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FOREIGN PRODUCTION BY U.S. FIRMS
AND PATENT FIRM EMPLOYMENT

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ABSTRACT

Despite the persistent fears that production abroad by U.S. multinationals reduces employment at home, there has, in fact, been almost no aggregate shift of production or employment to foreign countries. Some continuing shifts to foreign locations by U.S. manufacturing firms have been largely offset by shifts into the United States by foreign manufacturing multinationals.

An analysis of individual firm data indicates that higher levels of production in developing countries by a firm are associated with lower employment at home for a given level of production. The reason is that U.S. multinationals tend to allocate their more labor-intensive production to developing country affiliates and retain more capital-intensive and skill-intensive operations in the United States.

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Introduction

There has long been a suspicion in the United States that investment abroad by U.S. firms, especially manufacturing firms, involves replacing U.S. workers by foreign workers, with a resulting loss of employment and decline in wages for the firms' workers in the United States. That suspicion was probably at its peak during the late 1960s and the 1970s, and has declined somewhat since then, but it still exists. Worries about the impact of outward FDI led to Congressional proposals to restrict it and to administration measures to limit its financing in the United States.

The adverse effect on home labor was thought to occur through two main channels. One was the replacement of home production for the U.S. market by imports from the affiliates and the other was the replacement of home production for export by affiliate production in the host countries. Since imports into the United States from manufacturing affiliates abroad were relatively small, most attention was focussed on export replacement. However, a series of studies of export replacement failed to find evidence that it had taken place. Most studies, including parallel ones for Swedish firms, seemed to find that the net effect of affiliate production on parent exports was positive, if there was any effect at all. For the most part, these studies have found

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little or no effect or found that production abroad, on net balance, promoted parent exports and, presumably, parent employment in the United States.

Much of the concern over outward FDI arose from the impression that production and employment abroad had been rising rapidly. That was the case from the 1950s through the mid-1970s, but in the ten years after 1977, employment in foreign affiliates of U.S. firms outside banking fell by almost a million. It has recovered since then, but did not reach the 1977 level again until 1995. Most of this decline took place in manufacturing affiliates, and the number of these employees was still below the 1977 level in 1995.

It is clear from the data, as is demonstrated more fully below, that there has been no aggregate shift of production or employment by U.S. multinationals out of the United States to their foreign affiliates, at least in the last 20 or 25 years. If there is any impact of foreign operations by U.S. firms on U.S. labor markets, it must be through some different mechanism. The issue we explore here is a different one. We take the level of production by U.S. multinationals in the United States as given, determined by each firm's judgment as to the optimal geographical allocation of its worldwide production. We then ask whether these geographical allocations affect the firms' home employment or wage levels by altering the labor intensity or the skill intensity the firms' home production. They might do so if, for example, firms allocated their most labor-intensive or least skill-intensive activities or products to their foreign affiliates or to their affiliates in low-wage countries.

Foreign direct investment, or FDI, is one vehicle by which production is allocated among countries, or reallocated over time. The basic long-term forces behind these reallocations are the rising per capita incomes of home countries, which force their comparative advantages up the capital-intensity and skill-intensity scales, and the economic growth of foreign markets. For some

countries, the depletion of a natural resource alters comparative advantages. In other cases, major changes in currency values induce investment abroad. Often, home country firms have acquired, over a long time, firm-specific advantages in the industries that are seen to be inevitably declining at home. They may have built up technological skills, marketing skills, networks of trade, and brand names that provide market access at home and abroad. In that case, these firms can retain some of the rents on their firm-specific skills by FDI, establishing or acquiring production facilities in the countries to which comparative advantages in production, or in parts of a production chain, is migrating. Some familiar examples are U.S. petroleum industry firms that invested in crude production abroad as the cost of U.S. petroleum resources increased, and Swedish firms in the forest products and forest product machinery industries.

These shifts in the location of production are presumably reflected in the composition of a firm's home production. We would expect that home production within a firm would shift away from industries, or segments of industries, in which the home country was losing comparative advantage. Thus, we would expect that U.S. firms with foreign production facilities would allocate the more labor-intensive segments of their production to locations where labor, or unskilled labor, was relatively cheap. The result at home would be a shift toward more capital-intensive or skill-intensive types of production.

The data for the individual firm regressions used in this study are from the confidential individual firm responses to the benchmark survey of U.S. direct investment abroad in 1989 conducted by the Bureau of Economic Analysis (BEA) of the U.S. Department of Commerce. The calculations had to be performed at the BEA to preserve the confidentiality of the responses.

Have U.S. Firms Moved Their Production and Employment to Foreign Countries?

There are several ways to measure the importance of foreign production and employment by U.S. firms relative to economic activity at home. The two measures we use here are production, as represented by gross product, and employment. Activity abroad can be compared with parent production and employment at home or with production and employment in the whole domestic U.S. economy. The comparison with parent activity describes the choices made by the multinational firms themselves and the comparison with the U.S. as a whole describes the potential impact on the U.S. economy. The gross product data for parents begin only in 1977, after the major part of the expansion of overseas production, and are available only for benchmark survey years until 1994. The gross product data for the MNCs' foreign operations apply only to majority-owned affiliates (MOFAs).

