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ABSTRACT

There has been little analysis of the impact of inward foreign direct investment (FDI) on U.S. wage inequality, even though the presence of foreign-owned affiliates in the United States has arguably grown more rapidly in significance for the U.S. economy than trade flows. Using data across U.S. manufacturing from 1977 to 1994, this paper tests whether inward flows of FDI contributed to within-industry shifts in U.S. relative labor demand toward more-skilled labor. We generally find that inward FDI has not contributed to U.S. within-industry skill upgrading; in fact, the wave of Japanese greenfield investments in the 1980s was significantly correlated with lower, not higher, relative demand for skilled labor. This finding is consistent with recent models of multinational enterprises in which foreign affiliates focus on activities less skilled-labor intensive than the activities of their parent firms. It also suggests that if inward FDI brought new technologies into the United States, the induced technological change was not biased towards skilled labor.

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1 Introduction

The relative wage of more-skilled to less-skilled Americans has been rising sharply since the late 1970s.[1] At the same time, within most industries relative labor demands have been shifting toward the more skilled.[2] Many economists have argued that these within-industry labor-demand shifts are a primary cause of the rising skill premium, but there is still disagreement about what caused the demand shifts. They are consistent with skill-biased technological change (SBTC), as many researchers have pointed out. However, they are also consistent with explanations related to international trade, and there remains uncertainty about which forces have contributed to skill upgrading. For example, Feenstra and Hanson (1996a,b) find outsourcing to be correlated with skill upgrading, whereas Autor, et al (1998) conclude outsourcing's effect is not robust to other forces such as computerization.[3]

Most research has focused on trade and technology as demand shifters. The focus on trade is understandable because of the rapidly growing importance of trade in the U.S. economy. However, foreign direct investment (FDI) by multinational enterprises (MNEs) both into and out of the United States has on many measures grown even more rapidly. For example, from 1977 to 1994 U.S. manufacturing imports as a share of U.S. manufacturing shipments rose from 7.0 percent to 14.2 percent. During the same period, foreign-affiliate manufacturing sales in the United States as a share of U.S. manufacturing shipments rose from 5.6 percent to 17.3 percent.

This growth of foreign-owned manufacturing affiliate presence in the United States has paralleled the rise in U.S. wage inequality. Figure 1 shows the U.S. skill premium (measured as the ratio of average annual wages of non-production workers to average annual wages of production workers) and the share of foreign-owned affiliate employment in total U.S.

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[1] Several economists have documented this fall in terms of education, experience, and job classification. Bound and Johnson (1992) find that between 1979 and 1988, the ratio of the average wage of a college graduate to the average wage of a high school graduate rose by 15 percent. Davis (1992) finds that between 1979 and 1987, the ratio of weekly earnings of males in their forties to weekly earnings of males in their twenties rose by 25 percent. For all U.S. manufacturing, we find that between 1979 and 1994 the ratio of average annual wages of non-production workers to average annual wages of production workers rose by 10 percent, from about 1.52 to 1.67.

[2] Many studies have found that even though the relative wage of more-skilled workers has been rising, within most industries relative employment of these workers has risen. This evidence strongly suggests within-industry demand shifts.

[3] The link between SBTC and overall wage inequality depends crucially on whether there is one aggregate output sector or many. In one-sector models SBTC always raises the skill premium, but in multi-sector models what usually matters is the sector bias of technological change, not its factor bias. See Haskel and Slaughter (1998).

manufacturing employment from 1977 through 1994. The skill premium rose from a low of about 1.52 in 1979 to nearly 1.67 in 1994. At the same time, foreign affiliate employment rose from about 3.7% of total U.S. manufacturing employment in 1977 to 13.5% in 1994 (absolute employment nearly quadrupled over this period, from about 655,000 to over 2.3 million). These parallel trends suggest that rising affiliate presence may have contributed to economy-wide skill upgrading and inequality.

In addition to Figure 1, several studies have found substantial differences between operating characteristics of foreign-owned manufacturing plants in the United States compared both to plants owned by U.S.-headquartered MNEs and to plants owned by purely domestic firms. With plant-level data for 1989 and 1990, Howenstine and Zeile (1994) find that foreign affiliates in the United States are larger, more capital intensive, and pay higher wages than domestic plants. Globerman, Ries and Vertinsky (1994) find qualitatively identical results for foreign affiliates and domestically-owned plants in Canada. For U.S. manufacturing, Doms and Jensen (1996) report that foreign-affiliate plants are more productive and pay higher wages than domestic plants even after controlling for four-digit industry, state, plant age and plant size.[4] All these studies suggest that foreign affiliates may have quite different factor demands, even within the same industry.

Despite the evidence from plant–level studies and the time-series evidence of Figure 1, to our knowledge there has been no systematic investigation into FDI and foreign affiliate presence as a source of growing U.S. wage inequality. In fact, Baldwin (1995, p.55) notes that “there do not seem to be any studies of how the shifts in the pattern of U.S. direct investment and direct foreign investment in the United States have affected relative wages.”[5] In response, this paper examines the impact of inward FDI flows and rising foreign-affiliate presence on U.S. skill upgrading in manufacturing from 1977-1994.

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[4] Doms and Jensen (1996) proceed to group U.S. plants into three categories: plants of U.S. multinational firms, plants of large domestically-oriented firms, and plants of smaller firms. They find that plants of U.S. multinational firms are the most productive, largest, most capital-intensive, and pay the highest wages, closely followed by U.S. plants of foreign-owned multinationals. Thus, multinational orientation, rather than domestic orientation, is what seems to matter most for these plant characteristics.

[5] Slaughter (1999) looks at the effect of outward FDI on U.S. wage inequality. Beyond this, a number of studies have examined the impact of FDI on the general level of wages in the United States and other countries, including Aitken, et al, (1996) and Feliciano and Lipsey (1998).

To go beyond the aggregate evidence in Figure 1 and address the fact that skill upgrading has been predominantly within industries, our econometric analysis uses variation across and within industries. There has been substantial variation across sectors in the within-industry changes in foreign-affiliate presence. For example, our data will show that across all sectors the average 1977-1994 change in the foreign-affiliate employment share was a rise of about 10 percentage points -- but the standard deviation in this change was 14 percentage points. To exploit this cross-industry variation we create an industry-year panel data set for all U.S. manufacturing from 1977 to 1994 by merging data from the National Bureau of Economic Research's (NBER) Manufacturing Productivity Database with data on inward foreign-owned affiliates. Affiliate data come from the Bureau of Economic Analysis, U.S. Department of Commerce (BEA); the International Trade Administration, U.S. Department of Commerce (ITA), and the Japan Economic Institute (JEI). Importantly, the MNE data all start around 1977 when the U.S. skill premium began climbing. With our data we employ an empirical framework used frequently in this literature to examine whether foreign-owned affiliate activity affected within-industry skill upgrading.

In addition to examining overall affiliate activity, we have sufficient data to examine the separate impact of different forms of FDI -- in particular, new plant (or "greenfield") investment versus acquired establishments. This distinction may be important for a number of reasons. For example, acquired plants may be more likely than new plants to maintain factor demands similar to those of domestic plants. Alternatively, acquisitions may discipline inefficient firms to alter inefficient factor demands (e.g., by reducing union power). Our data also allow us to focus on Japanese affiliates, which were particularly controversial over our sample period.

