECD Sectoral Database (1994 Edition).

**Figure 3:
Labor Productivity, 1970-1991
Manufacturing**



CONVERGENCE AMONG MANUFACTURING INDUSTRIES

Table 4 shows labor productivity leadership in nine Manufacturing (3) industries. U.S. labor productivity was among the top three in all nine industries in both 1970 and in 1991. In 1970, the United States led labor productivity rankings in seven of nine manufacturing industries. By 1991, the United States' ranking had fallen in the following four industries: Food, beverages and tobacco (31); Paper and paper products, printing and publishing (34); Chemicals and chemical petroleum, coal, rubber and plastic products (35); and Basic metal industries (37).¹⁵ In 1991, the United States continued to lead Fabricated metal products, machinery and equipment (38), Non-metallic mineral products except products of petroleum and coal (36), Wood and wood products, including furniture (33), and Other manufacturing industries (39).

France ranked among the top three productivity leaders in six manufacturing sectors in 1970, but in 1991 was only among the top three in two industries. In contrast, Belgium, in 1970, was not among the top three in any manufacturing industries. By 1991, Belgium had moved into top three positions in five industries—Chemicals and chemical petroleum, coal, rubber and plastic products (35), Paper and paper products, printing and publishing (34), Basic metal industries (37), Textile, wearing apparel, and leather industries (32), and Non-metallic mineral products except products of petroleum and coal (36).

Japan was among the top three in labor productivity in two manufacturing industries in 1970. By 1991, Japan had also moved into a top three position in Fabricated metal products, machinery and equipment (38). In 1970, Germany was among the top three countries in labor productivity in four manufacturing industries, but by 1991 dropped out of the top three group in all but Other manufacturing industries (39).

Table 5 shows the coefficient of variation for nine manufacturing industries. By this measure, between 1970 and 1982, there was divergence in three industries: Food, beverages and tobacco (31), Textile, wearing apparel, and leather industries (32) and Chemicals and chemical petroleum, coal, rubber and plastic products (35). Between 1982 and 1991 divergence from the OECD average occurred in five of the nine sectors of manufacturing: Textile, wearing apparel, and leather industries (32); Wood and wood products, including furniture (33); Paper and paper products, printing and publishing (34); Non-metallic mineral products except products of petroleum and coal (36); and Fabricated metal products, machinery and equipment (38).

¹⁵ There was a sustained period of negative or near zero productivity growth in all of these U.S. industries except Chemicals and chemical petroleum, coal rubber and plastic products.

**Table 4:
Top three OECD Countries in Labor Productivity: Manufacturing**

| ISIC division | ISIC sector description | 1970 | 1982 | 1991 |
|---------------|--|---|--|--|
| 3 | MANUFACTURING¹ | United States Canada Australia | United States Belgium France | United States Belgium Italy |
| 31 | Food, beverages and tobacco | United States United Kingdom Canada | United States United Kingdom Italy | Italy United Kingdom United States |
| 32 | Textile, wearing apparel, and leather industries | France Italy United States | Italy France United States | Belgium Italy United States |
| 33 | Wood and wood products, including furniture | United States Germany Sweden | United States Italy France | United States France Italy |
| 34 | Paper and paper products, printing and publishing | United States France Italy | United States France Japan | Belgium Italy United States |
| 35 | Chemicals and chemical petroleum, coal, rubber and plastic products ¹ | United States France Germany | Japan Belgium United States | Japan Belgium United States |
| 36 | Non-metallic mineral products except products of petroleum and coal | United States Canada France | United States France Belgium | United States France Belgium |
| 37 | Basic metal industries | Netherlands United States Japan | Japan Netherlands United States | Japan Belgium United States |
| 38 | Fabricated metal products, machinery and equipment | United States Germany France | United States France Canada | United States Japan Italy |
| 39 | Other manufacturing industries ² | United States Germany France | Netherlands Italy France | United States Netherlands Germany |

¹ The 2nd place for Belgium is an estimate. There are no 1991 data for Belgium, which held the number two position 1990.

² Comparable data for Finland are not available prior to 1975..

Notes: Top three indicate the top three countries, for which data are available, ranked by labor productivity; see footnote 5.

Source: OECD Sectoral Database (1994 Edition).

As previously mentioned, the coefficient of variation offers no information about the relative position of individual countries. Thus, we turn again to the relative productivity measure (Table 6), which shows the convergence on the manufacturing labor productivity leader. This measure also reveals considerable divergence among manufacturing industries. Interpretation of this measure is somewhat more complicated for the manufacturing industries because the country holding the labor productivity lead has changed in a number of industries.