From 1977 to 1982 the share of foreign operations in the output of U.S. MNCs declined, by more than 10 per cent. After that there was some recovery, to the point that the 1997 share was almost identical to the 1977 level:

Gross Product of U.S. MOFAs as Per Cent of Gross Product

Of Parents and MOFAs, 1977- 1997

1977	24.7
1982	21.9
1989	23.4
1995	25.4
1996	25.2
1997	24.8

Source: Appendix Table 1.

Over these 20 years, taken as a whole, U.S. MNCs seem to have increased home and foreign production more or less in step with each other, without any substantial shift in or out of the United States.

The comparison with production in the United States as a whole, as represented by Gross Domestic Product (GDP) can be carried back to the earlier period of rapid growth in production abroad by U.S. firms:

Gross Product of U.S. MOFAs as Per Cent of U.S. GDP, 1966-1997

1966	4.89
1970	6.88
1977	7.95
1982	6.90
1989	5.88
1995	6.40
1996	6.50
1997	6.40

Source: Appendix Table 1.

We can describe this comparison as measuring the shift to foreign production by all U.S. firms, including non-multinationals. After the large increase in the relative importance of overseas production between 1966 and 1977, over 60 per cent, as compared with total U.S. domestic output, the foreign share fell back for more than a decade, although not to its 1966 level. After 1989, MOFA production rose again, relative to total U.S. production, by more than 10 per cent, but in 1997 it still remained almost 20 per cent smaller relative to U.S. domestic production than in 1977.

Employment has the advantage over production as a measure of foreign and domestic activity that it is not distorted by exchange rate changes, and lends itself to examination of absolute, as well as relative, movements. The number of employees of foreign affiliates of U.S. MNCs grew by almost 3&1/2 million between 1957 and 1977, more than doubling (Appendix Table 2). After that, there was a reduction by almost a million foreign workers over the next decade. That pullback was followed by a recovery that did not pass the 1977 level until 1995. Over the whole 20 years since 1977, only about 800 thousand overseas employees were added by U.S. firms, a negligible number compared with the up to 40 million added by the U.S. economy as a whole. However, parent firms increased their home employment only slightly; their employment in 1997 was only a million more than in 1977, and their share of total U.S. employment dropped from 21 to 15 per cent between 1977 and 1997. The MNCs were clearly occupying a different universe from that of the United States as a whole.

The affiliate share of MNC employment, which we can observe only since the peak in 1977, declined until the late 1980s, and then recovered, passing the 1977 level in 1995:

Employment in U.S. Affiliates Abroad
as Percent of Employment in Nonbank MNCs, 1977-1997

	MOFAs	All Affiliates
1977	22.1	27.6
1982	21.2	26.2
1985	21.0	26.2
1989	21.4	26.1
1995	24.2	28.3
1996	24.4	28.6
1997	24.7	28.8

Source: Appendix Table 2

Thus, within the multinationals, there was a small shift in the location of employment from the United States to foreign locations.

Relative to the whole domestic U.S. economy, U.S. firms' affiliate employment has not come near to returning to its 1977 levels:

Employment in U.S. Affiliates Abroad
as Per cent of Total U.S Employment, 1957-1997

	All Affiliates	MOFAs
1957	5.2	n.a.
1966	n.a.	5.3
1977	8.0	5.9
1982	6.8	5.1
1985	6.1	4.5
1989	5.7	4.4
1995	5.9	4.8
1996	5.9	4.8
1997	6.2	5.0

Source: Appendix Table 2.

After growing by over 50 per cent relative to total domestic U.S. employment between 1957 and 1977, foreign employment by U.S. firms then declined by over 30 per cent to a level not far above that of 1957. The ratio began to rise again during the 1990s, but remained far below that of the late 1970s.

All in all, it seems safe to conclude that there has been no shift of employment in the aggregate from the domestic U.S. economy to the foreign operations of U.S. firms.

Have U.S. Firms Moved Their Manufacturing Production and Employment to Foreign Countries?

Since manufacturing and petroleum are much more important in the internationalized output of U.S. firms than in domestic output, the internationalized shares of output are much larger in these two sectors than in others. The share of the petroleum output of U. S. firms that is produced abroad has increased greatly as U.S. domestic reserves of petroleum have declined or become more expensive to exploit, relative to those abroad. In manufacturing too, the foreign share of U.S. multinationals' production has risen even since 1977, the year in which the share of foreign production in general reached a peak and began to decline:

Gross Product of MOFAs of U.S. Manufacturing Parents as Per Cent of
Manufacturing Parents and MOFAs Gross Product

1977	21.2
1982	22.4
1989	26.1
1995	29.4
1996	28.6
1997	29.2

Source: Appendix Table 3

In 1977, 21 per cent of the total output of U.S. manufacturing MNCs was produced outside the United States, and that share had risen to 29 per cent by 1997. Thus, U. S. manufacturing MNCs have allocated more of their worldwide output to their foreign operations.

