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What Have Changes to the Global Markets for Goods and Services Done to the Viability of the Swedish Welfare State?

Edward E. Leamer

9.1 Introduction

When we learned professors from America, together with our distinguished Swedish colleagues, examined Sweden a decade ago and reported our findings in Freeman, Topel, and Swedenborg (1997), we offered our heartfelt but dour prognostication: this dog will never win a race—not hobbled by its welfare state. But like real three-legged dogs, the performance of the Swedish economy since last we examined this patient has been in many ways superior, including a growth rate of real gross domestic product (GDP) per capita in the years 1995 to 2004 equal to 2.4 percent per year, compared with the Organization for Economic Cooperation and Development (OECD) average of 2.2 percent (OECD 2005).

This might be a surprise to Leamer and Lundborg (1997), who warned that there are deep inconsistencies between the egalitarian goals of a welfare state and the ongoing but largely incomplete task of integrating masses of low-wage unskilled third-world workers into the global trading system. "Not really so surprising," Leamer and Lundborg might reply, as their conceptual framework applies to the long run, and the performance over the last decade may have been dominated by short-run circumstances that mask the long-run problems. It is best to keep in mind that a free-market economic system cannot tolerate persistent vast geographical differences in prices of gold or wages of unskilled workers, unless those differences have a technological/cost basis. With that dogged persistence, I offer you my message again, updated to address two startling changes in the global economy

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in the last decade: the remarkable growth of Chinese exports (more of the same, but lots more) and the communications revolution we call the Internet (a new and entirely different kind of threat).

9.1.1 Rise of China as a Manufacturing Powerhouse

It is not news that the liberalizations of China, India, Eastern Europe, Russia, and so on have increased the effective global supply of workers willing and able to do mundane manufacturing jobs at very low-wage rates under uncomfortable working conditions.[1] What is news is the remarkable speed at which millions of Chinese manufacturing workers are being integrated into the global trading system.

Part of the rise of China and other low-wage manufacturers comes from continued improvements in governance of global trade that have apparently reduced the risk of government interference in business transactions across national borders. That risk reduction plus improvements in transportation and communication have allowed firms to fragment supply chains, seeking the most cost-effective location for each point in the chain, in particularly by moving mundane labor-intensive assembly operations to low-wage locations. (According to the September 18, 2005 edition of the *Los Angeles Times,* 60 to 70 percent of the new Boeing 787 Dreamliner will be produced overseas, some of it in China.)

Meanwhile, at greater speed than ever before, standardization and mechanization are turning rooted innovative new products into footloose standardized commodities, where cost is the competitive driver. This has allowed Asian low-cost suppliers, particularly China, to enter markets in electronics and machinery that heretofore were completely controlled by the high-wage countries. To give a pertinent example, hardly any of the IBM mainframe computers were manufactured in low-wage countries, but the personal computer had a shelf life of only a few years as far as U.S. manufacturing workers were concerned.

9.1.2 The Transition to a Postindustrial Economy: The Personal Computer and the Internet

The fraction of the global workforce in manufacturing is under persistent pressure to contract because of the steady march of productivity, which allows fewer workers to do the tasks of many. This technological reduc-

1. The global competition for manufacturing jobs is made more intense because the high savings rates in Asia and other developing countries limit their demand for manufactured products. The transfer of manufacturing jobs from Northern Europe and North America to Eastern Europe and Asia thus tends to reduce the global total of manufacturing jobs, because the reduction in demand for manufactures in high-wage high-spending Europe and North America is not mitigated much by an increase in demand for manufactures in low-wage high-saving Asia and Eastern Europe. It's a less-than-zero sum game.

tion in the global number of manufacturing workers might be offset by new demand for new manufactured products and by increases in demand for existing products because of rising income levels and falling manufactured prices. But in the last three decades, the force of process innovation has outstripped the opposing forces of product innovation, rising income levels, and falling prices, and the fraction of the workforce in manufacturing has substantially fallen in Sweden and in every other OECD country. (The Swedish share of manufacturing has fallen from 26 percent in 1970 to 16 percent in 2003.[2])

This decline in manufacturing means that a rising fraction of the workforce has to be absorbed either by government or private services. It means that increasingly, the sources of growth will come from services. This is troubling, because in the last decade, the production of both mundane and creative intellectual services has been completely revolutionalized by the Internet and the personal computer (PC). The Internet, which has been likened to the printing press in terms of its potential effects on the way we communicate, is increasing the intensity of price competition among manufactures and is allowing the costless delivery of some knowledge services across borders. The Internet and the PC are altering the labor markets' compensation for education and talent.

The transition from artisan shop to factory floor came with a great deskilling of manufacturing and good jobs for high school graduates. Education and natural talent had mostly additive effects on earnings, with decent returns to educational investments for almost everyone. With that structure of earnings, compensatory education could easily offset talent deficiencies—if you and I are both trained to operate a forklift, we will be equally productive, no matter your strength advantage over me. But in a postindustrial PC/Internet age, compensation in the intellectual service sector may be determined more by the *interaction* of talent and education, meaning that the rate of return to education depends substantially on the talent of the student—if you and I are both trained to operate a computer, one of us is going to do a lot better than the other. This creates a Hollywood kind of inequality for which compensatory education is ineffective—without the talent, you cannot be a star.

It's not just talent. It's also hard work. In the industrial age, the problem was capital scarcity. That capital scarcity was relieved by hiring workers who were willing to operate the equipment at a high pace for long hours, thereby spreading the fixed capital cost over a large total output. In order to get workers to operate the equipment at a high pace for long hours, workers had to have an incentive, which has meant higher wages in manufacturing than in agriculture or services and higher wages in capital-intensive manufacturing

2. OECD STAN database.

than in labor-intensive manufacturing. That wage inequality causes some difficulty for an egalitarian state, of course, though access for most to the high-pace high-wage jobs in capital-intensive manufacturing is a politically mitigating factor.

Compensation is very different in the creative intellectual services. In the intellectual services, talent, not capital or worker time, is the scarce input. An efficient postindustrial economy cannot afford to have idle talent for the same reason that an efficient industrial economy cannot afford to have idle capital. Efficiency thus requires that the most talented among us work longer hours than the less talented. The Swedish decline in hours worked that is described in Davis and Henrekson (chapter 7 in this volume) and the compression of wage rates may be incompatible with efficient production in the intellectual services sector. Extreme disparities in rates of compensation in Hollywood and on Wall Street properly encourage long hours of talented workers, and the combined effects of long hours for the talented with enormous hourly compensation creates in Hollywood vast inequality that is deeply inconsistent with an egalitarian state. It's not just Hollywood. It's also all the other professions—law, architecture, accounting, medicine, and even economics.

This isn't news for Sweden, which experienced the friction between its welfare state and the creative services sector when Ingmar Bergman, after being arrested for tax evasion in 1976, suffered a mental breakdown and then went into self-imposed exile in Germany. That may be an apocryphal story replayed quietly but repeatedly as creative Swedes make the difficult choice between staying at home with comfortable livelihoods versus moving abroad, where the compensation for their ideas and creative products may seem limitless.

These two problems—the rise of China and the transition to a postindustrial economy—are addressed in separate sections of this chapter. The rise of China as a manufacturing powerhouse can be entirely beneficial for Sweden. The force of Chinese competition falls on countries that produce the same products, and high-wage countries that compete in the same product space as low-wage competitors inevitably must suffer wage reductions and slower growth, but investments in skills, human capital, and product innovations can support a product mix unlike the ones made in China, in which case the lowering of prices for Chinese products is all to the good. The next section provides an answer to the question, which countries compete with Sweden? This question is related but not identical to the question that Leamer and Lundborg (1997) posed: are Swedish wages set in Beijing? This section assembles a large amount of information about Swedish exports in comparison with other countries. There are some ominous developments here, especially the rapid rise of Chinese exports and their move up the value added chain, but all in all, the locus of Swedish competition remains (happily) in high-wage Europe, the United States, and Japan.

In the third section, I offer some theory and evidence of the transition from industrial to postindustrial societies, a transition that is being experienced by all advanced developed countries. This section is largely speculative, because countries are at the beginning of their transitions from industrial to postindustrial societies, with relatively little clear evidence of what that transition entails. One clear symptom of this transition is the decline in the value added share of manufactures and the rise in the value added share of finance and other intellectual services—what I am calling neurofacturing. With that as the backdrop, I contrast earnings and hours in finance with earnings and hours in manufacturing, in the United States, and in Sweden. Finance in the United States is characterized by long hours and exceptional pay. Sweden seems to have adopted a different solution. But I do not provide any evidence that the extraordinary levels of compensation for the leaders of the U.S. financial system have anything to do with any special talent, other than being in the right place at the right time, and I do not provide evidence that U.S. finance is more efficient by virtue of it compensation system. The clearer cases of U.S. talent-driven compensation are in entertainment and sports. But I also don't provide evidence that the Ingmar Bergman experience is common in Sweden. This section is intended to be thought provoking, suggesting, but not proving, that the transition to a postindustrial economy will put greater strain on the egalitarian aims of the Swedish welfare system.

9.2 Who Competes with Sweden?

Our first item of business is to look closely at the structure of Swedish exports to determine if the source of competition for Swedish products remains in the high-wage countries or if it has shifted south toward low-wage developing nations. To do that, I will be proposing a new measure of the extent to which exports from other countries compete with Swedish exports. This new measure suggests that in the U.S. market, it is Japan and Canada that historically have been Sweden's greatest competitors, but the degree of competition with these two principal competitors fell sharply from 1989 to 2004, while the degree of competition with China, Korea, and Mexico rose substantially. This is highly suggestive of a shift southward of the center of Swedish competition in manufactures. Incidentally, no correction is made for the part of Chinese exports that originate in high-wage countries such as Japan, but cost advantages apply to any export from China, no matter the value added fraction that originates elsewhere.

9.2.1 The Distinctiveness Barrier to Factor Price Equalization

The factor price equalization theorem is often invoked to support the alarming idea that international trade soon enough will equalize wages in

Stockholm, Los Angeles, Mexico City, and Shanghai. This is a possibility but is by no means a sure thing.

One important reason why wages might not equalize across counties is differences in product mix. The force for factor price equalization comes through the product market, but that force is completely inoperable if Sweden and other countries produce no products in common. There are a great variety of barriers that support distinctive product mixes and that help to prevent the equalization of wages in Stockholm and Shanghai. A natural barrier is the economic distinctiveness that comes from natural resources and from climate. For example, a country that exports softwood lumber products in exchange for apparel and footwear need not fear the low wages paid for the production of apparel and footwear. On the contrary, the lower the wages, the better, because that supports a terms-of-trade improvement, providing more shirts and shoes for each cord of wood or ream of paper exported.

The role of product differences in preventing wage equalization is illustrated well by contrasting a Ricardian model with a Heckscher-Ohlin (HO) model of international trade. In a Ricardian equilibrium, distinctive abilities lead to complete specialization according to one's comparative advantage. Countries with different abilities produce different mixes of products and are partners that share the gains from specialization, not competitors. In a Ricardian model, the gains from trade raise wages everywhere.

But in a Heckscher-Ohlin model, comparative advantage is marginal and is eroded as countries move to specialize according to their comparative advantage. In a simple Heckscher-Ohlin equilibrium, comparative advantage at the margin is completely eliminated; all countries produce the same mix of products and are consequently competitors, not partners. Though the inframarginal gains from exchange raise aggregate incomes for all countries, the remaining marginal competition forces an equalization of the rewards to all factors of production, including labor. Countries abundant in labor with low pretrade wages enjoy increased wages as their abundant factor finds external demand, but countries scarce in labor with high pretrade wages suffer reduced wages as the scarcity rents are eroded by foreign competition.

What drives the factor price equalization theorem is a sequence of zero-profit conditions that equate the prices of products to their costs of production:

$$p_i = A_{Li}\, w + A_{Ki}\, r + \ldots, i = 1, 2, \ldots,$$

where p_i is the price of product i, A_{Li} and A_{Ki} are the amounts of labor and capital (and other factors) needed to produce a unit of the good, and w and r refer to the wage rate and the rental cost of capital. If there are enough of these zero-profit conditions (if the number of traded products equals the number of factors of production) and if the input intensities A_i are fixed,

then it is a simple matter to solve this linear system for the wages and rental rates of capital as a function of the product prices.[3]

Thus, if international trade equalizes product prices, it also must equalize factor prices—wages and rental rates of capital. Trade in products is a complete substitute for trade in factors of production.

Lurking in the background behind the simple zero-profit equations that allow one to solve for factor prices given product prices are a number of critical assumptions that may not be fully met. These are conditions that are needed to assure (a) product price equalization and (b) identical input intensities. Here are some of the assumptions:

- Traded goods are commodities whose prices are set in global marketplaces. (Firms produce undifferentiated products and have no market power.)
- Transportation costs are zero. There are no other barriers to trade.
- The best methods of production are common knowledge; there are no first-mover advantages.
- The services of the factors of production—land, labor, and capital—are also undifferentiated internationally and are available in nationally integrated rental markets.
- The factors of production are costlessly mobile across firms/sectors.
- Production occurs at constant returns to scale; there are no benefits from agglomerations.

