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The Role of Globalization in the Within-Industry Shift Away from Unskilled Workers in France

Vanessa Strauss-Kahn

6.1 Introduction

An important correlate of recent extensions in international trade and globalization has been the observation that in nearly all countries less-skilled labor has fared less well than skilled labor. In some cases the wages of the unskilled have fallen absolutely whereas elsewhere they have simply increased much less rapidly. Likewise, while job opportunities for the skilled have been increasing strongly, those for the unskilled have been falling, frequently resulting in high involuntary unemployment rates among them. At the same time, an important component of recent globalization has been the huge growth in vertical specialization—the completion of the different production stages of a good in different countries and the international transportation of parts and components between countries. Moreover, the trends suggest that such "dividing up of the value chain" is likely to become more important in future.

This paper asks whether these two phenomena are linked—in particular, whether vertical fragmentation has allowed firms to move unskilled-labor-intensive activities away from industrial countries and toward less-developed ones, and thus to reduce their demand for the relatively expensive unskilled workers in the former. If so, globalization of this form could explain the poor relative showing of unskilled labor in industrial countries. This in turn suggests that the internal politics of trade liberal-

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ization and international investment will become more difficult and complex, as the unskilled—already a major force in industrial-country trade policy determination—become further detached from the increase in prosperity. Ultimately, such distributional consequences of globalization will need to be addressed by governments, by means of complementary policies or even by modifying the nature or extent of openness.

Strauss-Kahn (2002) sets forth theoretically the potential role of trade (via international vertical specialization) in explaining an increase in the within-industry share of unskilled labor. The present paper aims at assessing empirically the magnitude of this vertical specialization effect. I first show that international vertical specialization occurred in France over the past two decades and then estimate its contribution to the observed within-industry shift away from unskilled workers. Following Krugman's (1995) argument, I focus on employment rather than wages because of the particularly inflexible aspects of the French labor market (e.g., strong unions and a high minimum wage). This choice will be discussed more extensively in section 6.4. To determine the extent of international vertical specialization, I build an index that measures the value of imported inputs embodied in goods produced, using primarily data from input-output tables. The labor data used in the regression analysis distinguish workers per occupation within industry. All data come from the French National Institute of Statistics and Economic Studies (INSEE).[1] I find that international vertical specialization rose significantly over the period, from 9 percent in 1977 to 14 percent in 1993. A more limited index, restricted to inputs purchased from the same aggregated sector as the good being produced, shows an increase from 5 percent to 7.5 percent for the same period. I then show that international vertical specialization has contributed from 11 percent to 15 percent of the decline in the share of unskilled workers in manufacturing employment over the 1977–1985 period and for 25 percent of the decline in the 1985–1993 period.

France features several relevant characteristics that make it a particularly good case study. It has a large and diverse trading area because of (among other factors) preferential trade agreements with Eastern European countries and former colonies. Moreover, free markets in France have dramatically increased over the past three decades, as the European Union (EU) has been enlarged from six to fifteen member states and the free movement of goods, persons, services, and capital among members has been progressively established. Because labor costs differ across member countries, this market

1. Sebastien Jean has kindly provided the labor data used in this paper. The industry occupational decomposition is derived from an annual industry survey managed by the INSEE. The distinction between skilled and unskilled workers depends on occupation rather than education. Occupations have been divided into two groups that are roughly equivalent to the U.S. white-collar/blue-collar decomposition. For further information on these data, see Cortes and Jean (1997).

integration has probably increased international vertical specialization between France and its partners. In addition, the high French unemployment rate affects unskilled workers more than their skilled counterparts. The skilled-unskilled unemployment rate differential in France widened in the 1980s, rising from 2.4 percentage points in 1981 to 7.6 percentage points in 1994.[2] This increase in the unemployment rate of unskilled workers has been accompanied by a decrease in the share of the unskilled in total employment, as labor demand has shifted away from unskilled workers. Accordingly, many French citizens perceive international vertical specialization as one of the main causes of unskilled unemployment. To my knowledge, the accuracy of this belief has yet to be tested in any empirical work.

This paper is related to two strands of literature: one on vertical specialization and the other on the impact of trade on income distribution. Campa and Goldberg (1997) study vertical specialization in Japan, the United Kingdom, Canada, and the United States; Hummels, Ishii, and Yi (2001) consider the French case among other countries in the Organization for Economic Cooperation and Development (OECD). While both papers focus on the magnitude and evolution of vertical specialization, they neglect the effect of vertical specialization on the labor market. I also use a different index of vertical specialization and a higher level of industrial disaggregation than Hummels, Ishii, and Yi. In the large literature on trade and income distribution, my work is closest to Feenstra and Hanson (1996, 1997), which estimate the impact of outsourcing (vertical specialization) for the United States. They find that outsourcing made a significant contribution in explaining the observed increase in the relative wages of skilled workers during the 1980s.

The remainder of the paper is in five parts. Section 6.2 explains my measure of vertical specialization and the data used to construct it. It also presents results on vertical specialization levels and trends. In section 6.3, I examine the accuracy of the index by carrying out two different variance decompositions. Section 6.4 presents evidence on the within-industries shift away from unskilled labor. In section 6.5, I estimate the impact of vertical specialization on employment inequality through a regression analysis. Section 6.6 concludes.

6.2 The Index of Vertical Specialization

In order to assess the degree of vertical specialization across industries and its evolution over time, I build and study an index denoted by V. The

2. The unemployment rate for males with low education (i.e., levels 0, 1, and 2, up to lower secondary education) rose from 5.4 percent in 1981 to 13.5 percent in 1994. The unemployment rate for males with high education (levels up to tertiary education) increased from 3.0 percent in 1981 to 5.9 percent in 1994. The gap for female unemployment rate per education level is even larger. Data are from the OECD.

index is computed at the industry level and measures the share of imported inputs embodied in production. I primarily use input-output tables that include sector-level data on inputs. Data for outputs, value-added, imports, and consumption are derived from national account tables. All data come from INSEE and encompass 100 sectors, among which 50 are of interest for this paper.[3] The database covers the 1977–1993 period. Input-output tables provide the value of inputs used in production and distinguish between the different sources of supplies (i.e., the industries in which the inputs have been produced). However, these tables do not distinguish between domestically produced and imported inputs. In order to obtain an estimate of the value of imported input from industry j used in producing the output of industry i, I multiply the total value of inputs from industry j used in producing the output of industry i, namely, q_{ji}, by the ratio of the value of imported goods from industry j to the value of the domestic use of goods from industry j, namely, m_j, where domestic use includes use as final goods, intermediate goods, and capital goods. Dividing this estimate of imported inputs from industry j by the value of total production in industry i, and summing this ratio for all the n industries with imported inputs into industry i, yields the vertical specialization index for industry i, namely, V_i.

$$V_i = \sum_{j=1}^{n} \frac{m_j q_{ji}}{p_i} \tag{1}$$

The fact that the import penetration ratio mixes final goods, intermediate goods, and capital goods limits the precision of the index. It is indeed likely that the share of imported inputs in total consumption of intermediate inputs differs from the share of imported final goods in total consumption of final goods. One might expect the first ratio to be lower than the second due to quality/adequacy issues of international trade in intermediate goods. If such is the case, the index of international vertical specialization is overstated. However, because changes in variables are considered in the regression analysis, this issue is not a significant concern. More importantly, it is likely that imports in intermediate goods do not vary across industries in the same proportion as imports in final goods over the period considered. The manner in which this issue will bias the index, however, is unclear. Given this limitation, the import penetration ratio is used as the best available approximation of the share of intermediate-goods imports in intermediate-goods consumption.