In addition to the literature on U.S. skill upgrading, our analysis also aims to contribute some empirical evidence on the new class of MNE models in trade theory. Until the mid-1980s standard trade theory provided few explanations for capital flows into a capital-abundant country such as the United States, besides tariff-jumping motives.[6] During this time period, however, a less-formalized MNE literature existed, centered around the "eclectic paradigm" of Dunning (1981),

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[6] While avoiding protection is certainly one possible explanation for some FDI into the United States during our time period of analysis, few would argue that this was more than one of many causes.

which emphasized firm-specific assets (such as technological assets) are important causes of MNEs. This literature also argued that MNEs are important channels for international technology transfer. This suggests that MNEs may bring into host new skill-intensive technologies that induce or accelerate SBTC, even in advanced host countries like the United States.[7]

Beginning in the mid-1980s, researchers generated a number of new MNE models which incorporated features from new trade theory and industrial organization (see the survey in Markusen, 1995). These models generate a rich set of MNE and trade patterns across countries that depend on countries' relative endowments and sizes, economies-of-scale effects, and trade and investment policies. These newer models have the potential to formalize the theoretical impact of foreign-affiliate presence on skill upgrading and wage inequality even for an equilibrium like that of the United States in which most of the inward FDI stock is owned by other industrialized countries. However, these models do not generate unambiguous predictions about the link from inward FDI to skill upgrading. They commonly show that inward FDI changes the activity mix of a multinational firm between its home and host country. This changes industry-level factor demands--but both skill upgrading and its reverse are possible, depending on many variables that are often difficult to quantify. This ambiguity means the question of how FDI and foreign-affiliate presence affect host-country within-industry factor demands is largely an empirical one.

To preview our results, we find little evidence that inward FDI has contributed to U.S. skill upgrading within manufacturing industries. The insignificant relationship between inward FDI and skill upgrading is robust to several sensitivity checks including different measures of foreign-affiliate presence, alternative specifications of our control regressors, various sub-samples of our data, and focusing on different types of FDI such as greenfield plants versus acquired ones. We also present limited evidence that trade effects of foreign affiliates working through imported inputs is unlikely to have had any impact on skill upgrading. Thus, despite the plausible *a priori*

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[7] A recent paper by Adams (1998) finds that industries where foreign patents are more important pay a higher relative skilled wage in the United States. However, it is not clear whether this connection occurs directly because of transferred skill-biased technology to foreign-owned affiliates in the United States or other more indirect channels, such as industry-wide spillovers of skill-biased technology.

relationship, we do not find significant U.S. expansion in foreign-affiliate activity to be a source of U.S. skill upgrading.

However, we find one important exception: Japanese greenfield FDI. We examine FDI by Japanese firms specifically, since they were much more likely both to enter with greenfield investments than other source countries and exhibit many differences in operating characteristics relative to other foreign affiliates in the United States. We find that greater Japanese greenfield affiliate presence is significantly correlated with *lower,* not higher, relative demand for skilled workers; greater Japanese presence through acquisitions has no significant effect. The negative correlation is consistent with recent MNE models in which foreign affiliates focus on activities less skilled-labor-intensive than the activities of parents. These findings also suggest that if inward FDI brought new technologies into the United States, the induced technological change was not biased towards skilled labor.

The paper has three additional sections. Section 2 discusses the theoretical connections between foreign affiliate presence and relative demands for skilled and unskilled labor. Section 3 presents a brief set of facts about inward FDI, while section 4 presents econometric evidence on inward FDI and U.S. labor-demand shifts.

2 Theoretical Motivation

Most previous work on the effect of FDI on wages has examined the issue from a general-equilibrium trade model based on endowment-driven comparative advantage. Feenstra and Hanson (1996a;1996b;1997) develop a North-South model to examine the potential effects of FDI inflows on wages in both the host and parent countries. Here, a final good is produced from a continuum of intermediate inputs which vary in the relative amounts of skilled and unskilled labor required. The South has a comparative advantage in unskilled labor. This attracts FDI from the North, which in turn transfers some number of "marginal" inputs from North production to South production. Interestingly, the skill premium rises in both the North and the South both regions now produce a more skilled-labor-intensive mix of activities. Empirically, Feenstra and Hanson (1997) find substantial evidence that U.S. FDI into Mexico contributed to rising Mexican inequality. Slaughter's (1999) examination of U.S. MNE outsourcing follows Helpman's (1984) model of MNEs. Helpman's model is based on a two-good, two-factor Heckscher-Ohlin trade model. Here, vertically-integrated MNEs may arise when relative-endowment differentials are so large that trade alone cannot arbitrage international wage differentials.

Unfortunately, endowment-driven models cannot easily explain the recent wave of inward FDI into the United States. It seems unlikely that inward FDI into the United States has occurred because comparative advantage has changed so that other countries are now outsourcing unskilled-labor-intensive activities to the United States. But if FDI into the United States is not motivated by standard comparative advantage motivations, it is quite difficult to assess theoretically whether and how this inward FDI should affect wages.

An alternative theoretical literature on the formation of MNEs is summarized by Markusen (1995). These general-equilibrium models start with the observation that a distinguishing characteristic of MNEs is their firm-specific assets such as proprietary technology, marketing skills, and management skills. These assets have a within-firm public-goods aspect to them, so they can be used across all firm plants after incurring a one-time development cost. Thus, these firms can realize economies of scale from multiple plants, which becomes important in a world where there are trade costs. In fact, introducing these types of features into a general-equilibrium trade model leads to a very rich set of possible configurations of MNEs.

Markusen and Venables (1998) use this type of model to analyze the influence of MNEs on relative wages in the parent and host countries. They use a two-country, two-factor model in which production in the monopolistically competitive sector is comprised of three distinctactivities: 1) a firm-specific fixed cost using skilled labor, 2) a plant-level fixed cost using a mix of skilled and unskilled labor, and 3) final production which uses only unskilled labor. Intuitively, one can think of the first activity as headquarter services for a multi-plant firm. This means that branch-plant activity is less skilled-labor intensive than both headquarter services and the MNE's overall operations. In support of these assumptions, Carr, et al (1998) give empirical evidence that foreign affiliates tend to be less skill-intensive and less-R&D-intensive than parents. If a firm chooses not to service the foreign market through branch plant production, it remains a “national” firm and exports to the foreign market. Markusen and Venables assume that transportation of exports requires only unskilled labor; this ensures that MNE plants with foreign branch production are more-skilled intensive than exporting national plants.

Given this set-up Markusen and Venables show how relative wages are affected by various parameter changes such as trade-cost declines or endowment growth. In general, the wage effects depend on the initial equilibrium and on the underlying parameter change. For example, rising trade costs generally raise the wage inequality in the skilled-labor abundant country as MNE firms replace national firms, and lower wage inequality in the unskilled-labor abundant country. But if the countries are different enough in size to begin with, then wage inequality may rise in both countries. Another example is the wage effects of world endowment growth. Growth leads to a greater role for MNEs as they displace national firms, but the wage effects depend on the initial equilibrium. If initially there are many national firms and few MNEs, growth triggers a "regime shift" away from national firms into mainly MNEs. Since MNEs are more skilled-labor intensive than national firms, relative wages go up in one or both countries. However, if the initial equilibrium has mainly MNEs, growth lowers the skill premium in both countries. The intuition is that growth leads to greater firm-scale effects. Since skilled labor makes the firm-specific assets with a public-good aspect to them, firm-scale effects with growth occur mainly with MNE assembly operations which use only unskilled labor.

