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The Impact of Foreign Trade on the Employment of Unskilled U.S. Workers: Some New Evidence

Frederic L. Pryor*

This paper explores four empirical relationships reflecting the impact of foreign trade on the employment of unskilled workers: (i) the direct relationship between net exports and embodied education of the corresponding goods; (ii) the changes in domestic prices accompanying changes in net exports; (iii) the relationship between real or potential import competition and defensive measures such as more investment or increasing the skill level of the labor force; and (iv) the relationship between foreign trade and domestic prices. None of these exercises suggests that foreign trade has much impact on the employment of less skilled U.S. workers.

1. Introduction

At first glance, it seems unlikely that foreign trade should have a significant impact on the employment of unskilled U.S. workers. For example, imports from non-OPEC low-wage nations amount to less than 2% of the GDP.¹ Furthermore, as shown elsewhere (Pryor and Schaffer 1998), the number of jobs for prime-age workers (ages 25–49) in the United States that requires a high school diploma or less has increased at a faster rate than the number of workers in this age bracket with the corresponding educational credentials.

However, does the foreign trade sector really have such a benign impact? Over the last two decades, the relative importance of foreign trade in the U.S. economy has roughly doubled, and imports from developing countries have grown even faster. Simultaneously, the rates of employment of prime-age men with only a high school education or less have fallen, real wages among employed but less educated workers have fallen, and wage differences between workers with different levels of education have increased.

Attention to the linkage between foreign trade and labor market trends is part of a broader debate on whether the falling wages and employment rates of less educated male workers in the United States are due to skill-biased technical change or to foreign trade. In the fields of

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Several people generously supplied data used in this essay, and I am grateful to David Schaffer for the education data from the Current Population Survey, Wayne G. Gray for supplying in advance of publication the Bartelsman–Gray data bank on the manufacturing sector, and Robert Feenstra for advance copies of his data on U.S. exports and imports. I also appreciate the helpful remarks on previous drafts of this essay from Richard N. Cooper, Janet Ceglowski, Steven Golub, Stephen A. O’Connell, Zora Pryor, and an unknown referee. Data underlying Tables 1–3 can be found at my Web site: www.swarthmore.edu/SocSci/fpryor1/.

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¹ By low-wage nations, I include all Latin American nations plus all non-OPEC nations of Africa and Asia except Israel, Japan, and South Africa. In 1994, such imports amounted to 1.8% of the GDP or, using as the denominator only the GDP originating from the manufacturing, agricultural, and mining sectors of the economy, 9.0%. The data for this calculation are from *Survey of Current Business* 76, nos. 7 and 8 (U.S. Department of Commerce 1996).

both labor economics and international economics, various economists place quite different weights on these two factors.²

For example, in this debate among foreign trade economists, some, such as Lawrence and Slaughter (1993), find little empirical linkage between these foreign trade and labor market trends. Others, such as Bhagwati and Dehijia (1994), question on theoretical grounds the empirical relevance of the factor content arguments linking trade and domestic employment in manufacturing. Moreover, if labor markets function properly, foreign trade should have little overall employment effect, although the shift of unskilled workers from import-competing industries to other industries might place a downward pressure on their wages.

By way of contrast, Wood (1994, 1995) finds considerable employment and wage effects due in large measure to the increasing imports of noncompeting goods that are highly unskilled-labor intensive. He further shows that among nations of the OECD, a strong inverse relationship exists between the decline in their share of manufacturing workers in the labor force and the increase in net imports of manufacturers from developing nations as a ratio of their GDP. Theoretical arguments about employment effects of foreign trade on unskilled workers focus on imperfections in the labor market. For example, import penetration places downward pressures on U.S. prices of goods, which are unskilled-labor intensive and which compete with imports from low-wage nations. Such pressures are in turn transmitted to wages of the U.S. workers in these industries. If the U.S. wages in these industries are sticky or if their equilibrium levels sink below the minimum wage, U.S. producers can no longer profitably employ their labor force. Alternatively, if the wages of U.S. unskilled workers in affected industries sink below their reservation wage, they would voluntarily leave their employers and perhaps the labor market. In either case, if wages in other U.S. industries are also downwardly sticky, such displaced workers might never find alternative employment.

It is difficult to sort through these various competing theoretical and empirical claims regarding employment and wages of unskilled U.S. workers and to decide which tests are decisive. In this essay, I focus mainly on employment trends, as the causal forces underlying employment are easier to disentangle than those for wages. Further, a more exclusive focus on employment issues allows some crucial new empirical evidence to be introduced. The major conclusion is that foreign trade has relatively little impact on the employment of less educated workers, even in import-competing industries. I reach this result from the exploration of four hypotheses linking trade and the employment of unskilled U.S. workers:

- (i) Over the long run, net imports of the United States have increased, especially in those industrial branches that are characterized by a high percentage of unskilled workers in their labor force. Although this has occurred in certain well-known cases, I find no evidence to support the notion that this has been a general tendency for the manufacturing sector as a whole.
- (ii) Over the long run, prices in unskilled-labor-intensive branches of industry that are vulnerable to import penetration have risen less than in other branches of industries once domestic shocks such as differential changes in productivity are taken into account. I also find no empirical support for this hypothesis.
- (iii) Over the long run, productivity and investment in unskilled-labor-intensive branches of

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² Cline (1997) has a magisterial review of the literature. Wood (1994) has an earlier yet useful summary as well. The various essays in the symposia on income inequality and trade in the *Journal of Economic Perspectives* 9, no. 3 (Summer 1995), provide additional insights.

industries have increased more rapidly than other branches to meet potential competition from imports. This hypothesis receives no empirical confirmation.

- (iv) Imports are increasing most rapidly at the “low end of the market” and for products whose import prices are generally increasing less rapidly than prices of domestic production for the same product category. The low end of the market consists of those goods in a given product line that are most unskilled-labor intensive. Although the data on these matters leave much to be desired, the empirical evidence does not appear promising.

If trade does not account for much of the fall of employment rates of unskilled male workers, then what does? The final section of this paper briefly surveys several other possible culprits.

2. The Data and a Methodological Issue

Like others working on this topic, I use the NBER databases for trade and production, recently updated by Bartelsman and Gray (1996) and Feenstra (1997). Most investigators have used as a proxy of unskilled to skilled labor in a given industry the ratio of production workers to nonproduction workers. Many of those skeptical of the relationship between trade and unemployment find this proxy an imperfect solution, especially because many production workers are considerably more skilled and educated than office clerks classified as nonproduction workers. In the tables in this paper, I use both this proxy and a more direct measure, namely, the average years of formal education of all workers in an occupation or an industry.³ I also carry out regression experiments using average wages as another proxy for skill. Because I reached the same conclusions with the wage variable as with the other two proxies, I do not discuss these results further. Several additional methodological issues also require our immediate attention.