This index V seems to capture adequately any changes in production

3. The 100 sectors are divided in six industries: agriculture, business, manufactures, mining, services, and transportation. Agriculture, mining, and manufactures account for 90 percent of traded goods and are the sectors covered in this study. Index V has been computed for the services, transportation, and business sectors, however, and indicates low levels of vertical specialization (under 5 percent in 1996).

structure toward more or less international vertical specialization (i.e., if V increases then an industry becomes more vertically specialized). However, in order to measure the impact of vertical specialization on unskilled labor shares, I also calculate a modified version of the original index. The modified index only measures inputs purchased from the same aggregated sector as the good being produced. This provides information on the relative extent of international intermediate-goods specialization within the same industry. As most of the decline in unskilled labor shares occurred within industries (see section 6.4), the modified index captures such an intra-industry movement. The rationale of using the so-called limited index may be illustrated as follows. If (to use a common example) the French automobile industry imports more steel, this will not affect French workers in the automobile industry but rather those in the steel industry. In contrast, if the French automobile industry imports more automobile parts, then automobile workers will be affected—especially if the parts were formerly made by the same company (or, at least, were purchased in France). The limited index of vertical specialization, Vl, is constructed the same way as V, with the input subscripts i and j belonging to the same aggregated sectors (i.e., three-digit industry j belongs to two-digit industry i.)

In constructing the Vl index, I would ideally like to have firm-specific data on the production process that included the amount of imported inputs in total production, among which are parts and components and also contracts done by others. Such data would be more precise than the data used here and would provide information on stages of production that are located abroad. For example, many French-contracted goods involve domestic design, marketing, and headquarter activities but are produced abroad and then directly exported to their final destinations. Hence such goods do not appear in the French input-output tables. This type of outsourcing, which tends to separate production and nonproduction activities internationally, has dramatically increased over the past few decades. Among the multitude of European- and U.S.-branded goods made abroad, a typical example is Nike,[4] which employs 2,500 persons for marketing and headquarter activities in the United States and about 75,000 persons for production activities in Asia. Firm-specific data are collected for the United States in the *Annual Survey of Manufactures.*[5] Unfortunately, equivalent data do not exist for France. The unavailability of "contracts done by others" data tends to reduce the level of international vertical specialization and therefore to underestimate its impact on the changes in the share of unskilled workers. Nevertheless, I believe that Vl, using available data, captures a significant part of the vertical specialization trend. One should,

4. Mentioned in Feenstra and Hanson (1996).

5. The *Annual Survey of Manufactures* provides information, at a high level of disaggregation, on such outsourcing as (a) parts and components, (b) resales, and (c) contracts done by others.

Table 6.1 **Index *V* and Limited Index *Vl* of International Vertical Specialization: Overall and Selected Results**

	1977	1993	% Growth
Index V			
Overall	0.092	0.138	50.0
Apparel and other fabricated textile products	0.080	0.181	126.3
Synthetic fibers	0.164	0.323	96.9
Miscellaneous plastic products	0.155	0.303	95.5
Textile industries	0.097	0.188	93.8
Aircraft	0.129	0.239	85.3
Motor vehicles	0.084	0.154	83.3
Nonelectrical industrial machinery	0.093	0.169	81.7
Industrial chemicals	0.117	0.196	67.5
Farm machinery and equipment	0.083	0.137	65.1
Electronic computing equipment	0.081	0.123	51.9
Primary steel industries	0.143	0.216	51.0
Metalworking machinery	0.067	0.098	46.3
Wood product	0.093	0.074	–20.4
Iron mining	0.085	0.030	–64.7
Limited Index Vl			
Overall	0.049	0.073	49.0
Miscellaneous plastic products	0.012	0.037	208.3
Apparel and other fabricated textile products	0.072	0.164	127.8
Textile industries	0.059	0.127	115.3
Synthetic fibers	0.136	0.279	105.2
Motor vehicles	0.039	0.079	102.6
Aircraft	0.107	0.212	98.1
Industrial chemicals	0.085	0.168	97.7
Electronic computing equipment	0.042	0.079	88.1
Farm machinery and equipment	0.028	0.047	67.9
Nonelectrical industrial machinery	0.049	0.080	63.3
Metalworking machinery	0.015	0.024	60.0
Primary steel industries	0.139	0.208	49.6
Wood product	0.084	0.059	–29.8
Iron mining	0.016	0.004	–75.0

however, keep in mind that *Vl* represents the lower bound of the potential magnitude of international vertical specialization.

Table 6.1 presents overall estimates of the level of international vertical specialization as measured by *V* and *Vl*, as well as sectoral results for selected industries. It also shows growth rates in the indexes for the 1977–1993 period. Overall, *V* increases from 9 percent to 14 percent, which represents more than a 50 percent growth over the period. Campa and Goldberg (1997) computed a similar measure of vertical specialization for the 1974–1993 period for the United States and other countries. They found that *V* rose from 4 to 8 percent in the United States, from 16 to 20 percent in Canada, and from 13 to 22 percent in the United Kingdom. Japan, in

contrast, experienced decreasing vertical specialization, with V falling from 8 to 4 percent. My growth rate estimates for France are roughly similar (although somewhat lower) than Campa and Goldberg's estimates for the United Kingdom when their longer-coverage period is taken into account. This similarity may be explained by the fact that the two countries have several common features (European countries, part of the EU, size, etc.). Moreover, Campa and Goldberg use more aggregated data (about twenty sectors) than in this paper and do not include the agricultural sector in their calculation, which tends to increase the index's value.[6] Hummels, Rapoport, and Yi (1998) and Hummels, Ishii, and Yi (2001) consider the value of imported inputs embodied in goods that are exported. Their measure, although more limited than mine, gives a useful estimate of vertical specialization in goods sold abroad. However, my index measures the shift in labor demand whether the final good is exported or consumed domestically. Their index shows a rise in vertical specialization in France from 18 percent in 1972 to 24 percent in 1990. Two factors inflate their index compared to mine. First, Hummels and colleagues take into account the imported inputs embodied in domestic inputs purchased. Second, sectors featuring the highest share of imported inputs are relatively more export-oriented (the correlation between the levels of vertical specialization and the level of export orientation is 0.45).[7] This observation supports the idea of undertaking vertical specialization for cost-advantage reasons, since export-oriented sectors must be competitive in international markets.