In summary, greater MNE activity can either raise or lower the skill-mix of activities performed within industries, and thus help raise or lower wage inequality. With respect to the recent U.S. experience, then, there’s no clear theoretical prediction about the wage effects of rising inward FDI unless one knows the initial equilibrium and the underlying parameter changes that are increasing multinational activity. This is not a criticism of recent MNE models. They fill an important void in our understanding of the real-world distribution of production and trade. Instead, the ambiguities highlight the need for empirical work to help inform which equilibrium states of the model seem relevant. In our concluding section, we address how our empirical results may serve this purpose.

3 Data Description and Stylized Facts About Foreign-Affiliate Presence in the United States

To analyze inward FDI we combine the U.S. data from the NBER with FDI data from several sources. The Data Appendix describes all our data in detail. The NBER data are a panel of 4-digit SIC (revision 2) industry-year observations reporting the value, quantity, and price of output produced and inputs hired within U.S. manufacturing. We combined the NBER data with each of our affiliate data sources, aggregating the NBER industries when necessary.

The BEA Data

Through responses to legally mandated surveys, the BEA tracks affiliates of foreign-headquartered MNEs, each of which is defined as one foreign "parent" plus one or more U.S. "affiliates." A parent is an individual or a group such as a trust, corporation, or partnership which controls a business enterprise incorporated abroad. A U.S. affiliate is a business enterprise located in the United States in which there exists "inward foreign direct investment." In turn, inward FDI is defined as direct or indirect ownership or control by a single parent of at least 10% of either the voting power of an incorporated or unincorporated U.S. business enterprise. For the years with publicly available data, 1977 through 1994, we constructed a consistent data series for 56 industries, most of which are collections of three-digit SIC industries (see Appendix Table).

The BEA data show that foreign-affiliate activity has increased substantially during the period of rising U.S. wage inequality. Figure 1 showed this affiliate rise for employment as a share of total U.S. manufacturing employment; Figure 2 presents the analogous trends for affiliate shares of payroll, capital stock, and sales in U.S. manufacturing from 1977 to 1994. All four shares show an ongoing rise since 1977, with an acceleration in this rise from about 1987 through 1991. We note that the large rise in capital-stock share is at least partly a data artifact: the total U.S. data measure property, plant, and equipment (PPE) but the BEA data measure PPE plus all other assets such as accounts receivable. Unfortunately, the annual BEA data are not sufficiently detailed to separate PPE from all affiliate assets in all years.[8]

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[8] In absolute numbers, total U.S. manufacturing affiliate activity increased from 1977 to 1994 as follows: employment rose from about 655,000 to over 2.3 million; payroll rose from about $11 billion to nearly $109 billion; assets rose from $56 billion to nearly $548 billion; and sales rose from $60 billion to $580 billion.

Because our analysis explores the impact of foreign-affiliate presence on *within-industry* skill upgrading, it is important to note there is substantial cross-industry variation in foreign-affiliate presence and growth. As mentioned earlier, the average change in employment shares from 1977 through 1994 was 10 percentage points, but with a standard deviation over 14 percentage points.

The ITA Data

One limitation of the BEA data is they do not have disaggregated information on whether foreign affiliates are born and/or expand via a merger or acquisition (M&A), a new "greenfield" investment, or other types of transactions.[9] As we discussed earlier, different types of FDI may have very different effects on skill upgrading. To allow us to explore this idea we use data from the ITA. Every year since 1974 the ITA has compiled a census of inward FDI transactions with the following information for each transaction: type of investment, foreign investor, U.S. state location, 4-digit SIC industry, and (when available) the dollar value.

The ITA distinguishes seven transaction types: M&A, new plants, joint ventures, plant expansions, reinvested earnings, equity increases, and other. In our analysis we do not use ITA information on the last three categories both because they account for only a very small share of total ITA observations and because they are fairly uninformative about the type of initial investment. Over our sample period of 1977 through 1994, of all remaining transactions 52% were M&As, 26% were new plants, 13% were plant expansions, and 9% were joint ventures.[10] Figure 3 plots annual counts for these two largest categories and their sum; the overall picture is broadly consistent with the BEA trends in Figures 1 and 2. Transaction counts peaked during the second half of the 1980s, with M&A activity accounting for most of this surge.

Ideally we would use the ITA data to analyze whether different types of inward FDI have different effects on skill upgrading. However, these data have a number of disadvantages. First, the ITA generates data from publicly available media sources. This is problematic both because not

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[9] BEA measures of foreign-affiliate activity by activity type are available annually for all manufacturing beginning in 1980. Greater industry detail by activity type is generally not available due to BEA restrictions not to disclose proprietary firm information.

[10] What transactions data are available from the BEA also show M&As to be the largest transaction category. Klein and Rosengren (1994) note that from 1979 to 1991, this category accounted for from 60% to 89% of annual U.S. FDI inflows.

all FDI transactions are publicly announced and because actual changes may end up differing from announced changes. Second, approximately one-third of the ITA observations do not list dollar values. Third, the ITA counts capture only gross flows into the U.S. affiliate stock: they have no information on exits. Because of these concerns, in our econometric analysis we use these data only in conjunction with the BEA data. Specifically, we use the ITA counts to decompose changes in the industry-level BEA measures of total affiliate activity among various affiliate types. Below, we discuss this data merge in greater detail.

The JEI Data

Our final inward FDI data source is the JEI census of Japanese affiliate plants. Japanese plants in particular are of interest because of the substantial Japanese FDI inflow during our sample period which started from very low levels. Additionally, Howenstine and Shannon (1996) find substantial differences between Japanese and non-Japanese affiliates. Japanese affiliates are much more likely to be greenfield investments, to have a higher share of intermediate inputs in final sales, and to pay slightly lower wages. These findings suggest that Japanese plants may affect U.S. skill upgrading differently than do non-Japanese plants.

Semi-annually from 1980 through 1990 the JEI collected the following information on every Japanese manufacturing plant in the United States: 4-digit SIC industry, location, age, employment, and M&A or greenfield status. We measure total Japanese affiliate activity using the JEI employment data; we also separate total employment between M&A and greenfield employment. Because of the difficulty in obtaining these data, we use data only from 1980 and 1990.[11] Japanese employment grew by more than 400% during this decade, from around 57,000 to over 262,000, with these totals about evenly split between M&A and greenfield plants. As with the BEA data, the JEI data show substantial cross-industry variation in foreign-affiliate presence and growth. The average change in greenfield employment was plus 1700 with a standard deviation over 5000; for M&A employment the average change was plus 1800 with a standard deviation of 3000. Among greenfield plants the largest growth occurred in Motor Vehicles &

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[11] We thank Keith Head and John Ries for providing the 1990 data in electronic form.

Equipment (37,000), while among M&A plants it was Electronic Components (12,000). Industries such as Agricultural Chemicals and Other Transportation Equipment actually lost employees over the decade.

