Globalization and Deindustrialization:
Myth and Reality in the OECD

By

Steven S. Saeger

Contents: I. Introduction. – II. Defining Deindustrialization and Its Causes. – III. Review of the Empirical Literature. – IV. Empirical Methodology and Description of the Data. – V. Empirical Results. – VI. Conclusion.

I. Introduction

Does trade with less-developed countries (the "South") have an adverse impact on workers in developed economies (the "North")? This concern is not a new one, but it has gained renewed prominence in recent public debates on trade. This heightened fear of foreign competition is the result of three important labor market developments during the last 25 years: first, substantial increases in wage disparities between skilled and unskilled workers in the Anglo-American economies; second, persistently high levels of unemployment in Europe; and third, a sharp contraction in both relative and absolute manufacturing employment across the developed economies of the Organisation for Economic Co-operation and Development (OECD), a phenomenon commonly referred to as "deindustrialization." The fact that these three developments have coincided with an expansion of trade with the South has prompted calls for policies to protect manufacturing industries in the North from low-wage competitors.

A rapidly growing literature in the fields of both labor economics and international trade has examined the relationship between trade and relative wages in the United States. [1] This paper will take a different approach, however, focusing on the relationship between the increasing integration of the South in the global economy and deindustrialization.

There has been comparatively little research examining the issue of deindustrialization in developed economies. It is clear, however, that there has been a major change in the structure of employment within the OECD during the last 25 years, as the relative importance of manufacturing has declined sharply in virtually all member countries (see Table 1). This paper will not attempt to address whether deindustrialization improves or reduces economic welfare in developed countries. It instead attempts to examine why deindustrialization has occurred. Is the contraction of manufacturing employment merely the result of the increasing maturity of developed economies? Or have the forces of globalization contributed to the shift of labor from the manufacturing sector into services?

Exploring the causes of deindustrialization provides a different perspective on how globalization could impact the structure of developed economies. Most previous studies, particularly those of trade economists, have concentrated solely on trade's role in intra-manufacturing adjustment. In contrast, this paper examines the position of the manufacturing sector in the broader industrial structure of an economy. Given the fact that manufacturing now accounts for less than one-fifth of employment in most of the OECD, it is essential to consider the effects of globalization in a general equilibrium setting. As Berman et al. (1994: 392) note, "trade may have played a greater role in [the] overall decrease in the size of manufacturing than it did in the reallocation of employment within manufacturing."

By utilizing both pooled and fixed effects estimates of the manufacturing share of employment and real value added, one can assess the empirical support for alternative explanations of deindustrialization. The results of this paper are consistent with the view that the expansion of economic linkages between the North and South has been associated with deindustrialization in developed economies. Imports of manufactured goods from the South are a statistically significant predictor of the manufacturing share of employment and real output. This result holds even after controlling for differential produc-

---

[1] See Burtless (1995), Deardorff and Hakura (1994), Freeman (1995), Richardson (1995) and Wood (1995) for reviews of the recent literature.

Table 1 — *Manufacturing Share of Employment and Real Value Added for 22 OECD Economies, 1970 and 1990 (percent)*

	Manufacturing employment as a share of total employment		Manufacturing value added as a share of real GDP[a]	
	1970	1990	1970	1990
Canada	20.7	14.8	19.2	16.2
USA	24.4	16.2	22.4	20.0
Japan	28.5	24.6	25.1	31.4
Australia	24.5	14.9	23.9	16.9
New Zealand	24.9	16.5	.	.
Austria	28.7	23.6	.	.
Belgium	32.0	20.9	20.9	24.0
Denmark	24.6	19.6	15.9	15.4
Finland	23.7	18.8	21.0	21.6
France	26.7	21.0	23.5	21.3
Germany	38.7	32.0	35.3	30.2
Greece[b]	17.2	19.5	.	.
Iceland	23.1	19.4	.	.
Ireland[c]	20.4	19.7	.	.
Italy	28.1	24.3	25.8	25.3
Netherlands	26.3	16.8	19.4	17.3
Norway[d]	22.8	14.1	21.3	12.5
Portugal[e]	21.9	19.8	31.9	30.8
Spain[f]	25.1	22.3	.	.
Sweden	27.9	21.1	22.4	20.7
Turkey	10.0	14.0	.	.
UK	34.7	20.7	27.8	22.0

[a] Constant price value added and real GDP at 1985 prices. — [b] 1970 employment data for Greece from 1971; 1990 data from 1989. — [c] 1990 employment data for Ireland from 1989. — [d] 1970 employment data for Norway from 1972. — [e] 1970 value added data for Portugal from 1978. — [f] 1970 employment data for Spain from 1972.

Source: Value added at constant prices from OECD, STAN database. Real GDP from OECD, *National Accounts, Main Aggregates* (1995). Employment data from OECD, STAN database and *Labour Force Statistics* (various issues).

tivity growth, human capital accumulation, and the effects of Dutch disease.

Econometric estimates also indicate that intra-OECD and North-South trade may have fundamentally different effects on the structure of employment and production at the aggregate level. While balanced North-South trade is associated with deindustrialization, substantial deficits in intra-OECD manufacturing trade appear to have only a minor impact on the share of manufacturing employment. This points to the importance of differentiating between intra-OECD and North-

South trade when analyzing the possible impacts of globalization on patterns of employment and wage inequality in the OECD.

The evidence presented here is consistent with the proposition that there is a robust relationship between deindustrialization and the integration of the South in the global economy. This evidence should not be interpreted, however, as proving that globalization is the primary cause of the declining share of manufacturing employment in the OECD. There is also a strong link between differential productivity growth and deindustrialization. The endogeneity of trade flows also prevents one from establishing a causal link running from globalization to deindustrialization. The empirical evidence in this paper instead underlines the robustness of the partial correlation between increased imports from the South and deindustrialization, a relationship that alternative theories should also be able to explain.

The remainder of this study is structured as follows: Section II discusses the phenomenon of deindustrialization and explores several possible explanations for its occurrence. Section III briefly reviews other research on this issue, while Section IV discusses the paper's methodological approach. Empirical results shedding light on the link between trade and deindustrialization are presented in Section V, and Section VI concludes the paper.

II. Defining Deindustrialization and Its Causes

1. What Is Deindustrialization?

The most common definition of deindustrialization is based on the share of manufacturing in total employment. There are a number of reasons why most analyses have focused on employment rather than output measures of manufacturing to define deindustrialization: first, the share of manufacturing employment is a commonly used indicator of the level of industrialization and economic development; second, employment is the most visible measure of the size of the manufacturing sector, and therefore one that tends to drive public perceptions of the issue; and third, to the extent that concerns about deindustrialization are based on the cost of adjustment between sectors, it makes sense to focus on changes in factor markets rather than output markets.[2] Defining deindustrialization in terms of the share of manufac-

---

[2] Lawrence (1983) correctly points out that absolute rather than relative changes in employment are a better indicator of total adjustment costs. Absolute changes in manufacturing employment do not, however, provide evidence on the position of manufacturing within the broader economy.

turing employment also helps to focus attention on the changing structure of employment at the aggregate level.

2. Why Does Deindustrialization Occur?

This paper will focus on three basic explanations for the declining share of manufacturing employment across the OECD: increasing economic maturity, the expansion of economic linkages between the North and South, and changes in relative resource endowments that affect a country's comparative advantage.

a. Economic Maturity and Deindustrialization

Economists have long recognized the link between economic maturity and the structure of employment. Even before deindustrialization became a common phenomenon in the OECD, Clark (1957: 492) noted:

A wide, simple and far-reaching generalisation ... [is that] as time goes on and communities become more economically advanced, the numbers engaged in agriculture tend to decline relative to the numbers in manufacture, which in their turn decline relative to the numbers engaged in services.[3]

According to this view, the time path of the manufacturing share of employment generally takes the form of an inverted U-shaped curve. Pooled data for OECD countries during the last 25 years is indeed broadly consistent with this pattern (see Figure 1).