First, should we calculate only the skills directly embodied in various domestically produced goods, or should we use some type of input–output table and calculate both direct and indirectly embodied skills? On this topic, Feenstra and Hanson (1996a, b) contend strongly that focusing only on the skills directly embodied in various domestically produced goods misses the impact of increased outsourcing abroad. This trend, which was especially important in the period 1979–1990, allows a firm to focus its domestic efforts only on skilled-labor intensive parts of their production and to import unskilled-labor intensive inputs, a strategy that allows them to stave off import penetration. From this we can infer that import penetration should be inversely related to skill intensity of production of domestic production. More specifically, those industries that have upgraded their production, either by changing their production methods or by outsourcing unskilled-labor-intensive parts of their production process, have experienced less import penetration than other industries. In Table 1, I specifically test this hypothesis and find no empirical evidence to suggest that this effect is statistically significant.⁴ Moreover, when I

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³ Berman, Bound, and Griliches (1994) and Sachs and Shatz (1994) present the case for equating nonproductive and productive workers with skilled and unskilled workers. Table 1 shows that both this proxy and a more direct measure of skill yield about the same results.

⁴ Feenstra and Hanson (1996a, b) also focus their econometric attention solely on imports. In this paper, I also account for exports and deal with changes of net exports (exports minus imports) to production rather than import penetration alone.

Table 1. The Impact of Skill Intensity of Production on the Change in Net Exports (Weighted Regressions)

Constant	Low-Skilled Workers, 1971		Average Annual Change of Low-Skilled Workers, 1971-1991		Labor-Capital Ratio		Coefficient of Determination (R^2)	Sample Size
	Percentage of Less-Educated Workers	Percentage of Production Workers	Percentage of Less-Educated Workers	Percentage of Production Workers	Ratio in 1971	Average Annual Change, 1971-1991		
Dependent Variable: Change in Ratio of Net Exports to Domestic Consumption, 1971-1991								
Two-Digit Industrial Classification								
-0.0586 (0.1497)	+0.1119 (0.1697)	—	-2.166 (3.976)	—	-1.618* (0.437)	+1.197 (1.650)	0.5813	20
-0.0332 (0.1072)	—	+0.0089 (0.1501)	—	-1.184 (3.953)	-1.656* (0.422)	+0.3888 (1.2111)	0.5716	20
Three-Digit Industrial Classification								
+0.1905 (0.0811)	-0.1662 (0.0933)	—	+2.210 (1.328)	—	-1.405* (0.306)	+0.2203 (0.7468)	0.3088	71
+0.1471* (0.0606)	—	-0.1468 (0.0795)	—	-1.554 (2.130)	-1.265* (0.297)	+0.9296 (0.7190)	0.3108	71
Four-Digit Industrial Classification								
+0.0641 (0.0804)	—	-0.0684 (0.1062)	—	-1.539 (3.079)	-0.7158 (0.3803)	-2.264* (0.8383)	0.0173	449

Standard errors are in parentheses below the estimated regression coefficients; statistical significance at the 0.05 level is indicated by asterisks. The average values of shipments serve as weights. Because of a controversy about measurement, I omit SIC 357 (office, accounting, computing equipment) and SIC 3573 (computing equipment). Source: The trade data come from Feenstra (1996, 1997), the industrial data from the Bartelsman-Gray (1996) database, and the education data from the Current Population Survey, adjusted for consistency to the SIC classification used for the trade and production data. This adjustment is described in Pryor and Schaffer (1998).

examine the entire structure of industry in a quite different way in Table 5, I also find no such effect.

Second, how can we interpret changes in total (direct and indirect) requirements of skilled and unskilled labor? This issue comes sharply into focus when we compare direct and indirect requirements of good A for a dollar's worth of production of good B over a period of more than a decade and a half.⁵ The changes have been enormous, and, combined with the important shifts in the structure of imports, we have a problem in interpreting the relevant regression coefficients. That is, we do not know what is the key causal force, whether it is changes in production methods in the industry under examination, in the domestic industries supplying the inputs, or in the outsourcing abroad. If we focus only on direct requirements of skilled and unskilled labor, the causal relation is clear, and the impact of outsourcing abroad is picked up by directly examining net import penetration of those products used as inputs in the production of other goods.

Third, what trade variable should be explained? In this paper, I focus on the change of net exports (exports – imports) to domestic consumption (domestic shipments + imports – exports) of the various product branches. Such an approach seems appropriate because it captures most fully the basic idea of the Heckscher–Ohlin approach toward trade, namely, that it is the contrast between the factor endowment of domestic production versus potential imports that determines whether net exports in that industry are positive or negative. If, by way of contrast, we focus on the gross levels of trade, we introduce additional issues of interindustry trade that, insofar as the goods are relatively similar, take us far from the factor-proportion hypotheses that we are trying to test.⁶ For the empirical results of any such alternative approach to allow interpretation, its underlying theoretical justification would need to be carefully spelled out and linked to particular causal variables. It should also be noted that in section 5 of this paper, I do attempt to analyze empirically some of the key issues arising in cases in which interindustry trade represents quite different goods with different factor proportions.

3. Long-Term Changes in Net Exports in Low-Skill-Intensive Industries

Is net import penetration over the long term increasing fastest in those industries characterized by low-skilled workers? The initial year for the comparison is 1971, two years before the first oil shock; the end year is 1991, a roughly comparable year in terms of the business cycle. In both years, comparable data on trade, production, and the characteristics of industrial branches are available.

I try to explain changes in the net exports to domestic consumption in the initial and final years and to relate these changes to the initial state and changes in such explanatory variables as total factor productivity, the general labor intensity of production (measured by the labor–capital ratio), and the relative importance of unskilled workers. Such a specification allows us

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⁵ A description of the method of comparison can be obtained on request.

⁶ In other words, the use of net exports does not distinguish between cases in which net exports are the same, but in one case the volume of both is considerable, whereas in the other case the volume of both is small. Nevertheless, if domestic production and imports are roughly the same in quality and production methods, the Heckscher–Ohlin approach would lead us to suspect that the two cases should have the same net impact on domestic employment. I present some results of experiments of the two approaches in several footnotes for those who are curious about how this alternative approach would affect my main conclusions.

to separate the particular impact of trade on the total labor force and on the less skilled labor force. I measure unskilled labor by two variables: the percentage of workers in each industry with only a high school education or less (available only on a three-digit basis) and the share of production workers in the total labor force.