While violation of one or more of these conditions will allow sustained differences in (pretax) wages between Stockholm and Los Angeles, the substantial gap in wages between Stockholm and Shanghai may rely especially on the violation of another critical condition: all countries are sufficiently similar in factor endowments so that they produce the same mix of products.

Technically speaking, if different countries produce different mixes of products, they solve different sets of zero-profit conditions to determine wages and other factors of production, and factor-price equalization need not apply.

Though identical product mix and factor price equalization are often taken as implications of a Heckscher-Ohlin model, this HO framework is also capable of producing a Ricardian-like equilibrium, in which countries sort into distinct groups with different product mixes. Factor price equalization then operates within the groups but not between. As in the Ricardian model, countries are competitors within the groups defined by product

3. If the technology allows substitution among the factors and thus variable factor intensities, A_{Li} and A_{Ki}, the proof of factor price equalization is a bit more involved, requiring that the technologies do not exhibit factor-intensity reversals, which would allow two or more solutions to the system of zero-profit conditions.

mixes, but between groups, they are partners, mutually enjoying the gains from specialization. Then trade is a tide that lifts all boats.

What determines the product mix? In a Heckscher-Ohlin model, the product mix is dictated by the availability of land, labor, and capital. If countries are sufficiently similar in their supplies of these productive resources, then the equilibrium has all countries producing the same mix of products, but if countries are greatly different, the multicone equilibrium occurs with countries producing different product mixes. For example, capital-abundant countries might produce a capital-intensive mix of products and have high wages and low returns to capital, while labor-abundant countries might produce a labor-intensive product mix and have low wages and high returns to capital.

If an equilibrium with different wages in different countries does emerge, there are powerful forces that work to destroy it. Differences in factor prices create arbitrage opportunities that can be pursued by migration of labor and capital. If there is enough international factor mobility, then countries can become sufficiently similar so that the two-wage solution is unsustainable. Even without capital mobility, high savings and investment rates responding to the higher returns in capital-scarce countries can eliminate the dissimilarities in countries that are necessary to support the multicone equilibrium.

9.2.2 Empirical Measurement of Product Mix Similarities

The message of the HO model is that while ample stocks of human and physical capital historically have helped to create a high barrier to protect Swedish workers from low-wage foreign competition, those barriers will be constantly under assault as the low-wage countries invest heavily in physical and education assets and shift their product mix ever closer to the Swedish capital-intensive mix. In the face of capital accumulation in low-wage countries, the distinctiveness barriers protecting Swedish wages can be maintained only by the maintenance of Swedish distinctiveness through further investments in education and infrastructure that maintain Sweden as the preferred place to produce high-tech, human-capital-intensive products.

There are several ways to measure progress in the race to stay ahead of the emerging low-wage countries, none of which is perfect. One approach is to compare Swedish educational attainments and rates of investment in new capital with the same in countries whose low wages might threaten Swedish wages, as in Leamer and Lundborg (1997). This can be a blunt instrument, because knowledge of the global distribution of human and physical capital by itself cannot tell us whether Sweden is a partner or a competitor of China and other low-wage countries. It depends on how much of each productive resource is absorbed in nontraded goods, and it depends also on the technologies of production.

Another way to measure Swedish distinctiveness is to compare the products made in Sweden and the products made in China and other countries.

Are they the same or not? If they are the same, and if they are traded, that makes Sweden and China competitors.

As is often the case, the theory yields important insights, but there is a great gulf between the literal theory and the real world. In the theory, product mix differences can be determined merely by the presence or absence of a product in the mix originating in each country. In reality, data are collected at a high enough level of aggregation that almost every product category is present in almost every country. If the category is women's dresses, high-fashion gowns might be sewn in Los Angeles and Boston, while high-volume standardized dresses might be sewn in Guonddong.[4] Thus, to measure Swedish distinctiveness through its product mix, we will have to tolerate a somewhat casual link between the theory and the data.

We also will want to make use of export data, which are much more detailed than production or value added data. The problem with export data is that Chinese wages can come to Stockholm, because Swedish exporters compete in the same foreign markets as the Chinese, or because Swedish imports from China compete with Swedish production sold at home. A focus on exports ignores competition at home.

9.2.3 Export Correlations to the United States and the European Union

Correlations across products of Swedish exports to the United States and the European Union with the exports of other countries for 1987 and 1999 are illustrated in figure 9.1 and figure 9.2. These figures are sorted by similarity with Sweden in 1987, lowest to highest. At the right are the countries one suspects are the greatest competitors of Sweden. These countries on the right are offering these two large marketplaces about the same mix of products as Sweden offers. That means that for the 1987 EU market, Sweden's closest competitors were Finland, Germany, Canada, and the United States, and for the United States market, they were Germany, Canada, Mexico, and Japan. (Note that this comparison doesn't depend at all on total export values, only on the composition.) At the left in these figures are countries with export mixes unlike Sweden's. These are generally low-wage developing countries, such as China, Turkey, and Malaysia.

These 1987 correlations were good news for Sweden, as they suggest that Sweden had successfully isolated itself from the force of competition with the emerging low-wage exporters through a fortuitous choice of product mix, with Sweden concentrating on one set of exports and the low-wage developing world concentrating on another.

But figure 9.1 and figure 9.2 also reveal that things changed dramatically from 1987 to 1999, with sharply rising correlations between Swedish exports

4. If disaggregation were pursued far enough to create separate categories for high-fashion gowns and standardized dresses, we would need to deal with another problem: high-fashion gowns are not commodities sold in global markets, and global product price equalization could not be taken as a useful approximation.

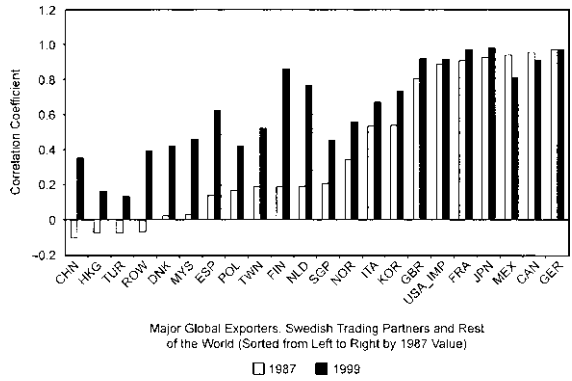

Fig. 9.1 Who competes with Sweden? Product mix correlation coefficient with Sweden, exports to the U.S. market, 1987 and 1999, three-digit ISIC

Note: Major global exporters, Swedish trading partners, and rest of the world (sorted from left to right by 1987 value).

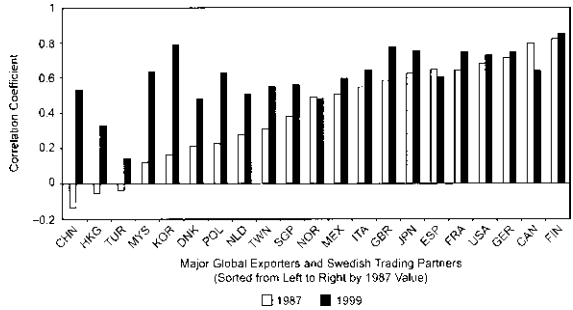

Fig. 9.2 Who competes with Sweden? Product mix correlation coefficient with Sweden, exports to the EU market, 1987 and 1999, three-digit ISIC

Note: Major global exporters and Swedish trading partners (sorted from left to right by 1987 value).

and exports of many of the low-wage developing countries in both the U.S. and EU markets. This is a very ominous development. We need to find out why these correlations have elevated so much. We also need to determine if these correlations are the correct measures of the problem.

9.2.4 A Measure of the Competition between Two Exporters

The increase over time in the correlation between the mix of Swedish exports and the mix of Chinese exports is suggestive of an increase in the intensity of competition. Another commonly used measure is the Finger-Kreinen export similarity index, to be discussed later. Neither of these measures depends on the level of exports coming from the hypothetical competitor, and neither answers a clear economic question based on a clear economic model. I suggest another measure that answers this question: which

countries have the greatest impact on the prices that Sweden receives for its exports?

Expressed more precisely, the question is: what would be the impact on the value of Swedish exports if a competitor were to double the quantity of its exports while Sweden held fixed the quantity of its exports?

To answer this question, we need to commit to a model of competition, and we need to know the values of the models' most important parameters: the price elasticities. In principle, one might carry out an econometric exercise that estimated an elaborate model of demand, with products distinguished by place of production. Well, short of that lofty goal, I will assume that all products in a given disaggregated product category are perfectly substitutable, in which case it is the global supply that determines the Swedish price. Then, the impact on Swedish prices from a doubling of competitor exports depends on the size of the competitor. If, for example, the Chinese currently have a 1 percent market share, then a doubling of Chinese output would increase global output by a little less than 1 percent, driving down Swedish prices in that category by an amount that depends on the product price elasticity. For the numbers reported next, the price elasticities are all assumed to be equal to negative one, and the exposure of Swedish export prices to Chinese exports is simply equal to the weighted average Chinese market share, weighted by the importance of the product, measured by the Swedish export share.

Unlike the correlations discussed in the previous section, this measure properly allows for the economic size of a competitor. After all, if the competitor hardly exported anything, the competition for Sweden is small, even if the mixes of products are similar. But be alert, while I have given the proposed measure an explicit theoretical basis, that theoretical basis is entirely unlike the Heckscher-Ohlin model. In particular, no formal attempt is made to connect these measures with Swedish wages, though implicitly the mechanism is a terms-of-trade effect. Thus, our question is, which countries are large enough and similar enough to Sweden to affect the Swedish terms of trade?

In contrast, the Heckscher-Ohlin factor price equalization theory depends on the relative prices of labor-intensive products. The HO question is, which exporters of labor-intensive products are large enough to affect relative prices of labor-intensive products made in Sweden?

Notation

Measures of the intensity of competition between two exporters in third markets depend on the following data: x_j^c = export quantity by country c to destination/product market j; p_j = export price in destination/product market j, assumed to be the same for all exporters; T^c = total value of exports of country $c = \sum_j p_j x_j^c$; I_j^c = *importance* fraction of product j for country c = country c value share of export $j = p_j x_j^c/(\sum_j p_j x_j^c)$; and M_j^c = country c *market share* of export $j = p_j x_j^c/(\sum_c p_j x_j^c)$.

Note that the importance measures sum to one, $\sum_j I_j^c = 1$, while the market shares, which sum to the average market share multiplied by the number of products, depend on the size of the exporter, as well as the composition of exports.

Finger and Kreinin's Export Similarity Index

A commonly used measure of the similarity of exports of two countries (e.g., Sweden and China) to a third market is Finger and Kreinin's (1979) export similarity index, which is equal to the sum of the minimum of the importance measures:

$$\text{ESI(SWE, CHN)} = \sum_j \min(I_j^{\text{SWE}}, I_j^{\text{CHN}}).$$

Figure 9.3 illustrates the calculation based on importance distributions for Chinese and Swedish exports to a third market (e.g., the United States). The horizontal axis is a hypothetical measure of product sophistication, and it is assumed that the Chinese exports are concentrated at the lower end and the Swedish exports at the upper end. The overlap is the minimum value of the two importance numbers, and the ESI (export similarity index) is the area of the indicated overlap region.

This measure does have the feature that it is equal to zero if there is no overlap of products and is equal to one if the distributions are identical, but there are many other measures of the difference between two densities that have that feature. A very popular nonparametric measure is the Kolmogorov-Smirnov (KS) distance, which is the maximum difference between the two cumulative distributions. One minus the KS distance seems like an equally good measure, because it is also equal to one if the distributions are identical and is equal to zero if they do not overlap at all. (But the KS measure does require an ordering, like the skill intensity, because otherwise there is no way to compute the cumulative.)

What's the Question?

If the answer is the Finger and Kreinin export similarity index or the Kolmogorov-Smirnov statistic, it seems appropriate to ask, what is the question? I can't imagine what it might be.

One good question would be this: what would be the percentage reduction in the value of Sweden's total export if China were to double its exports of every product, assuming the elasticities in all markets were equal to negative one?

The following measure answers this question:

$$\text{Competition for Sweden's exports emanating from China} = \sum_j I_j^{\text{SWE}} M_j^{\text{CHN}}.$$

This is the inner product of the Swedish importance and the Chinese market share. Sweden faces intense competition from China if China has a

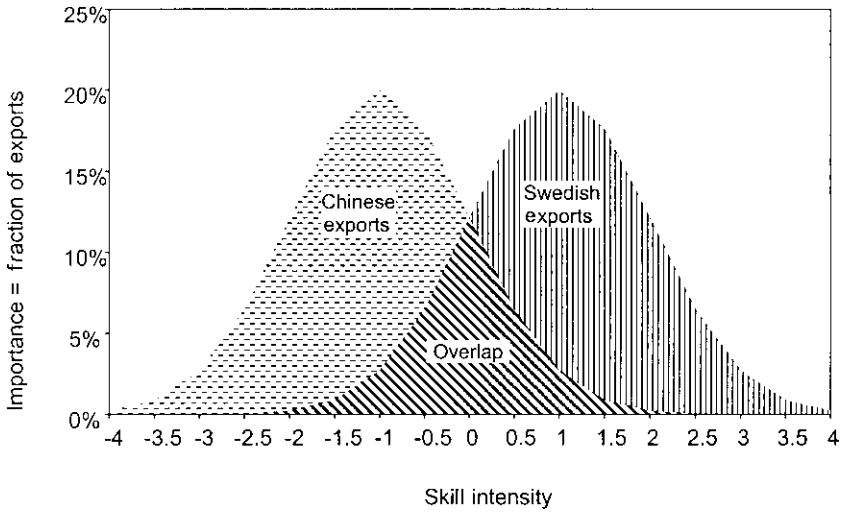

Fig. 9.3 Finger and Kreinin export similarity measure: A measure of the overlap of two distributions of exports sum of the minimum of the importance fractions

large market share of the exports that are most important for Sweden. Note that this is not a symmetric measure: the degree of competition for Sweden's exports from China is not the same as the degree of competition for China's exports from Sweden. Even if the composition of exports were exactly the same, the larger country competes for the smaller country's exports, but not the other way around.