The contraction of the share of manufacturing employment has thus been viewed as a natural phenomenon in the course of economic development, similar in nature to the dramatic long-term decline in the share of agricultural employment. This shift of labor out of agriculture has been the subject of an extensive literature in the fields of economic growth and development. Engel's law and agricultural productivity growth are generally cited as the primary causes of this change in the structure of employment.

While the contraction of manufacturing employment has often been compared to that of agriculture, it does not appear that non-homothetic preferences have played a similarly important role in deindustrialization. If services are "superior" goods, then consumers would increase their relative demand for services as per capita incomes increase. This would in turn cause a decline in output and employment

---

[3] Clark actually credits Sir William Petty as first having made this observation in 1691.

Figure 1 – *Manufacturing Employment and Per Capita GDP (Data from 1970, 1975, 1980, 1985 and 1990 for 23 OECD countries)*
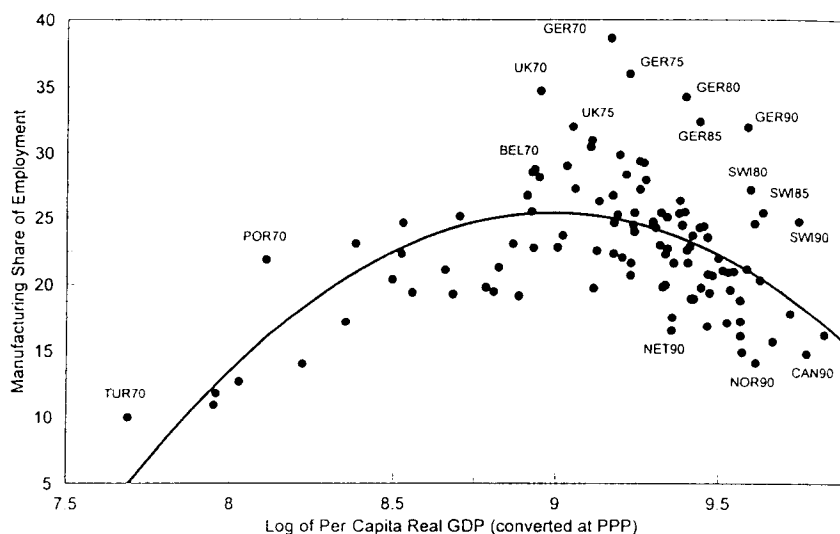
Source: Summers and Heston (1995); OECD, *Labour Force Statistics* (various issues); OECD, STAN database.

in the manufacturing sector. There is, however, little evidence that shifts in the pattern of expenditures between services and manufacturing can explain the secular shift of employment out of manufacturing into services (Baumol et al. 1989; Rowthorn and Ramaswamy 1997; Rowthorn and Wells 1987).

Differential labor productivity growth in manufacturing and services provides a more empirically plausible explanation for why the manufacturing share of employment has tended to contract as economies mature. Given a fixed pattern of demand, differential productivity growth will result in a shift of employment out of the more dynamic sector. Faster relative productivity growth in manufacturing implies that the share of manufacturing in real value added can remain constant or even increase while the share of employment and nominal output is declining. Rowthorn and Wells (1987: 5–6) have referred to deindustrialization that results from differential productivity growth as "positive deindustrialization ... a symptom of economic success. It is not a pathological phenomenon, as many believe, but is the normal result of industrial dynamism in an already highly developed econ-

omy." This explanation for deindustrialization has been heavily emphasized by a number of researchers, including Lawrence (1991) and the International Monetary Fund (1997).

b. North-South Integration and Deindustrialization

The expansion of economic linkages between the North and the South provides a second type of explanation for the contraction of manufacturing employment. While most analyses of the impact of globalization have been based on the two-sector Heckscher-Ohlin model of international trade, it is necessary to consider production of a nontraded good to address the phenomenon of deindustrialization. This study considers two ways in which increased North-South trade could be associated with deindustrialization: first, through the Stolper-Samuelson mechanism of a decline in the relative price of unskilled-intensive goods, and second, through the outsourcing of unskilled-intensive production to the South.

The predictions of the Stolper-Samuelson theorem continue to hold in an extension of the Heckscher-Ohlin model incorporating a nontraded good (Komiya 1967; Hazari et al. 1981). In this model, the opening-up of trade with countries relatively abundant in unskilled labor will cause the price of the unskilled-intensive good to fall in the skill-abundant North. This will lead to a fall in the relative wages of unskilled workers in the North. Given the contraction of production in the unskilled-intensive manufacturing sector, labor will shift into skill-intensive manufacturing and nontraded goods production, generating deindustrialization.

It is important to recognize that trade between the two countries is assumed to be balanced. North-South integration can therefore be associated with deindustrialization even if a country does not run a manufacturing trade deficit. This is the result of the differing skill intensities of production in the import-competing and export sectors. The labor required to produce an additional unit value of output in the export sector is much lower than the labor displaced by a unit value of unskilled-intensive imports. Excess labor will flow into production of nontraded goods, shrinking the size of the manufacturing labor force. If one relaxes the assumption of balanced trade, a rising deficit in manufactured trade with the South would tend to amplify the negative effects on manufacturing employment and output.

Outsourcing of unskilled-intensive production represents another way in which increasing North-South integration could be associated

with deindustrialization. Indeed, anecdotal evidence of firms relocating production to the South has driven much of the populist rhetoric on globalization. Sachs and Shatz (1995) provide some theoretical grounding for these fears in a model capturing the possible effects of capital mobility. In contrast to the Stolper-Samuelson theorem, increasing wage inequality and declining manufacturing employment occur in this model even in the absence of changes in the relative price of the unskilled-intensive good.

The model of Sachs and Shatz assumes that unskilled wages are lower in the South than in the North, generating higher quasi-rents for owners of sector-specific capital. Restrictions on foreign direct investment in the South initially prevent all capital in the unskilled-intensive sector from relocating to the South. A reduction in these restrictions, however, results in the exogenous movement of capital from the North to the South. Production and employment in the unskilled-intensive tradable sector contract as a result, and unskilled labor moves into the nontradable sector. The wage of unskilled workers could also fall, even though the price of the unskilled-intensive product is assumed to be fixed. While this model is quite restrictive in its assumptions, outsourcing represents an alternative mechanism through which North-South integration could be associated with deindustrialization and rising wage inequality.

These two models linking globalization and deindustrialization are not discussed here to represent competing explanations. They instead help to highlight the different ways in which the increasing integration of the North and South could impact the structure of employment in the North. It is not crucial to this paper's findings whether trade with the South has increased as a result of outsourcing, capital accumulation in the South or trade liberalization. The key assumption underlying the analysis is that shifts in export supply in the South are driving the rising imports of manufactured goods in the North.

In attempting to identify the impact of export supply shifts in the South, it is also critical to examine how shifts in import demand could also coincide with the contraction of manufacturing employment. While it is true that all OECD countries except Turkey have experienced a steady deterioration in their manufacturing trade balances with the South during the last 25 years, this could be consistent with either demand or supply shifts. The next section therefore discusses the importance of controlling for changes in relative resource endowments that affect patterns of both trade and employment.

c. Changing Relative Endowments and Deindustrialization

One reason why a country's patterns of trade and employment may shift is as a result of changes in resource endowments. The importance of relative resource endowments in determining a country's comparative advantage has long been recognized and is the primary thrust of the Heckscher-Ohlin theory of international trade. Countries that lack natural resources, agricultural goods or tradable services that can be exchanged for imports will generally specialize in manufactured exports and tend to have a larger share of employment in the manufacturing sector.