Since these MNCs are a large, though declining, part of U.S. manufacturing output, their foreign production was large also relative to total U.S. manufacturing output.

Gross Product of MOFAs of U.S. Manufacturing MNCs as Per Cent of

U.S. Manufacturing Gross Product

1977	17.5
1982	18.7
1989	20.4
1995	23.4
1996	23.4
1997	22.9

Source: Appendix Table 3.

Since 1977, U.S. manufacturing firms' production outside the United States has increased from 17½ to 23 per cent of all manufacturing production in the U. S., including that of non-multinational and foreign owned firms.

Since 1977, the share of the MNC parent firms in U.S. manufacturing output has fallen from 65 to 55 per cent. This does not mean that non-multinational firms are taking over U.S. manufacturing. Instead, the share of U.S. manufacturing affiliates of foreign multinational firms has increased. Foreign-owned manufacturing affiliates in the United States, which produced only 3½ per cent of U.S. manufacturing output in 1977, accounted for 12½ per cent in 1997 (Zeile,

1999, and Appendix Table 3). Thus, both U.S. and foreign manufacturing firms were increasing their degree of internationalization; each group was producing more in the other's home market.

Affiliate Employment of U.S. Manufacturing MNCs as Per Cent
Of Total Manufacturing MNC Employment

1977	30.9
1982	31.4
1989	30.8
1994	33.9
1995	34.3
1996	34.8
1997	36.7

Source: Appendix Table 4

The data on employment show that from 1977 through the 1980s, there was essentially no change in the share of foreign employment in the total employment of U.S. manufacturing MNCs. Then the foreign share began to creep up during the 1990s, reaching 37 per cent in 1997. As can be seen in Appendix Table 4, the number of employees outside the United States in 1997 remained below the 1977 level, but while foreign employment fell by about 250 thousand, the parents' domestic employment fell by over 3 million.

The comparison with total manufacturing employment in the United States can be made for a longer period, and puts the 1980s and 1990s in a different perspective:

Employment in Foreign Affiliates of U.S. Manufacturing MNCs as
Per Cent of Total Manufacturing Employment in the United States

1957-1997

1957	10.9
1966	19.1
1977	26.0
1982	25.7
1989	23.3
1994	25.4
1995	25.6
1996	26.0
1997	26.9

Source: Appendix Table 4

The move to overseas manufacturing employment took place mainly between 1957 and 1977, when about 300 thousand foreign employees were added, almost tripling the number. Domestic manufacturing employment was also rising during those two decades, by 2.6 million, so that the growth of foreign employment was not a matter of reducing employment in the United States.

The absolute number of affiliate employees fell sharply in the decade after 1977, by something like 850 thousand, and the ratio to domestic U.S. manufacturing employment fell also. Then, the number of foreign employees increased again, but in 1997 it remained below the 1977 level. Relative to domestic employment, foreign employment regained its earlier level and, by 1997, was slightly above it.

While the extent of internationalization of U.S. manufacturing MNCs was about the same in 1996 as in 1977, the parent share of U.S. manufacturing employment has declined steadily, from 60 per cent in 1977 to 46 per cent in 1997. As was the case for production, the parents' place as employers was mostly taken by foreign manufacturing firms. Employment in U.S. affiliates of foreign manufacturing firms jumped from 3&1/2 per cent in 1977 to more than 12 per

cent in 1997 (Zeile, 1999, Table 8). Thus, U.S. and foreign manufacturing MNCs were both internationalizing; each group increased its employment in the other group's region. In the U.S. at least, the main result was a shift of manufacturing employment from U.S. MNCs operating at home to foreign MNCs operating in the United States.

The Geographical Allocation of Production and Employment

Even if there had been no major growth in the overall importance of foreign production or employment, there could have been geographical shifts that might have affected domestic labor markets, such as an increase in the proportion of employment in developing, or low-wage, countries. If we divide the affiliate locations roughly into developed and developing, treating Canada, Europe, Japan, Australia, and New Zealand as developed, we find the following trend:

Gross Product of MOFAs in Developed Countries as Per Cent of Total MOFA Gross Product, 1977- 1997

1977	65.9
1982	72.4
1989	81.8
1995	79.9
1996	78.5
1997	77.5

Source: Mataloni and Goldberg (1994), and Mataloni (1998) and (1999).

Until the end of the 1980s, production by U.S. MOFAs was increasingly concentrated in developed countries. After that, a small rise occurred in the developing country share, but it still remains less than a quarter of the worldwide total, a considerably smaller proportion than in 1977 and 1982.