According to the hypothesis under examination, both the initial state and the change over time of the unskilled labor variables should be inversely related to the change in the ratio of net exports to domestic consumption. For the results of such an exercise to be meaningful, it is necessary to assume that rankings of the ratios of skilled and unskilled workers in different production branches are roughly the same in the United States and its trade partners. Although I have no direct evidence on this matter, it seems a reasonable assumption, given the convergence of manufacturing technology throughout the world.

It would be desirable, of course, to hold both domestic and foreign productivity changes constant in these experiments. Unfortunately, data on foreign productivity changes are not available, and data on changes in domestic total factor productivity alone add little to the explanatory power of the regressions. Moreover, the calculated coefficients of total factor productivity growth are the wrong sign and are usually not statistically significant.

Finally, I carry out these regression exercises with data at different levels of aggregation to isolate the effects of various aggregation biases. The various industries included in the regression analysis are weighted by their value of shipments, although, I might add, unweighted regressions yield quite similar results.

The results of these calculations, reported in Table 1, can be quickly summarized. Most important, in none of the five regressions is the coefficient for the variable representing the relative importance of unskilled workers in the industry statistically significant.⁷ Part of the explanation of such results lies in the fact that at higher levels of aggregation the variation in the share of the less educated workers is relatively low. For example, in the 71 industries under consideration at a three-digit level, the coefficient of variation (the ratio of the standard deviation to the mean) of this ratio is only 12.4%. Roughly the same results are obtained when the average wage in the industry and the average annual change in these wages are used as proxies for the skill variables.

Most of the calculated coefficients for the labor–capital variable are statistically significant. In other words, U.S. net exports increased relatively more in those industries characterized by low labor intensity or in which the labor intensity is falling relatively faster. To look at the results from a different perspective, import penetration was having the most adverse effect on those industries with labor intensive methods of production, and the skill mix within those industries was relatively unimportant.

Therefore, the factor-proportion argument seems to have validity, but only regarding aggregate labor and capital and not different subcategories of labor. Differential unemployment of unskilled workers could occur as a secondary effect, of course, but only if the unemployed high-skilled workers start competing for the jobs previously held by the less skilled workers.

Two obvious objections to this procedure can be raised. First, such an exercise does not focus on the possibility that unskilled-labor-intensive industries might have adopted defensive

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⁷ Following the suggestion of one of the referees, I also calculated the regressions using other dependent variables, namely, the ratios of total imports and total trade (exports plus imports) to domestic consumption rather than net exports. The results are what we might expect and do not change any conclusions reached in the text. More specifically, the calculated coefficients for the less educated workers or production workers are also not statistically significant, and, moreover, the coefficients of determination are lower as well.

measures to prevent import penetration. For example, they might have upgraded the skill levels of their labor force, substituted capital for unskilled labor, or outsourced labor-intensive segments of the production process. However, the results in Table 1 suggest that this is not occurring because the calculated coefficients of the change in the percentage of less skilled workers or the change in the labor–capital ratios are not statistically significant nor often with even the correct sign. When the average wage is used as a proxy for skill, similar results are obtained. In short, the addition of variables representing “defensive measures” add little explanatory power, their calculated coefficients are generally not statistically significant, and they do not lead to greatly different coefficients of the other variables. I deal with this issue more directly and at greater length in section 4.

Second, the regression exercise reported in Table 1 says nothing about the problem of the impact of noncompeting imports, which Wood (1994, 1995) has so strongly emphasized. However, two conflicting aspects of the regression results are relevant to this problem:

First, the degree of explanatory power (R^2) of these regressions decreases as the degree of disaggregation increases. At higher levels of aggregation, other causal variables that influence changes in net export appear to be correlated with the factors on which I am focusing. However, as we disaggregate and move closer to the actual goods being traded, these correlations become less important. This works against the noncompeting import hypothesis, which is concerned with highly specific goods within a product line. The results in Table 2 suggest that as the data focus more sharply on specific products, the unskilled labor hypothesis has almost no explanatory value.

Second, as the data become increasingly disaggregated, the calculated coefficient for the variable describing the initial importance of unskilled labor in production of the various production branches becomes increasingly negative. Because the predicted relationship between this variable and the change in net exports is negative, such a result offers support for the noncompeting import hypothesis.

The conflicting results of the previous two paragraphs suggest that if the noncompeting import hypothesis has validity, it would explain little of the changing pattern of net exports at a highly disaggregated level. I focus more directly on this matter in section 5.

The most important message is that the regression experiments provide no direct evidence to support the proposition that the U.S. trade pattern has shifted against those industries characterized as unskilled-labor intensive. Nevertheless, some indirect evidence is also important to examine.

4. Trade and Prices

Increasing foreign trade can cause changes in international prices that in turn lead to changing factor returns. According to the simple version of the Stolper–Samuelson theorem, these circumstances lead to higher returns to the relatively abundant factor and lower returns to the relatively scarce factor.

In comparison to the rest of the world, the United States has a relative abundance of educated, skilled workers and a relative scarcity of less educated or unskilled workers. This is suggested by the fact that U.S. exports embody a much higher ratio of skilled labor to unskilled

Table 2. The Relation of Domestic Price Changes to Trade and Productivity Changes, 1971–1991 (Weighted Regressions)

Constant	Change in Ratio of Net Exports to Domestic Consumption	Average Annual Change in Total Factor Productivity	Coefficient of Determination (R^2)	Sample Size
Dependent Variable: Annual Average Change in Prices of Domestic Shipments				
Two-Digit Industrial Classification				
+0.0570* (0.0013)	+0.0344 (0.0216)	–1.581* (0.198)	0.8353	20
Three-Digit Industrial Classification				
+0.0561* (0.0010)	+0.0231 (0.0125)	–1.314* (0.134)	0.6256	71
Four-Digit Industrial Classification				
+0.0567* (0.0004)	–0.0007 (0.0014)	–1.020* (0.031)	0.7041	449
Dependent Variable: Average Annual Change in Double-Deflated Prices of Domestic Shipments				
Two-Digit Industrial Classification				
+0.0560* (0.0017)	+0.0302 (0.0292)	–1.377* (0.268)	0.6770	20
Three-Digit Industrial Classification				
+0.0552* (0.0010)	+0.0439* (0.0124)	–1.642* (0.140)	0.7224	70
Four-Digit Industrial Classification				
+0.0551* (0.0007)	–0.00008 (0.00229)	–1.545* (0.053)	0.6652	444

Standard errors are in parentheses; statistical significance at the 0.05 level is indicated by asterisks. The average values of shipments serve as weights. For other notes, see Table 1.

labor than its imports or its manufacturing production for domestic consumption.⁸ Other things being equal, the simple version of the Stolper–Samuelson theorem predicts that increasing trade over the last two decades should have led to a relative increase in exports of skill-intensive goods, to a relative increase in the price of those goods and services, and to a relative increase in the wages of skilled versus unskilled workers.⁹ These price and wage movements are important to the argument about falling employment rates of less skilled workers for the argument outlined in the introduction. By focusing on prices rather than wages, it is possible to isolate the impact of trade from other factors influencing wages and, moreover, to deal with the Stolper–Samuelson theorem on its own turf and with its own set of assumptions.