4 Estimation Strategy, Measurement, and Empirical Results

Estimation Strategy and Measurement

To identify the link between inward FDI and within-industry shifts in U.S. labor demand, we exploit the variation in inward FDI across industries. To proceed, we assume that in each industry *k* capital is a quasi-fixed factor and that the industry minimizes the cost of skilled and unskilled labor according to a translog cost function.[12] In each industry cost minimization leads to an equation explaining the level change over some time period in that industry's skilled-labor share of the total wage bill:

$$(1) \quad \Delta SH_{kt} = \beta_1 \Delta\log\left(\frac{w_s}{w_u}\right)_{kt} + \beta_2 \Delta\log\left(\frac{K}{Y}\right)_{kt} + \beta_3 \Delta\log(Y)_{kt} + \delta(TD)_t + e_{kt} \ ,$$

where *k* indexes industries; *t* indexes time; ΔSH_{kt} is the level change in the skilled-labor share of the total wage bill -- i.e., skill upgrading; w_{skt} is the skilled wage; w_{ukt} is the unskilled wage; K_{kt} is capital; Y_{kt} is real value-added output; TD_t is a full set of time dummy variables; and e_{kt} is an additive error term. The wage regressor accounts for variation in SH_{kt} due to industries substituting away from more-expensive factors. The coefficient β_1 is positive or negative depending on whether the cross-industry average elasticity of substitution between skilled and unskilled labor is below or above one. The capital-to-output regressor accounts for variation in SH_{kt} due to capital investment. A positive β_2 indicates capital-skill complementarity whereby investment stimulates skilled-labor demand. The output regressor controls for industry scale. The time dummies control for any skill upgrading that is common to all industries. Industry fixed effects, accounted for through time-differencing the data, capture any industry-specific technology differences that are common over time.

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[12] The advantage of the translog functional form is it imposes fewer restrictions on factor substitutability than either CES, Cobb-Douglas, or Leontief production technologies.

If one pools all industries and estimates equation (1), then the variation in SH_{kt} not explained by changes in wages, capital, and output is commonly attributed to SBTC. Variations of equation (1) have been used recently by a number of researchers. Berman, Bound, and Griliches (1994) use equation (1) to document the large amount of within-industry SBTC in the United States in recent decades. Feenstra and Hanson (1996a,b), Autor, Katz, and Krueger (1998), and Slaughter (1999) expand this methodology by adding new regressors to equation (1), such as outsourcing, computerization, and outward FDI. These studies explain skill upgrading more thoroughly than the assumption of equation (1) that any residual variation in SH_{kt} is attributed by default to SBTC.

Our empirical specification adds to equation (1) measures of inward FDI activity. Following earlier findings that computerization is robustly correlated with skill upgrading, we also add computer use to (1). Thus, our baseline estimating equation is given by equation (2):

$$(2)\ \Delta SH_{kt} = \beta_1 \Delta\log\left(\frac{w_s}{w_u}\right)_{kt} + \beta_2 \Delta\log\left(\frac{K}{Y}\right)_{kt} + \beta_3 \Delta\log(Y)_{kt} + \gamma\Delta(FDI)_{kt} + \eta(COMP)_{kt} + \delta(TD)_t + u_{kt},$$

where FDI_{kt} is some measure of inward FDI activity, $COMP_{kt}$ measures computer use, and u_{kt} is an additive error term. The key question in equation (2) is the sign of γ. The null hypothesis is $\gamma = 0$: no relationship between affiliate activity and skill upgrading. The alternative hypothesis is $\gamma > 0$: increases in affiliate activity are associated with greater skill upgrading. A significantly positive (negative) estimate of γ will be interpreted as evidence that affiliates contributed to within-industry shifts in demand towards more-skilled (less-skilled) workers.

Estimating equation (2) requires industry-level data on affiliate activity, computer use, capital stocks, output, and employment and wages for both skilled and unskilled workers. FDI sources were discussed in Section 3; computer use comes from the U.S. Census of Manufactures, and all other data come from the NBER Manufacturing Productivity Data Base. We measure $COMP_{kt}$ as the share of computer investment in total investment. Note that this variable enters (2) in levels, not in changes, under the assumption that it is the flow of investment that creates changes in SH_{kt}. We construct SH_{kt} as the nonproduction wage bill divided by total wage bill of production and nonproduction workers. We construct w_{skt} (w_{ukt}) as total nonproduction (production) wage bill divided by total nonproduction (production) employment. K_{kt} is measured as real equipment and plant. Value-added price deflators are not available, so we measure Y_{kt} as real value of shipments.

Before presenting our results, we mention three general estimation issues. First, all results are robust to the exact treatment of the non-FDI regressors in equation (2). Below we report results for specifications which omit the wage regressor, disaggregate capital between plant and equipment, and include real output and computer use.[13] These results are qualitatively similar to unreported results which include the wage regressor; aggregate plant and equipment; and omit output or computer use. Second, we use weighted least squares weighting industries by their share of total manufacturing wage bill. Third, all estimates use White-adjusted standard errors.

Table 1 reports summary statistics for our key variables discussed so far; the various $\Delta(FDI)_{kt}$ regressors in Table 1 we define in turn below. For consistency, all data are aggregated to the 56 BEA industries. Skill upgrading is visible in the positive mean changes in SH_{kt}. Again, there is substantial cross-industry variation in ΔSH_{kt} that we aim to link with our $\Delta(FDI)_{kt}$ regressors.[14]

The Effect of Total Affiliate Activity on Skill Upgrading

We first measure affiliate activity (FDI_{kt}) using the BEA data, our most complete data source on all foreign-affiliate activity in the United States. We construct the ratio of total affiliate activity to total U.S. industry activity four ways: in terms of employment, payroll, assets, or sales. Rather than measuring the absolute level of affiliate activity, this construction scales how important affiliates are relative to U.S. industry overall. In principle, industry-years in which affiliate activity constitutes a greater share of U.S. industry activity have greater scope for affiliates to affect U.S. industry labor demand. Accordingly, these industry-years have larger measures of FDI_{kt}.

We use these BEA data across 56 industries from 1977 through 1994 to estimate equation (2). Table 2 reports estimation results for one-year differences. Each column reports estimates for one of our FDI_{kt} measures plus a common set of controls. The control regressors in Table 2 all have

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[13] The wage regressor is omitted because cross-sectional relative-wage variation might reflect skill-mix differences rather than exogenous wage differences. Standard trade theory with perfect interindustry factor mobility predicts no such cross-sectional wage variation, in which case time fixed effects capture the truly exogenous wage changes.

[14] We have data on $COMP_{kt}$ for only 1977, 1982, and 1987. We imputed the 1977 level to years 1978-1981, the 1982 level to years 1983-1986, and the 1987 level to years 1988 and beyond.

coefficient estimates in line with earlier studies: skill upgrading is positively correlated with capital intensity, output, and computer use. While the fit of the equation and control regressors suggests a reasonably specified equation, all four measures of affiliate activity have no significant correlation with industry-wide skill upgrading. Statistical significance aside, three of the four FDI measures are actually *negatively* correlated with skill upgrading, suggesting that greater affiliate activity is associated with reduced, not increased, skill upgrading.