U.S. Affiliate Employment in Developed Countries
as Percent of Total Affiliate Employment

	All Affiliates	MOFAs
1966		71.5
1977	69.2	71.1
1982	67.0	67.9
1989	67.4	69.6
1995	63.8	66.4
1996	64.2	66.7
1997	62.8	65.7

Source: U.S. Department of Commerce (1972?), (1981), Tables II.G3 and III. G3; (1985), Tables II.F3 and III.F3; (1992), Tables II.G3 and III.G3; and Mataloni (1998) and (1999).

The developing countries' shares of U.S. firms' foreign employment are somewhat larger than their shares of production, because output per worker is lower in developing countries than in developed ones. The fluctuations in shares are much smaller, however, perhaps because the influence of exchange rate changes is eliminated. The trend seems to be toward a larger share of

employment in developing countries, especially in the 1990s, but most employment continues to be in developed countries. The developing country share of MOFA employment rose from a little under 30 per cent in 1966 to 34 per cent thirty years later, probably not enough for major effects on U.S. labor markets.

On the whole, it does not appear that aggregate movements in the location of production by U.S. MNCs have been of a type or size to have any major effects on U.S. labor markets as a whole. If that is the case, the place to look for possible impacts may be within the individual firm, rather than in aggregates of employment.

Parent Employment in Individual Firms

Since the aggregate movements in production and employment, especially since 1977, do not appear likely to have had major domestic labor market effects in the United States, we turn next to studying possible impacts of overseas production on an individual firm's home employment. And since, as pointed out in the introduction, there are no indications from past studies that foreign production by a U.S. firm reduces the firm's exports, and therefore its total production, we look for possible impacts elsewhere. We ask whether, even given the total level of production by a parent firm, its level of employment is affected by its choices about the allocation of different types of production to its home and foreign operations. Two firms with the same total parent firm (home) output might have different levels of home employment if they had made different allocations of their worldwide production. For example, one firm may have placed its labor-intensive operations abroad and retained only its capital-intensive operations at home while the other firm either had no foreign operations or did have them but did not split production between home and abroad by this criterion. The first firm would then have lower home

employment for the same home production level. Another possibility might be that one firm places all the supervisory activity and research and marketing support for its worldwide production at home while the other firm spreads them around to its production locations. In that case, the first firm would have a higher level of home employment, given its home production.

A study for an earlier period (Lipsev, Dravis, and Roldan, 1982) found strong evidence that capital intensities in US affiliates differed among locations in response to differences in factor prices. Capital intensities were much higher in developed country affiliates than in those in developing countries, where wages were far lower. That was true for affiliate aggregates within industries, and remains true, according to the latest BEA survey (US Department of Commerce, 1998b).

It was also true among affiliates within individual US multinationals, and it was pointed out that a positive relationship between the price of labor and the capital intensity of affiliate production could represent several different phenomena. One is adaptation to factor price differences by choosing different factor proportions along a single isoquant. Another is adaptation by choosing different technologies to produce the same product in different countries. A third is various types of allocation or, as described there, selection of products or sub-industries from among those in the firm's repertoire.

The first two explanations of the relationship would not imply any impact on an MNC's home production, but the third one would, if the allocation included the firm's home country operations. The earlier study could not distinguish among these alternative explanations because home country operations were not covered, but they are included in this paper.

We examine this question here by running a set of regression equations in which parent employment (PEMP) is related to parent production (PNS), proxied by parent net sales (sales

minus imports from affiliates abroad) and affiliate production (ANS), proxied by affiliate net sales (affiliate sales minus imports from the parent). We also have experimented with variants separating different types of affiliates. The equations presented here for all affiliates are similar to those for manufacturing alone in Blomström, Fors, and Lipsey (1997), and in some respects to those in Kravis and Lipsey (1988).

The first equation (with constant term suppressed, t-values in parentheses) suggests that there is some allocation of labor-intensive activities to foreign operations, since the coefficient for ANS is negative.

$$(1) \text{ PEMP} = 5.55 \text{ PNS}(53.7) - 1.10 \text{ ANS}(8.9) \quad \text{RSQ}(\text{corr.}) = .666 \quad \text{No. Obs.} = 2,054$$

However, the same equation in log form gives the opposite result:

$$(2) \text{ Ln PEMP} = .867 \text{ Ln PNS}(75.4) + .020 \text{ Ln ANS}(1.9) \quad \text{RSQ}(\text{corr.}) = .815 \quad \text{No. Obs.} = 2,054$$

The log form gives a heavier weight to the differences at the lower end of the size scale, and the difference in the signs of the coefficients suggests that the negative influence comes from the largest affiliates. That suspicion is confirmed to some degree by arithmetic equations omitting the 150 largest affiliates, which produce positive, but only marginally significant, coefficients for ANS.