In contrast, countries that are richly endowed with natural resources will instead tend to import manufactures, export resource-intensive products and have relatively low shares of manufacturing employment. A change in natural resource endowments due to an exogenous event (such as an oil discovery) could thus lead to a change in comparative advantage. This would cause a shift of exports from manufactured goods to resource-intensive products, causing employment and output in manufacturing to contract. Changes in natural resource endowments can thus result in what will be termed "Dutch disease" deindustrialization.

Human capital represents another resource endowment that affects a country's comparative advantage in manufactured versus non-manufactured goods and services. If the production of services is relatively skill-intensive, human capital accumulation would lead to an expansion of production in services and a contraction of employment and production in manufacturing. This is the Rybczyinski effect in the Heckscher-Ohlin model. Human capital accumulation could therefore be consistent with both deindustrialization and rising manufactured imports from the South.

III. Review of the Empirical Literature

Current concerns about the role of globalization in deindustrialization in the North are basically a revival of fears that first surfaced in the USA during the late 1970s and early 1980s. At that time, however, firms from countries such as Japan and Germany were viewed as the primary competitive threat for US manufacturers. Most studies examining the relationship between trade and deindustrialization therefore concentrated on the effects of intra-OECD trade and concluded that it is of only limited importance. This view is best

exemplified by Robert Lawrence (1983, 1987, 1991). In his earliest work on the topic, Lawrence (1983) argues that deindustrialization is actually a myth in the USA given the fact that manufacturing employment increased in absolute terms until 1979. While manufacturing employment actually declined in absolute terms in the USA during the 1980s, Lawrence (1991) attributes this to faster relative productivity growth. Lawrence (1987) similarly concludes that deindustrialization in France, Germany, and Sweden between 1973 and 1985 was largely the result of domestic factors. Although he finds that trade did contribute to deindustrialization in the UK, it accounted for only one-fifth of the sharp decline in manufacturing employment.

Dollar and Wolff (1993) also find little evidence of trade-induced deindustrialization, as they argue that the USA suffered only a small decline in its share of OECD manufacturing output and exports between 1970 and 1987. It is not especially useful to look at relative shares of OECD manufacturing output as an indicator of deindustrialization given the fact that deindustrialization has occurred across the OECD. Dollar and Wolff note that manufacturing output in the OECD in 1985 was distributed across countries in proportions roughly equal to each country's share of total OECD population. They apparently cite this fact to calm concerns about Japanese competition. If one applies this logic to shares of world manufacturing output, however, it would surely imply the potential for a massive decline in the relative importance of OECD manufacturing. It is exactly the specter of this type of convergence which lies at the heart of fears of globalization-induced deindustrialization.

Rowthorn and Wells (1987) provides a cross-country perspective on deindustrialization by examining the experiences of 12 OECD countries between 1953 and 1978. Their empirical approach is similar to this study, as panel data is used to estimate the manufacturing share of employment. Rowthorn and Wells incorporate three explanatory variables: real per capita GDP (both in levels and squared), the unemployment rate, and the ratio of net manufactured exports to GDP.

As is the case with most previous studies of deindustrialization, Rowthorn and Wells' empirical work does not provide much insight into the possible effects of globalization. Instead, they focus on the distinction between countries which are large net exporters of manufactured or nonmanufactured goods. Rowthorn and Wells argue that trade specialization explains persistent cross-country differences in the manufacturing share of employment, but that manufacturing trade balances cannot explain intertemporal changes in employment

shares within countries. This conclusion seems relatively unremarkable, as it is not surprising that the share of manufacturing employment tends to be higher in countries which are net exporters of manufactured goods. The authors, however, do not address how trade specialization is determined or whether increasing North-South integration over the last 25 years can help explain the secular decline of manufacturing employment in the OECD during this period.

One study that posits a direct link between deindustrialization and North-South trade is Wood (1994). He graphs the change in the manufacturing share of employment versus the change in imports of manufactured goods from the South as a share of GDP (see the upper panel of Figure 2). The figure shows an inverse relationship between gross import penetration of manufactured goods from the South and the share of manufacturing employment. Both Wood and *The Economist* (Woodall 1994: 16) have cited the negative correlation shown in this figure as persuasive evidence that North-South trade has caused an acceleration of deindustrialization in the North. There is a similar relationship between net imports from the South and the share of manufacturing employment (see the lower panel of Figure 2). No attempt is made, however, to control for alternative explanations for deindustrialization, such as differential productivity growth.

The IMF (1997) directly confronts Wood's hypothesis and argues that North-South trade has contributed very little to deindustrialization in the North. Differential productivity growth is instead cited as the primary cause of the declining share of manufacturing employment in the developed economies. This conclusion is based on a background study by Rowthorn and Ramaswamy (1997), which builds on the previous analysis of Rowthorn and Wells (1987). Rowthorn and Ramaswamy estimate the manufacturing share of employment utilizing panel data for 21 OECD economies for selected years between 1963 and 1994. In addition to controlling for per capita GDP and total manufacturing trade balances, some of the specifications reported by Rowthorn and Ramaswamy also follow the example of an earlier version of this paper (Saeger 1996) and incorporate North-South trade variables.

Rowthorn and Ramaswamy's conclusions are quite similar to those of Rowthorn and Wells (1987), as they also emphasize the role of trade specialization in determining the structure of employment across countries. Unfortunately, Rowthorn and Ramaswamy present little evidence that illuminates the relationship between globalization and the secular decline of manufacturing employment across the

Figure 2 – *Deindustrialization and Imports from the South, 1970 – 1990*

a. *Gross imports from the South*

Change in Gross Manufactured Imports from South as Percentage of GDP (1990-1970)

b. *Net imports from the South*

Change in Net Manufactured Imports from South as Percentage of GDP (1990-1970)
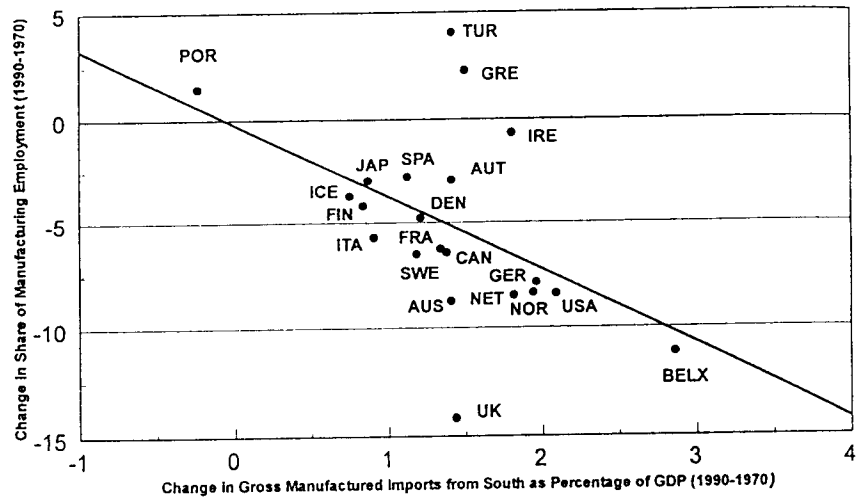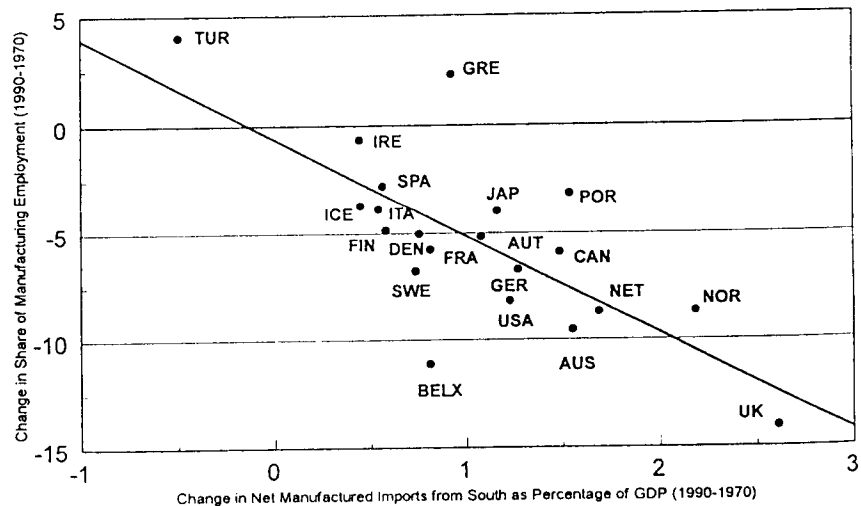
Note: Figure 2a is a revised version of Figure 5.10 in Wood (1994: 206).