We next conducted a number of sensitivity checks on the results in Table 2. First, our specification with one-year differences assumes that a given year's changes in affiliate activity immediately influence industry-level skill upgrading in that same year. This assumption might be too restrictive. For example, with M&A activity it may take considerable time for a new foreign owner to change operations of a formerly domestic-owned operation. If this is true, one-year changes in affiliate shares may not capture the long-run impact of foreign affiliate presence on skill upgrading very well. Since most U.S. affiliates were originally "born" via acquisitions (versus greenfield plants), this may be an important consideration.

To examine the potential long-run impact of foreign affiliates, Table 3 reports estimation results for equation (2) where each industry is long-differenced over the period from 1977 to 1994. Despite the change in specification we get qualitatively identical results to our sample with one-year differences. The control variables retain the correct signs and are generally statistically significant, and overall the fit of the regressions is quite high for a cross section with so few observations. Yet we still find no significant correlation between any of the affiliate-activity measures and skill upgrading. Three of the four measures now show positive correlations, but none are even close to statistical significance at standard confidence levels.

As a second check of our results in Table 2, Table 4 reports results for two different sub-periods: 1977 through 1985 and 1986 through 1991. The 1986-1991 sub-period is of particular interest because during that time aggregate inward FDI into the United States surged to record levels. For brevity we only report estimates measuring affiliate activity in terms of employment; the other three measures yielded no qualitative differences. As Table 4 reports, using both short and long differences on both sub-periods we again find no clear link between affiliate activity and skill upgrading. In summary, our finding that overall affiliate activity has no significant impact on skill upgrading in the U.S. manufacturing is surprisingly robust to a variety of specifications and data sub-periods.

The Effect of Different Forms of Affiliate Activity on Skill Upgrading

To this point we have assumed that foreign affiliates in an industry are homogeneous. However, the different forms of establishing a foreign-affiliate presence may have different implications for skill upgrading. For example, the acquisition of an existing domestic firm will have no impact on industry skill upgrading unless and until the foreign parent changes the affiliate's production technology in a way that affects the affiliate's relative labor demands. This contrasts with a new greenfield or joint-venture affiliate, which may immediately employ a much different technology from that of domestically owned establishments in the industry. Empirically, Kogut and Chang (1991) and Blonigen (1997) find evidence consistent with a story where foreign firms are accessing firm-specific assets, such as new technologies, through acquisition of U.S. establishments. To the extent that foreign acquisitions are motivated by these considerations, it’s not clear that acquisition FDI necessarily changes the acquired establishments' operations.[15]

To examine how the effect of foreign-affiliate activity on skill upgrading may vary by type of initial FDI, we construct a second set of FDI_{kt} measures by combining our BEA data with the ITA data that details FDI transactions by type. To link these data we first aggregate the 4-digit SIC ITA counts up to the 56 BEA industries. Then we decompose the change in total foreign-affiliate presence into four FDI types: M&A, greenfield, joint venture, and plant expansion. That is, we apportion the change in the BEA affiliate measures into the four FDI types using the shares of each FDI type in the total ITA transaction counts for each industry in each year. For one-year BEA changes between years (t-1) and t we used ITA counts during year t. For longer full-sample BEA changes we accumulated ITA counts over the full sample period.

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[15] There is also an established literature on acquisitions as a disciplining device, whereby efficient firms acquire inefficient ones. This may have implications for skill upgrading. However, if foreign firms are no more likely to be the acquiring firm in these cases than U.S. firms, there is no expected effect from greater foreign presence in an industry on skill upgrading.

Alternatively, we could simply use the counts of ITA transactions as our measures of yearly changes in affiliate presence by type of FDI. However, this approach would impose strict assumptions on the data that are likely not satisfied. This would assume that transactions across type and industry are equal in size, i.e., that each transaction represent the same change in foreign-affiliate presence. A simple look at the ITA transactions for which dollar values are recorded shows this is not the case: there are systematic differences in transaction sizes across industries and type. M&A transactions, for example, tend to be much larger than all other types, so counts alone would understate the importance of M&A transactions and overstate that of all other types. By taking the BEA measure of affiliate-presence change for an industry and year and then apportioning that change by type of FDI using the ITA data, we no longer assume that transactions are equal in size across industries. But we must still assume that transactions are identical in size across types within an industry. One important reason we turn to the JEI data on Japanese FDI in the next section is because those data allow us to relax this assumption as well.

Table 5 reports results for the BEA-ITA measures of FDI_{kt} by type for one-year differences. For brevity, in Table 5 we report results using changes in foreign affiliate activity measured by employment share only; the other measures (in terms of payroll, assets, or sales) yield qualitatively identical results to those reported here. As Table 5 shows, isolating the role of different transaction types does not change the picture much. There is no significant correlation between skill upgrading and any particular type of inward FDI measures. The same is true in Table 6, which continues with the BEA-ITA data, but reports long-difference estimates.[16]

The Effect of Different Forms of Japanese Affiliate Activity on Skill Upgrading

As we noted, the ITA data don’t have information on transaction sizes, a limitation we can only partially alleviate by linking the ITA data with the BEA data. In contrast, the JEI data described in Section 3 reports both size (in terms of employment) and type (M&A or greenfield) of all Japanese affiliate activity in the United States. So with these data we no longer need to make restrictive

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[16] Note that the non-FDI regressors in Tables 5 and 6 have nearly identical coefficient estimates and standard errors across the different FDI regressors. This suggests that the ITA allocations across transaction types are quite stable over time (e.g., M&A transactions account for about 50% of all transactions every year) such that the sample variation is quite similar across the various BEA-ITA regressors.

assumptions about the relative size of transactions, which reduces potentially serious bias from measurement error.

In addition, a focus on Japan as a source country has the potential to yield more insight on the potentially different effects on skill upgrading from M&A versus greenfield activity because Japan had a much greater share of greenfield activity in the United States than most foreign countries. Our JEI data show that Japanese investors had almost identical numbers of total employees in greenfield affiliates and acquired affiliates in both 1980 and 1990. This contrasts with Howenstine and Shannon's (1996) finding that other major source countries spent less than 10% of their total U.S. FDI outlays on greenfield operations.

To use the JEI data as our third set of FDI_{kt} measures we construct the share of Japanese affiliate employment in total U.S. employment by industry-year. We construct three different shares: of total Japanese affiliate activity, of acquired Japanese affiliate activity, and of greenfield Japanese affiliate activity.[17] These measures are similar to the BEA-only measure, as the ratios allow us to scale how important affiliates are relative to overall U.S. industry. We construct these measures using JEI data for 1980 and 1990, and then estimate equation (2) separately on these three measures for the ten-year difference over the 1980s.

Table 7 reports results using the JEI measures of FDI_{kt}. As with all previous specifications, the control variables are estimated precisely and with correct sign, and the general fit of the specification is quite high. However, our results for our FDI measures differ markedly. We now estimate a significant *negative* correlation with U.S. industry-wide skill upgrading for changes in new-plant Japanese affiliate employment; this also shows up to a lesser degree for changes in all Japanese activity. This suggests that greater Japanese inward FDI decreased, rather than increased, skill upgrading within U.S. manufacturing industries over this time period. These results are estimated from JEI data aggregated up to our 56 BEA industries. We obtain qualitatively identical results when we alternatively estimate equation (2) using the JEI measures of

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[17] Greenfield activity includes establishments that may be joint ventures with more than one Japanese firm, or between a Japanese firm and another foreign or U.S.-based partner.