If we divide parent firms into manufacturing and non-manufacturing parents, we find the overall negative effect in both groups:

$$(3) \text{ MPEMP} = 5.95 \text{ PNS}(55.8) - 0.775 \text{ ANS}(5.56) \quad \text{RSQ}(\text{corr.}) = .853 \quad \text{No. Obs.} = 1296$$

$$(4) \text{ NMPEMP} = 5.03 \text{ PNS}(26.3) - 1.446 \text{ ANS}(6.9) \quad \text{RSQ}(\text{corr.}) = .495 \quad \text{No. Obs.} = 759$$

Despite the emphasis on reallocation in manufacturing, the effect seems to be stronger in the non-manufacturing sector. One problem is the heterogeneity of that sector. A major part of

production there is in the Petroleum industry, which includes all activities of firms in that group, whether they are in extraction, refining, transportation, or retailing.

If we separate affiliate net sales into those by manufacturing affiliates (ANSM) and those by affiliates in non-manufacturing industries (ANSNM), the negative effect on home employment appears, somewhat surprisingly, to be concentrated in the non-manufacturing affiliates.

$$(5) \text{ PEMP} = 5.52\text{PNS}(53.6) - 0.37\text{ANSM}(1.7) - 2.25 \text{ ANSNM}(7.2) \quad \text{RSQ}(\text{corr.}) = .668$$

No. Obs. = 2,054

However, if we examine manufacturing parents separately, it is clear that the negative coefficient for non-manufacturing affiliates comes entirely from the non-manufacturing sector:

$$(6) \text{ MPEMP} = 6.02\text{PNS}(56.9) - 1.63\text{ANSM}(8.2) + 1.66\text{ANSNM}(3.9) \quad \text{RSQ}(\text{corr.}) = .866$$

No. Obs. = 1,295

Among manufacturing MNCs, the negative association is only with the sales of manufacturing affiliates; higher sales by non-manufacturing affiliates are associated with higher home employment. The allocation of labor-intensive activities to foreign affiliates by manufacturing firms mainly involves manufacturing operations themselves.

If firms are reallocating production to take advantage of factor price differences, and in particular, labor price differences, it would be reasonable to expect that production in developing countries would reflect this motivation more than production in developed countries. Average wages in developed country affiliates of manufacturing parents in 1989, the year of this cross-section, were only 10 per cent below parent firm averages. Average wages in developing country affiliates, however, were about 75 per cent below the parent level. It would therefore be to such countries that production would be allocated for labor cost saving. We therefore test whether the negative influence on parent employment, given parent production, comes mainly from production

by affiliates in developing countries (ANSLDC) or from production by affiliates in developed countries (ANSDC).

$$(7) \text{ PEMP} = 5.46\text{PNS}(53.8) + .472\text{ANSDC}(2.3) - 10.1\text{ANSLDC}(10.5)$$

$$\text{RSQ (corr.)} = .679 \quad \text{No. Obs.} = 2,054$$

That expectation is strongly confirmed by equation 7. Production in developed countries adds to parent employment per unit of home output while production in developing countries reduces it.

It should be noted that the log version of the equation does not suggest this type of allocation of production.

$$(8) \text{ LnPEMP} = .849\text{LnPNS}(77.1) + .036\text{LnANSDC}(6.5) + .004\text{LnANSLDC}(0.9)$$

$$\text{RSQ(corr.)} = .818 \quad \text{No. Obs.} = 2,054$$

The log equation, giving heavier weight to the smaller affiliates, suggests that affiliate production in developed countries adds to parent employment, given parent production, but that production in developing countries has no effect on parent employment.

If we examine the impact separately for manufacturing and non-manufacturing parents, the strong influence of the production in developing countries is evident:

$$(9) \text{ MPEMP} = 5.96\text{PNS}(56.1) - 0.286\text{DCANS}(1.31) - 4.806\text{LDCANS}(3.47)$$

$$\text{RSQ(corr.)} = .864 \quad \text{No. Obs.} = 1296$$

$$(10) \text{ NMPEMP} = 5.02\text{PNS}(26.7) + .185\text{DCANS}(0.5) - 9.47\text{LDCANS}(5.9)$$

$$\text{RSQ(corr.)} = .511 \quad \text{No. Obs.} = 759$$

Given the supposed non-tradability of many of the services included in the non-manufacturing sector, the large negative coefficient for production in developing countries is surprising, because the MNCs could not allocate production to developing countries for sale in developed countries.

However, if the petroleum industry is important in the results, the negative coefficient would be

more understandable, although the motivation would in that case involve mainly resource costs other than labor. Only a disaggregation of the non-manufacturing sector could answer this question.