The algebra needed to derive this measure is reported in the appendix.

Sweden and China Competing for the U.S. Market

Table 9.1 reports the competition measures applicable to exports to the United States for Sweden vis-à-vis the major exporters and regions of the world, excluding these major exporters. These are sorted by the change in the competition measures.

The measure of Chinese competition for Swedish exports to the United States rose from 0.5 percent in 1989 to 5.3 percent in 2004. Keep in mind that this is intended to estimate the effect on the value of Swedish exports to the United States if China were to double its exports and thereby drive down the prices of products for which the Chinese market share is considerable. By this measure, China hardly mattered in 1989 but became the number eight competitor by 2004.

Though Japan (12.7 percent) and Canada (12.5 percent) remained in 2004 the most important sources of competition for Swedish products in the U.S. marketplace, both had experienced sharp reductions in their competition intensities from lofty 1989 levels (27.8 percent and 19.4 percent). These reductions were offset by large gains for China, Korea, and Mexico.

Table 9.1 **Who competes with Sweden in the U.S. market?**

Region	1989 (%)	Rank	2004 (%)	Rank	Change (%)
China	0.5	15	5.3	8	4.8
Korea	2.1	11	5.8	7	3.7
Mexico	3.9	7	7.5	5	3.6
Europe	7.6	4	9.4	4	1.7
Great Britain	4.6	5	6.1	6	1.5
Germany	9.5	3	10.2	3	0.7
Middle East	0.7	13	1.1	14	0.4
East Asia	2.1	12	2.4	11	0.3
Central/Carribean	0.3	17	0.5	16	0.2
India	0.2	18	0.3	18	0.2
Africa	0.6	14	0.7	15	0.1
Not available	0.0	19	0.0	19	0.0
Pacific	0.5	16	0.4	17	–0.1
South America	2.6	8	2.4	10	–0.2
Italy	2.2	10	1.8	12	–0.5
France	4.2	6	3.6	9	–0.6
Taiwan	2.2	9	1.4	13	–0.8
Canada	19.4	2	12.5	2	–6.9
Japan	27.8	1	12.7	1	–15.1
Total	91.0		83.9		–7.1

Notes: Swedish competition is switching from Japan and Canada to China, Korea, and Mexico. Swedish importance times competitor market share; top ten Countries in 2004 and regions excluding these countries; sorted by change.

This raises some serious questions regarding the extent of competition for Swedish jobs. Are Swedish wages set in Guangdong, Seoul, and Monterrey? If not now, what about a decade from now?

We need to do a little detective work to find out what accounts for the rise in the competition between China and Sweden. Is it merely the rise in Chinese exports overall, or is there some significant change in the Chinese product mix—a more worrisome possibility? Product detail for computing the competition for Swedish exports to the United States coming from China is reported in table 9.2 at the two-digit Standard International Trade Classification (SITC) level of aggregation. The columns labeled "Swedish importance" are the Swedish shares of exports to the United States. The denominator in that fraction is total Swedish exports to the United States. For example, SITC 76, "telecommunications equipment, etc." in the first row of the table, comprised 1.7 percent of Swedish exports to the United States in 1989 and 8.7 percent in 2004.

The columns labeled "Chinese market share" are the Chinese fractions of U.S. imports. For example, 3.4 percent of U.S. imports of SITC 76 came from China in 1989 and 29.8 percent in 1976. The denominator in this fraction is the total U.S. imports in the product category.

Our measure of the intensity of Chinese competition for Swedish exports

is the sum of the product of the Swedish importance multiplied by the Chinese market shares. If the Chinese market share were the same in every product, then this would be equal to the Chinese market share, because the Swedish importance measures sum to one. The competition measure will exceed or fall short of the Chinese market share, depending on whether the Chinese have large shares of markets that are important sources of Swedish export earnings.

The final columns in table 9.2 labeled "contribution to competition" report the Swedish importance multiplied by the Chinese market share, commodity by commodity. These numbers are summed to get to the overall competition indicator. The table is sorted by the change in this contribution, thus highlighting the sources of any change in competition for Swedish exports.

At the very bottom of the table is the overall Chinese market share, which rose from 2.5 percent in 1989 to 19.3 percent in 2004. From 1989 to 2004, the competition measure rose from 1.1 percent to 9.5 percent, in both cases about half the Chinese market share, suggesting that many Chinese exports are in products that are unimportant to Sweden. These are typically labor-intensive manufactures. For example, in 2004, Chinese goods comprised 72 percent of U.S. imports of SITC 83, "travel goods, handbags," and 69 percent of SITC 85, "footwear," for which Swedish exports are virtually nil. (Incidentally, the competition measure depends on the level of aggregation, and the difference between the measures in table 9.1 and table 9.2 come from the fact that the finest product detail is used in table 9.1.)

The products are sorted by their *increase in contribution* to Swedish-Chinese competition between 1989 and 2004. At the top of the list are not traditional labor-intensive products. These new sources of competition are telecommunications, manufactures of metal, electrical machinery, and road vehicles, a finding that parallels Schott's (2006) description of the increased sophistication of Chinese exports. This seems like a rather ominous development for the Swedish economy, as it suggests some serious erosion of the degree to which newness protects the Swedish economy from competition with China. It is an altogether good thing for Sweden if the Chinese drive down the prices of apparel, textiles, and footwear, because Sweden has virtually no exports of these items. That's only a terms-of-trade improvement for Sweden. But it is not such a good thing if electrical equipment becomes a commodity like T-shirts and jeans and if Swedish comparative advantage in other high-tech items likewise is eroded.

To explore this issue more carefully, we need to disaggregate the data to figure out where exactly the new competition resides. It is possible that at a lower level of disaggregation, what is important for Sweden has small Chinese market shares. Table 9.3 reports details for SITC 76, Sweden's biggest problem sector. The first panel has the three-digit detail. It is true that this disaggregation suggests somewhat less competition between China and Sweden, lowering the 2004 contribution to the measure from 2.59 percent to 2.12

Table 9.2 **Chinese competition for Swedish exports to the United States, 1989 and 2004**

		Swedish importance (%)			Chinese market share (%)			Contribution to competition (%)		
SITC	Description	1989	2004	Change	1989	2004	Change	1989	2004	Change
76	Telecommunications and sound recording and reproducing apparatus and equipment	1.7	**8.7**	7.0	3.4	29.8	26.4	**0.06**	**2.59**	2.53
69	Manufactures of metals, n.e.s.	**3.3**	4.1	0.8	3.7	27.2	23.5	**0.12**	**1.13**	1.00
77	Electrical machinery, apparatus and appliances, n.e.s., and electrical parts thereof (including nonelectrical counterparts of household type, n.e.s.)	**3.6**	**4.7**	1.1	1.1	15.0	13.9	**0.04**	**0.71**	0.67
78	Road vehicles (including air-cushion vehicles)	**43.5**	**21.7**	–21.7	0.0	3.0	3.0	0.02	**0.66**	0.64
74	General industrial machinery and equipment, n.e.s., and machine parts, n.e.s.	**7.5**	**7.3**	–0.2	1.2	9.5	8.2	**0.09**	**0.69**	0.60
89	Miscellaneous manufactured articles, n.e.s.	2.6	1.6	–0.9	11.5	**43.5**	32.0	**0.30**	**0.72**	0.42
75	Office machines and automatic data processing machines	1.7	1.1	–0.6	0.2	**38.2**	38.0	0.00	**0.42**	0.42
82	Furniture and parts thereof; bedding, mattresses, mattress supports, cushions, and similar stuffed furnishings	1.3	0.9	–0.4	1.2	**41.1**	39.9	0.02	0.37	0.36
98	Estimate of import items valued under $251 and of other low-valued items nonexempt from formal entry	0.0	2.5	2.5		10.5	10.5	0.00	0.26	0.26
87	Professional, scientific, and controlling instruments and apparatus, n.e.s.	1.8	3.6	1.8	1.1	6.6	5.5	0.02	0.24	0.22
72	Machinery specialized for particular industries	**3.3**	4.2	0.9	0.3	5.2	4.9	0.01	0.22	0.21
64	Paper, paperboard, and articles of paper pulp, paper, or paper board	3.3	1.0	–2.3	0.8	14.9	14.2	0.03	0.16	0.13
67	Iron and steel	0.6	2.2	1.6	4.2	6.6	2.4	0.03	0.15	0.12
66	Nonmetallic mineral manufactures, n.e.s.	0.6	0.8	0.2	2.7	17.9	15.1	0.02	0.14	0.12
71	Power-generating machinery and equipment	**6.9**	**4.5**	–2.4	0.5	3.3	2.8	**0.03**	0.15	0.11
63	Cork and wood manufactures other than furniture	0.1	0.5	0.4	2.2	21.1	18.9	0.00	0.10	0.10
59	Chemical materials and products, n.e.s.	0.2	1.2	1.0	0.8	7.6	6.8	0.00	0.09	0.09
81	Prefabricated buildings; sanitary, plumbing, heating, and lighting fixtures and fittings, n.e.s.	0.2	0.2	0.0	3.8	**58.8**	55.0	0.01	0.09	0.09
54	Medicinal and pharmaceutical products	1.2	**11.6**	10.4	1.3	0.8	–0.5	0.02	0.09	0.07

65	Textile yarn, fabrics, made-up articles, n.e.s., and related products	0.2	0.3	0.1	**15.2**	28.0	12.8	0.02	0.08	0.05
68	Nonferrous metals	1.7	1.1	–0.6	0.3	4.4	4.1	0.01	0.05	0.04
62	Rubber manufactures, n.e.s.	0.5	0.3	–0.1	0.2	12.1	11.9	0.00	0.04	0.04
88	Photographic apparatus, equipment, and supplies and optical goods, n.e.s.; watches and clocks	0.5	0.2	–0.3	1.2	24.0	22.8	0.01	0.05	0.04
57	Plastics in primary forms	0.6	1.0	0.4	0.7	4.0	3.3	0.00	0.04	0.04
51	Organic chemicals	0.3	0.6	0.3	0.5	5.1	4.7	0.00	0.03	0.03
24	Cork and wood	0.2	1.2	1.0	0.0	2.3	2.3	0.00	0.03	0.03
52	Inorganic chemicals	0.2	0.4	0.2	4.1	8.8	4.7	0.01	0.03	0.02
73	Metalworking machinery	1.1	0.9	–0.2	1.0	3.6	2.6	0.01	0.03	0.02
61	Leather, leather manufactures, n.e.s., and dressed furskins	0.0	0.1	0.0	0.7	24.7	24.0	0.00	0.01	0.01
11	Beverages	2.7	3.3	0.6	0.4	0.7	0.3	0.01	0.02	0.01
55	Essential oils and resinoids and perfume materials; toilet, polishing, and cleansing preparations	0.0	0.2	0.2	1.5	4.9	3.4	0.00	0.01	0.01
85	Footwear	0.0	0.0	0.0	3.9	**69.1**	65.3	0.00	0.01	0.01
84	Articles of apparel and clothing accessories	0.3	0.2	–0.2	7.5	19.4	12.0	0.03	0.03	0.01
58	Plastics in nonprimary forms	0.1	0.2	0.1	0.1	5.2	5.1	0.00	0.01	0.01
33	Petroleum, petroleum products, and related materials	0.8	**4.3**	3.5	1.4	0.4	–1.0	0.01	0.02	0.01
93	Special transactions and commodities not classified according to kind	**4.2**	1.7	–2.5	0.7	2.1	1.4	0.03	0.04	0.01
83	Travel goods, handbags, and similar containers	0.0	0.0	0.0	**25.6**	**72.4**	46.8	0.00	0.01	0.00
4	Cereals and cereal preparations	0.0	0.2	0.2	0.3	1.3	1.0	0.00	0.00	0.00
53	Dyeing, tanning, and coloring materials	0.2	0.2	0.0	1.5	2.7	1.2	0.00	0.00	0.00
79	Transport equipment, n.e.s.	1.5	0.3	–1.2	0.4	2.2	1.9	0.01	0.01	0.00
9	Miscellaneous edible products and preparations	0.1	0.0	0.0	0.9	3.9	3.0	0.00	0.00	0.00
5	Vegetables and fruit	0.0	0.0	0.0	2.4	7.1	4.7	0.00	0.00	0.00
26	Textile fibers (other than wool tops and other combed wool) and their wastes (not manufactured into yarn or fabric)	0.0	0.0	0.0	0.0	7.4	7.3	0.00	0.00	0.00
27	Crude fertilizers (imports only), except those of division 56, and crude minerals (excluding coal, petroleum, and precious stones)	0.0	0.0	0.0	0.9	2.4	1.6	0.00	0.00	0.00