However, this proposition is based on some very strict assumptions, and the simple version may not hold. Indeed, the real-world relevance of this proposition and its intellectual cousins have been often challenged, for example, by Bhagwati and Dehejia (1994) and Berman, Machin,

⁸ Pryor (1996) presents data on this phenomenon.

⁹ Various economists have pointed out that the introduction of additional factors of production or nontraded goods into a Stolper–Samuelson model can result in perverse effects in industrialized nations in which the fall of trade barriers throughout the world and an increase in both exports and imports can result in the relative fall of wages of the most abundant factor (in this case, skilled labor). Examples would occur if the new imports are substitutes for nontraded goods that are skilled-labor intensive or if the new exports are raw-material intensive and if these industries are unskilled-labor intensive.

and Bound (1996). Nevertheless, it provides a useful framework for examining whether the prices and wages in those industries with relatively higher shares of unskilled workers are falling in comparison to those industries producing more skill-intensive goods and services. Others have carried out such investigations, but the regression analysis that follows includes several innovations.¹⁰ It is useful to carry out the analysis with two models.

The most relevant price changes to examine are those of domestic prices, as these determine wages, not the prices of imports.¹¹ In the calculations in Table 2, the variable to be explained is the average annual price increase during the two decades between 1971 and 1991. Cooper (1997) has correctly pointed out that instead of the price change of shipments per se, we should use some type of double-deflated price index. This is because the changing prices of raw material used in domestic production are irrelevant for analyzing import competition, given the world market price for raw materials that must be paid by both domestic and foreign producers. Although the Bartelsman–Gray database does not provide such an index, I could calculate a proxy to use as the variable to be explained.¹² However, it turns out that this refinement makes very little difference to the results.

The Stolper–Samuelson approach suggests that two key variables explain the change in domestic prices: (i) the degree of integration of the domestic economy into the world markets and (ii) domestic shocks such as productivity changes. Although integration and import penetration are not synonymous, we would expect that changing integration would be mirrored by changes in the ratio of net exports to domestic consumption. Given this assumption, we predict, for example, that domestic prices would fall with increasing net import penetration. Given the way in which I have defined the variables, this means that a positive relation exists between domestic prices and the change in net exports. Falling domestic prices should also be related to increases in total factor productivity of domestic producers. That is, the faster the growth of domestic productivity, the relatively lower the increases in price.

I assume that changes in net exports lead to a change in domestic prices. It is also possible that the reverse causation is at work, that is, that changes in domestic prices lead to a change in net exports. However, this would come about mainly as a result of a change in technology. The variable that indicates changes in total factor productivity is a good proxy for technological change, and its inclusion among the explanatory variables in the regression is important. The

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¹⁰ For example, Lawrence and Slaughter (1993) use an earlier version of the NBER database than I employ. Nevertheless, they identify skilled and unskilled labor with nonproductive and productive workers. They carry out two exercises. The first shows that relative wages of the two types of labor and the relative share of nonproductive and productive workers did not change in the manner predicted by the Stolper–Samuelson theorem. (However, this exercise raises some problems because the Stolper–Samuelson theorem assumes a constant technology.) The second explores the relationship between changes in export and import prices to the ratio of nonproduction to production workers in various industries at different levels of aggregation.

In my discussion, I use domestic prices rather than trade prices because the former are more relevant to the problem of domestic wages and employment. However, in the next section I do consider foreign prices. Moreover, in both this section and the next, where I look at trade prices, I try to hold certain other key factors constant, which Lawrence and Slaughter do not do.

¹¹ The price changes should reflect changes on the supply rather than the demand side. This is because the period under examination covers 20 years, and over this period domestic producers had the time to adjust to any such demand shifts. It might be added that because the sample consists of all manufacturing industries, the price variable can be interpreted as the relative prices in comparison to the entire producer price index.

¹² For 1991, I deflated the value of raw materials (including energy) by the appropriate price index and the sum of the materials and value added by the price index for shipments. This yielded an estimate of the deflated value added that I then compared with value added in 1971 in current prices to calculate a price index. On a four-digit level, such a calculation gave reasonable results for all but five commodity groups, which were dropped from the sample.

other factors underlying domestic price changes, which lead to changes in trade, appear relatively unimportant and can be excluded from further consideration.¹³

The regressions, presented in Table 2, have a high degree of explanatory power. The calculated coefficient for the variable that represents changes in domestic productivity has the correct sign and is statistically significant. Nevertheless, in none of the six regressions is the calculated coefficient that links the change in net exports to the change in domestic prices statistically significant.¹⁴ Indeed, on a four-digit level the sign of the calculated regression coefficient is incorrect.¹⁵ Moreover, the value of the coefficient that relates changes in net exports to price changes becomes increasingly smaller as the level of disaggregation increases. Therefore, with even more disaggregated data, we might expect that the regression results would provide even stronger evidence against the hypothesis.

Therefore, in the various branches of manufacturing, such results suggest that import competition has not resulted in a significant lowering of domestic prices. In other words, the evidence for the operation of a mechanism whereby import penetration lowers domestic prices and wages in the affected industries appears weak. This means that although trade might have had some influence for the relative decline in employment of particular unskilled-labor-intensive industries, it is difficult to assign any major role to import penetration for falling relative prices or wages in these industries in the long term.¹⁶

Downward pressures on prices and wages have occurred in production branches with high unskilled-labor intensities, but these price pressures arise from domestic circumstances. This can be easily shown by adding to the regressions in Table 2 several independent variables that represent unskilled labor and the labor-capital ratio. When the change in net exports is held constant, the calculated regression coefficients show a statistically significant downward price pressure in labor-intensive or non-skilled-intensive industries ratings, at least at the four-digit level. Such a phenomenon could come about for several reasons. For example, on the supply side it could arise in highly competitive industries if the wages of unskilled labor are falling for reasons having nothing to do with foreign trade, such as skill-biased technical change.¹⁷

The same two objections can be raised against these statistical exercises as could be made

¹³ My inclusion of the domestic productivity variable is also based on the assumption that prices in the United States are not the same as world prices and that imported and domestic goods can be imperfect substitutes for each other.

¹⁴ I also repeated the experiments reported in footnote 7 for the regressions in Table 2. In all cases, the coefficients of determination were relatively high because of the key role of total factor productivity changes. For imports as a share of domestic consumption, domestic price changes (gross) of shipments (but not the double-deflated price changes) were significantly and negatively related at the three- and four-digit level. Moreover, at the three-digit level, total trade was also negatively and significantly related to domestic price changes (gross) but not to the double-deflated price changes. Although several interpretations of these differences with the regressions using net exports can be offered, more research is required for a definitive answer.