The ability of MNCs to allocate production in response to factor price differences might be affected by host country characteristics, including trade policies. To test this possibility, we divided developing countries into two groups, one we thought of as outward-oriented, and the other inward-oriented. The former group includes Asian countries, except for India, and Mexico, and the latter group includes other developing countries. The coefficients for sales by the two groups were sharply different, despite the crudeness of the classification:

$$(11) \text{ MPEMP} = 6.15\text{PNS}(54.7) + 0.11\text{ANSDC}(0.5) + 0.86\text{ANSLDCO}(0.3) - 23.50\text{ANSLDCI}(10.2)$$

$$\text{RSQ}(\text{corr.}) = .876 \quad \text{No. Obs.} = 1,296$$

All of the effects on parent employment appear to be associated with production in countries with relatively inward-looking trade policy. Neither production in developed countries nor production in outward-oriented developing countries affected home employment. These results raise the possibility that some allocation in response to factor costs may be a consequence of production location biased by host country rules.

Within manufacturing, it is possible to examine some of these relationships in several major groups of industries. A listing of only the ANS coefficients from equations explaining parent employment, given parent production, shows that negative coefficients, which we interpret as indicating allocation by degree of capital intensity, are not ubiquitous.

	ANS	t	RSQ(corr.)
Foods	-0.28	0.8	0.44
Chemicals	-0.67	1.6	0.87
Metals	-0.40	0.7	0.87
Non-Elect. Mach.	0.83	5.7	0.97
Elect. Mach. & Equip.	4.03	6.1	0.97
Transp. Equip.	-7.53	26.5	0.99

In two major industries of U.S. manufacturing direct investment abroad, the two machinery industries, the relationship of affiliate production to home employment is positive; more affiliate production means more home employment, given the level of home production. Only in Transport Equipment, mainly motor vehicles, is there strong evidence for the allocation of labor-intensive production to affiliates.

If we characterize the affiliates by the distinctions made in Equation 11, there is considerably more evidence of effects on home employment in the various ANS coefficients:

	DC	LDC-Outward	LDC-Inward	RSQ(corr.)
Foods	-7.87(2.8)	98.9(4.7)	-96.4(3.2)	.601
Chemicals	-1.13(1.6)	-16.0(3.2)	9.4(2.3)	.873
Metals	-7.29(4.9)	112.3(8.4)	-11.0(2.8)	.890
Non-el. Mach.	0.68(4.0)	3.7(1.1)	-12.8(2.1)	.969
El. Mach. & Eq.	6.70(5.4)	4.1(1.5)	-15.1(3.5)	.973
Transp. Eq.	-8.07(13.1)	-28.0(3.9)	9.6(3.2)	.993

For only one industry group, Foods, was the equation substantially improved by this breakdown of affiliate locations. In three of the industry groups, Foods, Metals, and Transport Equipment, the coefficients for developed country affiliate net sales are negative and significant, suggesting some allocation of labor intensive activities to affiliates, but in the two machinery industries, the coefficients are positive. Food industry affiliates are particularly oriented to their host country markets, as are, to a smaller extent, affiliates in Chemicals and Metals, but those in the Transport Equipment group are export-oriented, as are those in the two machinery groups. Thus, the apparent allocation effect is not associated with export orientation, as we expected, but more with orientation to local sales among these developed country affiliates, Transport Equipment being a conspicuous exception.

Among developing country affiliates, the evidence for allocation of labor intensive production is mainly in the countries classified here as inward-oriented, the exceptions being Chemicals and Transport Equipment, where the affiliates in outward-oriented developing countries showed the negative coefficients we associate with allocation by the MNCs. On the whole, appears that it is the outward oriented industries and locations that require complementary employment at home and the inward oriented ones that involve the allocation of labor-intensive activities to affiliates.

In general, the coefficients for sales by developed country affiliates are smaller than those for affiliates in developing countries. One reason may be that the wage differences between the United States and many other developed countries were not large in 1989, and some developed countries had higher nominal wages. The motivation for allocating labor-intensive production to developed countries was therefore slight.

A possible ground for skepticism about some of these coefficients is the fact that when squared terms for affiliate sales are added to the equations, the coefficients for ANS change considerably. For example, in foods, both ANS terms turn positive while the squared terms are negative and significant. The Chemicals equation is not affected much but the large positive coefficient in Metals is much reduced and becomes insignificant, while the squared term is positive and significant. In the two machinery industries, the terms for inward-oriented countries become positive and significant. In fact, no significant negative term for ANS remains. It is difficult to judge without access to the data, but the effects of including the squared terms suggests that the results are heavily influenced by the largest affiliates. Taken literally, the coefficients could imply that small affiliates tend to lead to higher home employment for supervision or other headquarters functions while large affiliates are used as locations for labor-intensive activities.

Affiliate Production and Parent Wage Levels

If foreign operations affect the labor intensity of a firm's home operations, they might also affect the skill intensity of the parent firm. Again, there are at least two possible avenues for such effects. One is that low-skill operations may be allocated to foreign affiliates, particularly those in developing countries, resulting in a higher skill mix, and presumably a higher average wage, at home. The other avenue is that higher levels of foreign activity may require more staff at home for supervision and financial oversight. In this case, both effects go in the same direction; more foreign production should lead to higher wages at home.