FDI at their original 4-digit SIC industry level. Results are also robust to alternative specifications of the controls and specifications which include both M&A and greenfield regressors separately.

A closer look at the data underlying these regressions finds a few outlier industries. Motor vehicles and equipment had the single largest level rise in greenfield share of industry employment ($\Delta FDI_{kt} = +.053$), yet this industry was one of the few with a decline in the skilled-labor share of the wage bill ($\Delta SH_{kt} = -.013$). This observation squares with anecdotal evidence that Japanese FDI in this industry, largely thought to be "VER jumping," focused on relatively unskill-intensive assembly activities. Similar to cars, rubber products had one of the largest rises in greenfield share ($\Delta FDI_{kt} = +.017$) combined with the single largest decline in wagebill share ($\Delta SH_{kt} = -.026$). Conversely, the communications-products industry had a relatively small rise in greenfield employment share ($\Delta FDI_{kt} = +.007$) but the single largest rise in wagebill share ($\Delta SH_{kt} = +.141$). These three industries in particular help drive the major finding of Table 7. However, our sensitivity checks showed this finding to be robust to excluding outliers such as these.

Discussion of Empirical Results and Conclusions

Our results suggest zero or even a negative correlation between increases in foreign-affiliate activity and skill upgrading in the United States from 1977 through 1994. That is, skill upgrading within U.S. manufacturing industries is *not* positively correlated with greater foreign-affiliate activity. This suggests that foreign affiliates have not been an important source of SBTC, contrary to any anecdotal evidence. This eliminates one possible force behind SBTC that until now has not been systematically explored.

One concern we had about our results was that three of our four measures of affiliate activity capture part of value added (either labor or capital), while our fourth (sales) encompasses both value added and intermediate inputs. These measures might miss important affiliate effects on skill upgrading working through just intermediate inputs. There is reason to suspect that a role for input activity in particular. First, Feenstra and Hanson (1996a,b) find a strong correlation between skill upgrading and a rising share of imports in total U.S. intermediate-input purchases. Second, Zeile (1998) shows that on average, affiliates rely on imported intermediate inputs to a much greater degree than do domestically owned companies. Together, these two facts suggest that the rising share of imported intermediate inputs found by Feenstra and Hanson might be caused by the increased presence of foreign affiliates.

Unfortunately, the publicly available BEA data do not contain sufficiently detailed information on affiliate intermediate-input purchases to test this idea as formally as our earlier regressions. However, what little data are available on this question suggest that affiliate input purchases did not play an important role. For example, 1977 to 1989 saw extensive skill upgrading in the majority of U.S. industries. Yet over this period the share of imports in total manufacturing-wide affiliate input purchases held constant at 16%. The share rose only slightly in only two of the five broad industries for which the BEA breaks out the manufacturing totals: chemicals (from 9% to 12%) and other manufacturing (from 15% to 17%). From 1989 to 1994 the all-manufacturing share rose up to nearly 19%, but during this time U.S. skill upgrading slowed considerably. We do not have the data to explore cross-industry patterns, but these aggregate data do not indicate a strong link between U.S. skill upgrading and rising affiliate imports of inputs.

Our results using the Japanese data are intriguing. Unfortunately, we cannot disentangle whether the significant negative correlation between greenfield affiliate activity and skill upgrading is because the JEI data have more accurate measures of greenfield activity or because the JEI data are picking up an effect specific to differences in Japanese investors from those in other source countries. In some respects, our overall conclusions are not affected by which explanation matters. Suppose greenfield activity across all source countries has a different impact on skill upgrading relative to other affiliate types, but we are just not able to measure this precisely using the ITA counts. The overall impact of total foreign affiliate activity is still likely negligible because the vast amount of activity for source countries other than Japan is M&A activity which shows no impact even in the Japanese data. If the negative correlation between Japanese greenfield activity and skill upgrading is specific to Japan only, then the overall impact must be even smaller.

The negative correlation between greenfield activity and skill upgrading has relevance beyond the skill-upgrading literature. The result lends empirical support to recent models of MNEs in which foreign affiliates focus on activities less skilled-labor intensive than the activities of MNE parents. In these models parents are skill-intensive relative to affiliates because only parents perform firm-wide skill-intensive activities such as R&D and advertising. In U.S. manufacturing, parents of U.S. MNEs account for at least 50% of activity in terms of employment and sales (see Slaughter, 1999). So "on average" U.S. industries look like parents, in which case foreign-affiliate expansion into the United States should tend to reduce the skill mix of U.S. industries--a prediction that squares with our empirical findings. Thus, we think our findings provide some of the first empirical support for some aspects of this newer class of MNE models.

Finally, our findings also highlight a possible issue for future theory work: differences between types of FDI. We find significant effects of inward FDI on U.S. labor demands only for greenfield activity, not M&A activity. To date, the type of FDI has received relatively little attention in MNE models. Our results indicate that FDI type might be an important factor in determining host-country labor-market effects.

Data Appendix

BEA Data

Under the International Investment and Trade in Services Survey Act, MNEs are obligated to participate in BEA censuses and surveys. In 1987 and 1992 the BEA conducted censuses of every U.S. business enterprise that was a U.S. affiliate of a foreign person. In the intervening years from 1977 through 1994 the BEA surveyed a subset of all U.S. affiliates and then estimated universe totals. The censuses (also called "benchmark surveys") sample every American affiliate identified both by checking whether each affiliate from the previous census has "died" and by monitoring news services for the "birth" of new affiliates since that census. Substantive data must be reported by only those affiliates whose total assets, sales, or net income/loss exceeds $1 million.[18] The surveys sample larger U.S. affiliates in existence for the most recent benchmark survey. To generate universe estimates from these surveys, the BEA calculates activity growth rates for sampled affiliates and then assumes the same growth rates for all affiliates. Data are required to be reported on a fiscal-year basis following generally accepted U.S. accounting principles. In particular, monetary amounts must be reported in U.S. dollars. The BEA defines parents and affiliates as described in the text. When there is more than one ownership link between the parent and affiliate, the percentages of ownership for each link are determined and then multiplied to determine the parent's overall stake in the affiliate.

To classify the activity of affiliates in its publicly available data, the BEA assigns each to a single industry that accounts for the largest share of its total activity.[19] From 1977 through 1986 the BEA classified industries using the Direct Investment (DI) classification, adapted directly from SIC revision 2 (1972) industry codes. Starting in 1987 the BEA switched to the International Surveys Industry (ISI) classification, based on the SIC revision 3 (1987) industry codes. We concorded the ISI data back to the DI classifications by following both an internal BEA concordance plus an SIC revision 2 - revision 3 concordance accompanying the NBER data base. This concordance left us with 56 BEA manufacturing industries. Some are individual three-digit SIC industries; others are the sum of several three-digit SIC industries; and a few are single two-digit SIC industries. For our analysis we aggregated the NBER data up to these 56 industries.

Sales are defined as gross sales minus returns, allowances, and discounts. Employment is defined as the number of full and part-time employees on the payroll either at fiscal-year end or at some representative time during the year. Compensation is defined as wages, salaries, payments-in-kind, and employee benefit plans. Total Assets are defined as current assets (e.g., accounts receivable) plus non-current assets (e.g., gross plant, property, and equipment).