Food, beverages and tobacco (31) showed divergence from 1970 to 1982, when the United States led the industry. There was little to no convergence on the leader from 1982 to 1991. The U.S. had virtually no productivity growth in this industry from 1982 to 1991. This enabled Italy and the United Kingdom to overtake the United States, during this latter period.

**Table 5:
Convergence on OECD Average Labor Productivity: Manufacturing**

| ISIC | ISIC sector description | Coefficient of Variation | | |
|------|-------------------------|--------------------------|------|------|
| | | 1970 | 1982 | 1991 |

| division | | | | |
|----------|---|--------------|--------------|--------------|
| 3 | Manufacturing | 0.212 | 0.182 | 0.208 |
| 31 | Food, Beverages and Tobacco | 0.264 | 0.282 | 0.281 |
| 32 | Textile, wearing apparel, and leather industries | 0.231 | 0.244 | 0.295 |
| 33 | Wood and wood products, including furniture | 0.295 | 0.208 | 0.210 |
| 34 | Paper and paper products, printing and publishing | 0.211 | 0.194 | 0.210 |
| 35 | Chemicals and chemical petroleum, coal, rubber and plastic products | 0.378 | 0.421 | 0.402 |
| 36 | Non-metallic mineral products except products of petroleum and coal | 0.242 | 0.174 | 0.238 |
| 37 | Basic metal industries | 0.397 | 0.358 | 0.201 |
| 38 | Fabricated metal products, machinery and equipment | 0.235 | 0.170 | 0.285 |
| 39 | Other manufacturing industries ¹ | 0.429 | 0.385 | 0.349 |

¹ Comparable data for Finland are not available prior to 1975..

Note: Calculations made for all countries for which data are available; see footnote 5. Divergence from one period to the next shown in bold.

Source: OECD Sectoral Database (1994 Edition).

**Table 6:
Convergence on Labor Productivity Leader: Manufacturing**

| ISIC division | ISIC sector description | 1970 | | 1982 | | 1991 | |
|---------------|---|----------------------|----------------|----------------------|----------------|----------------------|----------------|
| | | Leader | Relative Prod. | Leader | Relative Prod. | Leader | Relative Prod. |
| 3 | MANUFACTURING | United States | 0.652 | United States | 0.733 | United States | 0.677 |
| 31 | Food, beverages and tobacco | United States | 0.660 | United States | 0.629 | Italy | 0.648 |
| 32 | Textile, wearing apparel, and leather industries | France | 0.772 | Italy | 0.717 | Belgium | 0.680 |
| 33 | Wood and wood products, including furniture | United States | 0.590 | United States | 0.674 | United States | 0.801 |
| 34 | Paper and paper products, printing and publishing | United States | 0.627 | United States | 0.662 | Belgium | 0.780 |
| 35 | Chemicals and chemical petroleum, coal, rubber and plastic products | United States | 0.540 | Japan | 0.509 | Japan | 0.463 |
| 36 | Non-metallic mineral products except products of petroleum and coal | United States | 0.631 | United States | 0.741 | United States | 0.706 |
| 37 | Basic metal industries | Netherlands | 0.559 | Japan | 0.551 | Japan | 0.649 |
| 38 | Fabricated metal products, machinery and equipment | United States | 0.643 | United States | 0.786 | United States | 0.624 |
| 39 | Other manufacturing industries ¹ | United States | 0.622 | Netherlands | 0.728 | United States | 0.628 |

¹ Comparable data for Finland are not available prior to 1975..

Note: Calculations made for all countries for which data are available; see footnote 5. Divergence from one period to the next shown in bold.

Source: OECD Sectoral Database (1994 Edition).

Textile, wearing apparel, and leather industries (32) shows divergence by both measures from 1982 to 1991. In textiles industries, the United States had steady productivity growth during this latter period and continued to rank third. The United States has not, however matched the rapid productivity growth in other countries, particularly labor productivity growth in Belgium from 1985 onward.