Source: OECD, STAN database (1994), *Foreign Trade Statistics* (various issues) and *Labour Force Statistics* (various issues).

OECD. While the authors explicitly control for North-South trade in their pooled specification, this does not provide compelling evidence that globalization has not contributed to deindustrialization during the sample period. As emphasized in Section V of this paper, it is essential to control for persistent country-specific factors affecting the structure of employment if one is attempting to analyze the intertemporal relationship between North-South integration and deindustrialization. Rowthorn and Ramaswamy, however, do not incorporate the North-South trade variables in the three regressions they report that use a fixed effects specification. This makes it difficult to judge the accuracy of their claim that "North-South trade has had very little to do with deindustrialization" (Rowthorn and Ramaswamy 1997: 7).

This brief review of the existing empirical work on trade and deindustrialization highlights the need for further analysis. While a number of researchers have emphasized the role of differential productivity growth as the primary cause of deindustrialization, relatively little attention has been given to the possible role of North-South integration in this phenomenon. This contrasts sharply with both the popular perception that trade with developing countries has had a major impact on labor markets in the North and the illustrative evidence provided by Wood. It is therefore essential that the empirical record be examined more closely to differentiate between these competing explanations for deindustrialization.

IV. Empirical Methodology and Description of the Data

In order to assess the robustness of the relationship between North-South integration and deindustrialization posited by Wood, this paper analyzes the determinants of both the manufacturing share of employment and real value added using panel data for the OECD. This section discusses some of the methodological issues encountered in this study and describes the data utilized in the analysis.

1. Measuring the Impact of Globalization

How should one measure the effects of globalization on relative wages and patterns of employment? This is a key question for any study analyzing the causes of rising inequality or deindustrialization in the North. This paper utilizes gross manufactured trade flows between the North and South as a share of GDP to capture the increasing integration of the South in the global economy. There are

two criticisms which can be leveled against the use of trade flows as an explanatory variable: first, there is little theoretical justification for measuring the effects of globalization using a quantity variable; and second, trade flows are not exogenous, as they are determined simultaneously with employment and production.

From a theoretical perspective, trade flows are not an ideal measure of the impact of globalization. As was noted in the discussion of deindustrialization in the Heckscher-Ohlin model, changes in relative goods prices are the mechanism through which Stolper-Samuelson effects operate. A number of authors have therefore argued that the only valid evidence for testing the predictions of the Stolper-Samuelson theorem comes from the relative prices of unskilled-intensive goods (Bhagwati and Dehejia 1994; Lawrence and Slaughter 1993; Leamer 1994, 1996).

The model of outsourcing discussed earlier, however, indicates that changes in relative prices will not always capture the impact of increasing North-South integration. In this model, the relocation of capital to the South is associated with deindustrialization and rising manufactured imports, even though there is no change in relative prices. Ideally, one would therefore attempt to combine relative price data and some measure of outsourcing to capture the different ways in which globalization could be associated with deindustrialization.

This approach immediately runs into important difficulties, however. Freeman (1995) and Wood (1995) have highlighted some of the problems inherent in using relative price data to measure the impact of globalization, including measurement errors associated with product upgrading and heterogeneity. Measuring the extent of outsourcing across countries is also extremely difficult, particularly given the prevalence of arms-length transactions in industries such as textiles, electronics and apparel. [4] Given the difficulty of empirically identifying and measuring the specific channels through which globalization may impact the structure of employment in the OECD, this study therefore uses North-South trade flows as a proxy to capture the broad effects of North-South integration.

From an empirical standpoint, the endogeneity of trade flows does pose an additional problem for isolating the effects of globalization. This study therefore suffers from the same limitations that beset the empirical literature on the cross-country determinants of economic

---

[4] See Slaughter (1995) and Feenstra and Hanson (1995) for a more complete discussion of the empirical measurement of outsourcing.

growth (Mankiw 1995). In these circumstances one cannot establish a causal relationship between globalization and deindustrialization. The partial correlations obtained here nonetheless provide evidence on the existence of a link between trade flows and the contraction of manufacturing. Competing theories should also be able to explain this relationship.

2. Description of the Data

A data set covering the years 1970, 1975, 1980, 1985, and 1990 was constructed for 23 OECD economies. The dependent variables used in this paper are the manufacturing share of employment and the manufacturing share of value added in constant 1985 prices. [5]

Two different explanatory variables are utilized to control for the effects of differential productivity growth. For the full sample, regressions include the log of real per capita income converted at purchasing power parity from Summers and Heston (1995). This is a poor proxy for differential productivity growth, however, as it implicitly assumes that manufacturing accounted for all productivity growth during the period in question. An alternative interpretation of this variable would be that it more broadly captures the effects of "economic maturity." A second proxy for differential productivity growth (the log of real value added per employee in manufacturing over value added per nonmanufacturing employee) was also constructed for the 15 countries with comparable real value added data.

Natural resource variables representing the value of coal, mineral, and oil production were constructed to capture the impact of changes in relative natural resource endowments. [6] These variables were created based on the example of Leamer (1984), who utilized similar variables in his study of the sources of international comparative advantage. Human capital endowments are measured as the average

---

[5] The manufacturing share of employment is based on the OECD's STAN database and *Labour Force Statistics (LFS)*. Manufacturing employment (ISIC Major Division 3) is taken from STAN for those countries for which it was available, as this data is corrected for changes in sample coverage and industry definition. Civilian employment for all countries and manufacturing employment for Greece, Iceland, Ireland, Spain and Turkey are from *LFS*. Manufacturing value added in constant 1985 prices is national accounts compatible and is also from the STAN database. It is expressed as a share of real gross domestic product.

[6] The minerals variable is based on the value of production of ores bearing iron, copper, nickel, lead, zinc and tin, as well as bauxite, phosphates, and unrefined salt. The oil variable also includes the value of natural gas production.

years of higher education for the total population over age 25 and are from Barro and Lee (1994).