ITA Data

As reported in the text, each year since 1974, the International Trade Administration, U.S. Department of Commerce (ITA) reports a list of the year’s FDI transactions, including the type of investment, the foreign investor and country, the four-digit SIC of the U.S. investment, the U.S. state location, and the dollar value of the transaction when available. These transactions are classified by type of investment 1) acquisitions and mergers, 2) new plants, 3) joint ventures, 4) plant expansions, 5) reinvested earnings, 6) equity increases, and 7) other. These data represent a compilation of material from generally publicly available sources, including newspapers, business and trade journals, as well as from Federal regulatory agencies, such as the Securities and Exchange Commission, Federal Trade Commission, and the Federal Reserve Board. While this means that the universe of FDI

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[18] Affiliates not meeting this criterion account for negligible amounts of activity: in 1992 they accounted for only about 1% of total affiliate assets, sales, and net employment. The data reported in censuses as covering "all U.S. affiliates" actually refers to only those affiliates meeting this size criterion.

[19] This classification follows a three-step procedure. First, the parent or affiliate is classified in the one-digit industry that accounts for the largest percentage of its sales. Second, within that one-digit industry it is classified in the two-digit industry that accounts for the largest percentage of its sales. Third, within that two-digit industry it is classified in the three-digit industry that accounts for the largest percentage of its sales.

transactions in the United States are not accounted for in the data, the ITA and others have found they track the BEA data reasonably well.

This paper uses counts of FDI occurrences (by transaction type and 4-digit SIC) listed in the ITA data for the years 1977 through 1994. To concord counts of transactions listed in the ITA database to our 56 BEA sectors, a number of data issues were addressed. First, for reasons cited in the text, we eliminated observations classified as reinvested earnings, equity increases, or "other." Second, counts recorded from 1988 through 1994 are recorded using revision 3 of the SIC and were concorded into revision 2 of the SIC. Next, a small fraction of the counts (approximately one hundred observations out of more than five thousand) had no record of the type of transaction. For these observations, we simply distributed a transaction across the 4 types according to their average distribution for the sample: 1) 52% to AM, 2) 9% to JV, 3) 26% to NP, and 4) 13% to PE. There were an additional twelve observations with no type recorded *and* which were only listed at a 2-digit SIC. For these observations, we distributed across type (by distribution above) and equally across the first 4-digit codes within the corresponding 3-digit sectors. For example, if the observation listed a transaction in SIC 28, we distributed equally into SIC 2812, 2821, 2831, 2841, 2851, 2861, 2873, 2891. There were approximately 50 observations that had type of transaction specified, but were only listed at a 2-digit or 3-digit SIC code. For the 2-digit SIC observations, we used the same procedure to distribute the specified transaction equally across the first 4-digit codes within the corresponding 3-digit sectors. For the 3-digit observations, we distributed the transaction equally across all 4-digit SIC in the corresponding 3-digit industry. Finally, there were a handful of transactions (less than ten) that were deleted because of recorded SICs in the ITA data that do not exist - i.e., coding problems. Once these data steps were taken, we concorded the 4-digit SIC industries (revision 2) into the 56 BEA sectors we use for the paper's empirical analysis.

JEI Data

Our data on Japanese manufacturing affiliate presence in the United States comes from survey data of Japanese plants in the United States conducted by the Japan Economic Institute (JEI) and published semi-annually from 1980 through 1990 by JEI in *Japan's Expanding U.S. Manufacturing Presence*. The appendix of this report lists all Japanese plants in the United States and includes information on 4-digit SIC (revision 3), location of U.S. plant, plant-level employees, year of establishment, and whether the plant was acquired or greenfield investment.

Keith Head and John Ries provided us with an electronic form of the 1990 update, the final year published by JEI. After eliminating observations for which Japanese ownership was less than a fifty percent share, we concorded the 1990 employee levels (listed separately by greenfield or acquisition) into revision 2 of the SIC and then into the 56 BEA sectors. Construction of the 1980 employee levels was more problematic. We created an electronic form of the 1980 survey and eliminated plants with Japanese ownership less than fifty percent share. We noticed that there were 1990 plants with establishment dates of 1980 or earlier, for which there was no record in the 1980 survey. These were plants that were presumably missed in the initial 1980 survey. A number of these plants appear in the 1981, 1983, or 1984 updates, and so we assumed the employee numbers in these updates were the same as 1980 levels. A smaller number of observations on 1980 plants did not have records until surveys or updates after 1986. For these we first calculated the average growth from 1980 to 1990 for all plants for which we had employee numbers in our sample. The average growth rate was 9.4% over the 10 years. A simple interpolation implies growth of 5.6% from 1980 to 1986. We used these growth rates to get 1980 employee levels from 1986 and 1990 employee levels. Finally, there were a small number of observations which had no employees listed in 1980 and also did not show up in later surveys. We imputed 1980 employee numbers for these plants by taking the average 1980 employees for other plants in the same 4-digit SIC or, if necessary, the same 3-digit SIC. In the end, about one-eighth of our observations in 1980 had employee levels estimated in some manner described above, because we didn't have information on 1980 employee levels directly from the 1980 survey or 1981 update. The final step was concording the 1980 employee levels, listed separately by greenfield or acquisition and by revision 2 of the SIC, into the 56 BEA sectors.