In examining V by sector, two broad relationships emerge.[8] First, the level of vertical specialization varies widely across sectors. Although certain industries experience a rapid increase, V declines in a number of industries (e.g., iron mining or wood products). Second, the sectors most affected by international vertical specialization in France (in level as well as in trend) tend to be the same than in other countries. In France, among the industries that experience the greatest rise (for a significant level of V) are chemicals and allied products (drugs and medicines, industrial chemicals, soaps and cosmetics, and synthetic fibers); electronic computing equipment; nonelectrical industrial machinery; textiles (apparel and other fabricated textile products, footwear industries, leather and leather products, and textile industries); transportation equipment (aircraft, motor vehicles, and ship and boat building); and rubber and plastics products. These findings are consistent with those of Hummels, Rapoport, and Yi (1998), Hummels, Ishii, and Yi (2001), and Campa and Goldberg (1997) for other industrial countries.

6. Omitting the agricultural sector, the French vertical specialization rises from 10 percent in 1977 to 16 percent in 1993, with a growth of 67 percent.

7. Author's calculation.

8. Table 6.2 reports the index for selected representative sectors. Results for all sectors are available upon request.

Results obtained with the restricted measure of international vertical specialization are also reported in table 6.1. Overall, *Vl* increases from 5 percent in 1977 to 7.5 percent in 1993, a 49 percent growth over the period. As would be expected, *Vl* is lower than *V* across all sectors. Certain sectors, however, exhibit significantly high limited vertical specialization index *and* growth in limited vertical specialization. Such sectors belong to the chemicals and allied products industries, transportation equipment industries, machinery industries, and textile industries. In these sectors it is apparently relatively easy to "divide up the value chain" and import inputs from abroad.

Distinguishing international vertical specialization by regional source of imported inputs provides interesting results. In disaggregating these imports into OECD versus non-OECD import sources I find that the levels and growth rates of the overall *V* and *Vl* can be mainly imputed to OECD imports.[9] In fact, 79 percent of international vertical specialization is attributed to OECD countries in 1977, and 85 percent in 1993. Breaking the results down by subperiods reveals that vertical specialization involving OECD countries accounts for 100 percent of the growth in vertical specialization for 1977–1985, but only 80 percent for 1985–1993. The importance of vertical specialization involving OECD countries reflects the French pattern of trade.[10] However, results on trends are more significant. While import growth rates declined during the 1977–1993 period—from 64 percent for the 1977–1985 period to 42 percent for the 1985–1993 period—international vertical specialization growth rates increased over the period. Import growth rates from OECD countries show a similar declining trend as total import growth rates. Growth rates in vertical specialization involving OECD countries reached 27 percent in the two subperiods. More importantly, whereas imports from non-OECD countries grew by 58 percent from 1977 to 1985, vertical specialization involving nonmember countries did not increase. However, for 1985–1993, imports from non-OECD countries grew by 54 percent, with *V* and *Vl* increasing by 16 percent and 21 percent, respectively. This suggests that, in the second period, imports from non-OECD countries became more oriented toward sectors that vertically specialize. Sectoral decomposition of the international vertical specialization index shows a dramatic growth in *V* and *Vl* from non-OECD countries in electronic computing equipment, office and computing machinery, and all the textiles industries. It is plausible that some issues specific to trade in intermediate inputs, such as quality or adequacy of products along the pro-

9. The OECD data used in this paper cover only those countries that were members prior to 1994 (i.e., the data exclude the Czech Republic, Hungary, Mexico, Poland, and South Korea).

10. About 84 percent of French imports came from OECD countries during 1977–1993, with this share being stable over the period.

duction chain, became less important over time as communication (and thereby monitoring) was eased. Further research on patterns of trade and vertical specialization according to source countries would be of great interest. However, such research is beyond the scope of this paper, which focuses more specifically on the broad impact of international vertical specialization on French employment shares of unskilled and skilled workers.[11]

6.3 Is the Index a Good Measure of International Vertical Specialization?

The index of international vertical specialization aims at capturing changes caused by the relocation of different stages of production across countries. International vertical specialization is hence expected to occur at the industry level and to increase international trade. Thus, it is important to verify (a) that the index captures the change in intensity of a sector's vertical specialization (and not the variation in sector composition of total production) and (b) that it reflects a variation in the share of imported inputs in production for a given level of inputs (and not a variation in the use of inputs independently of the supply's source).

A rise in V or Vl could be due simply to an increase in production shares of highly vertically specializing sectors relative to production of other sectors. I check for this possibility by decomposing the variance of V and Vl. The change in these indexes for the 1977–1993 period is decomposed into the variation in intensity of a sector's vertical specialization (the *within* component) and the variation in sector share of total production (the *between* component):

$$\Delta V = \Delta \sum_{i=1}^{n} \theta_i V_i = \sum_{i=1}^{n} \overline{\theta}_i \Delta V_i + \sum_{i=1}^{n} \overline{V}_i \Delta \theta_i,$$

where θ_i is industry i's share of total manufacturing production at time t. (Henceforth, a bar over a variable denotes the mean value over the considered period.)

Overall results of this variance decomposition are summarized in table 6.2.[12] The between-and-within sector decomposition of the rise in vertical specialization is indicated for the entire period 1977–1993 as well as for the subperiods 1977–1985 and 1985–1993. The column labeled "Total" reports the annual percentage-point increase in vertical specialization. A comparison of the rates between periods shows an acceleration over time. In terms of V (Vl), the rise in vertical specialization occurred at a rate of 0.20 (0.10)

11. Note that the importance of vertical specialization with OECD countries does not affect its potential impact on unskilled and skilled labor shares. Within the OECD, differences in labor costs could lead France to relocate its unskilled-intensive activities to lower-wage countries (e.g., southern European countries).