(*continued*)

Table 9.2 (continued)

SITC	Description	Swedish importance (%)			Chinese market share (%)			Contribution to competition (%)		
		1989	2004	Change	1989	2004	Change	1989	2004	Change
43	Animal or vegetable fats and oils processed; waxes and inedible mixtures or preparations of animal or vegetable fats or oils, n.e.s.	0.0	0.0	0.0	0.3	0.8	0.6	0.00	0.00	0.00
21	Hides, skins, and furskins, raw	0.0	0.1	0.1		0.1	0.1	0.00	0.00	0.00
34	Gas, natural and manufactured	0.0	0.0	0.0		0.1	0.1	0.00	0.00	0.00
41	Animal oils and fats	0.0	0.0	0.0		0.0	0.0	0.00	0.00	0.00
56	Fertilizers (exports include group 272; imports exclude group 272)	0.0	0.0	0.0		1.4	1.4	0.00	0.00	0.00
97	Gold, nonmonetary (excluding gold ores and concentrates)	0.0	0.0	0.0		0.2	0.2	0.00	0.00	0.00
0	Live animals, other than fish, crustaceans, molluscs, and aquatic invertebrates of division 03	0.0	0.0	0.0	0.1	0.8	0.8	0.00	0.00	0.00
23	Crude rubber (including synthetic and reclaimed)	0.0	0.0	0.0	0.5	1.1	0.6	0.00	0.00	0.00
1	Meat and meat preparations	0.0	0.0	0.0	**23.2**		–23.2	0.00	0.00	0.00
12	Tobacco and tobacco manufactures	0.0	0.0	0.0	0.1		–0.1	0.00	0.00	0.00
95	Coin, including gold coin; proof and presentation sets and current coin	0.0	0.0	0.0	**19.7**	3.3	–16.4	0.00	0.00	0.00
42	Fixed vegetable fats and oils: crude, refined, or fractionated	0.0	0.0	0.0	4.1	0.9	–3.2	0.00	0.00	0.00
6	Sugars, sugar preparations, and honey	0.1	0.0	–0.1	1.1	6.8	5.6	0.00	0.00	0.00
2	Dairy products and birds' eggs	0.1	0.0	–0.1	1.1		–1.1	0.00	0.00	0.00
3	Fish (not marine mammals), crustaceans, molluscs, and aquatic invertebrates, and preparations thereof	0.0	0.0	0.0	10.9	3.3	–7.6	0.00	0.00	0.00
7	Coffee, tea, cocoa, spices, and manufactures thereof	0.3	0.2	0.0	4.1	0.7	–3.4	0.01	0.00	–0.01
29	Crude animal and vegetable materials, n.e.s.	0.2	0.0	–0.2	**15.2**	30.6	15.4	0.03	0.00	–0.03
28	Metalliferous ores and metal scrap	0.4	0.1	–0.2	**18.3**	0.3	–18.0	**0.07**	0.00	–0.07
	Total	100	100		2.5	19.3		**1.08**	**9.54**	8.46

Notes: SITC = Standard International Trade Classification; n.e.s. = not elsewhere specified. Swedish importance = Swedish share of Swedish exports to the United States. Chinese market share = U.S. imports from China as share of total U.S. Imports. Contribution to competition = Importance times market share. Commodities ordered by change in contribution. Noteworthy numbers in bold.

Table 9.3 **Chinese competition for Swedish exports to the United States, 1989 and 2004, three-digit and four-digit detail for SITC 76**

SITC		Swedish importance (%)			China market share (%)			Contribution to competition (%)		
		1989	2004	Change	1989	2004	Change	1989	2004	Change
76	Telecommunications and sound recording and reproducing apparatus and equipment	1.7	8.7	7.0	3.4	29.8	26.4	0.06	2.59	2.53
761	TV receivers (including video monitors and projectors) whether or not incorporating radio-broadcast receivers or sound or video recording or reproducing apparatus	0.0	0.0	0.0	5.3	12.8	7.5	0.00	0.00	0.00
762	Radio-broadcast receivers, whether or not incorporating sound recording or reproducing apparatus or a clock	0.0	0.0	0.0	4.8	49.8	45.0	0.00	0.00	0.00
763	Sound recorders or reproducers; television image and sound recorders or reproducers	0.0	0.0	0.0	1.9	56.2	54.3	0.00	0.01	0.01
764	**Telecommunications equipment, n.e.s., and parts, n.e.s., and accessories of apparatus falling within telecommunications, etc.**	**1.7**	**8.7**	7.0	**4.1**	**24.4**	20.4	0.07	2.12	2.05
	764 total	1.7	8.7	7.0	4.1	24.4	20.4	0.07	2.12	2.05
7641	Electrical apparatus for line telephony or line telegraphy (including such apparatus for carrier-current line systems)	0.1	0.2	0.1	13.6	29.5	15.9	0.01	0.06	0.04
7642	Microphones and stands thereof; loudspeakers, headphones, earphones, and combined microphone/speaker sets; audio-frequency electric amplifiers, etc.	0.0	0.1	0.1	3.2	50.2	46.9	0.00	0.04	0.04
7643	**Transmission apparatus for radiotelephony, telegraphy, broadcasting, or television, whether or not including reception or sound recording apparatus, etc.**	**0.4**	**5.7**	5.3	**1.4**	**24.8**	23.5	0.01	1.41	1.40
7648	Telecommunications equipment, n.e.s.	0.1	0.2	0.1	3.0	9.5	6.6	0.00	0.02	0.01
7649	Parts and accessories suitable for use solely or principally with the apparatus of telecommunications and sound recording and reproducing equipment	1.1	2.5	1.5	1.6	16.1	14.5	0.02	0.41	0.39
	Total all Products, two-digit analysis	100.0	100.0	0.0	2.5	19.3	16.8	2.47	19.27	16.80

percent, all of which is from SITC 764. Next, this is disaggregated into the four-digit detail, revealing that it is SITC 7643, "transmission apparatus for radiotelephony," and SITC 7643, "parts for telecommunications and sound recording," that is the main source of this increase in competition.

Table 9.4 has the three-digit detail for two subsets of products: those that contributed most to the increase in competition from 1989 to 2004 and those that are important for Sweden for which the Chinese market shares are relatively small. Again, at the top of the list of contributors to increased competition is SITC 764, telecommunications equipment. Next comes SITC 775, "household electrical and nonelectrical equipment," then SITC 821, "furniture," then tools and then pharmaceutical products. While these last two products are not very important to Sweden, the increase in the Chinese market shares was great enough that these products contribute substantially to the increase in the measured intensity of Chinese competition for Swedish exports.

The most important sector for Sweden that faced little Chinese competition is SITC 781, "motor vehicles," which comprised 41.4 percent of Swedish exports in 1989 but only 20.2 percent in 2004. While China has hardly any exports to the United States in this category, plans are already in place to produce vehicles in China for export to the United States.

Parenthetically, one reason why the rise of Chinese exports is not as ominous as it sounds is that a significant fraction of Chinese export value originates in Japan and other high-wage countries, which ship intermediate products and ideas to China, where they are transformed into final goods for export. Nonetheless, some of the value added in Chinese exports surely originates in China, and the cost reductions from global production sharing with China create a cost disadvantage for Sweden if the same production sharing is not exploited also by Swedish manufacturers.

The changing nature of the global marketplace can be met by a clinging to the old industries or by a rapid adjustment away from the sectors in which low-wage competition is most problematic. Ideally, losses in jobs and production in the losing sectors would be offset by gains in jobs and production in the winning sectors. Sweden is not clinging to the past, but on the other hand, the winning sectors in manufacturing are few and far between. That fact of life puts greater emphasis on the transition from industrial to postindustrial work, which is discussed in the next section.

The bad news regarding Swedish employment is displayed in table 9.5, which reports the number of Swedish workers in two-digit International Standard Industrial Classification (ISIC) industries in 1980, 1990, 2000, and 2003. Industries are sorted by percentage job loss in this period, reported in the last column. That loss varies from a 69.2 percent loss in textiles (wearing apparel, footwear, and textiles) to a loss of 10 percent in gasoline. The only gain was 11.6 percent for motor vehicles. Theses changes in the mix of manufacturing jobs are symptomatic of the increased competition from

Table 9.4 **Chinese competition for Swedish exports to the United States, 1989 and 2004, three-digit detail: Selected sectors**

	SITC 3		Swedish importance (%)		Chinese market share (%)		Contribution to competition (%)		
			1989	2004	1989	2004	1989	2004	Change
		Sectors for which the increase in competition was greatest							
1	764	Telecommunications equipment, n.e.s., and parts, n.e.s., and accessories of apparatus falling within telecommunications, etc.	1.7	8.7	4.1	24.4	0.07	2.12	2.05
2	775	Household-type electrical and nonelectrical equipment, n.e.s.	0.1	1.6	13.7	39.4	0.02	0.63	0.61
3	821	Furniture and parts thereof; bedding, mattresses, mattress supports, cushions, and similar stuffed furnishings	1.3	0.9	1.2	41.1	0.02	0.37	0.36
4	695	Tools for use in the hand or in machines	1.6	1.7	5.4	19.8	0.09	0.33	0.24
5	541	Medicinal and pharmaceutical products, other than medicaments (of group 542)	0.1	5.5	1.7	4.5	0.00	0.25	0.25
6	894	Baby carriages, toys, games and sporting goods	0.4	0.3	33.8	81.1	0.15	0.24	0.09
7	745	Nonelectrical machinery, tools, and mechanical apparatus, and parts thereof, n.e.s.	1.1	1.8	0.7	11.8	0.01	0.21	0.20
8	699	Manufactures of base metal, n.e.s.	1.1	0.7	2.1	24.5	0.02	0.18	0.16
9	893	Articles of plastics, n.e.s.	0.8	0.5	6.7	36.9	0.05	0.18	0.13
10	751	Office machines	0.2	0.4	1.2	41.4	0.00	0.18	0.18
11	874	Measuring, checking, analyzing, and controlling instruments and apparatus, n.e.s.	1.1	2.2	0.8	8.0	0.01	0.18	0.17
12	691	Metal structures and parts of iron, steel or aluminum, n.e.s.	0.1	1.5	0.2	9.8	0.00	0.15	0.15
13	752	Automatic data-processing machines and units thereof; magnetic or optical readers; machines transcribing coded media and processing such data, n.e.s.	0.6	0.3	0.2	41.6	0.00	0.14	0.14
14	743	Pumps (not for liquids), air or gas compressors and fans; ventilating hoods incorporating a fan; centrifuges; filtering apparatus, etc.; parts thereof	1.6	1.2	2.6	11.7	0.04	0.14	0.09
15	778	Electrical machinery and apparatus, n.e.s.	0.9	0.7	1.6	19.4	0.01	0.13	0.11
16	772	Electrical apparatus for switching or protecting electrical circuits or for making connections to or in electrical circuits (excluding telephone, etc.)	1.2	0.9	0.6	12.9	0.01	0.12	0.11
17	771	Electric power machinery (other than rotating electric plant of power-generating machinery) and parts thereof	1.0	0.3	1.3	33.8	0.01	0.11	0.10

(*continued*)

Table 9.4 (continued)

	SITC 3		Swedish importance (%)		Chinese market share (%)		Contribution to competition (%)		
			1989	2004	1989	2004	1989	2004	Change
18	759	Parts and accessories suitable for use solely or principally with office machines or automatic data-processing machines	1.0	0.3	0.1	31.4	0.00	0.10	0.10
19	744	Mechanical handling equipment and parts thereof, n.e.s.	1.5	1.3	1.5	7.2	0.02	0.10	0.07
20	728	Machinery and equipment specialized for particular industries and parts thereof, n.e.s.	1.0	1.3	0.2	6.7	0.00	0.09	0.09
		Important Swedish sectors facing little Chinese competition							
1	781	Motor cars and other motor vehicles principally designed for the transport of persons (not public transport), including station wagons and racing cars	41.4	20.2	0.0	0.2	0.00	0.04	0.04
2	542	Medicaments (including veterinary medicaments)	1.1	6.1	0.6	0.1	0.01	0.00	0.00
3	334	Petroleum oils and oils from bituminous minerals (other than crude), and products therefrom containing 70 percent (by weight) or more of these oils, n.e.s.	0.6	4.3	0.2	0.4	0.00	0.02	0.02
4	112	Alcoholic beverages	2.7	3.3	0.4	0.2	0.01	0.01	0.00
5	713	Internal combustion piston engines and parts thereof, n.e.s.	1.5	2.2	0.1	0.9	0.00	0.02	0.02
6	931	Special transactions and commodities not classified according to kind	4.2	1.7	0.7	2.1	0.03	0.04	0.01
7	723	Civil engineering and contractors' plant and equipment	1.2	1.6	0.4	2.3	0.00	0.04	0.03
8	714	Engines and motors, nonelectric (other than steam turbines, internal combustion piston engines, and power-generating machinery); parts thereof, n.e.s.	3.9	1.4	0.4	1.8	0.02	0.03	0.01
9	248	Wood, simply worked, and railway sleepers of wood	0.2	1.2	0.0	2.3	0.00	0.03	0.03
10	784	Parts and accessories for tractors, motor cars, and other motor vehicles, trucks, public transport vehicles and road motor vehicles, n.e.s.	2.0	1.2	0.1	4.0	0.00	0.05	0.05
11	872	Instruments and appliances, n.e.s., for medical, surgical, dental, or veterinary purposes	0.6	1.1	2.1	3.0	0.01	0.03	0.02
12	598	Miscellaneous chemical products, n.e.s.	0.1	1.0	0.6	4.4	0.00	0.05	0.04
13	575	Plastics in primary forms, n.e.s.	0.6	1.0	0.5	8.8	0.00	0.08	0.08
14	641	Paper and paperboard	3.1	1.0	0.1	4.0	0.00	0.04	0.04
		Grand total (including omitted sectors)	100.0	100.0	2.5	19.3	0.95	8.37	7.16