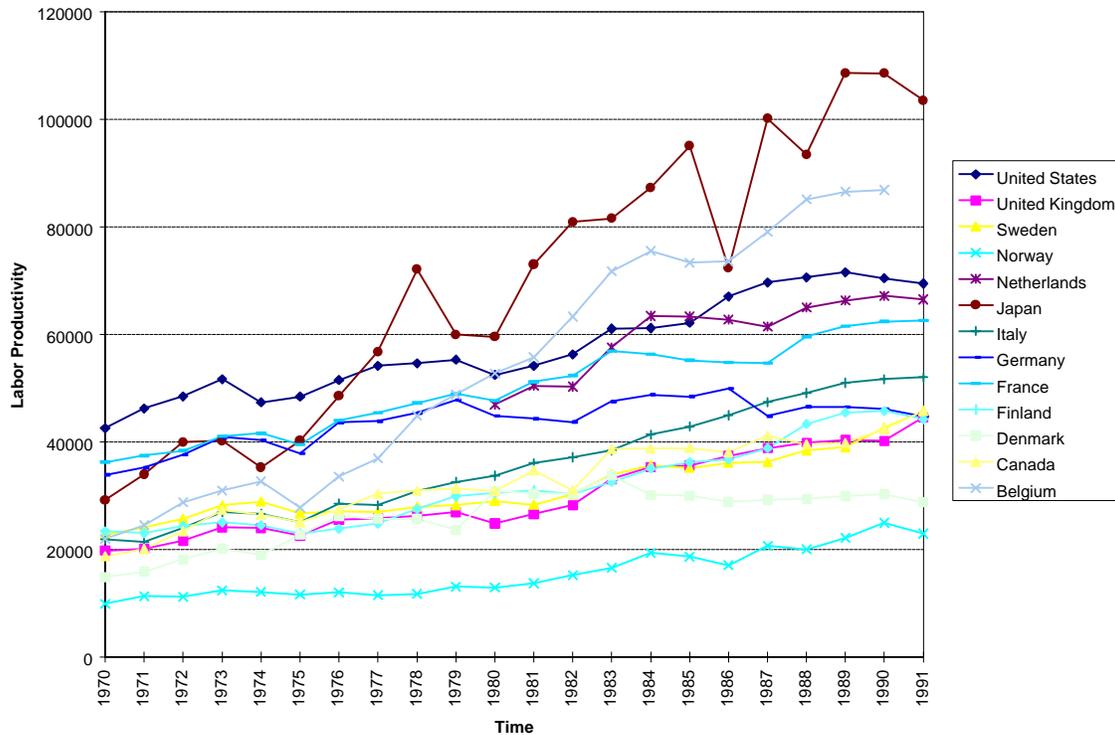
Both Wood and wood products, including furniture (33) and Paper and paper products, printing and publishing (34) show divergence from 1982 to 1991 as measured by the coefficient of variation, but not by the relative productivity measure. The divergence in

the wood industries was caused by increasing convergence on the large 1982 United States lead by a few countries while other countries were experiencing little productivity growth. The divergence in the coefficient of variation for Paper and paper products, printing and publishing (34) industries was caused by slow labor productivity in Denmark and Norway. These countries did not keep up with the growth in the other OECD countries, causing divergence from the OECD mean. Labor productivity in the majority of OECD countries converged due to strong labor productivity growth in the majority of them. The United States, which had a strong lead in 1983, had virtually no productivity growth from 1983 through 1991. This enabled Belgium and Italy to overtake the United States in the late 1980s.

Chemicals and chemical petroleum, coal, rubber and plastic products (35), shows divergence from the average from 1970 to 1982. Chemicals also show divergence from the leader, Japan, from 1970 to 1991. (Japan took the labor productivity lead from the United States in 1978.) (Figure 4). Both Japan and Belgium have had stronger labor productivity growth than the United States, since the mid-1970s. Japan has also taken a strong lead in Basic metal industries (37) and pulled far ahead of the other OECD countries.

From 1982 to 1991, there was also divergence from the U.S. lead in three industries: Non-metallic mineral products except products of petroleum and coal (36), Fabricated metal products, machinery and equipment (38), and Other manufacturing industries (39). In Non-metallic mineral products except products of petroleum and coal (36) the United States, France, and Belgium, together, led other OECD countries. In Other manufacturing industries (39), the divergence from the U.S. lead, from 1983 to 1991 has been minor.

Figure 4 :
Labor Productivity, 1970-1991
Chemicals and chemical petroleum, coal, rubber and plastic products