To maintain consistency with the work of Wood (1994), trade in manufactured goods with the South is defined as gross imports or exports in SITC sections 5 through 8 (excluding division 68, nonferrous metals) with non-OECD, non-Comecon trading partners, plus Greece, Portugal and Turkey.[7] Manufacturing trade with the North equals gross manufacturing imports from or exports to OECD countries, excluding Greece, Portugal and Turkey.

Utilizing gross trade flows for the North and South enables us to examine a number of different issues. As noted earlier, the differing factor intensities of the export and import-competing sectors in the North create the possibility that North-South integration could be associated with deindustrialization even if trade is balanced. One would therefore expect the coefficient on gross imports from the South to be larger in absolute value (and of opposite sign) compared to the coefficient on gross exports. In contrast, balanced intra-OECD trade should not have a significant impact on the share of manufacturing employment if this trade is dominated by intra-industry trade in products with similar factor intensities.

V. Empirical Results

The first set of estimates of the manufacturing share of employment utilize pooled data for the full 23 country sample and is reported in Table 2.[8] The pooled estimates are most usefully viewed as helping to explain cross-country differences in the manufacturing share of employment. As noted previously, there is a strong relationship between the share of employment in manufacturing and per capita GDP (see Figure 1). Relative endowments of both human capital and natural resources are also statistically significant predictors of the manufacturing share of employment. Endowments of human capital are negatively related to the share of manufacturing employment, supporting the view that countries which are relatively abundant in highly

[7] Dropping Greece, Portugal and Turkey from the sample reduced the statistical significance of per capita GDP as an explanatory variable, but had no impact on other variables.

[8] All standard errors are based on the "HC2" heteroskedasticity-consistent covariance matrix of MacKinnon and White (1985) and Davidson and MacKinnon (1993). This estimator performs better in finite samples than the heteroskedasticity-consistent estimates originally developed in White (1980) and is still consistent under the null of homoskedasticity.

Table 2 – *Pooled Estimates of Manufacturing Share of Employment for 23 OECD Economies, 1970–1990*

	(1)	(2)
GDP	134.48 *	123.44 *
	(22.47)	(16.37)
GDPSQ	− 7.186 *	− 6.534 *
	(1.268)	(0.934)
Imports from South	− 1.972 *	0.370
	(0.748)	(0.968)
Exports to South	0.349	0.149
	(0.323)	(0.263)
Imports from North	− 0.188 *	− 0.224 *
	(0.065)	(0.061)
Exports to North	0.199 *	0.199 *
	(0.081)	(0.063)
Human capital	− 9.566 *	− 9.343 *
	(2.395)	(2.096)
Coal	3.038 *	2.714 *
	(1.186)	(0.975)
Minerals	− 1.565 *	− 1.861 *
	(0.532)	(0.439)
Oil	− 0.392 *	− 0.449 *
	(0.079)	(0.096)
Time dummies?	No	Yes
Adjusted R squared	0.741	0.801

Note: Heteroskedasticity-consistent standard errors in parentheses; constant term not reported. Statistically significant coefficients (at 5 percent level) are denoted by an asterisk (*). GDP is log of per capita real GDP at PPP; GDPSQ is squared log of per capita GDP. Manufactured trade is defined as trade in SITC 5–8, excluding Division 68. South is defined as Non-OECD, Non-Comecon countries plus Greece, Portugal, and Turkey. North is defined as OECD countries excluding Greece, Portugal, and Turkey. Human capital is average years of higher education in population over 25. Coal is value of coal production as a percentage of GDP. Minerals is value of mineral production as a percentage of GDP. Oil is value of oil production as a percentage of GDP.

Source: Barro and Lee (1994); OECD, STAN database; OECD, *Labour Force Statistics* (various issues); Summers and Heston (1995); UN, *Industrial Statistics Yearbook* (various issues).

educated workers tend to have larger service sectors. Economies that are relatively rich in natural resources also tend to have lower manufacturing shares of employment, as the coefficients on the mineral and oil variables have the expected negative sign. In contrast, the value of

coal production has a positive coefficient. This could reflect the fact that manufacturing sectors such as steel and automobiles initially concentrated in areas near large coal deposits. While falling transportation costs have reduced the importance of proximity to natural resources, regions such as the Ruhr Valley in Germany continue to have high concentrations of manufacturing firms.[9]

The importance of North-South trade as a predictor of cross-country differences in manufacturing employment is less clear in the pooled regressions. The statistical significance, magnitude and sign of coefficient estimates on imports from the South vary considerably depending on the inclusion of time dummies in the specification. In contrast, the coefficients on intra-OECD manufactured imports and exports are consistently significant, of the expected signs, and of approximately equal magnitude.

The results of the pooled regressions are thus quite similar to those reported by Rowthorn and Ramaswamy (1997), as countries with deficits in intra-OECD manufacturing trade tend to have lower shares of manufacturing employment. This does not suggest, however, that trade with other OECD countries causes deindustrialization. If a country such as Germany is heavily dependent on manufacturing production, it would not be surprising if its net imports of manufactured goods from other countries are low compared to other countries. The pooled results therefore should not be interpreted as indicating that there is a link between intra-OECD trade and deindustrialization or that there is no relationship between North-South integration and the declining share of manufacturing employment.

In contrast to the pooled specification, a fixed effects specification enables us to instead focus on changes within countries by controlling for country-specific characteristics that are constant over time. This type of evidence is clearly essential if one is trying to understand the factors underlying the decline in the share of manufacturing employment that has occurred in virtually all OECD countries over the last 25 years. Indeed, as can be seen in Table 3, one can reject the pooled specification restricting the constant term to be equal across countries based on a Wald test for the joint significance of the country dummies. This is not particularly surprising given the difficulty of controlling for all of the factors that affect the structure of employment, but it underlines the importance of persistent country-specific factors.

---

[9] This could be explained in a model of economic geography such as Krugman (1991).

Table 3 — *Fixed Effects Estimates of the Manufacturing Share of Employment for 23 OECD Economies*

	(1)	(2)	(3)	(4)
GDP	113.50*	130.56*	87.30*	102.98*
	(27.30)	(24.22)	(31.41)	(26.25)
GDPSQ	−6.327*	−6.577*	−4.915*	−5.131*
	(1.517)	(1.377)	(1.730)	(1.474)
Imports from South	−1.484*	−0.577	−2.058*	−1.313*
	(0.572)	(0.523)	(0.563)	(0.595)
Exports to South	0.198	0.636*	0.164	0.663*
	(0.250)	(0.276)	(0.286)	(0.307)
Imports from North	−0.222*	−0.244*	−	
	(0.098)	(0.084)		
Exports to North	0.008	0.022	−	
	(0.081)	(0.060)		
Net imports from North	−	−	−0.085	−0.110
			(0.074)	(0.066)
Human capital	−4.444*	0.115	−4.698*	−0.175
	(2.155)	(1.531)	(2.100)	(1.525)
Oil	−0.316*	−0.384*	−0.261*	−0.298*
	(0.081)	(0.063)	(0.100)	(0.073)
Wald test for gross	4.354	0.014	9.637	1.307
vs net trade flows	(0.037)	(0.905)	(0.002)	(0.253)
Time dummies?	No	Yes	No	Yes
Adjusted R squared	0.917	0.937	0.911	0.932

Note: See Table 2 for explanation of variables and other notes. Wald test for gross vs net trade flows tests whether coefficients on imports from the South and exports to the South are equal and of opposite sign (p-value in parentheses).