12. Detailed results across sectors are available upon request.

Table 6.2 **Industry/Sector Decomposition of the Rise in International Vertical Specialization**

	Between	Within	Total	Within/Total
V				
1977–1985	0.00	0.20	0.20	101%
1985–1993	0.01	0.30	0.31	97%
1977–1993	0.01	0.27	0.27	98%
Vl				
1977–1985	0.00	0.09	0.10	98%
1985–1993	–0.01	0.18	0.17	105%
1977–1993	0.00	0.14	0.14	101%

Sources: National Institute of Statistics and Economic Studies (1977–1992, 1977–1996, 1993–1996) and author's calculations.

Notes: The "Total" columns report the sum of the within and the between components. Due to rounding, total numbers vary slightly across tables.

percentage points per year during the 1977–1985 period and increased to 0.31 (0.17) percentage points per year during the 1985–1993 period.

The within component dominates in both periods, accounting for 0.20 (0.09) of the 0.20 (0.10) percentage point per annum increase in vertical specialization for V (Vl) in the 1977–1985 period and for all the acceleration between the two periods. Over all sectors, the within component of the variance decomposition accounts for almost 98 percent (101 percent) of the total variation in vertical specialization indexes for 1977–1993. The increase in V and Vl is thus due mainly to an increase in the individual sector's vertical specialization intensity.

I also want to determine if the observed vertical specialization is internationally oriented. The growth in V and Vl could actually be caused either by an increase in the use of inputs from all sources or by a shift from domestically produced inputs to imported inputs. Obviously, vertical specialization affects the domestic labor market only if it occurs internationally, substituting foreign for French labor. For this purpose, I decompose the variance of the index of vertical specialization by industry into the variation in the use of production inputs, independently of the supply's sources (the within component) and the variation in share of imported input in production for a given level of inputs (the between component):

$$\Delta V_i = \sum_{j=1}^{n} \overline{m}_j \Delta\left(\frac{q_{ji}}{p_i}\right) + \sum_{j=l}^{n} \left(\overline{\frac{q_{ji}}{p_i}}\right) \Delta m_j, \tag{3}$$

where V_i is the level of vertical specialization in sector i, m_j is the import penetration ratio of industry j, q_{ji} is the value of inputs from industry j used in the production of industry i, p_i is the value of total production in industry i, and n is the number of industries considered.

Table 6.3 **Source Decomposition of the Rise in International Vertical Specialization: Domestic versus Foreign**

	Between	Within	Total	Between/Total
V				
1977–1985	0.23	–0.02	0.21	112%
1985–1993	0.31	–0.01	0.30	103%
1977–1993	0.30	–0.02	0.27	108%
VI				
1977–1985	0.11	–0.01	0.09	114%
1985–1993	0.19	–0.01	0.18	103%
1977–1993	0.16	–0.01	0.14	108%

Sources: See table 6.2.
Notes: See table 6.2.

Overall results of this decomposition are presented in table 6.3.[13] The between component, which corresponds to a rise in foreign outsourcing, accounts for all the increase in vertical specialization in each period, and thus, for all the acceleration. As measured by V (VI), it increases from 0.23 (0.11) percentage points per year during the 1977–1985 period to 0.31 (0.19) percentage points per year during the 1985–1993 period. The within component, which captures the annual rate of change in outsourcing from all sources, is negative and stable over the entire period.

The variance decompositions indicate that vertical specialization occurs within-industry and internationally. While results from the second decomposition are in accordance with the findings of Thesmar and Thoenig (2002), the fact that we do not observe any decrease in the use of inputs from all sources (the within component) is somewhat surprising. However, sectoral results show that this feature varies widely across industries. In most machinery, textile, and transportation industries, the within component accounts for a significant share of vertical specialization (i.e., these industries outsource more of their inputs independently of the supply source). For example, the within component represents 20 percent of total change in the footwear industry and 30 percent in the motor vehicles industry. In contrast, most agriculture and mining industries show a negative within component, suggesting that these industries have become increasingly self-sufficient over time. Technological progress could explain part of this latter development, as new machines and techniques may allow firms to produce goods that would have been outsourced otherwise. Excluding the agriculture and mining sectors changes the overall decomposition results. The between component now accounts for only 93 percent of the total change. In any case, these results suggest that most of the vertical specialization occurs internationally as imports substitute for inputs outsourced from other domestic firms.

13. Sector results are available upon request.

6.4 The Within-Industry Shift Away from Unskilled Workers

An analysis of the declining intraindustry share of skilled to unskilled workers or of the widening wage gap between skilled and unskilled workers requires explaining both supply and demand factors. However, there is evidence that changes in the relative supply of skilled to unskilled labor did not play a major role. In most industrialized countries, the share of skilled workers in the labor force rose over the period being studied. For example, the ratio of low- to high-educated workers in the French population decreased from 6.6 in 1981 to 2.7 in 1994; for the United Kingdom, the decline is from 3.6 in 1984 to 1.3 in 1994.[14] One would expect this change in relative supply to be reflected by a decline in the relative wage of skilled workers and an increase in the ratio of skilled to unskilled workers across industries. Hence, the observed increase in wage premia for skilled workers seems to refute the hypothesis of predominant supply-side effects on wage inequality. Moreover, although the supply of unskilled workers fell relative to the supply of skilled workers, evidence on the employment/population ratio for these two groups indicates a relative decline for unskilled workers. For example, in France the difference in the employment-population ratio for highly skilled versus less skilled workers increased by more than 11 percentage points over the 1981–1994 period.[15] Therefore, in analyzing these changes, I focus on the demand side of the labor market.

In this paper, I focus on the employment shares of skilled versus unskilled workers. Although it could be argued that one should focus on the change in the relative wages (earnings) of these two groups, I believe that changes in employment shares is the more appropriate variable to analyze in considering the French case. Over the past three decades the French earnings dispersion between skilled and unskilled workers did not significantly rise, whereas France's employment share of skilled workers increased dramatically. This behavior of relative wages is common to most continental European countries and differs greatly from the U.K. and U.S. experience. Data from the OECD *Employment Outlook* (1996, 1997) show the trends: earnings dispersion (as measured by the ratio of the upper earnings limit of the 9th decile of workers to the 1st decile) shows a significant increase in the United States and the United Kingdom over the 1970–1995 period, while it is stable for France and for most continental European countries.[16] Moreover, employment-share differentials between more-educated and less-educated workers rose by 95 percent for the 1981–1994 period in France yet increased by only 28 percent in the United States and 48 percent in the United Kingdom for equivalent periods. This suggests significant factor-price rigidities in the French labor market and the strong

14. A low level of education corresponds to levels up to lower secondary education. A high level of education corresponds to levels up to tertiary education.