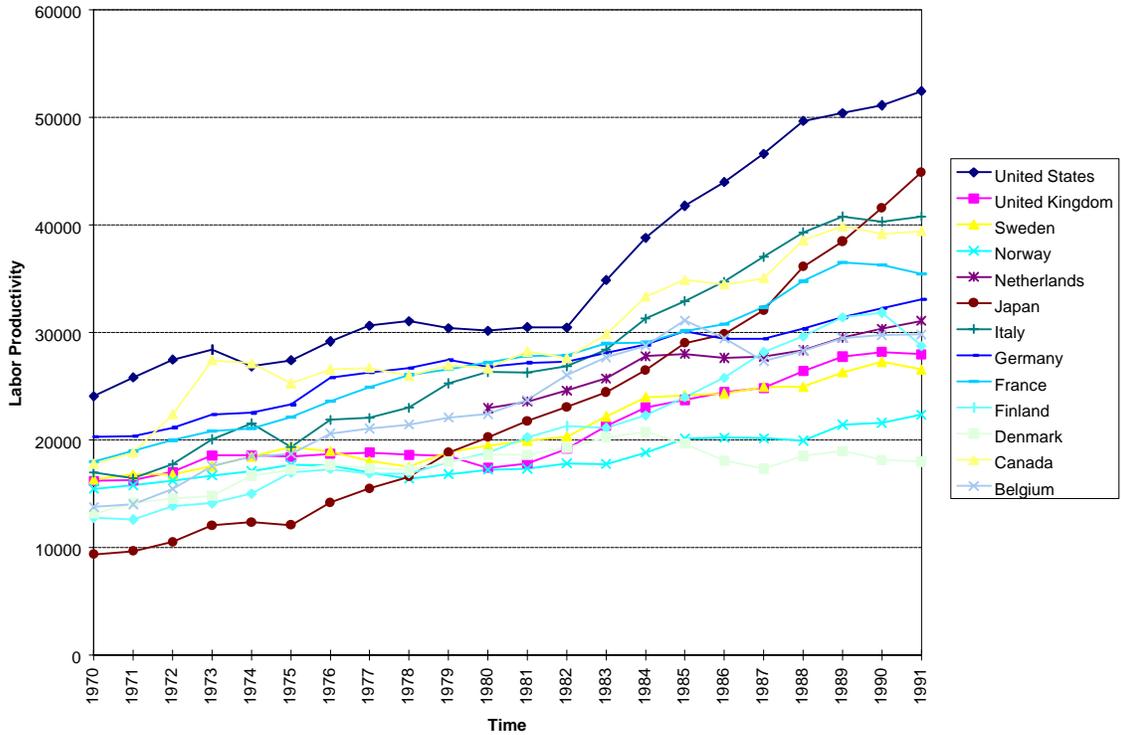


Source: OECD Sectoral Database (1994 Edition).

The relative productivity measure also indicates divergence from the U.S. productivity lead in Fabricated metal products, machinery and equipment (38). This is a key manufacturing industry—accounting for more than more than 45 percent of OECD manufacturing output in 1991. The sector also includes many high-technology industries, which are often credited with creating high wage high skilled jobs and performing R&D with important spillover to other industries.

The United States has a strong labor productivity lead and strong productivity growth in the fabricated metal products, machinery and equipment industry. It was the productivity leader in each year of the observation period, except 1974, when Canada briefly topped the U.S. level. Figure 5, however, shows that a number of other countries also had strong productivity growth. In particular, labor productivity in Japan has increased rapidly since 1970 and Japan is the only country whose productivity relative to the U.S. increased from 1982 to 1991. In 1991, labor productivity in Japan attained 85.6 percent of the U.S. level.

Figure 5
Labor Productivity, 1970-1991
Fabricated metal products, machinery and equipment



Source: OECD Sectoral Database (1994 Edition).

CONCLUSION

The United States led other major OECD countries in overall labor productivity from 1970 to 1982. After 1982, the United States converged both towards the mean OECD labor productivity and on the U.S. level of labor productivity. This suggests living standards among the OECD countries are indeed converging, but the rate of convergence slowed after 1982. The industrial components of aggregate labor productivity offer insight into the causes of this convergence slowdown. Although most groups—Manufacturing (3) and Finance, insurance and real estate and business services (8)—did not. Rapid growth in Japanese labor productivity created the divergence in Finance, insurance and real estate and business services (8). High initial labor productivity in the United States combined with strong productivity growth, especially in the fabricated metal products, machinery and equipment (38) industry, together with divergence in a few other, smaller, industries, was sufficient to create divergence in Manufacturing (3), as a whole. ISIC 38 includes most of the key high-technology manufacturing industries.

In 1991, the United States was among the labor productivity leaders in almost all of the manufacturing industries. It was, however, no longer the unequivocal labor productivity leader in all manufacturing industries. Other countries had overtaken U.S. labor productivity in four of the nine industries. Japan, for example, had a dominant labor productivity lead in Chemicals and chemical petroleum, coal, rubber and plastic products (35). The United States widened its lead in Fabricated metal products, machinery and equipment (38). The United States' labor productivity performance in this industry was largely responsible for its continued leadership in overall manufacturing productivity.

Labor productivity is a key measure of national competitiveness. The slow down of OECD convergence on the overall U.S. level of labor productivity since 1982 is a sign of continued U.S. competitiveness. These results suggest that the pundits of the 1980s were too quick to point to the demise of the U.S. competitiveness. This analysis shows that although the United States' overall labor productivity lead is not as overwhelming as it once was, it is still significant. The United States continues to lead in labor productivity overall and in many individual industries.

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