The switch from a pooled to a fixed effects specification has a varying impact on the explanatory power of the independent variables. Per capita GDP continues to be statistically significant, providing evidence that per capita income growth is associated with a decline of manufacturing employment once countries attain a sufficiently high level of development. By contrast, the predictive power of resource endowments does change significantly in the fixed effects specification. The values of coal and mineral production are no longer statistically significant (results not reported here). This lends credence to the interpretation that these two variables largely captured cross-country differences in natural resource endowments in the pooled

specification. Given that there is relatively little variation over time in these variables, it is not surprising that they are no longer significant in the fixed effects specification. Human capital is also statistically insignificant in the fixed effects specification when both per capita GDP and time dummies are included. The value of oil and gas production remains a statistically significant predictor of the manufacturing share of employment. This variable captures the Dutch disease effects of oil and gas discoveries during the sample period (affecting countries such as Norway and the UK).

The fixed effects specification also allows for a more direct analysis of the relationship between North-South integration and deindustrialization in the OECD. While inclusion of time dummies again lowers the statistical significance and magnitude of the coefficient on imports from the South, this variable is statistically significant at the 5 percent level in all but one case. The coefficient on imports from the South is generally larger in magnitude than the export coefficient, and one can reject the restriction that only imbalances in North-South trade are related to the manufacturing share of employment in specifications without time dummies. Imports from the North are also statistically significant, albeit of relatively low magnitude.

Closer examination of the specifications incorporating gross intra-OECD trade flows as explanatory variables suggests that multicollinearity of intra-OECD imports and exports could be affecting the coefficient estimates. In order to assess the severity of this problem in the context of the fixed effects specification, one can calculate the difference from the country mean for all trade flows and the raw correlations between these mean-differenced variables. While imports from the South and North are positively correlated (correlation coefficient equal to 0.58), there is an even stronger correlation between intra-OECD imports and exports (correlation coefficient of 0.70). This compares to correlation of only 0.22 between imports from the South and exports to the South.

Regressions 3 and 4 reduce the effect of multicollinearity by utilizing net rather than gross flows for intra-OECD trade. This is justified on theoretical grounds if intra-OECD trade consists largely of intra-industry trade in goods of similar factor intensities. In this case, only trade imbalances would impact demand for factors of production at the aggregate level. Regression results using net intra-OECD trade flows are clearly more robust, as imports from the South are negative and statistically significant, even when time dummies are included. The remainder of this paper will therefore focus on specifications

using net intra-OECD trade flows, although specifications using gross flows will also be reported.

The evidence generated using the full OECD sample to estimate the manufacturing share of employment is generally consistent with the view that economic maturity (proxied for by per capita GDP), Dutch disease, and both intra-OECD and North-South trade are statistically significant predictors of the manufacturing share of employment. There are, however, at least two reasons why one might not be satisfied with the robustness of these estimates. First, as noted earlier, per capita GDP is not a good proxy for differential labor productivity growth in the manufacturing and service sectors. Second, inclusion of time dummies and gross intra-OECD trade flows has a significant effect on the statistical significance and magnitude of estimated coefficients on the North-South trade, thus limiting our ability to draw conclusions from the results.

Use of a smaller sample of 15 OECD countries allows construction of a better proxy for differential productivity growth in the manufacturing and service sectors. [10] The regressions reported in Table 4 utilize the log of real value added per employee in manufacturing over value added per employee in nonmanufacturing as this proxy. When the manufacturing share of employment is the dependent variable, the coefficient of differential productivity is statistically significant and has a negative sign, which is consistent with inelastic demand for manufactures. Per capita GDP and human capital are both statistically insignificant when incorporated in this specification, perhaps reflecting the loss of variability due to the exclusion of the poorer OECD countries from the sample. The value of oil production is statistically significant and the magnitude of the estimated coefficient is similar to previous results.

Gross manufactured imports from the South are statistically significant in all regressions, although gross exports no longer are significantly related to employment. The absolute magnitude of the coefficient on gross imports from the South is again higher than that on gross exports, although one cannot reject the hypothesis of equality at conventional confidence levels when time dummies are included. The results in this specification do not vary greatly depending on whether net or gross intra-OECD trade flows are utilized. While the coeffi-

---

[10] New Zealand, Austria, Greece, Iceland, Ireland, Spain, Switzerland, and Turkey were dropped from the sample due to a lack of comparable data.

Table 4 — *Fixed Effects Estimates of the Manufacturing Share of Employment and the Manufacturing Share of Real Value Added for 15 OECD Economies*

	Manufacturing share of employment				Manufacturing value added as a share of GDP (1985 prices)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Differential productivity	-7.834* (1.981)	-6.466* (2.055)	-8.282* (1.913)	-6.689* (2.026)	9.651* (2.196)	10.873* (2.251)	9.793* (2.066)	10.967* (2.190)
Imports from South	-1.945* (0.489)	-1.314* (0.505)	-2.124* (0.493)	-1.442* (0.553)	-2.018* (0.571)	-1.660* (0.690)	-1.961* (0.510)	-1.606* (0.675)
Exports to South	0.128 (0.295)	0.458 (0.455)	0.060 (0.301)	0.333 (0.426)	0.009 (0.312)	0.374 (0.499)	0.031 (0.316)	0.427 (0.468)
Imports from North	-0.202 (0.101)	-0.206* (0.088)			-0.061 (0.126)	-0.063 (0.122)		
Exports to North	0.101 (0.139)	0.104 (0.130)			0.093 (0.136)	0.106 (0.135)		
Net imports from North			-0.175 (0.107)	-0.192* (0.092)			-0.069 (0.119)	-0.069 (0.116)
Human capital	-2.998 (1.872)	0.110 (1.726)	-3.117 (1.749)	-0.039 (1.594)	-3.446 (1.832)	-0.759 (1.616)	-3.408 (1.826)	-0.697 (1.623)
Oil	-0.424* (0.065)	-0.347* (0.082)	-0.397* (0.058)	-0.309* (0.068)	-0.406* (0.061)	-0.327* (0.071)	-0.414* (0.055)	-0.343* (0.056)
Wald test for gross vs net N-S trade flows	8.26 (0.004)	1.59 (0.208)	11.08 (0.001)	2.64 (0.104)	8.45 (0.004)	2.57 (0.109)	8.77 (0.003)	2.28 (0.131)
Time dummies?	No	Yes	No	Yes	No	Yes	No	Yes
Adjusted R squared	0.950	0.956	0.950	0.956	0.942	0.946	0.943	0.947

Note: Differential productivity variable is the log ratio of value added per employee in manufacturing and nonmanufacturing. Sample excludes Austria, Greece, Iceland, Ireland, New Zealand, Spain, Switzerland and Turkey. See Tables 2 and 3 for additional notes.

cients on gross and net intra-OECD imports are also generally significant, they are of much lower magnitude than imports from the South.

Use of the smaller sample also allows for analysis of the share of manufacturing in real value added. Results of these estimates are presented in the right panel of Table 4. While per capita GDP does poorly as predictor of the manufacturing share of value added (regressions not reported), differential productivity is statistically significant and positive. Faster relative productivity growth in manufacturing is thus associated with an increase in manufacturing's share of value added. This contrasts with (but is not inconsistent with) the earlier result that differential productivity growth is negatively related to the share of manufacturing employment.

Gross imports from the South are a statistically significant predictor of the manufacturing share of value added, even after accounting for the effects of differential productivity growth. In contrast, the coefficients on intra-OECD trade flows are statistically insignificant and of much smaller absolute magnitude than North-South trade. The value of oil production is statistically significant in all estimates of the manufacturing share of value added, while human capital is generally insignificant.

The fixed effects estimates of the manufacturing share of both employment and real value added thus are consistent with the view that the increasing integration of the South in the global economy has been associated with deindustrialization in the OECD. Even after controlling for both differential productivity growth and Dutch disease, gross imports of manufactured goods from the South are a statistically significant predictor of the manufacturing share of output and employment. The partial correlation identified by Wood thus holds up even after one accounts for other plausible explanations for deindustrialization.