15. All data in this paragraph are from the OECD *Employment Outlook* (1997).

16. This feature is robust to the choice of deciles.

role of institutions and regulations. In fact, strong unions and a high minimum wage have probably compressed wage dispersion in continental Europe and have induced instead an increasing employment-share differential. Hence, following Krugman (1995), I believe that in Europe the effects of trade are manifested mainly in changes in industry employment shares of less-educated (unskilled) versus more-educated (skilled) workers.

If firms vertically specialize to take advantage of labor-cost differentials across countries, the skilled-unskilled relative demand for labor should change within industries. In relatively high-skill countries (such as France), the share of unskilled workers within industries should decrease as firms outsource their unskilled-intensive stages of production. In fact, vertical specialization, as well as skill-biased technological change, shift the skill composition of labor demand within industries. In contrast, trade in final goods shifts the skill composition of labor demand between industries: from unskilled-intensive to skilled-intensive industries. A variance decomposition analysis of the aggregate shift away from unskilled labor indicates which of these effects has been dominant in France during the past two decades. Following Berman, Bound, and Griliches (1994), the change in the aggregate share of unskilled workers in total employment is decomposed into the change in the allocation of employment across industries (the between component) and the change in the allocation of employment within industries (the within component):

$$\Delta E = \sum_{i=j}^{n} \overline{E}_i \Delta s_i + \sum_{i=l}^{n} \overline{s}_i \Delta E_i, \tag{4}$$

where s_i is the employment share of industry i at the national level. The E term denotes the aggregate share of unskilled workers, that is,

$$E = \sum_{i=l}^{n} E_i s_i,$$

where E_i is the share of unskilled workers in industry i.

Table 6.4 reports the within-and-between components of the change in

Table 6.4 **Industry/Sector Decomposition of the Decline in the Share of Unskilled Workers**

	Between	Within	Total	Within/Total
All sectors				
1977–1985	–0.24	–0.40	–0.65	63%
1985–1993	–0.21	–0.48	–0.69	70%
1977–1993	–0.23	–0.44	–0.67	65%
Manufacturing sectors				
1977–1985	–0.08	–0.49	–0.57	86%
1985–1993	–0.06	–0.43	–0.50	88%
1977–1993	–0.08	–0.46	–0.53	86%

Sources: Author calculation; Cortes and Jean (1997) database.

the aggregate share of unskilled workers for the entire economy and for the manufacturing sector. Over all sectors, the shift away from unskilled labor occurs at a rate of 0.65 percentage points per year for 1977–1985 and accelerates to 0.69 percentage points per year for 1985–1993. The annual rate of decrease is lower when only the manufacturing sector is considered (0.53 percentage points per year over the entire period) and shows a deceleration between the two periods.

The within component strongly dominates in each period. In the manufacturing sector, for example, it accounts for 0.46 percentage points of the 0.53 percentage points per annum decrease. The within-industry shift away from unskilled workers accounts for 86 percent of the fall in demand for this type of worker in total manufacturing employment.

To explain the change in the employment shares of unskilled and skilled workers, one must therefore focus on factors that affect the within-industry employment structure. As mentioned earlier, vertical specialization and skill-biased technological progress are the most likely explanatory factors.[17]

6.5 Estimation of the Impact of Vertical Specialization on the Labor Market

The contribution of vertical specialization to the observed decrease in the within-industry share of unskilled workers is assessed through a regression analysis. An appropriate way to do so is to estimate a cost function. Following Berman, Bound, and Griliches (1994) and Feenstra and Hanson (1996, 1997), I estimate a cost-share equation of a translog function. This specification allows using the within-industry share of unskilled workers as a dependent variable in a regression that estimates the parameters of the cost function. Related studies in the literature use instead the level change in the share of less-skilled workers in industry wage bill. While it is theoretically a more appropriate regressand, as it results directly from the short-run cost-minimization problem of firms which face a translog production technology, I believe that using level change in the share of less-skilled workers in industry employment is appropriate for France. As already discussed in the previous section, relative wages of unskilled to skilled workers in continental European countries such as France have been relatively stable over the period and thus the main impact of vertical specialization has been on changing the employment share of unskilled workers within industries. Brown and Christensen (1981) also show that, with such a specification, level data can be used for quasi-fixed factors. This allows me to use quantity data for the quasi-fixed factor (i.e., capital)

17. In the rest of the paper, the limited measure of international vertical specialization is used in all the calculations, although it will be referred to as vertical specialization.

instead of price data, which are rarely available. Thus, the specification for estimating the change in the share of unskilled labor in industry i over the time period t, namely, δE_{it}, is

$$\delta E_{it} = \beta_0 + \beta_1 \delta \ln\left(\frac{W_{uit}}{W_{sit}}\right) + \beta_2 \delta \ln\left(\frac{K_{it}}{Y_{it}}\right) + \beta_3 \delta \ln Y_{it} + \beta_4 \delta V_{it} + \beta_5 \mathrm{PD}_t + \varepsilon_{it}. \tag{5}$$

Here, for each period t, E_i is the share of unskilled workers in industry i, W_{ui}/W_{si} represents the relative wages of skilled to unskilled labor in industry i, K_i is industry i's level of capital utilization, Y_i is industry i's level of gross output, V_i is industry i's level of vertical specialization, and PD is a period dummy.

The sign of the coefficient on the (logarithmic) relative wage, β_1, is ambiguous and depends on the elasticity of substitution between skilled and unskilled labor. The coefficient on the (logarithmic) share of capital in production, β_2, should be negative owing to the substitutability between capital and unskilled labor. Similarly, the coefficient on the (logarithmic) level of output, β_3, is expected to be negative. The output regressor controls for industry scale, and I expect firms to take the opportunity of increased production to decrease their shares of unskilled labor. Such an outcome is likely in a rigid labor market such as the French one, where layoffs are cumbersome and costly. The coefficient on the (logarithmic) index of international vertical specialization, β_4, should have a negative sign because French and foreign unskilled labor are supposedly substitutes, and vertical specialization should take place to exploit lower unskilled labor cost abroad. The measure β_0, of cross-industry changes (including technological progress and institutional change), is expected to be negative. Finally, $\beta_0 + \varepsilon_i$ represents industry-specific changes.

Following Berman, Bound, and Griliches (1994), I assume that, although there might be some industry-specific mixes of skill types, the relative price of labor does not vary across industries. Then, to avoid endogeneity problems, I omit relative wages from equation (5). This omission should affect only the constant term. Thus, the estimated regression is

$$\delta E_{it} = \beta_0 + \beta_1 \delta \ln\left(\frac{K_{it}}{Y_{it}}\right) + \beta_2 \delta \ln Y_{it} + \beta_4 \mathrm{PD}_t + \varepsilon_{it}. \tag{6}$$

Endogeneity problems may arise when estimating equation (6), since changes in the dependent variable and changes in capital utilization may be correlated. There are, indeed, factors (such as computer innovations), that could simultaneously affect the share of unskilled workers in total employment and the level of capital. Consequently, the independent variable K_{it} and the unexplained change in the share of unskilled labor (captured in

ε_i) could be correlated. This is a serious issue because the correlation might significantly bias the slope estimates. Two different approaches are considered to address this problem.