¹⁵ Unweighted regressions with value of shipments as the weights yield roughly the same results, except at the three-digit level, where the calculated coefficient of the net export variable for the regression with the double-deflated prices of domestic shipments is not statistically significant at the 0.05 level.

¹⁶ Revenga (1992) presents data on price elasticities of imported goods, showing that imported goods falling in price replace domestically produced goods. Although this is undoubtedly true, I am dealing with a different problem.

¹⁷ Mishel, Bernstein, and Schmitt (1997) have an interesting table that shows a relative fall in prices of internationally traded goods that are unskilled-labor intensive. However, this could occur for reasons having nothing to do with international trade per se.

On the demand side, a fall in net exports might induce a deflationary monetary or fiscal policy to forestall any balance of payments crisis. This in turn would lead to a general rise in unemployment. Because less skilled workers have more volatile unemployment rates than the more skilled, the fall in net exports would be associated with a differential rise in the unemployment of less skilled workers and greater downward pressure on their wages.

against the results in the previous table. Namely, such an analysis does not take into account either the defensive measures of industries facing potential import competition or the heterogeneity of imported and domestically produced products leading to noncompeting imports. In the following two sections, I look directly at these objections and, to relieve the suspense, find little evidence that these factors are very important.

5. Effects of Potential Import Competition on Investment and Increased Skills of the Labor Force

Wood (1994, 1995) emphasizes that domestic producers are not passive in the face of actual or potential import competition. To meet this threat, they can, for example, increase their rate of technical change, upgrade their labor force, or substitute capital for labor. Contrary to the assumption underlying the previous analysis, this means that causation runs from trade to change in the capital–labor ratio or skill intensity rather than the reverse. The signs of these relationships, independent of the causal direction, are the same.

Because the regressions reported in Table 1 show little relation between changes in trade ratios and changes in either the capital–labor or the skill-intensity ratio, we might readily dismiss such an idea. However, the theoretical arguments used by Wood are sufficiently strong that the hypothesis deserves more serious attention.

Testing whether producers in those domestic branches of production that face potential or actual import penetration are especially likely to take defensive measures raises some serious problems, and the approach adopted is straightforward but crude. I examine whether the annual average increases in such variables as the labor–capital ratio, the total factor productivity rate, and the upgrading of the labor force are related in the expected manner to such initial conditions as the labor–capital ratio or the share of less skilled workers, as Wood's hypothesis would lead us to believe. This type of test does not account for scale effects, various kinds of subtle substitution effects, and changes in profits,¹⁸ but it has the advantage of providing a useful overview of the major effects that we would expect.

The results, presented in Table 3, can be readily summarized. The industrial branches with a high share of unskilled workers that allegedly face actual or potential import competition do not appear to have engaged markedly in more defensive measures than other industries. More specifically, the calculated coefficients for the variable representing the initial share of unskilled labor is not significantly related to any of the defensive measures. Although the regressions provide some evidence of substitution of capital for labor in those industries with initially high labor intensity (high labor–capital ratios), the degree of explanatory power is very low. Therefore, for both the upgrading of the labor force and the increase in total factor productivity, Wood's hypothesis does not receive verification.

Variations on these statistical experiments yield roughly similar results. If we substitute into the regressions as a measure of unskilled labor the percentage of the labor force with a high school education or less in 1971 for the percentage of production workers, our conclusions do not change. When the change in net exports is added to these regressions as an independent

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¹⁸ It would be useful to test whether cost–price margins have also changed. However, I do not believe that the data are sufficiently comparable in the different years, especially with changes in the tax structure, to allow much confidence to be placed in the results of such an exercise.

variable, my basic conclusion does not change, nor does it when average pay is used as a measure of labor skill.

In short, the industries that we might suspect would be most vulnerable to import penetration are not upgrading their labor force or increasing their productivity relatively more than other industries. This confirms my previous results, and the conclusions drawn in section 2 still stand.

6. Product Heterogeneity and Noncompeting Imports

Wood's (1994, 1995) most interesting attack on the conventional wisdom about foreign trade is also the most difficult to examine empirically. He argues that domestic production and import-competing goods are often different and that domestic manufacturers in the United States do not now produce many goods purchased from abroad. These are goods that are especially unskilled-labor intensive and that would be prohibitively expensive to produce at the going market wage for unskilled labor in the United States. For example, the United States imports stuffed animals for children and produces many higher-tech toys domestically. However, such an example should not imply that such low-skilled imports are only in a few branches of industry. According to Wood, such unskilled-labor-intensive goods appear in all branches of production and are not dominant in any particular branch of industry. Therefore, the tests carried out in the first two sections are, he would argue, beside the point.

To estimate the domestic labor displaced by such noncompeting imports, Wood develops a counterfactual scenario in five steps: (i) He looks at the trade between the developing countries (South) and the industrial nations (North) to determine the embodied domestic factors (capital, high-skilled labor, and low-skilled labor) of these goods. (ii) He estimates, by use of an assumed production function, what the factor content of the exports of the South to the North would have been had the factor prices been the same as in the North. This is the counterfactual technology estimate that he uses to determine what factors would have been employed had the North needed to produce these goods domestically. (iii) He estimates what trade between industrial and developing countries would have been had the South traded only its traditional exports (primary products) with the North. Of course, the South would then have been limited by these trade receipts to imports financed by receipts from their traditional exports, namely, primary products. This is the counterfactual trade estimate. (iv) He estimates the changes in the domestic production pattern in the industrial countries that would have occurred. He accounts for price differences in the noncompeting imports from the South so that a dollar of (high-cost) domestic production corresponds to less than a dollar's worth of these noncompeting imports, which, under the counterfactual trade estimate, are no longer imported from the South. This is the counterfactual output estimate. (v) By combining the counterfactual technology and output estimates, he determines the unskilled labor in the North displaced by the trade in noncompeting imports from the South.

According to Cooper (1997), this is "a highly sophisticated analysis on the basis of weak data combined with thoughtful judgments." However, Cooper also notes that in developing his counterfactuals Wood fails to allow for the possibility that demand for these formerly noncompeting imports from the South would be very much lower because of their price. That is, their labor content, combined with high wages in the North, would raise their domestic price considerably and as a result would be neither domestically produced nor domestically purchased.