While these results appear robust, it is important to recognize the limitations of the estimates given problems with both simultaneity and multicollinearity. While multicollinearity should not bias estimates, it is nonetheless a cause for concern. The extent to which the statistical significance of trade with the South at times hinges on the inclusion of gross intra-OECD trade suggests that multicollinearity complicates attempts to differentiate between competing hypotheses. A second reason to worry about multicollinearity lies in the assumption that all countries in the sample represent independent observations. Mankiw (1995) stresses that spatial correlation of residuals would most likely result in an overstatement of statistical significance and thus an under-

statement of the extent of multicollinearity. The likelihood of regional shocks affecting a subset of the OECD (i.e., the European Union) suggests that it is plausible that residuals are correlated across countries. Time dummies have been incorporated to capture the impact of shocks affecting all sample countries, but this will not remedy the problem when shocks have a differential impact across countries.

Interpretation of the results is also complicated by the fact that inclusion of time dummies substantially lowers the magnitude of the coefficients on North-South trade. These time dummies pick up the trend decline in the share of manufacturing employment that is common across countries. There are a number of alternative explanations for the significance of the time dummies. First, the dummies could be capturing common cross-country trends in productivity which the differential productivity growth variable does not pick up. Given that the inclusion of time dummies generally eliminates the statistical significance of human capital, the dummies may also be picking up the general upgrading of skills or increases in educational levels across the OECD. A third interpretation is that the time dummies are capturing those effects of North-South integration that are common across OECD countries.

The importance of the time dummies can easily be seen when one attempts to address whether the relationship between increasing North-South integration and deindustrialization is economically significant. While trade with the South is a statistically significant predictor of the manufacturing share of employment and output, it is clear from the regression results that globalization is not the only viable explanation for deindustrialization in the OECD. A number of authors have stressed the small magnitude of manufactured trade with the South as evidence supporting their view that only technological change could have played a significant role in recent labor market developments. It is therefore important to assess the relative importance of globalization as an explanation for deindustrialization.

Table 5 utilizes coefficient estimates from Table 4 to calculate the implied impact of North-South trade and other explanatory variables on the share of manufacturing employment in some OECD countries. This implied impact can then be compared to the predicted decline in manufacturing employment to estimate the share of deindustrialization accounted for by each of these alternative explanations.

The counterfactual estimates shown in the upper panel of Table 5 are based on a specification incorporating time dummies. According to this estimate, North-South trade could account for an average of

Table 5 — *Accounting for Deindustrialization in the OECD:*
Changes in Manufacturing Share of Employment Implied
by Fixed Effects Estimates (percent of total)

	Change in manu-facturing share of employment 1970 - 1990		Percentage share of fitted deindustrialization accounted for by:					
	actual	fitted	changes in North-South trade	changes in intra-OECD trade	differen-tial pro-ductivity growth	human capital accum.	Dutch disease	time effects
Estimates based on specification including time dummies (cf. (4) in Table 4)								
CAN	−5.9	−6.8	29.8	−0.3	19.4	0.3	4.6	46.1
USA	−8.2	−8.5	32.0	2.1	28.7	0.2	0.4	36.7
JAP	−4.0	−7.8	17.2	−1.8	44.4	0.2	−0.0	40.1
AUS	−9.5	−6.7	31.0	−1.1	17.7	0.3	5.3	46.8
BELX	−11.1	−11.9	28.9	2.3	42.3	0.1	−0.0	26.3
DEN	−5.0	−5.4	29.7	−24.5	31.4	0.1	4.8	58.4
FIN	−4.8	−5.7	19.7	−13.8	38.8	0.2	0.0	55.1
FRA	−5.8	−6.4	27.5	3.1	20.2	0.1	−0.1	49.1
GER	−6.7	−6.0	43.2	−2.3	7.1	0.1	−0.2	52.1
ITA	−3.9	−5.5	21.6	−0.5	21.2	0.1	0.3	57.3
NET	−9.4	−8.2	31.4	−8.3	35.1	0.2	3.6	38.1
NOR	−8.7	−9.8	29.4	−5.5	3.8	0.1	40.2	32.0
SWE	−6.8	−6.0	25.8	−7.4	29.5	0.2	0.0	51.9
UK	−14.0	−9.7	25.5	9.3	27.6	0.1	5.0	32.4
Estimates based on specification excluding time dummies (cf. (3) in Table 4)								
CAN	−5.9	−6.7	44.1	−0.2	24.6	25.5	6.0	
USA	−8.2	−8.9	49.2	1.8	34.0	14.6	0.5	
JAP	−4.0	−7.0	26.5	−1.9	61.3	14.1	−0.1	
AUS	−9.5	−6.5	46.2	−1.0	22.6	25.2	7.0	
BELX	−11.1	−13.2	45.1	1.9	47.3	5.7	0.0	
DEN	−5.0	−4.1	62.3	−29.3	51.1	7.9	8.0	
FIN	−4.8	−4.7	37.4	−15.2	58.2	19.5	0.0	
FRA	−5.8	−5.3	52.8	3.3	30.0	14.0	−0.1	
GER	−6.7	−5.0	82.1	−2.5	10.5	10.3	−0.3	
ITA	−3.9	−3.7	50.7	−0.6	38.3	11.1	0.6	
NET	−9.4	−8.3	46.7	−7.5	43.3	13.0	4.6	
NOR	−8.7	−10.2	40.7	−4.8	4.5	9.9	49.8	
SWE	−6.8	−5.2	47.9	−7.9	42.6	17.4	0.0	
UK	−14.0	−8.9	35.2	9.2	37.2	11.3	7.0	

about 25 to 30 percent of deindustrialization in the OECD. While differential productivity growth or Dutch disease account for up to 40 percent of deindustrialization in the majority of countries, time effects account for the largest share in all but three countries.

When time dummies are dropped from the specification, the possible importance of globalization increases substantially. This can be seen in the counterfactual reported in the lower panel of Table 5. Changes in North-South trade account for an average of approximately 50 percent of the extent of deindustrialization, ranging from a low of 27 percent in Japan to a high of 82 percent in Germany. According to this counterfactual, North-South trade can account for the largest share of deindustrialization in 9 of 14 countries. While the share of human capital accumulation is also much higher in this case, it generally accounts for a much lower share of deindustrialization than either North-South trade or differential productivity growth.

It should be noted that the fit of the regression results across countries is generally good, particularly for the counterfactual reported in the upper panel of Table 5. The major exceptions to this are Japan, the UK, and, to a lesser extent, Australia. Comparing the fitted results with the actual changes in manufacturing employment, the regressions do not appear to capture Japan's strength as a manufacturing production center during this period. By contrast, the UK experienced a much greater decline in manufacturing employment than predicted based on the regression model. In this case, the change in the value of oil production as a share of GDP does not appear to have sufficiently captured the impact of North Sea oil discoveries on the competitiveness of British manufacturing.

These counterfactual estimates are not intended to provide point estimates of how "blame" for deindustrialization should be apportioned. The impossibility of this task is instead highlighted by the degree of variability in the share estimates presented here. These estimates are nonetheless informative, as they indicate that the implied impact of North-South integration is not necessarily as economically insignificant as some researchers have suggested. The preferred specification including time dummies suggests that increasing North-South integration could be associated with up to a third of the decline in the share of manufacturing employment. While globalization is clearly not the only explanation for deindustrialization, its possible role in this phenomenon should not be ignored or dismissed as insignificant.