Table 9.5 **Swedish number of employees in two-digit ISIC manufacturing industries**

	Number of employees				Annualized rate of growth (%)				Total (%)
	1980	1990	2000	2003	1980s	1990s	2000s	All	1980–2003
Total	968.3	885.9	745.7	713	–0.9	–1.7	–1.5	–1.3	–26.4
Textiles (17–19)	40.2	24.6	13.6	12.4	**–4.8**	**–5.8**	**–3.0**	**–5.0**	–69.2
Metals, basic (27)	67.7	45	31	33.2	**–4.0**	**–3.7**	**2.3**	**–3.1**	–51.0
Transportation: other (35)	39.9	26.2	20.1	19.7	**–4.1**	–2.6	–0.7	**–3.0**	–50.6
Mineral products (26)	30.5	26.7	17.5	18.5	–1.3	**–4.1**	**1.9**	–2.2	–39.3
Printing (22)	72.5	70.6	50.9	44.2	–0.3	**–3.2**	**–4.6**	–2.1	–39.0
Paper (21)	61.6	53.9	42.1	38.4	–1.3	–2.4	**–3.0**	–2.0	–37.7
Wood (20)	54	49.6	38.4	36.5	–0.8	–2.5	–1.7	–1.7	–32.4
Food processing (15–16)	82.8	79	62.2	62.8	–0.5	–2.4	**0.3**	–1.2	–24.2
Electrical (30–33)	103.5	91.6	96.8	79.9	–1.2	**0.6**	**–6.2**	–1.1	–22.8
Metal, fabricated (28)	95	93.7	80.4	73.9	–0.1	–1.5	–2.8	–1.1	–22.2
Not elsewhere classified (36–37)	65.4	61.4	54	52.1	–0.6	–1.3	–1.2	–1.0	–20.3
Rubber (25)	29.2	26.7	25.2	23.8	–0.9	–0.6	–1.9	–0.9	–18.5
Chemicals (24)	44.3	39.2	38.6	39.5	–1.2	–0.2	**0.8**	–0.5	–10.8
Machinery, n.e.c. (29)	110.7	116.3	96.5	99.3	**0.5**	–1.8	**1.0**	–0.5	–10.3
Gasoline (23)	3	3.2	2.8	2.7	**0.6**	–1.3	–1.2	–0.5	–10.0
Motor vehicles (34)	67.9	78.2	75.6	75.8	**1.4**	–0.3	**0.1**	**0.5**	11.6

Notes: Sweden suffered two periods of substantial declines in manufacturing employment: 1980 to 1983 and 1989 to 1993. These declines were pretty much across all sectors, though they were somewhat greater in labor-intensive sectors. Boldface numbers are those greater than 0.0 percent. Boldface numbers in shaded boxes are those less than –3.0 percent. Not elsewhere classified = "n.e.c."

low-wage suppliers of standardized products, to which a response helps to maintain the Swedish distinctiveness barrier. As will be discussed in the next section, the across-the-board losses are not so unusual, as many advanced developed countries are experiencing declines in manufacturing employment.

It is not just the jobs that are changing. It's also value added reported in table 9.6, which is sorted from losers (of which there are many) to winners (of which there are none). Here, we see more of the same.

All in all, the degree of competition between Swedish products and products made in low-wage emerging economies remains quite low, but storm clouds are gathering on the horizon, suggesting the need to take preventative measures to maintain the distinctiveness barrier that has protected Swedish workers from low-wage foreign competition. The proper antidote is increased emphasis on innovation in manufacturing and thus educational investments for the humans who do the innovating. But the decline in jobs in manufacturing and the stagnation overall in value added means that Sweden increasingly will have to look elsewhere for sustained economic growth.

Table 9.6 **Swedish value added in manufacturing (millions of constant U.S. dollars, 2003)**

	1970	1980	1990	2000	2002	Max	Year	Loss (%)
Communication (32)		2,083	1,997	2,803	383	4,089	1998	–91
Apparel (18)		584	277	119	112	584	1980	–81
Transportation: ships (351)		1,221	473	251	242	1,221	1980	–80
Computers (30)		1,019	588	253	267	1,269	1988	–79
Leather (19)		212	103	50	48	212	1980	–77
Textiles (17–19)	1,713	1,555	1,087	611	576	2,126	1975	–73
Gasoline (23)		328	772	553	283	942	1986	–70
Textiles (17–18)		1,343	984	560	528	1,343	1980	–61
Metals, nonferrous		737	748	421	391	899	1988	–57
Electrical (30–33)		5,319	5,738	6,144	3,886	8,291	1998	–53
Transportation: other (35)		2,557	2,005	1,208	1,246	2,557	1980	–51
Transportation: railroad (352, 359)		591	536	260	352	693	1992	–49
Wood (20)	2,229	3,871	3,982	2,209	2,161	4,160	1974	–48
Transportation: aircraft (353)		746	997	697	652	1,206	1992	–46
Metals, basic (27)		4,047	3,387	2,323	2,207	4,047	1980	–45
Metals, steel (271+)		3,310	2,639	1,902	1,816	3,310	1980	–45
Textiles (17)		759	707	441	416	759	1980	–45
Mineral products (26)	1,389	1,782	2,015	1,125	1,119	2,015	1990	–44
Chemicals: other (not 2423)		3,082	3,022	2,193	1,931	3,269	1988	–41
Paper (21)		4,784	5,722	4,830	4,120	6,697	1995	–38
Machinery and equipment (29–33)	6,302	12,335	13,986	12,457	10,094	16,290	1996	–38
21–22	5,010	8,110	9,273	8,231	7,102	10,766	1995	–34
Printing (22)		3,327	3,551	3,400	2,983	4,325	1996	–31
Metals (27–28)	5,753	8,385	8,533	6,694	6,164	8,938	1975	–31
Metals and equipment (27–35)	15,252	27,100	29,847	26,792	22,209	32,161	1996	–31
Food processing (15–16)	2,350	3,670	5,346	4,020	3,975	5,576	1996	–29
Motor vehicles (34)		3,823	5,322	6,433	4,705	6,433	2000	–27
Transport (34–35)	3,197	6,380	7,327	7,641	5,951	7,969	1988	–25
Instruments (33)		541	1,462	1,480	1,703	2,279	1998	–25
Machinery, n.e.c. (29)		7,017	8,249	6,313	6,208	8,249	1990	–25
Metal, fabricated (28)		4,338	5,146	4,371	3,957	5,146	1990	–23
Not elsewhere classified (36–37)	967	1,414	1,558	1,422	1,291	1,673	1996	–23
Rubber (25)		1,432	1,540	1,433	1,381	1,752	1996	–21
Electric, other (31)		1,675	1,691	1,608	1,533	1,810	1996	–15
23–25	2,939	5,664	6,915	7,198	7,441	7,626	1998	–2
Chemicals (24)		3,904	4,602	5,213	5,777	5,777	2002	0
Chemicals: pharmaceutical (2423)		822	1,580	3,019	3,846	3,846	2002	0
Total	31,848	53,166	60,022	51,609	45,875	61,182	1996	–25

9.3 The Difficult Transition to a Postindustrial Creative Economy

While the problem of competition with low-wage countries intensifies, there is a new problem emerging—Sweden and all other advanced developed countries are experiencing a difficult transition from industrial to postindustrial economies, symptomized by a declining fraction of GDP and employment in manufacturing production and a rising fraction of GDP and employment in creative/intellectual services. While manufacturing is reasonably compatible with a compressed income distribution and an aggressive welfare state, the efficient production of creative services is likely to produce much greater natural income inequality and greater dissonance with the goals of a welfare state. It's the difference between Detroit, where there are good jobs for many, and Hollywood, where there are great jobs for few.

The transition from industrial to postindustrial economy is likely to be more difficult than the transition from agrarian to industrial economy. The transition from agrarian to industrial society was driven fundamentally by a *pull* of manual workers off of the farms into *higher*-paying mechanical jobs on the factory floor and a *parallel elimination* of skilled craft jobs in artisan shops because of standardization and mechanization in manufacturing. Though entrepreneurial activities at the early stages of industrialization required great concentrations of capital, giving rise to the inequality that so bothered Karl Marx, by the second half of the twentieth century, manufacturing had proven its worth in generating good jobs for many and a comfortable degree of income equality.

The next transition from industrial to postindustrial economy is being driven fundamentally by a *push* of manual workers off of the factory floor into *lower*-paying service jobs in retail and hospitals and a parallel expansion of skilled creative craft jobs in the intellectual services, both traded and nontraded.

The word itself—manufacturing—tells us much about the transition from agrarian to industrial economies in the first part of the twentieth century. "Manu" in manufacturing is a reference to manual labor. Manufactured literally means "built by hand" (with the help of equipment, of course.) In a postindustrial age, manufacturing is giving rise to neurofacturing—made with the mind. In the industrial age, a mechanic was one who operated the equipment, producing reliably identical output, hour after hour. In the postindustrial age, mechanical is an epithet, referring to intellectual output that is the same as all the others—the last thing we want.

While innovations in equipment spurred by the electric motor have greatly increased productivity in manufacturing, most of the innovations of the industrial age have made very little encroachment on intellectual tasks, mundane or otherwise. An attorney, an architect, a teacher, and a clerk all did about the same work in 1970 as they did in 1800—pushing pencils and filing the work. But the microprocessor has changed the future of intellectual

work, eliminating the mundane intellectual tasks and the filing. Think about an architect. In 1970, the time of a creative architect partly was consumed by the task of rendering the drawings. Some of this work could be done by assistants, but the communication costs were often so high that it made more sense to have the master do the drawings. The personal computer, however, has allowed the architect to render the drawings with great efficiency, thus freeing up time to do the creative tasks that the computer cannot ever perform. Doing economics is the same. I used to hire teams of research assistants and secretaries, but now I do all that work at the touch of a button or two on my computer keyboard.

The effect of the personal computer and Internet access has been to eliminate the mundane and to leave mostly the creative tasks. That puts a heavy emphasis on creativity and talent, which tends to create a highly unequal Hollywood-style income distribution.

9.3.1 The U.S. Transition from Industrial to Postindustrial Economy

For more than a century beginning in the mid-1800s, the U.S. economy created wealth by moving workers off of the family farm, where annual earnings were low, and onto the factory floor, where annual earnings were three times as high (see figure 9.4).

The transition from agrarian to industrial society reduced the fraction of the U.S. workforce on farms from 41 percent at the beginning of the twentieth century to 2.5 percent at the end (see figure 9.5). During the first seven decades of the twentieth century, job losses in agriculture were partly offset by job gains in manufacturing, as the fraction in manufacturing rose from 22 percent in 1900 to a peacetime peak of 31 percent in 1953.

1970 Marks the Beginning of the Postindustrial Age for the United States

The U.S. transition from agrarian to industrial society ended in 1970, with the workforce in agriculture down to 5 percent and the workforce in manufacturing hovering at 27 percent. Thence commenced the more difficult transition from industrial to postindustrial society, whose prominent symptom is a collapse in manufacturing jobs, from 27 percent in 1970 to a meager 11 percent after the recession of 2001.

The speed of this decline in manufacturing opportunities after 1970 from a 28 percent share to an 11 percent share was every bit as rapid as the speed in the decline of agricultural jobs in the first seven decades of the twentieth century.