For the capital variable, I use both net capital stock and electricity consumption as proxies. Net capital stock data, provided by INSEE, are constructed according to the rule of perpetual inventories. This method provides estimated data on net capital stock which are measured with error. More importantly, French data on net capital stock are not available at high levels of industrial disaggregation—a restriction that limits the estimation possibilities.[18] I therefore use electricity consumption as a proxy for capital at the three-digit industry level. This strategy was first used by Griliches and Jorgenson (1967) and thereafter by (among others) Costello (1993) and Burnside, Eichenbaum, and Rebelo (1995). All these authors argue that electricity consumption is a good measure of capital utilization, and Anxo and Sterner (1994) offer convincing proof in a paper devoted to the issue. Regression analysis performed with both measures of capital at the two-digit industry level confirms that the choice of the proxy used for capital does not significantly affect the results.

Assessing endogeneity therefore implies considering both capital stock and electricity consumption as measures of capital. Following Berman, Bound, and Griliches (1994) I assume that, when net capital stock is used, the endogeneity bias should not be significant because investments in capital and change in the share of unskilled workers should not have the same timing, since new investments last several years. I also instrumentalize electricity consumption by its lagged values to verify that it is not an endogenous variable. Past electricity consumption is, a priori, a good instrument since it is not affected by current innovation and since it is correlated (at more than 30 percent) with current electricity consumption. Estimations (not reported here but available upon request) show that the effect of changes in electricity consumption on changes in the unskilled share in employment is robust with respect to the instrumentation. A Hausman test confirms that electricity consumption is nonendogenous.

Determining the appropriate data to be used for Y is also a concern. Two potential candidates are value-added and gross output. Berman, Bound, and Griliches (1994) use value-added, since labor and capital are the only independent variables in their specification. Feenstra and Hanson (1996, 1997) include a measure of outsourcing as regressor but also equate Y to value-added.[19] Equation (6) introduces data on material inputs other than

18. Data on net capital stock exist at the two-digit standard industrial classification (SIC) level, whereas data on all other variables are available at the three-digit SIC level. The French nomenclature differs slightly from the American; the SIC terminology is used for simplicity.

19. Berman, Bound, and Griliches (1994), as well as Feenstra and Hanson (1996, 1997), equate Y to value-added. However, because of the unavailability of certain price deflators, these authors use shipment in their empirical estimates. Consequently, using value-added and gross output interchangeably when performing the regression analysis does not seem to be an issue of major concern.

capital and labor (recall that vertical specialization is the share of imported inputs in production). Hence gross output would seem to be a more appropriate measure for *Y*. However, results are robust to the use of value-added.[20]

It is necessary to control for the output level in equation (6). Wald tests performed on equation (6) strongly confirm that omitting *Y* would misspecify the model, as the null hypothesis of an insignificant *Y* is systematically rejected at the 1 percent significance level. The output level controls for industry scale. Such control is especially important owing to the French labor market's inflexibility. Firms willing to alter their shares of unskilled to skilled labor encounter difficulties in laying off workers because of strong unions and protective labor laws. Hence, changes in the share of unskilled labor in employment often occur as firms increase production.

Endogeneity of output is also considered as a potential issue. I therefore perform an instrumental-variables estimation using the lagged value of *Y* as the instrumental variable. (Table 6.7 reports results for standard and instrumental-variables estimation over the 1982–1987 and 1987–1992 periods combined.) The coefficient for output varies across specification; however (and more importantly), the international vertical specialization coefficient is not greatly affected by the change in specification.

Finally, I consider the possibility of multicollinearity. The tests for correlation between output and vertical specialization and for correlation between output and capital utilization do not show any evidence of multicollinearity (the correlations are always under 0.7 and include some extremely low levels, depending on the considered data).

Data are weighted by the industry's average share in total manufacturing employment over each period. A weighted least-squares estimation is conducted, which considerably reduces the industry-specific heteroskedasticity. The weights have been chosen so that, over each period, summing up the dependent variables gives the total within-industry change. I estimate the slope parameters by running equation (6) over the 1977–1985 and 1985–1993 periods combined. Variables are in annual changes averaged over the corresponding period.[21] Both OECD and non-OECD measures of international vertical specialization are considered. Robustness is checked by extending the time period to three subperiods: 1977–1982, 1982–1987, and 1987–1992. Further exploitation of the time-series properties of the data could give misleading results, since the long-run change relationship may not be isolated from business-cycle effects.[22]

Table 6.5 gives the annual rates of change in the (logarithmic) variables for the three-digit industry sample. As reported in section 6.4, we observe

20. All the estimations were conducted using value-added. Results are not reported in this paper but are available upon request.

21. For example, averaged over the 1977–1985 period for the 1977–1985 change.

22. Results are available upon request.

Table 6.5 **Mean Rate of Change of Variables**

	1977–1985	1985–1993
$\delta\, Eu$	–0.485	–0.435
$\delta \ln(Kelc/Y)$	2.345	1.905
$\delta \ln(Y)$	0.954	1.060
$\delta\, V$	0.094	0.185
$\delta\, V$oecd	0.102	0.146
$\delta\, V$noecd	–0.008	0.039

Sources: Author calculations; Cortes and Jean (1997) database for labor data; and National Institute of Statistical Economic Studies (1977–1992, 1977–1996, 1993–1996) for data on output capital, and vertical specialization.

Notes: Data are weighted by the industry share of unskilled employment in total manufacturing employment. The sample consists of 50 three-digit industries. Variables are defined as follows: $\delta Eu = 100 \cdot$ annual change in unskilled workers' share of total employment; $\delta \ln(Kelc/Y) = 100 \cdot$ annual change in ln([electricity consumption]/[real output]); $\delta \ln(Y) = 100 \cdot$ annual change in ln(real output); and $\delta V = 100 \cdot$ annual change in vertical specialization.

an annual within-industry decrease in the share of unskilled workers in total employment, with a deceleration in the second period. This share decreases at a rate of 0.49 annual percentage points in the first period and of 0.44 annual percentage points in the second period. The annual growth rate of production rises over time, and production becomes more capital-intensive in both periods regardless of the measure chosen to proxy capital. However, while the growth rate of net capital stock used in production rises over the two periods (results obtained at the two-digit industry level), the electricity used in production increases at a decreasing rate. Most notably, vertical specialization increases over both periods with an acceleration over time. The growth rate of vertical specialization is 0.094 percent per year for 1977–1985 and 0.185 percent per year for 1985–1993. Finally, the table shows that the growth rate in vertical specialization involving non-OECD countries is actually slightly negative in the first period and is lower than growth in vertical specialization from OECD countries in both periods.