Average parent wages increase with size of parent, as represented by parent net sales(PNS). However, the effect does not appear to be linear, but declines as parent firms are larger, and we therefore include in the equations a term for PNS squared:

$$(12) PW = .055PNS(2.43) - .011PNSSQ(3.34) + .082ANS(2.78) \quad RSQ(\text{corr.}) = .025$$

Not much of wage variation among parents is explained by this equation, but larger foreign production is associated with higher average earnings, presumably from a higher average skill level, at home.

To the extent that allocation of low-skill activities to low wage countries was an important element of this effect, production in developing countries should have a greater impact than production in developed countries:

$$(12) PW = .05PNS(2.17) - 0.11PNSSQ(3.33) + .054ANSDC(1.53) + .0039ANSLDC(1.81) \\ RSQ(\text{corr.}) = .026.$$

If anything, production in developed countries seems to have a greater impact on parent wage levels than production in developing countries, but neither coefficient is significant and too much weight should not be placed on them. Similar equations with dummy variables for 3 digit industries do not alter the results.

Wage equations for the individual industry groups produced few coefficients for affiliate sales that were even marginally significant. In Chemicals and in the miscellaneous collection called "Other manufacturing," coefficients for sales by developing country affiliates were a positive influence on parent average wages, but the coefficients for the squared terms were negative. In metals, the coefficient for production in affiliates in inward-oriented regions was positive and significant.

The weak evidence we find on wages points to positive relations between affiliate production and parent wage levels. However, there is hardly any evidence to support the idea that allocation of low-skill operations to affiliates, rather than requirements for headquarters services, is the crucial factor.

Conclusions

There is no indication in aggregate data that movements of production from the United States to foreign affiliates of U.S. firms have had any negative effect on employment by parent firms or in the United States as a whole, at least in the last twenty years. Even if such movements in production by U.S. MNCs could have that effect, they cannot explain recent labor force developments because there has been almost no shift of production or employment by U.S. firms. Some continued shifts to foreign locations have taken place in U.S. manufacturing firms, but these have been offset by matching shifts into the United States on the part of foreign manufacturing firms.

A regression analysis of individual firm data does point to some effects of foreign production on employment within firms. Higher levels of affiliate production in developing countries are associated with lower parent employment for any given level of parent production at home. The allocation by MNCs of the more labor-intensive segments of their production to their developing country affiliates and the more capital-intensive segments to their home operations reduces the labor intensity of their home production and thus their demand for labor for any given level of home production. There is only weak evidence for a wage or skill effect. If there is any effects it is that foreign operations are associated with higher wages at home.

We do provide at least a partial answer to the question raised in an earlier paper by Lipsey, Kravis, and Roldan (1982). That is whether the low capital intensities of affiliates in developing countries involve simply responses to low labor costs by changing factor proportions for identical products or processes. The answer here is that at least some of the reason for low capital intensities is the MNCs' choice of which products to produce in low wage countries.

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Appendix Table 1

Gross Product of Nonbank U.S. Multinational Firms and U.S. GDP				
	Parents and MOFAs	Parents	MOFAs	US GDP
	\$ Million			\$ Billion
1966	n.a.	n.a.	36,752	787.8
1970	n.a.	n.a.	54,720	1,035.6
1977	651,665	490,529	161,136	2,026.9
1982	1,019,734	796,017	223,717	3,242.1
1983	n.a.	n.a.	216,683	3,514.5
1984	n.a.	n.a.	220,331	3,902.4
1985	n.a.	n.a.	220,074	4,180.7
1986	n.a.	n.a.	231,644	4,422.2
1987	n.a.	n.a.	269,734	4,692.3
1988	n.a.	n.a.	297,556	5,049.6
1989	1,364,878	1,044,884	319,994	5,438.7
1990	n.a.	n.a.	356,033	5,743.8
1991	n.a.	n.a.	355,963	5,916.7
1992	n.a.	n.a.	361,524	6,244.4
1993	n.a.	n.a.	359,179	6,558.1
1994	1,717,488	1,313,792	403,696	6,947.0
1995	1,831,046	1,365,470	465,576	7,269.6
1996	1,978,948	1,480,638	498,310	7,661.6
1997	2,089,796	1,570,490	519,306	8,110.9

Sources: Howenstine (1977), Table 1, Lipsey, Blomström, and Ramstetter (1998), Table 1, Mataloni and Goldberg (1994), Mataloni (1998), Seskin (1998), Table 1, and Mataloni (1999), Table 1, and U.S. Department of Commerce (1999), Table 1.1.