Table 3. Defensive Measures Taken in Industrial Branches Facing Potential or Actual Import Penetration, 1971–1991

Constant	Labor–Capital Ratio, 1971	Percentage of Production Workers, 1971	Coefficient of Determination (R^2)	Sample Size
Dependent Variable: Average Annual Change in the Labor–Capital Ratio				
Two-Digit Industrial Classification				
–0.0294 (0.0226)	–0.0940 (0.0944)	+0.0098 (0.0325)	0.0552	20
Three-Digit Industrial Classification				
–0.0335* (0.0098)	–0.0626 (0.0521)	+0.0136 (0.0138)	0.0286	71
Four-Digit Industrial Classification				
–0.0254* (0.0043)	–0.0406 (0.0215)	–0.00066 (0.00592)	0.0082	449
Dependent Variable: Average Annual Change in Percentage of Production Workers				
Two-Digit Industrial Classification				
–0.0125 (0.0069)	–0.0242 (0.0289)	+0.0144 (0.0100)	0.1149	20
Three-Digit Industrial Classification				
–0.00815* (0.00332)	–0.0159 (0.0176)	+0.00823 (0.00466)	0.0478	71
Four-Digit Industrial Classification				
–0.00708* (0.00116)	–0.00621 (0.00585)	+0.00670* (0.00161)	0.0379	449
Dependent Variable: Average Annual Change in Total Factor Productivity				
Two-Digit Industrial Classification				
+0.0124 (0.0148)	+0.0622 (0.0617)	–0.0166 (0.0213)	0.1670	20
Three-Digit Industrial Classification				
+0.00399 (0.00606)	+0.0325 (0.0321)	–0.00536 (0.00850)	0.0175	71
Four-Digit Industrial Classification				
+0.00284 (0.00340)	+0.00959 (0.01715)	–0.00188 (0.00472)	0.0009	449

Standard errors are in parentheses below the estimated regression coefficients; statistical significance at the 0.05 level is indicated by asterisks. The average value of shipments serve as weights. For other notes, see Table 1.

This means that Wood's estimates for the labor displacement is much too high. Freeman (1995) and Cline (1997) level other valid objections to some of Wood's assumptions and estimation methods.

Empirically determining the impact of noncompeting imports on factor demand requires not only a series of assumptions, many of which can be questioned, but also highly detailed and comparable data on trade and production. These statistics would allow us to distinguish trade and production of different qualities of particular goods. Unfortunately, we do not have such data and by necessity must adopt shortcuts.

I try one such shortcut to this disaggregation problem in the first two sections of this paper,

namely, by extrapolating trends in the calculated regression coefficients as the statistical experiments are carried out on increasingly detailed data. The results suggest that at highly disaggregated levels of trade and production, the skill intensity of production does not explain very much and therefore that the impact of noncompeting imports should not be great.

Sachs and Shatz (1994) try two other shortcuts to test Wood's hypothesis by using U.S. trade data disaggregated by trade partners. First, if domestic industries are hard hit by imports from the South, they should drop those lines of production that are especially unskilled-labor intensive so that their average skill intensity of production rises. Sachs and Shatz test for this phenomenon and find no such trends. Second, defensive measures in those industries with considerable import penetration from developing nations should be greater than in other industries. Their approach is similar to that surrounding my discussion for Table 3, but with an exclusive focus on trade with the South. In particular, they explore whether total factor productivity rose more in those industrial sectors in which trade penetration from the South was greatest, especially as those sectors would be shedding the lowest-productivity workers in an attempt to meet such foreign competition. Although they find such an effect, it is small, and it occurred only in the period 1978–1989.

A more direct way of approaching this problem is to examine differences in price changes of traded goods and of domestic production. If the import competition hypothesized by Wood is becoming increasingly important, average prices of imported goods should fall relative to the average prices of domestically produced goods. This is because the latter would be increasingly focused on producing goods at the high end of the market.

Therefore, we need only compare the price indices of imported and domestically produced goods to see whether this is occurring. Fortunately, the U.S. Bureau of Labor Statistics does calculate separate and comparable price indices for imported, exported, and domestically produced goods arranged according to their SIC codes. Unfortunately, the sample is not as large as we would hope, so the results must be interpreted cautiously. Using certain assumptions, these data can yield some limited information that is relevant to the problem. First, however, we must directly face three additional, serious difficulties.

1. The “average price” problem: A major difference between unit-value price indices often used for foreign trade series and the price indices used for production concerns the ability of the index to distinguish a pure price change from the upgrading of the quality of the goods purchased that is reflected in a higher unit value. Nevertheless, unless a price index includes every single quality of every good as a separate commodity in the index, some of the price increases measured by the index really reflect a quality upgrade (associated with a higher price) of the various goods in the index. The Bureau of Labor Statistics calculates both trade and production indices on a product basis so that we can readily compare domestic and foreign prices. Although a relatively rising domestic price could reflect higher prices for the same goods by domestic markets, the lack of a complex spectrum of qualities of goods in the indices could also mean that the domestic producers are upgrading the quality of their goods and, as a result, charging higher prices rather than charging higher prices for the same quality of goods. I interpret part of the divergence of domestic and foreign prices in this manner.
2. The time-period problem: These comparable price indices are available only for a period that in most cases spans a period from the early and middle 1980s to the early 1990s.

Moreover, the starting and ending dates of the various series are different. Considerable statistical noise can also occur in such short time series.

3. The problem of changes in the value of the currency: Because the 1980s was a period of dramatic appreciation and depreciation of the dollar, it is necessary to hold the real exchange rate constant in making any calculations for the different series. Such a task requires calculating an index of the real exchange rate and, from such data, including with each set of price changes a change in the real exchange rate for the same period.¹⁹

By including a variable that reflects the changes in the real exchange rate, a problem of variable markups arises. If, for example, trade markups remained constant, the domestic price of imported goods would fluctuate according to the exchange rates. If, by way of contrast, foreign exporters price to the U.S. market, their prices would remain constant in U.S. dollars, but their markups would vary according to the exchange rate. However, pricing to the market means that the price of particular goods varies between nations and opens up the possibility of arbitrage of these traded goods. As a result, pricing to the market is necessarily incomplete. For the regressions presented in the following discussion, this means that the calculated coefficient for the exchange rate variable incorporates both the revaluation of the currency and the variability of the markets induced by such currency rate changes.

In the regression experiments presented in Table 4, the variable to be explained is the change in the ratio of imports to total domestic consumption of the good. I also experimented with changes in the export ratio and the total trade ratio but report only the import results because they are most relevant to Wood's argument.

The first explanatory variable is the difference between the annual rise in import prices and prices of domestic production for each particular category of goods. If import prices rise in comparison to domestic prices, import penetration should decline, so that the hypothesized relationship is negative. The second explanatory variable is the change in the real exchange rate, which rises as the dollar depreciates (foreign goods become more expensive). If the real exchange rate depreciates, import penetration should decline, and the calculated regression coefficient should also be negative. I calculate the regressions at various levels of aggregation to determine the impact of aggregation.