9.3.2 This Transition Is Occurring for All the Advanced Developed Countries

It is not only the United States that has experienced a sharp decline in manufacturing jobs. Figure 9.6 illustrates the declining fraction of manufacturing for all OECD countries. In the middle, you can see both the industri-

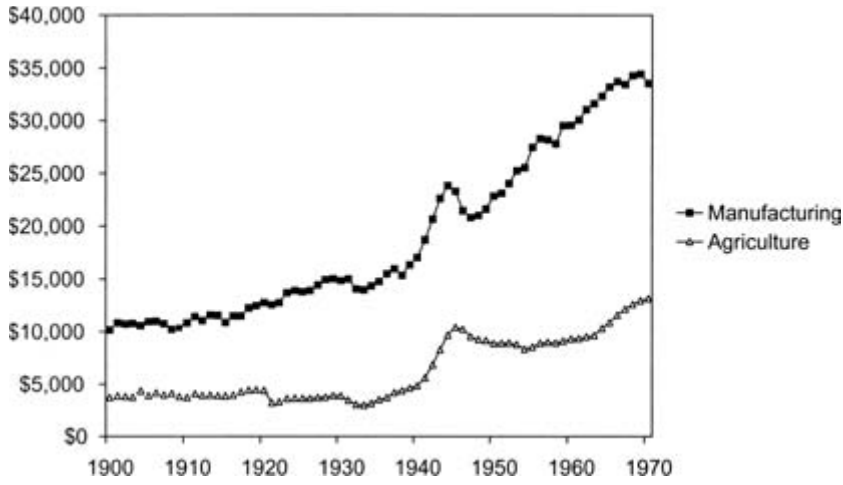

Fig. 9.4 Annual earnings in agriculture and manufacturing (Consumer Price Index 1999 U.S. dollars)

Source: BLS = Bureau of Labor Statistics; HSUS = Historical Statistics of the United States.

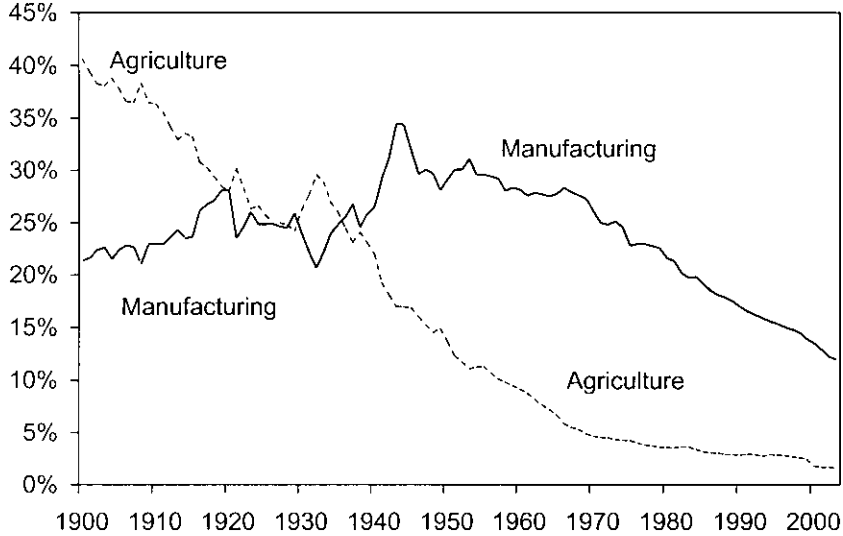

Fig. 9.5 U.S. employment shares in agriculture and manufacturing

alization period and the postindustrial period for Korea, with the fraction of the workforce in manufacturing peaking in 1990 at 28 percent of the workforce. The only other exception to the experience of sharply declining manufacturing jobs is the Czech Republic, which had a small increase in the share of manufacturing in the 1990s.

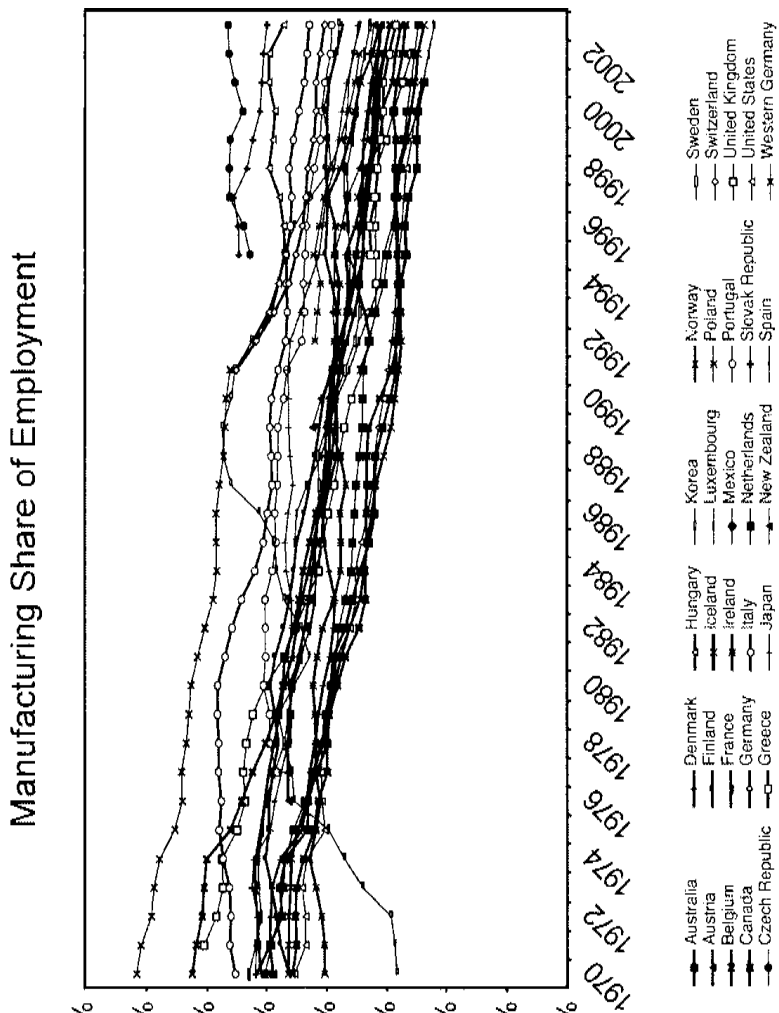

Fig. 9.6 Declining manufacturing shares of employment in OECD countries

Further information about the transitions experienced by these OECD countries is reported in table 9.7, which indicates the total number of workers from the OECD STructural ANalysis (STAN) database in 1970, 1980, 1990, 2000, and 2003, together with the employment shares in manufacturing, agriculture, mining, and the rest (services, including government). Countries are sorted by their manufacturing shares in 2000, from largest to smallest. The values that are in the top 20 percent are printed in bold.

This table indicates the rapid transition into a postindustrial economy for almost all of these OECD countries. The Korean data are particularly interesting, because this period encompasses both the period of industrialization, in which workers were moved off of the farm and onto the factory floor, and the beginning of the postindustrial period, in which a diminishing share of the workforce found jobs in manufacturing. The Korean agricultural share falls steadily in this period, from a peak of 47 percent in 1970 to a low of 9 percent in 2003. That 9 percent is still among the highest, suggesting that this trend is not likely to abate. Meanwhile, the Korean share of the workforce in manufacturing rose from 14 percent in 1970 to a peak of 28 percent in 1990 but has fallen dramatically in the 1990s to 20 percent.

Table 9.8 reports the current and the peak levels of employment in manufacturing since 1970 for the OECD countries in the STAN database. The penultimate column indicates the percent by which the latest available figure is less than the peak value, and the last column indicates the year in which the peak occurred. The countries are sorted by this last column, roughly the point at which this country begins the difficult transition into a postindustrial economy. By this measure, *Sweden was among the first countries to experience the end of the manufacturing age.* Employment in manufacturing in Sweden was the greatest at the very start of the time period covered. From that value of 1.04 million in 1970, manufacturing employment had fallen 32 percent by 2003. The long-term downward trend in manufacturing employment was punctuated by a very sharp decline in the crisis of the early 1990s, from which Swedish manufactures recovered only in the sense of not losing more workers (see figure 9.7). Meanwhile, value added in manufactures, illustrated in figure 9.8, has only the most modest upward trend, if any, and is punctuated by periodic recessions.

9.3.3 The Industrial Model and the Postindustrial Model

Figure 9.9 compares the growth in real per capita incomes for fourteen OCED countries in three decades for which the data are complete with the corresponding decline in agricultural share. Sure enough, we see the force of the old business model: those countries that most rapidly moved workers off of the farms are the ones that experienced the most rapid increase in per capita incomes. With agricultural shares very low in many OECD countries, most notably only 2 percent in Sweden, that industrialization process is mostly historical. Now, economic growth will come in the intellectual service sectors.

Table 9.7 **Employment: OECD STAN database**

	Total: Millions of employees					Manufacturing share (%)					Agricultural share (%)					Mining and quarrying share (%)					Government and services (%)				
	1970	1980	1990	2000	2003	1970	1980	1990	2000	2003	1970	1980	1990	2000	2003	1970	1980	1990	2000	2003	1970	1980	1990	2000	2003
Czech Republic				4.8	4.9				**27**	**28**				5	4				**1**	**1**				67	67
Slovak Republic				2.0	2.1				**26**	**25**				6	4				1	**1**				68	70
Hungary				3.8	3.9				**24**	**24**				7	5				0	0				69	71
Italy	19.9	21.4	22.6	**23.1**	**24.3**	**28**	**29**	**25**	**22**	**21**	21	13	7	5	4	0	0	0	0	0	52	57	68	73	74
Portugal		4.5	4.6	4.9	5.0		**25**	**24**	**20**	20		**21**	**16**	**10**	**10**							54	61	70	70
Korea	9.6	13.7	18.1	21.1	**22.1**	14	23	**28**	20	19	**47**	**31**	**16**	**11**	**9**	1	1	0	0	0	38	45	56	69	72
Finland	2.3	2.4	2.5	2.3	2.4	23	25	20	20	19	**21**	13	9	6	5	0	0	0	0	0	55	62	71	74	76
Japan	**54.4**	**58.7**	**64.3**	**66.6**	**65.1**	26	23	**23**	19	17	20	13	9	6	6	0	0	0	0	0	54	64	68	75	77
Spain		12.4	13.8	15.7	16.6		23	20	18	17		17	**11**	6	6		1	1	0	0		59	69	75	77
Poland				15.0					18					**26**					**2**					54	
Ireland	1.1	1.2	1.2	1.7	1.8	20	21	19	18	16	**27**	**18**	**15**	8	7	1	1	**1**	0	0	52	60	65	74	77
Sweden	3.9	4.3	4.6	4.3	4.3	26	23	19	17	16	7	5	3	3	2	0	0	0	0	0	66	72	77	80	81
Denmark	2.5	2.5	2.6	2.7	2.7	26	20	19	17	15	11	8	6	4	4	0	0	0	0	0	63	72	75	79	81
New Zealand			1.2	1.4	1.5			20	16	16			1	0	1			0	0	0			**79**	**83**	**83**
Austria		3.8	3.9	4.1	4.1		23	20	16	15		**20**	**17**	**13**	**13**		0	0	0	0		57	63	70	71
Belgium	3.8	3.8	3.9	4.1	4.1	**31**	24	20	16	15	6	4	3	2	2		1	0	0	0	63	72	77	82	**83**
France	21.1	22.2	**22.9**	**24.3**	**24.9**	25	24	19	16		14	9	6	4	4						61	68	75	80	
Iceland				0.2	0.2				15	14				**8**	**7**									76	79
Greece				3.9	4.0				15	14				**17**	**15**				0	0				67	70
Canada	8.4	11.1	13.4	15.2	16.0	23	19	16	14	13	6	5	4	3	3	**2**	**2**	**1**	**1**	**1**	**69**	**75**	**79**	81	83
United Kingdom	**26.5**	**27.1**	**29.0**	**29.4**			**25**	18	14			2	2	2			**1**	1	0			71	**79**	**84**	
The Netherlands	6.1	6.2	6.7	8.1	8.3	25	20	17	13	12	6	5	4	3	3	0	0	0	0	0	**68**	**75**	**78**	**83**	**84**
Norway	1.6	1.9	2.1	2.3	2.3	23	19	14	13	12	13	8	6	4	4	1	1	**1**	**1**	**1**	63	71	78	82	**83**
United States	**86.9**	**107.1**	**128.3**	**149.7**		23	19	15	13		4	3	3	2		1	**1**	1	0		**73**	**76**	**82**	**85**	
Luxembourg			0.2	0.3	0.3			19	12	11			3	2	1			0	0	0			78	**86**	**87**
Australia	5.4	6.3	7.8	9.1		24	20	15	12		8	7	6	5		**2**	**1**	**1**	**1**		66	**72**	78	**82**	
Germany				**38.7**	**38.3**				**21**	**20**				2	2				0	0				76	77
Western Germany	**26.6**	**27.4**	**30.3**			**36**	**31**	**28**			9	5	4			**1**	1	1			54	63	67		
Mexico																									
Switzerland																									

Note: Values in the top 20 percent in bold.