Appendix Table 2

Employment of Nonbank U.S. Multinational Firms and Total U.S. Employment (Thousands)

	MNCs		Parents	Affiliates		Total Employment U.S.
	Parents and All Affiliates	Parents and MOFAs		All Affiliates	MOFAs	
1957				3,178		61,308
1966					3,874	73,516
1977	26,081	24,254	18,885	7,197	5,369	90,421
1982	25,345	23,727	18,705	6,640	5,022	97,763
1983	24,783	23,253	18,400	6,383	4,854	98,529
1984	24,548	22,973	18,131	6,418	4,842	103,123
1985	24,532	22,923	18,113	6,419	4,810	105,804
1986	24,082	22,543	17,832	6,250	4,711	107,737
1987	24,255	22,650	17,986	6,270	4,664	110,751
1988	24,141	22,498	17,738	6,404	4,761	113,906
1989	25,388	23,879	18,765	6,622	5,114	116,642
1990	25,264	23,786	18,430	6,834	5,356	117,557
1991	24,837	23,345	17,959	6,878	5,387	116,630
1992	24,190	22,812	17,530	6,660	5,282	117,116
1993	24,222	22,760	17,537	6,685	5,223	118,772
1994	25,670	24,273	18,565	7,105	5,707	121,695
1995	25,921	24,500	18,576	7,345	5,924	124,576
1996	26,334	24,867	18,790	7,544	6,077	127,015
1997	27,885	26,392	19,867	8,018	6,525	129,980

Sources: Lipsey (1989), Mataloni (1992), (1998) and (1999), Seskin (1998), U.S. Dep't. of Commerce (1998), Vol. 2, Table 6.4, and (1999), Table B. 8.

Appendix Table 3

Gross Product of U.S. Multinational Manufacturing Firms
and U.S. Manufacturing Gross Product

	Parents and MOFAs	Parents	MOFAs	U.S. Gross Manufacturing Output (\$Billion)
	(\$ Million)			
1977	382,280	301,286	80,994	462.6
1982	542,689	421,050	121,639	649.8
1989	793,771	586,568	207,203	1,013.5
1995	1,023,697	723,182	300,515	1,282.2
1996	1,071,324	764,725	306,599	1,309.1
1997	1,080,824	765,122	315,702	1,378.9

Sources: Lum and Yuskavage (1997), Mataloni and Goldberg (1994), Mataloni (1998) and (1999), and U.S. Department of Commerce (1999), Table B. 3.

Appendix Table 4

Employment of U.S. Multinational Manufacturing Firms
and Total U.S. Manufacturing Employment
1957, 1966, 1977 and 1982-96
(Thousands)

MNCs										U.S. Part-time & Full Time Employment in Manufacturing ^a
Parents and All Affiliates by Industry of		Parents and MOFAs by Industry of		Parents	All Affiliates by Industry of		MOFAs by Industry of			
Parent	Affiliate	Parent	Affiliate		Parent	Affiliate	Parent	Affiliate		
1957						(1,846) ^b	1,700			17,009
1966						(3,654) ^c		2,615		19,138
1977		16,630		15,548	11,775	(5,272) ^b	4,855		3,773	19,601
1982	15,347	14,966	14,247	13,890	10,533	4,814	4,433	3,714	3,358	18,750
1983	15,104	14,723		13,694	10,493	4,611	4,230		3,201	18,366
1984	15,350	15,030		13,906	10,660	4,689	4,370		3,245	19,329
1985	15,194	14,852		13,705	10,503	4,692	4,349		3,202	19,207
1986	14,849	14,552		13,523	10,431	4,418	4,121		3,092	18,901
1987	14,606	14,314		13,226	10,196	4,410	4,118		3,030	18,951
1988	14,292	13,964		12,878	9,820	4,473	4,144		3,058	19,321
1989	14,640	14,318	13,791	13,374	10,127	4,513	4,191	3,664	3,247	19,365
1990		14,138	13,458	13,182	9,805	(4,586) ^d	4,333	3,741	3,377	18,984
1991		13,773	13,293	12,814	9,514	(4,612) ^d	4,259	3,779	3,300	18,374
1992		13,255	13,012	12,515	9,246	(4,575) ^d	4,009	3,766	3,269	18,023
1993		12,999	12,684	12,245	9,019	(4,430) ^d	3,980	3,664	3,226	18,025
1994	13,692	13,313	12,908	12,565	9,049	4,643	4,263	3,858	3,516	18,281
1995	13,811	13,423	13,224	12,685	9,080	(4,731) ^e	4,344	4,144	3,606	18,448
1996	13,745	13,353	13,044	12,626	8,960	(4,785) ^e	4,393	4,084	3,666	18,436
1997	13,625	13,216	12,843	12,503	8,623	(5,002) ^e	4,593	4,220	3,880	18,621

^aExcluding Petroleum and Coal Products

^bExtrapolated from 1982 by employment by industry of affiliate

^cExtrapolated from 1977 by MOFA employment by industry of affiliate

^dInterpolated between 1989 and 1994 by employment by industry of affiliate

^eExtrapolated from 1994 by employment by industry of affiliate

Source: Lowe and Mataloni (1991), Mataloni (1992) (1993), (1994) (1995), (1996), (1997), (1998) and (1999); Mataloni and Fahim-Nader (1996); Seskin (1998); U.S. Department of Commerce (1999), Table B. 8; and Whichard (1989).