The regression results in Table 4 are disappointing because the two independent variables do not have much explanatory power. Indeed, only at the highest level of disaggregation is the coefficient for the real exchange rate statistically significant and, moreover, with the correct sign. The estimated coefficients linking changes in import penetration to differences in the average annual change in import and domestic prices are not statistically significant, and, moreover, all have the wrong sign.

I also experimented with a series of other explanatory variables that might be necessary

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¹⁹ The available indices are not satisfactory for this purpose, and it proved necessary to calculate such a special index for this purpose. For the exchange rate weights, I started with a sample of nations whose trade amounted to at least 0.5% in 1980, 1985, 1990, or 1995. Eliminating those for which exchange rate or price data were not available, I calculated the average trade share in the four years. The final index included 29 countries whose trade covered 81% of U.S. trade turnover. I then collected exchange rates for the dollar, deflating each by a producer price index, a wholesale price index, or a manufacturing price index, whichever was available.

The volume of trade used as the weights are mainly from the International Monetary Fund's *Direction of Trade Statistics Yearbook* (various years) and some miscellaneous sources, including Republic of China (1996). The exchange rate data are mainly from International Monetary Fund (1996) but also from certain additional statistical sources for particular countries.

Table 4. Relationship Between the Change in Imports and Differences in the Change of Import and Domestic Prices, 1971–1991

Constant	Difference in Average Annual Change in Import and Domestic Prices	Change in Real Exchange Rate	Coefficient of Determination (R^2)	Sample Size
Dependent Variable: Change in the Ratio of Imports to Domestic Consumption, 1971–1991				
Two-Digit Industrial Classification				
+0.0488 (0.3089)	+0.131 (2.364)	–1.482 (13.114)	0.0016	18
Three-Digit Industrial Classification				
+0.0812 (0.0238)	+0.516 (0.390)	+1.995 (1.113)	0.0771	49
Four-Digit Industrial Classification				
+0.105* (0.021)	+1.124 (0.650)	–3.327* (1.275)	0.1744	36

Standard errors are in parentheses below the calculated coefficients; statistical significance at the 0.05 level is indicated by asterisks. The trade data come from sources cited in Table 1. The real exchange rate calculation is described in footnote 10. Sources: The producer and import prices come from the Web. The producer prices come from <http://stats.bls.gov/> and thereafter by selecting data, gopher, time-series, and producer prices. The foreign trade price series come from <http://stats.bls.gov:90/ipphome.htm> and thereafter by selecting historical series. These foreign trade price series are also contained in the CD-ROM accompanying Fenestra (1996).

to hold constant to isolate the impact of differential price effects. These included the average annual growth of total factor productivity and of the domestic consumption of the category of good, both for the relevant periods and for each good. These did not markedly affect either calculated coefficient for the differential price variable. Because I am not focusing on specific characteristics of the industrial branches, it is not necessary to include variables that indicate the relative importance of unskilled labor in the various branches, as in the first three tables of this paper.

In sum, these statistical experiments provide no evidence that imports are sweeping the low end of the various product markets, as is argued by Wood. One could add one theoretical support for such negative results: It is true that most low-quality goods that use highly unskilled-labor-intensive methods are produced domestically only in very small quantities because the high labor costs would have made them expensive in relation to their quality. However, as the incomes of consumers rise, consumers are also unlikely to buy such goods if those goods are imported. Rather, consumers turn increasingly toward goods of higher quality (and prices), which might or might not be produced abroad.

Given the fact that none of the other attempts reported above could show evidence for the noncompeting imports to have a major impact, the most important conclusion of the first two sections of this paper still stands: Foreign trade does not appear to have had a direct and major impact on the employment rates of unskilled U.S. workers.

7. If Not Trade, What Is to Blame?

Although the regression analysis provides insight into causation, it does not allow us easily to gain an idea of how many unskilled workers have been displaced by trade or by other possible causes, such as a change in the pattern of domestic consumption. It is simplest to approach this

problem by first looking at the changes occurring in trade and production by means of comparisons between the current situation and a series of counterfactuals. Then we can investigate the relative importance of external and internal causes in bringing about some of these changes.²⁰

A simple shift-share analysis gives us the clearest view of the changes between 1971 and 1991. The object of the exercise is to determine what part of the changes in the employment of workers of different levels of education can be traced not only to changes in the pattern of trade but also to two competing hypotheses: (i) shifts in the pattern of consumption and (ii) shifts in employment patterns within specific industries. The method requires constructing a series of counterfactuals in which these factors did not change and comparing these with actual changes in the employment of workers of different levels of education.²¹

Part A of Table 5 shows that although manufacturing production has more than doubled between 1971 and 1991, employment declined 4.5%. This is mostly due to the dramatic increase in labor productivity. If the share of exports and imports had remained the same so that production would have grown as fast as domestic consumption (taking trade into account), the manufacturing labor force would have declined only 3.3%. The 1.2 percentage point difference is due to the increased imbalance of trade in manufacturing in the two years under examination.

Part B of Table 5 uses disaggregated data and simulates three scenarios. In the first statistical experiment, I allow the structure of consumption to change as it did between 1971 and 1991. However, I hold constant in all 77 industries the share of exports and imports and the shares of workers with different educational qualifications for all industries. In the second experiment, I allow the structure of trade to change as it did between 1971 and 1991 while holding the other two variables constant. In the third experiment, I allow the distribution of workers between different educational groups to vary while holding the other two variables constant.

For all four educational groups, the economy-wide changes in the educational levels of workers employed in each industry account for almost all the actual changes of employment. By way of contrast, shifts in the pattern of trade or consumption account for very little of the change in employment of workers with different educational qualifications. Such a result parallels the regression exercise in Table 1. Indeed, except for high school dropouts, the trade effect acts in the opposite direction as the actual change in employment. As noted in the discussion about Table 1, these results offer no support for the hypothesis that domestic manufacturers in general have met import competition by outsourcing abroad those parts of their production that are especially unskilled-labor intensive.

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²⁰ This is a variant of the standard embodied-factor approach used, for example, by Borjas, Freeman, and Katz (1992, 1996).

²¹ Essentially, this is the same approach as that followed by Sachs and Shatz (1994). However, they use a 51-sector input-output table to determine both the direct and the indirect amounts of workers at different skill levels that are affected by trade. They assume that if the net imports of electric pumps increase, the workers in the domestic industries making the metal, motors, measuring gauges, and other inputs used by the pump manufacturer should also be taken into account in determining the impact of trade. I discuss some of the dangers in using input-output calculations for long time periods in section 1.