VI. Conclusion

What can one conclude about the linkage between increasing North-South integration and deindustrialization? Utilizing fixed effects estimates on a panel of OECD data, one finds that imports from

the South are a statistically significant predictor of the manufacturing share of employment and real value added. While simultaneity problems hinder attempts to establish causality, the partial correlation between North-South trade and deindustrialization posited by Wood (1994) is robust to the inclusion of other explanatory variables. Rough counterfactual estimates indicate that the link between rising North-South integration and the declining share of manufacturing employment in the OECD is both economically and statistically significant.

These regression results also suggest that North-South trade and intra-OECD trade have fundamentally different effects on patterns of production and employment in developed economies. Econometric estimates indicate that even balanced North-South trade can be associated with a contraction in manufacturing employment. This lends support to the view that the integration of the South in the global economy has played a significant role in shaping recent structural changes in the North. In contrast, the relatively small magnitude of coefficients on intra-OECD trade flows imply that changes in intra-OECD manufacturing trade balances have only a minor effect on the structure of employment and production at the aggregate level. These results are thus consistent with the predictions of models of globalization, as well as earlier empirical studies discounting the role of intra-OECD trade in deindustrialization.

References

Barro, R., and J. Lee (1994). Data Set for a Panel of 138 Countries. NBER database.

Baumol, W. J., S. B. Blackman, and E. N. Wolff (1989). *Productivity and American Leadership: The Long View*. Cambridge. Mass.: The MIT Press.

Berman, E., J. Bound, and Z. Griliches (1994). Changes in the Demand for Skilled Labor Within U. S. Manufacturing: Evidence from the Annual Survey of Manufactures. *Quarterly Journal of Economics* 109(2): 367–397.

Bhagwati, J., and V. H. Dehejia (1994). Freer Trade and Wages of the Unskilled - Is Marx Striking Again? In J. Bhagwati and M. Kosters (eds.), *Trade and Wages: Leveling Wages Down?* Washington, D. C.: The AEI Press.

Burtless, G. (1995). International Trade and the Rise in Earnings Inequality. *Journal of Economic Literature* 33(2): 800–816.

Clark, C. (1957). *The Conditions of Economic Progress*. London: MacMillan.

Davidson, R., and J. G. MacKinnon (1993). *Estimation and Inference in Econometrics*. New York, N. Y.: Oxford University Press.

Deardorff, A. V., and D. S. Hakura (1994). Trade and Wages What Are the Questions? In J. Bhagwati and M. Kosters (eds.), *Trade and Wages: Leveling Wages Down?* Washington, D. C.: The AEI Press.

Dollar, D., and E. N. Wolff (1993). *Competitiveness, Convergence, and International Specialization*. Cambridge, Mass.: The MIT Press.

Feenstra, R. C., and G. Hanson (1995). Foreign Investment, Outsourcing and Relative Wages. NBER Working Paper 5121. Cambridge, Mass.

Findlay, R. (1995). *Factor Proportions, Trade, and Growth*. Cambridge, Mass.: The MIT Press.

Freeman, R. B. (1995). Are Your Wages Set in Beijing. *Journal of Economic Perspectives* 9(3):15–32.

Hazari, B. R., P. M. Sgro, and D. C. Suh (1981). *Non-traded and Intermediate Goods and the Pure Theory of International Trade*. London: Croom Helm.

International Monetary Fund (1997). *World Economic Outlook: A Survey by the Staff of the International Monetary Fund*. Washington, D. C.: International Monetary Fund.

Komiya, R. (1967). Non-Traded Goods and the Pure Theory of International Trade. *International Economic Review* 8(2):132–152.

Krugman, P. (1991). *Geography and Trade*. Cambridge, Mass.: The MIT Press.

— (1995). Growing World Trade: Causes and Consequences. *Brookings Papers on Economic Activity* (1):327–362.

Lawrence, R. Z. (1983). Is Trade Deindustrializing America? A Medium-Term Perspective. *Brookings Papers on Economic Activity* (1):129–171.

— (1987). Trade Performance as a Constraint on European Growth. In R. Lawrence and C. Schultze (eds.), *Barriers to European Growth: A Transatlantic View*. Washington, D. C.: The Brookings Institution.

— (1991). Deindustrialization: Concepts and Evidence. Mimeo, Harvard University. Prepared for Ford Foundation-Columbia University conference on Deindustrialization, Nov. 15–16, 1991.

Lawrence, R. Z., and M. J. Slaughter (1993). International Trade and American Wages in the 1980s: Giant Sucking Sound or Small Hiccup. *Brookings Papers on Economic Activity* (2):161–226.

Leamer, E. E. (1984). *Sources of International Comparative Advantage: Theory and Evidence*. Cambridge, Mass.: The MIT Press.

— (1994). Trade, Wages and Revolving-Door Ideas. NBER Working Paper 4716, Cambridge, Mass.

— (1996). In Search of Stolper-Samuelson Effects on U. S. Wages. NBER Working Paper 5427. Cambridge, Mass.

MacKinnon, J. G., and H. White (1985). Some Heteroskedasticity-Consistent Covariance Matrix Estimators with Improved Finite Sample Properties. *Journal of Econometrics* 29:305–325.

Mankiw, N. G. (1995). The Growth of Nations. *Brookings Papers on Economic Activity* (1):275–310.

OECD (1994). *STAN*/Industrial Database.

— (1995). *National Accounts, Main Aggregates. Volume 1, 1960–1993*. Paris: OECD.

(various issues). *Foreign Trade Statistics*, Series A. Paris: OECD.

— (various issues). *Labour Force Statistics*. Paris: OECD.

Richardson, J. D. (1995). Income Inequality and Trade: How to Think. What to Conclude. *Journal of Economic Perspectives* 9(3):33–55.

Rowthorn, R., and R. Ramaswamy (1997). Deindustrialization: Causes and Implications. IMF Working Paper 97/42. Washington, D. C.

Rowthorn, R., and J. Wells (1987). *De-Industrialization and Foreign Trade*. Cambridge, England: Cambridge University Press.

Sachs, J. D., and H. J. Shatz (1994). Trade and Jobs in U. S. Manufacturing. *Brookings Papers on Economic Activity* (1):1–84.

— (1995). International Trade and Wage Inequality in the United States: Some New Results. Paper prepared for Brookings Institution Project on "Imports, Exports and the American Worker." Mimeo, Harvard University, December.

Saeger, S. S. (1996). Globalization and Economic Structure in the OECD. Unpublished Ph. D. dissertation, Harvard University.

Slaughter, M. J. (1995). Multinational Corporations, Outsourcing, and American Wage Divergence. Mimeo, Dartmouth College, August.

Summers, R., and A. Heston (1995). The Penn World Tables (Mark 5.6). NBER data set.

Stolper, W. F., and P. A. Samuelson (1941). Protection and Real Wages. *The Review of Economic Studies* 9:58–73.

United Nations (various issues). *Industrial Statistics Yearbook*. New York, N. Y.: United Nations.

White, H. (1980). A Heteroskedasticity-Consistent Covariance Matrix Estimator and a Direct Test for Heteroskedasticity. *Econometrica* 48(4):817–838.

Wood, A. (1994). *North-South Trade, Employment and Inequality: Changing Fortunes in a Skill-Driven World*. Oxford: Clarendon Press.

— (1995). How Trade Hurt Unskilled Workers. *Journal of Economic Perspectives* 9(3):57–80.

Woodall, P. (1994). War of the Worlds: A Survey of the Global Economy. *The Economist*, October 1, 1–38.