Table 9.8 **Employment in manufacturing: Millions of workers**

	Post-1970 Max	Latest values			Loss	Year max
		2001	2002	2003		
The Netherlands	1.53	1.08	1.06	1.03	–33	1970
Sweden	**1.04**	**0.75**	**0.73**	**0.71**	**–32**	**1970**
Belgium	1.17	0.66	0.63	0.61	–48	1970
Denmark	0.64	0.45	0.43	0.42	–34	1970
United Kingdom	7.88	4.08	3.88		–51	1971
Australia	1.38	1.10			–21	1973
Austria	0.88	0.66	0.65	0.64	–27	1973
France	5.64	3.85	3.79		–33	1974
Finland	0.58	0.46	0.45	0.44	–25	1974
Norway	0.39	0.29	0.29	0.27	–30	1974
Spain	2.98	2.93	2.92	2.86	–4	1978
United States	**21.53**	**18.07**			**–16**	**1979**
Italy	6.21	5.16	5.20	5.21	–16	1980
Portugal	1.14	1.01	0.99	0.98	–14	1981
Luxembourg	0.04	0.03	0.03	0.03	–12	1986
Canada	2.20	2.17	2.15	2.15	–2	1989
New Zealand	0.26	0.23	0.24	0.25	–4	1989
Germany	10.58	8.13	7.95	7.74	–27	1991
Korea	5.16	4.27	4.24	4.21	–18	1991
Japan	15.27	12.16	11.58	11.33	–26	1992
Hungary	1.05	0.96	0.96	0.93	–12	1992
Greece	0.63	0.60	0.58	0.57	–9	1996
Poland	3.13	2.64	2.56		–18	1997
Czech Republic	1.45	1.34	1.38	1.38	–5	1997
Slovak Republic	0.59	0.52	0.51	0.51	–13	1997
Iceland	0.02	0.02	0.02	0.02	–13	1997
Ireland	0.30	0.30	0.29	0.28	–6	2001

Note: Transition to a postindustrial society; sorted by year in which maximum occurred.

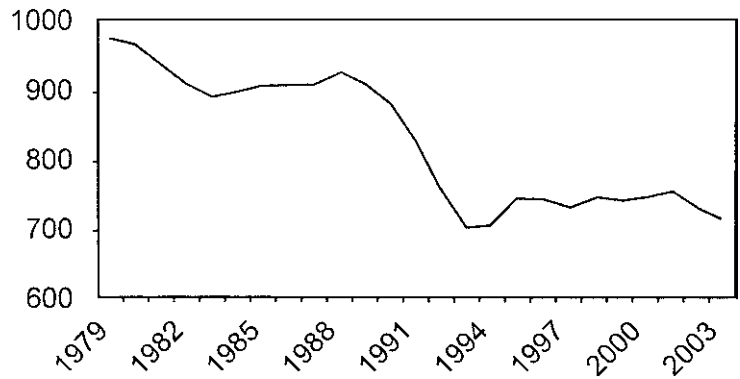

Fig. 9.7 **Swedish employment in manufactures (thousands)**

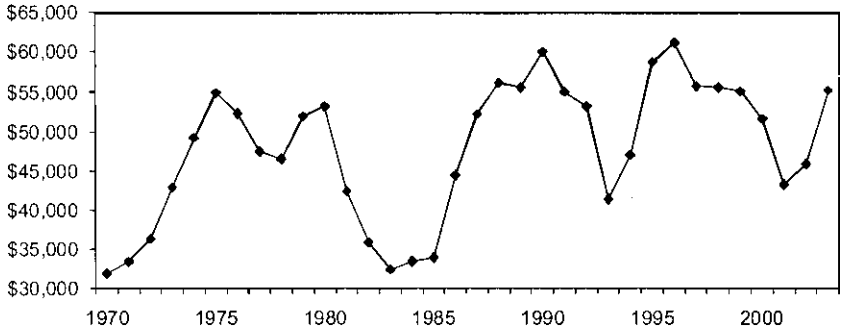

Fig. 9.8 Swedish value added in manufactures: Millions of U.S. dollars, 2003

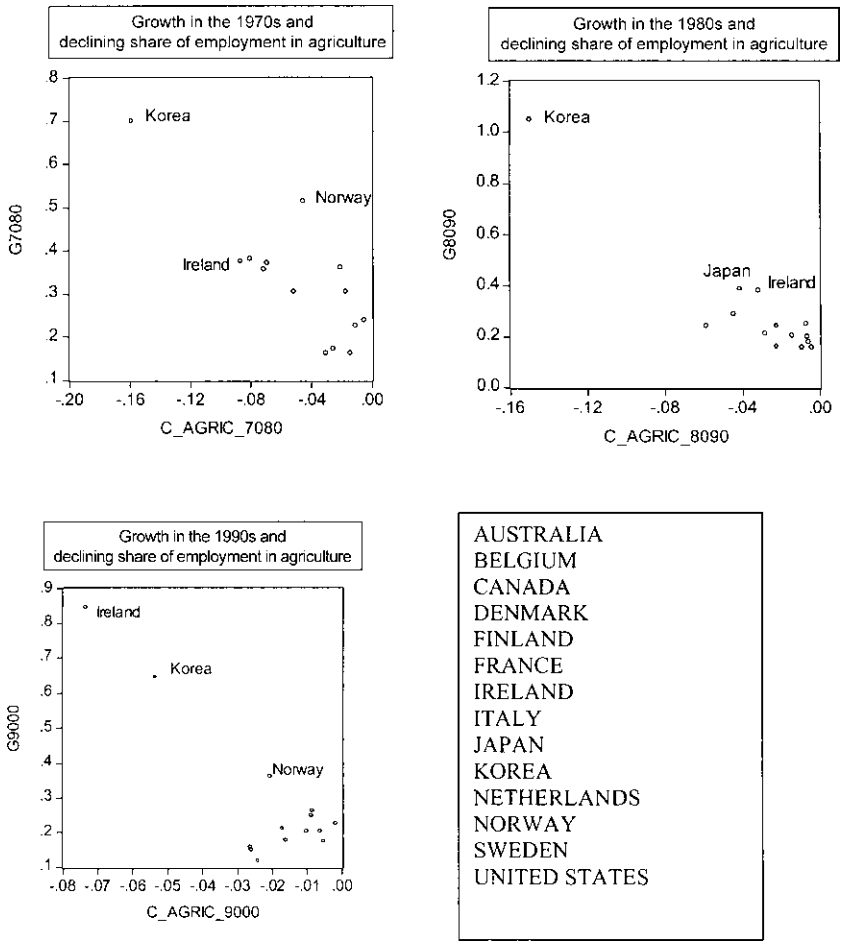

Fig. 9.9 Growth and the movement of workers off of the farm

Figure 9.10 displays the value added fractions of manufacturing and finance, insurance, and real estate (FIRE) over time for the United States. In 1987, 20 percent of U.S. GDP originated in manufacturing and 16 percent in FIRE. But the data trace out a large and ominous X, with FIRE crossing manufacturing in 1996, just when the Internet rush was beginning. Is that the essence of the new economy? We don't make anything anymore, but instead celebrate our genius in a gigantic parasitic bonFIRE?

Further details about the structure of U.S. earnings are reported in table 9.9, which reports the shares of earnings at the two-digit North American Industry Classification System (NAICS) level of aggregation. This new NAICS scheme was explicitly adopted to deal with the emerging knowledge work in the United States, and I have grouped the categories into manufacturing (including construction and transportation), distribution, services, government, and neurofacturing (information, finance, and professional and business services). Neurofacturing by this imperfect rendering now encompasses about 36 percent of earnings, while manufacturing is only 24 percent.

The Bureau of Economic Analysis discussion of 2007 first-quarter U.S. growth further illustrates the importance of financial activities in U.S. growth:

> Personal income in only five states (New York, Connecticut, New Jersey, Illinois, and Delaware) grew faster than the national average. Another four states matched the national growth rate and the rest of the states and the District of Columbia grew slower. This geographical concentration of personal income growth is attributable to the unusually strong contribution to earnings growth of the finance industry centered in New York (and to a lesser extent in Connecticut, New Jersey, and Illinois). The finance industry alone accounted for 38 percent of the nation's earnings growth in the first quarter of 2007 and earnings growth in these five states accounted for 36 percent of the nation's growth. Connecticut and New Jersey also benefited disproportionately because of their commuting flows into New York—personal income represents the income of a state's residents regardless of where it is earned. (U.S. Department of Commerce, Bureau of Economic Analysis 2007)

9.3.4 Postindustrial Earnings, Inequality, and Opportunity

While the shift out of manufacturing and into finance is clear in the data, what is not clear is the effect that the personal computer and the Internet are having on the market for intellectual services. A proper time series study of this hypothesis is beyond the scope of this chapter, but a look at the compensation in finance and manufacturing in the United States and in Sweden at one point in time sheds some light on the issues. The U.S. hourly and weekly earnings in 1999 to 2000 at the 10th, 50th, and 90th percentiles are reported in table 9.10 by gender and by skills (blue- and

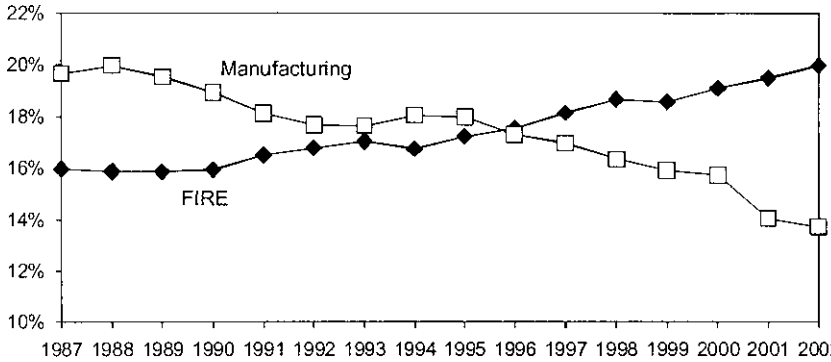

Fig. 9.10 Manufacturing and FIRE fraction of national income
Note: FIRE = finance, insurance, and real estate.

Table 9.9 U.S. earnings shares, 2006 (%)

U.S. 2006 national income without capital consumption adjustment	100
Manufacturing	**24.3**
Agriculture, forestry, fishing, and hunting	0.7
Mining	1.7
Utilities	1.6
Construction	5.3
Manufacturing	12.1
Transportation and warehousing	3.0
Distribution	**13.5**
Wholesale trade	6.1
Retail trade	7.3
Services	**14.5**
Other services, except government	2.4
Educational services, health care, and social assistance	8.4
Arts, entertainment, recreation, accommodation, and food services	3.6
Government	**11.7**
Neurofacturing	**35.5**
Information	3.7
Finance, insurance, real estate, rental, and leasing	18.0
Professional and business services	13.8
Rest of the world	**0.5**

white-collar occupations) and by sector (manufacturing, finance, and real estate). Weekly earnings are divided by hourly earnings to estimate apparent weekly hours.

This table and the corresponding figures are intended to help answer this question: what kind of earnings, inequality, and effort are characteristic of a postindustrial society? The table is sorted first by gender and then by the inequality measure: 90/10 ratio of weekly earnings.

Table 9.10 **U.S. earnings and hours in real estate, manufacturing, and finance: Current Population Survey, 1999/2000**

					Hourly earnings				Weekly earnings				Apparent hours = weekly earnings/hourly earnings			
Sex	Industry	Occupation	*n*	Fraction (%)	10	50	90	90/10	10	50	90	90/10	10	50	90	90/10
F	Real estate	Blue	2	0.0	8.7	10.3	12.0	1.4	346	413	481	1.39	40.0	40.0	40.0	1
F	Manufacturing	Blue	2,222	11.2	6.1	9.6	16.8	2.7	250	385	712	2.85	40.8	40.0	42.3	1.04
F	Finance	White	2,655	13.4	8.2	13.8	26.4	3.2	333	577	1,135	3.40	40.8	41.7	42.9	1.05
F	Finance	Blue	13	0.1	7.5	12.5	26.4	3.5	308	481	1,058	3.44	41.0	38.4	40.1	0.98
F	Manufacturing	White	2,172	11.0	8.7	15.1	28.8	3.3	346	625	1,250	3.61	40.0	41.4	43.3	1.08
F	Real estate	White	568	2.9	7.7	13.5	27.3	3.6	327	577	1,308	4.00	42.5	42.9	47.9	1.13
M	Real estate	Blue	110	0.6	7.4	14.1	23.8	3.2	300	564	962	3.21	40.5	40.0	40.4	1
M	Manufacturing	Blue	6,111	30.8	7.7	14.1	24.5	3.2	320	596	1,077	3.37	41.6	42.3	43.9	1.06
M	Manufacturing	White	3,701	18.7	11.5	23.1	43.3	3.8	500	1,019	1,981	3.96	43.3	44.2	45.8	1.06
M	Finance	Blue	26	0.1	6.9	15.3	28.8	4.2	288	712	1,154	4.00	42.0	46.6	40.0	0.95
M	Finance	White	1,730	8.7	11.5	24.0	57.7	5.0	495	1,058	2,692	5.44	42.9	44.0	46.7	1.09
M	Real estate	White	517	2.6	9.1	19.7	58.1	6.4	402	940	2,981	7.42	44.2	47.7	51.3	1.16
			19,827	100.0												

Notes: Occupation or industry of job last week and longest job last year were not the same; Usual hours < 35; Weeks worked < 26; wh < $5. A few service workers (e.g., janitors) were dropped. Integrated Public Use Microdata Series: white collar = occupation codes 3–389; blue collar = occupation codes 503–889.