For the pump manufacturer, my approach accounts for any decline in employment in the metal-working, motor, and instrument industries only in terms of what is happening to total production in these separate industries. In other words, in my counterfactual, I assume that the consumption pattern (domestic usage in each industry but not necessarily final consumption) in 1991 was the same as in 1971. In their counterfactual, Sachs and Shatz assume that the final consumption pattern in 1990 was the same as in 1978. Their counterfactual also assumes that interindustry relations and outsourcing remained the same. My counterfactual allows for changes and can account for the fact that a multinational might ship U.S. instruments to its foreign electric pump factory for those pumps that were exported to the United States.

Table 5. Trade, Production, and Employment of Workers with Different Levels of Education

Part A: Aggregative Analysis for Changes in Manufacturing, 1971–1991

	Percentage Change
Actual change in domestic shipments of manufactured goods	+102.6%
Actual change in manufacturing labor force	−4.5
Hypothetical change in manufacturing labor force if domestic shipments had increased at the same rate as consumption of manufactured goods	−3.3

Part B: Changes in Manufacturing Employment by Level of Education, 1971–1991

Structure of Consumption	Share of Trade	Labor Force Structure, Defined by Highest Level of Formal Education	Highest Level of Formal Education				Total
			High School Dropouts	High School Diploma	Some University or Trade/Vocational School	University Degree	
Hypothetical Changes							
Changed	Constant	Constant	−20.6%	+8.0%	+59.2%	+66.0%	+6.1%
Constant	Changed	Constant	−4.9	−3.3	−2.7	−1.9	−3.8
Constant	Constant	Changed	−54.5	+13.3	+63.6	+92.7	−3.3
Actual changes			−57.1	+10.6	+66.3	+101.6	−4.5

The data on educational levels of workers come from the March Current Population Surveys for the respective years. Because the Census Bureau uses a somewhat different industrial nomenclature than the BEA, for each industry I applied the percentage distribution of workers by educational groups derived from the census data to the BEA data on employment. The trade and manufacturing shipments by three-digit SIC classification come from Feenstra (1996, 1997). Data about prices, employment, and other aspects of the same industries come from Bartelsman and Gray (1996). For this discussion, I assume that the change in shipments represents the change in production for the 20-year interval.

At most, the balance-of-trade effect is equal to a 1.2 percentage point decline in actual employment. This is because closing the trade deficit does not necessarily mean that domestic output would have expanded because it also could have come about by a decline in domestic expenditures. As a result, it is difficult to say exactly what the total effect on employment would have been without the trade deficit. Nevertheless, the trade deficit effect would still be small, and any “great sucking sound” of a trade-induced outflow of U.S. jobs abroad seems faint indeed.

No dearth of alternate candidates exists to explain the falling employment rates of less skilled workers, especially males. The most popular explanation among economists is biased technical change, which positively shifts the demand curve for skilled labor and negatively shifts the demand curve for unskilled labor. For example, Berman, Bound, and Griliches (1994) provide data on the upgrading of the labor force from production to nonproduction workers in every major industry as evidence to argue this case. In a later paper, Berman, Machin, and Bound (1996) claim that this is a worldwide phenomenon as well.

Surely, no one will deny that the labor force in most industrial nations is being upgraded. Nevertheless, this can come about because of an increase in the education of the workers that is quite independent of whether technical change has taken place. A simple exercise is to take the 500 occupations in 1971, classify them according to the average education in each occupation, and examine the change in the number of people in each occupational group by 1991. Because the occupational nomenclature changed in the early 1980s, it is necessary to take special measures using a probabilistic mapping from one set of codes to the other, described in tedious

detail in Pryor and Schaffer (1997). Such a calculation, noted in the introduction of this paper, shows that the number of jobs available in occupations requiring a high school education or less has increased considerably faster than the number of people with these low education levels. Using a much different kind of analysis, Howell (1997) arrives at the same conclusions.

Although most of these jobs have not experienced an upgrading in their qualifications, they are now being filled by those who have more than a high school education. For example, “grader, dozer, and scraper machine operators” had 2.5 more years of education in 1991 than in 1971, and the average prime-age worker in this occupation now has more than a high school education, although the additional education does not seem justified by changes in the requirements for these jobs. More evidence on these matters can be found in Pryor and Schaffer (1998). In sum, although skill-biased technical change might be occurring, it is not responsible for the rise in joblessness among less skilled prime-age males.

Other explanations for the employment decline of less skilled workers are also available. Pryor and Schaffer (1998) show that a displacement effect has occurred in the job structure, with more educated workers bumping less educated workers out of particular jobs and these displaced workers bumping even less educated workers out of their jobs. This bumping mechanism can be easily documented and has some depressing implications. For example, downward wage pressure is strongest among the least educated, who, moreover, are most likely to get totally pushed out of the labor force. For reasons Schaffer and I discuss elsewhere, this mechanism is especially important in explaining trends in male employment rates.

8. A Brief Summary

Classical trade theory sees no impact of foreign trade on domestic unemployment other than short-term effects as workers move from one industry to another. The Heckscher–Ohlin theorem suggests that if joblessness did arise from foreign trade, in the United States, which has an abundance of capital and skilled labor, it would occur among the least educated. Although U.S. unemployment in the mid-1990s is relatively low, the share of the male prime-age (ages 25–49) labor force that is not included in the labor force has risen considerably over the last quarter century so that total joblessness in this group now runs about 11%. Further, the jobless rates are very much higher among the less educated than the more educated.

Using a regression analysis, the first part of this paper shows that the changing share of net exports (or net imports) to domestic production in particular industries is not related to the relative importance of less educated workers in that industrial branch. A regression analysis in the second part of this paper shows that those industries with especially large shares of less educated workers have not experienced any relative decline in domestic price due to import penetration, a result offering further evidence that these industries are not, in general, especially vulnerable to import competition and that we must look elsewhere for the causes underlying the high joblessness of the less educated. These results also do not seem contaminated by defensive measures undertaken by producers in industrial branches with high shares of less educated workers in their labor force.

However, this type of analysis does not directly face the critique of Wood in his analysis of noncompeting imports and quality differences between exports and imports in the same industrial branch. Unfortunately, the data used in this paper do not allow a definitive answer to

this question, but the detailed evidence brought forward offers little support to Wood's hypothesis.

Other explanations for the upward trend in the joblessness of less educated workers can be offered, for example, skill-biased technical change. This paper presents evidence about the changing occupational structure in the United States that appears to contradict the technical-change approach. The essay ends with a sketch of a different and more promising approach that relies on the changing occupational structure in the United States and the downward occupational mobility whereby an increasing number of university graduates are taking "high school jobs" and those with a high school diploma jobs previously held by high school dropouts, so that the latter are bumped out of the labor force.

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