The regression results for equation (6) are presented in tables 6.6 and 6.7. In table 6.6, the subperiods 1977–1985 and 1985–1993 are combined; in table 6.7, the subperiods 1982–1987 and 1987–1992 are combined. Estimations are made using net capital stock at the two-digit Standard Industrial Classification (SIC) level and using electricity consumption at the three-digit SIC level. Specification (1) in table 6.6 reports unweighted estimates based on the two-digit industry sample, while specification (2) reports unweighted estimation using the three-digit industry sample. Specifications (3) and (4) provide the corresponding weighted estimates. In specifications (4), (4′), and (4″), results are reported for all countries combined, OECD countries, and non-OECD countries, respectively. In table 6.7, the instru-

Table 6.6 **Regression Results: 1977–1993**

	Specification					
	(1)	(2)	(3)	(4)	(4′)	(4″)
$\delta \ln(K/Y)$	0.008	–0.014	–0.028	0.002	0.001	0.004
	(0.034)	(0.015)	(0.030)	(0.015)	(0.016)	(0.015)
$\delta \ln(Y)$	–0.063***	–0.032***	–0.126***	–0.082***	–0.079***	–0.081***
	(0.025)	(0.012)	(0.029)	(0.02)	(0.02)	(0.021)
δV	–0.511**	–0.703***	–0.857***	–0.584***		
	(0.282)	(0.225)	(0.331)	(0.180)		
δVoecd					–0.690***	
					(0.196)	
δVnoecd						–1.175**
						(0.552)
Constant	–0.348***	–0.301***	–0.291***	–0.357***	–0.342***	–0.428***
	(0.073)	(0.067)	(0.064)	(0.065)	(0.065)	(0.054)
1985–1993	–0.052	–0.093	0.138*	0.114	0.091	0.126*
	(0.095)	(0.084)	(0.090)	0.091	0.093	0.093
Adjusted R^2	0.123	0.091	0.453	0.438	0.423	0.415
Contribution V						
1977–1985			15%	11%	15%	0%
1985–1993			26%	25%	23%	10%
N	44	100	44	100	100	100

Sources: See table 6.5.

Notes: The dependent variable is the annual change in ratio of unskilled employment to total employment. Regressions are weighted by the average share of industry employment in total manufacturing employment. Numbers in parentheses are the estimated White standard errors, which are robust to cross-sectional heteroskedasticity and correlation. N = number of observations.

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

mental-variables estimations are presented. Specifications (5), (5′), and (5″) provide estimates of the variables for all countries combined, OECD countries, and non-OECD countries using current output value for Y, whereas specifications (6), (6′), and (6″) utilize lagged values of output as the instrumental variable for Y.[23]

In all specifications, the coefficient of international vertical specialization, which ranges between –0.408 and –0.857, is statistically and economically significant. The decomposition by country source of imports shows similar features. Results on capital utilization are ambiguous. In most (but not all) cases, coefficients have the expected negative sign, which reflects

23. A likelihood ratio test and a Wald test are used to test the hypothesis of groupwise heteroskedasticity. A Breush-Pagan Lagrange multiplier test is used to test the hypothesis of cross-sectional correlation.

Table 6.7 **Regression Results: 1982–1992**

	Specification					
	(5)	(5′)	(5″)	(6)	(6′)	(6″)
$\delta \ln(K/Y)$	–0.010	–0.011	–0.006	–0.027	–0.028	–0.017
	(0.016)	(0.016)	(0.016)	(0.022)	(0.023)	(0.022)
$\delta \ln(Y)$	–0.069***	–0.067***	–0.070***	–0.147***	–0.145***	–0.135***
	(0.019)	(0.020)	(0.019)	(0.0391)	(0.039)	(0.040)
δV	–0.408***			–0.465***		
	(0.144)			(0.157)		
δVoecd		–0.513***			–0.481***	
		(0.206)			(0.190)	
δVnoecd			–1.178***			–1.219***
			(0.399)			(0.491)
Constant	–0.378***	–0.382***	–0.401***	–0.271***	–0.274***	–0.362***
	(0.079)	(0.080)	(0.076)	(0.109)	(0.107)	(0.110)
1987–1992	0.209***	0.199***	0.222***	0.307***	0.294***	0.303***
	(0.081)	(0.081)	(0.081)	(0.102)	(0.103)	(0.098)
Adjusted R^2	0.313	0.310	0.317	0.196	0.183	0.207
Contribution V						
1982–1987	13%	12%	10%	15%	14%	0%
1987–1992	20%	18%	18%	23%	20%	10%
N	100	100	100	100	100	100

Sources: See table 6.5.

Notes: See table 6.6.

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

the substitutability between unskilled labor and capital. However, the capital coefficients are all statistically insignificant and make only a small contribution in explaining the decline in the share of unskilled workers in employment. The observed deceleration in the annual rate of change in the share of unskilled workers in employment is mirrored by the positive coefficient on the time dummy. This is especially significant in specifications (5) and (6) and can be explained by the large deceleration in the annual decrease in the share of unskilled employment that occurred between the two periods: from –0.515 during 1982–1987 to –0.415 during 1987–1992.

Tables 6.6 and 6.7 also report the contributions of the increase in vertical specialization to the decline in the share of unskilled workers in manufacturing employment. These are calculated by multiplying the slope coefficients by the annual rate of change in the corresponding variable and dividing them by the annual rate of change in the share of unskilled workers. For example, consider specification (4)'s vertical specialization coefficient of –0.584 in table 6.6. In the first period, the annual growth rate in vertical specialization at the three-digit industry level is 0.094. Dividing the

product of these two numbers by the annual rate of change in the share of unskilled labor of –0.485 for this period (see table 6.5) yields a figure of 11 percent for the contribution of vertical specialization to the annual decrease in the share of unskilled workers in manufacturing employment for the 1977–1985 period. The contribution of vertical specialization is always positive for all countries and for OECD countries alone and varies between 11 percent and 26 percent over the two periods. Moreover, contributions do not significantly vary with either the sample size or the choice made to proxy capital utilization (see specifications [3] and [4]). In specification (4), which is the preferred specification due to its high level of disaggregation, vertical specialization contributes 11 percent of the annual decline in the share of unskilled workers in manufacturing employment for 1977–1985 and 25 percent for 1985–1993. The observed acceleration in vertical specialization corresponds to an increase in its contribution to the decline in the share of unskilled workers. The persistently low level of non-OECD vertical specialization is reflected by a negligible contribution during 1977–1985, but this contribution reaches 10 percent during 1985–1993 as non-OECD vertical specialization takes off.