First, consider the mix of jobs. (Keep in mind that to highlight the transition issues from industrial to postindustrial work, the jobs here are limited to those in three sectors: manufacturing, finance, and real estate.)

- The three largest job categories for both men and women are blue-collar jobs in manufacturing and white-collar jobs in manufacturing and finance. That's a pretty fair characterization of the job transition from industrial to postindustrial: from semiskilled manual work in manufacturing to highly skilled brain work in intellectual services.
- Men are greatly overrepresented in the blue-collar occupations in manufacturing. In contrast, there are almost as many white-collar as blue-collar women in manufacturing, and there are more white-collar women in finance than blue-collar women in manufacturing.

Possible implication: the transition from manufacturing to finance and real estate requires a more educated and more talented workforce. This may be more difficult for men than for women. After all, manufacturing starts with man.

Next, consider earnings. For this discussion, some figures are helpful. Figure 9.11 illustrates U.S. data on weekly earnings at the 10th and 90th percentiles for men and women. (The female blue-collar real estate sector is excluded, because the data includes only two observations.) Figure 9.12 illustrates the corresponding 90/10 ratios.

- One thing that stands out in these figures is the clear positive association between median pay and inequality. If the higher-paid white-collar occupations were a simple translation of the low-paid occupations, with each individual in the higher-paid occupation receiving a fixed multiple of the lower-paid job, then the median would change, but the 90/10 ratio would stay exactly the same. In fact, what happens is that the 90/10 ratio increases along with the median, making the 90/10 ratio higher for the white-collar jobs than the blue-collar jobs.
- In addition to the skill effect, there is also a gender effect: males have both higher earnings and greater inequality than females.
- The inequality of the white-collar jobs comes especially at the top of the distribution—the 50th percentiles are only moderately higher than the 10th percentile. This is particularly the case for males in white-collar jobs in finance and real estate.

Implication: the U.S. postindustrial economy has a lot of inequality at the top, especially for men.

Next, we can take a look at the relationship between hours per week and the hourly wage rate. Inside of manufacturing, there is a close association between hours worked, capital intensity, and hourly rates of pay. There is an economic reason for this, explained in Leamer (1999) and explored in

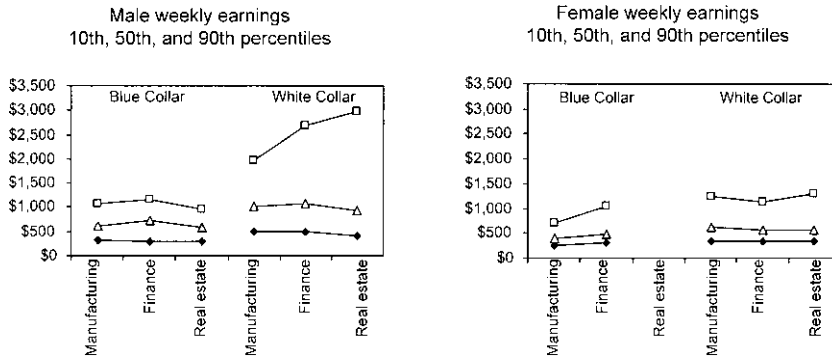

Fig. 9.11 Earnings: 90/10 ratio of weekly earnings

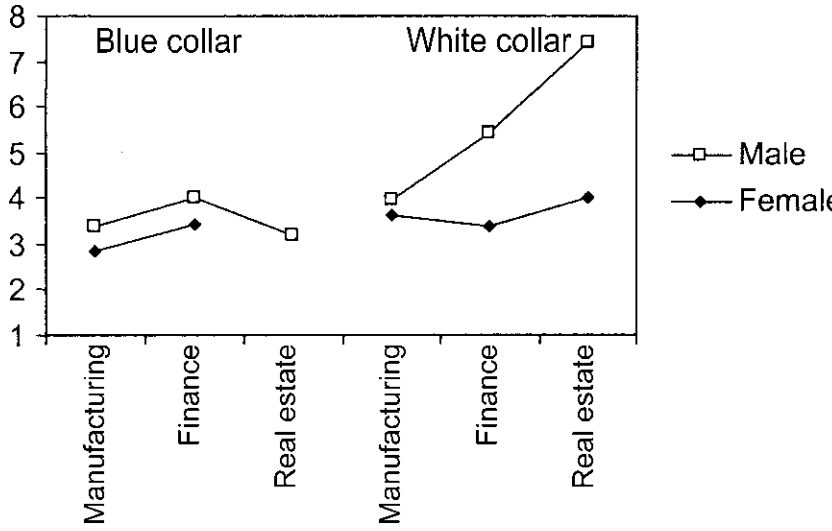

Fig. 9.12 Inequality

Leamer and Thornberg (2000). Expensive capital is efficiently deployed by spreading the fixed capital charges over the largest amount of labor input, which means operating the equipment at high speed for long hours during the day. Accordingly, the capital-intensive operations in manufacturing offer workers a special contract: a high hourly wage for hard work and long hours per day.

Figure 9.13 explores this idea for the data in table 9.10 by comparing the apparent hours worked per week with the average hourly earnings at the 10th, 50th, and 90th percentiles. The association between effort as measured by hours per week and wages for blue-collar workers is weak,

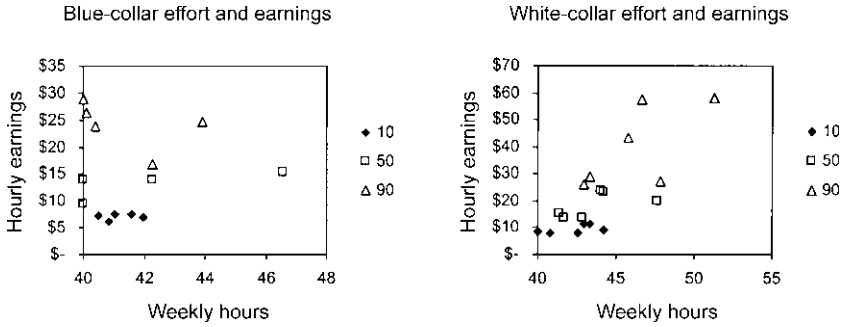

Fig. 9.13 Effort and pay

possibly because over this sample, these workers are operating about the same amount of capital. But for white-collar workers, there is a very clear tendency for higher hourly pay to come with higher weekly hours. The human capital that these knowledge workers acquired in school and on the job is very great, and it is economically inefficient to have that sit idle during short work weeks, long coffee breaks, and abundant vacation time. The U.S. economy responds efficiently to that reality with a reward system that puts a premium on hard work. You could call it inequality, but it is also opportunity. *Possible implication: the very expensive human capital operated by knowledge workers in the intellectual service sectors will earn its highest rate of return if operated for long hours over the lifetime. A country seeking to have high growth, therefore, will see that scarce human capital is allocated to those willing to work hard.*

Sweden

The corresponding Swedish earnings are reported in table 9.11. The earnings compression of the Swedish economy is evident in comparison of the 90/10 ratios with the U.S. ratios. For white-collar workers, these are illustrated in figure 9.14. (To make the next point, I would also need data on hours worked.) *Possibility: to get the highest return on its investment in human capital, Sweden needs more opportunity.*

9.4 Conclusions

Once, the United States entreated Europe (a plaque on the Statue of Liberty):

Give me your tired, your poor,
Your huddled masses yearning to breathe free,
The wretched refuse of your teeming shore.
Send these, the homeless, tempest-tost to me,
I lift my lamp beside the golden door!

Table 9.11 Swedish earnings

	Manufacturing ISIC 15–37				Financial activities ISIC 65–67				Real estate ISIC 70–74			
	D9	D5	D1	D9/D1	D9	D5	D1	D9/D1	D9	D5	D1	D9/D1
					Blue collar							
Male	2,919	2,437	2,065	1.41	n.a.	n.a.	n.a.	n.a.	2,869	2,276	1,855	1.55
Female	2,634	2,214	1,917	1.37	n.a.	n.a.	n.a.	n.a.	2,424	1,979	1,793	1.35
Total	2,882	2,399	2,028	1.42	n.a.	n.a.	n.a.	n.a.	2,721	2,127	1,830	1.49
					White collar							
Male	5,491	3,376	2,474	2.22	7,198	3,896	2,461	2.92	5,566	3,463	2,226	2.5
Female	4,329	2,746	2,152	2.01	4,440	2,869	2,177	2.04	4,242	2,696	1,942	2.18
Total	5,195	3,166	2,300	2.26	5,887	3,191	2,239	2.63	5,096	3,092	2,028	2.51
					Total							
Male	4,193	2,647	2,115	1.98	7,186	3,884	2,437	2.95	5,182	3,018	1,991	2.6
Female	3,636	2,412	1,979	1.84	4,428	2,857	2,140	2.07	3,983	2,474	1,830	2.18
Total	4,057	2,585	2,065	1.96	5,862	3,179	2,214	2.65	4,774	2,746	1,892	2.52

Note: n.a. = not applicable.

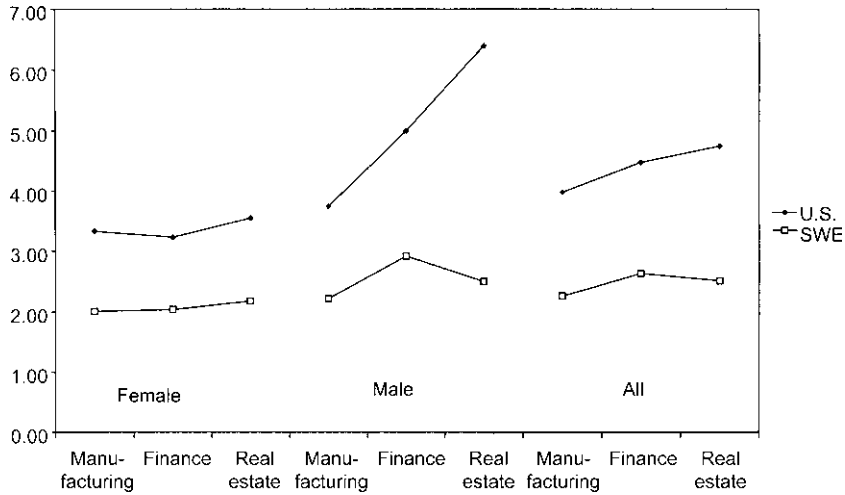

Fig. 9.14 U.S. and Sweden white-collar 90/10 ratios

Then, we needed manufacturing workers. Today, wealth is created in the postindustrial intellectual services. Now, our Statue of Liberty says to Sweden:

Give me your educated, your bright,
Your hardworking youth yearning to breathe free,
The sweet cream of your egalitarian consommé.
Send these, the suppressed, becalmed to me,
I lift my lamp beside the golden door!

Appendix

Competition Measure

The algebra needed to derive the competition measure depends on the price elasticity,

$$1/\gamma_j = \text{price elasticity in destination/product market } j.$$

If the demand function in destination/product market j (three exporters) is

$$p_j = \beta_j(x_{1j} + x_{2j} + x_{3j})^{-\gamma_j},$$

then the export revenue of country 1 is

$$R_1 = \sum_j x_{1j}p_j = \sum_j x_{1j}\beta_j(x_{1j} + x_{2j} + x_{3j})^{-\gamma_j}.$$

To compute the hypothetical increase in exports, note that the importance measure is the value of exports in the category divided by total exports T:

$$I_{2j} = \frac{x_{2j}p_j}{T_2}.$$

Holding prices fixed, an across-the-board expansion of exports increases T and increases each export item by a like amount:

$$\frac{dx_{2j}}{dT_2} = \frac{I_{2j}}{p_j}.$$

Given this increase in exports, the responsiveness of the revenue of country 1 to an increase in the exports of country 2 is:

$$\begin{aligned}
\frac{dR_1}{dT_2} &= -\sum_j x_{1j}\beta_j\gamma_j(x_{1j} + x_{2j} + x_{3j})^{-1-\gamma_j}\frac{dx_{2j}}{dT_2} \\
&= -\sum_j R_{1j}\gamma_j(x_{1j} + x_{2j} + x_{3j})^{-1}\frac{I_{2j}}{p_j} \\
\frac{dR_1/R_1}{dT_2/T_2} &= -\frac{\sum_j R_{1j}\gamma_j(x_{1j} + x_{2j} + x_{3j})^{-1}(I_{2j}/p_j)T_2}{\sum_j R_{1j}} \\
&= -\frac{\sum_j R_{1j}\gamma_j(x_{1j} + x_{2j} + x_{3j})^{-1}x_{2j}}{\sum_j R_{1j}} \\
&= -\sum_j I_{1j}\gamma_j\left(\frac{\sum_j I_{1j}\gamma_j M_{2j}}{\sum_j I_{1j}\gamma_j}\right)
\end{aligned}$$

= average elasticity of the exports of country 1 multiplied by the average market share of country 2.

Then, if all markets have the same elasticity, this becomes

$$\frac{dR_1/R_1}{dT_2/T_2} = -\gamma \sum_j I_{1j} M_{2j},$$

which finally reduces to $\sum_j I_{1j} M_{2j}$ when $\gamma = 1$.

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