The results described here are consistent with those found by Feenstra and Hanson (1996, 1997). These authors find that vertical specialization contributes from 11 percent to 15.2 percent of the decline in the share of production workers in the wage bill over the 1979–1990 period. They obtained these results using a limited measure of outsourcing (within the same two-digit industries) that is similar to mine. I believe that our results are in line; data discrepancy and country specificity explain the limited differences. The decrease in the share of unskilled workers in manufacturing employment that is not explained by changes in measured factors is presumably caused by skill-biased technological change and/or some institutional factors.

6.6 Conclusion

Vertical specialization rose dramatically in France over the 1977–1993 period. To the extent that this increase is due to a decline in trade costs, one expects globalization to affect the relative wages and employment shares of skilled and unskilled workers—by shifting relative labor demand across countries. In the case of France, which is typical of continental European countries, the relative wages of skilled to unskilled labor have been comparatively stable for various institutional reasons over the period examined. Consequently, globalization has manifested itself mainly in the form of a significant decline in the within-industry share of unskilled workers.

Regression analysis indicates that vertical specialization has contributed appreciably to the observed decline in the within-industry share of unskilled workers in French manufacturing employment. It accounts for

11 to 15 percent of the within-industry shift away from unskilled workers toward skilled workers over the 1977–1985 period and to about 25 percent over the 1985–1993 period. Although such figures are not negligible, most of the increase in inequality has other causes, among which skilled-biased technological progress presumably is the most important contributing element. It is striking, consequently, to observe that, whereas globalization often incites strong criticism, it is rare to hear that technological progress should be limited because of its effect on income distribution. In fact, policies should be encouraged that aim at supporting (via training or relocation subsidies) those unskilled workers who suffer from the effects of international integration. However, policies in line with the view of anti-globalization groups, which would aim at reducing trade and thereby vertical specialization, are economically inappropriate, as international trade has been widely shown to increase average welfare.

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Comment

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Increasing worker inequality (between skilled and unskilled workers) in developed countries has been a topic of heated debate during the last decade. The main reasons for increasing inequality that have been suggested in the earlier literature are globalization, especially trade liberalization, and technological change. Vanessa Strauss-Kahn's paper studies the effects of a specific form of globalization: international vertical specialization. This phenomenon also represents one facet of technical change. Given the political weight that these considerations carry, as well as the academic dispute over globalization and inequality, it is important to study their relevance empirically, and this paper is an excellent contribution to such a discussion.

Strauss-Kahn's work on constructing the measures of vertical specialization deserves special recognition. The justification for the chosen measure and discussion of the robustness of the index as a measure of vertical specialization are in general thorough and detailed. The problems arising from the fact that the import penetration rate is based on both final goods and inputs are also discussed to a sufficient extent.

An issue of major importance in the context of inequality is the institutional setup of the labor market. Strong unions and labor laws are briefly mentioned in Strauss-Kahn's analysis, but I think institutions enter the equation more strongly than that. Both the justification for using changes

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in employment as a measure of changing inequality and the details of the empirical approach chosen would require confirmation that no crucial *changes* in the institutional setup have occurred over the period studied.

As Strauss-Kahn points out, the argument that has often been presented in the inequality debate is that the same underlying phenomenon (e.g., trade or technological change) has different implications in countries with competitive labor markets (United States, United Kingdom) and countries that have more centralized, regulated wage-settings systems (most of continental Europe). In the United States and the United Kingdom the increase in wage inequality has been very pronounced, whereas in continental Europe, more attention has been paid to relative unemployment rates, which is also what the author does in her introduction. It is not clear-cut, however, whether the difference in unemployment rates is solely the result of a major shift in technology and thus in the demand for unskilled labor. Unemployment rates and differences therein are heavily dependent on the institutional setup of the labor market. For example, changes in the nature of employment contracts from permanent to temporary, or changes in minimum wages or replacement ratios, are likely to have more impact on the unemployment rates of unskilled than of skilled workers. Nickell and Bell (1996) also point out that relative, rather than absolute, changes in unemployment rates are the relevant indicator of asymmetric changes in demand for skilled and unskilled workers.

The author's justification for concentrating on employment and not wages is, correctly, the fact that wages in France are relatively rigid. She points out that changes in wages do not support the hypothesis of supply-side effects on inequality. However, in the presence of wage rigidity or institutionally determined wage rates, changes in labor supply may not necessarily have implications for wages either. Although demand shocks are indeed the most likely reason for the increase in inequality, the issue of labor supply is complicated because effective labor supply also depends on institutions (like unemployment benefits). Thus it does not necessarily equal the share of skilled or unskilled workers in the population, which is the measure mentioned in the paper.

The institutional background is also of major importance when justifying the empirical model chosen. At least the author should justify why institutional factors need *not* be controlled for in the estimations, as they can have considerable impact on the relative employment for aforementioned reasons. It is not completely clear to me why (at the industry level) factor prices (or at least the price of labor) would be completely exogenous, although from an individual firm's point of view this may be the case. Similarly, the assumption of a fixed relative price of skill across industries is highly restrictive. The definition of *skill* used is typically broad, and in reality I think it is quite plausible that some industries require very specific skills, the supply of which may be relatively small or inelastic, and thus that

industry-specific relative wages will differ. In terms of results this might have considerable implications, and as pointed out in the paper, the issue of endogeneity would have to be dealt with if relative wages were used as an explanatory variable. Also, attributing all the change in relative employment not explained by vertical specialization to technical change and some undefined institutional changes is a crude simplification. There is no reason to assume that institutional changes cannot be observed (and thus controlled for or at least noted); and, on the other hand, "technical change" is here interpreted in a very broad manner. An interesting issue to discuss, also related to the institutional setup, is the extent to which the results can be generalized and the analysis can be used in the context of other countries.

I find the decision to ignore the temporal aspect by averaging over periods slightly troubling, although it is obviously a standard method in this field of literature. Also, the time periods that the changes are averaged over are relatively short. More experimentation with different methods could be done to see if this produces different results. Industry-specific technical change is mentioned, but actual panel specification (with a firm-specific effect in the *change* of employment) is not used. Using the data as a panel in addition to the current approach (either as an annual one with corrections for the business cycle, or with averages of the periods used in the current specification) would also provide an opportunity to take into account the industry-specific change in relative employment. If this effect is correlated with vertical specialization, which is possible as both of them relate to technological change, the panel dimension could be used to obtain unbiased estimates of the coefficient of interest.

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