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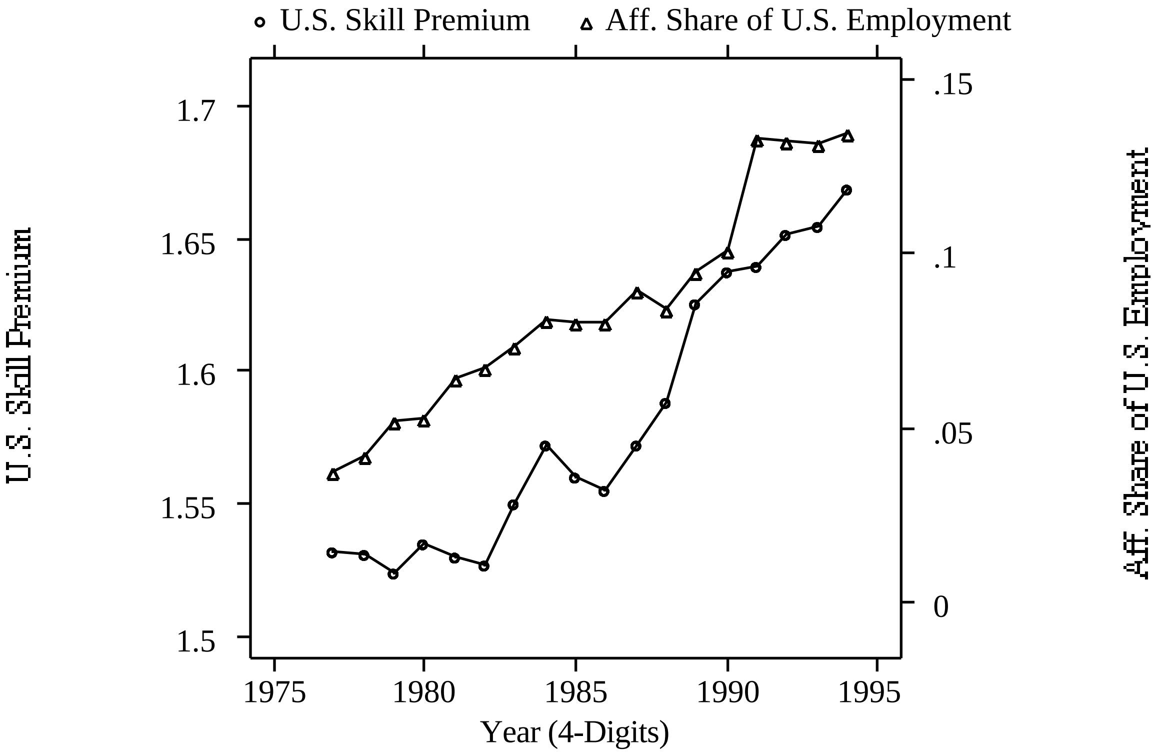
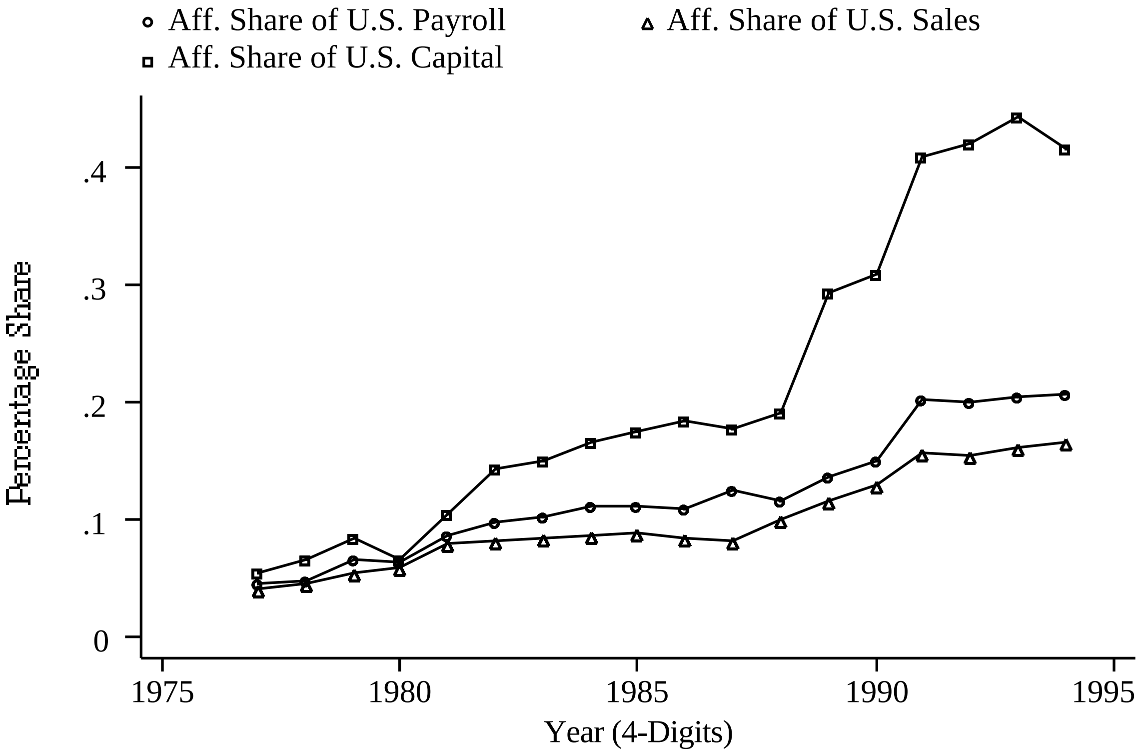
Figure 1
Skill Premium and Foreign-Affiliate Employment in U.S. Manufacturing, 1977-1994



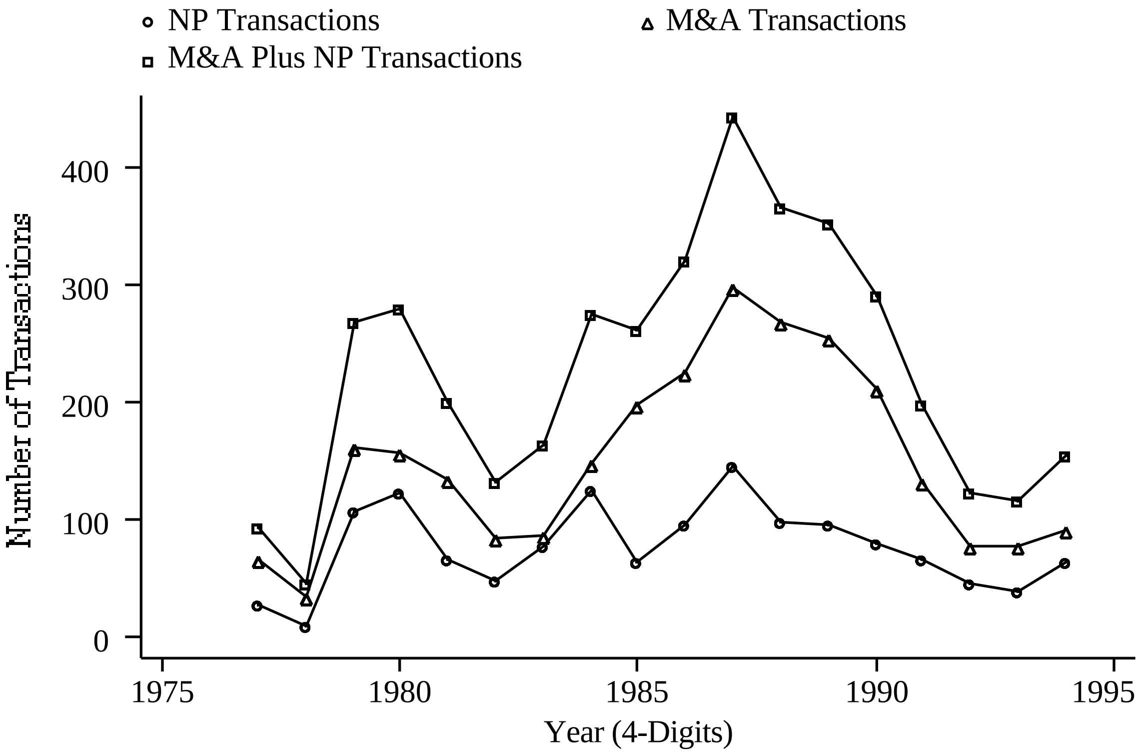
Notes: Skill premium is measured as the ratio of average annual wages of non-production workers to average annual wages of production workers in U.S. manufacturing. Employment share is the share of total U.S. manufacturing employment accounted for by foreign-owned affiliates operating in the United States.
Sources: Bureau of Economic Analysis and National Bureau of Economic Research.

Figure 2
Foreign-Affiliate Payroll, Capital, and Sales
in U.S. Manufacturing, 1977-1994



Notes: All activity shares are the share of total U.S. manufacturing activity accounted for by foreign-owned affiliates operating in the United States.
Sources: Bureau of Economic Analysis and National Bureau of Economic Research.

Figure 3
Inward FDI Transaction Counts
in U.S. Manufacturing, 1977-1994



Notes: "NP" transactions are new plants, "M&A" transactions are mergers & acquisitions.
Sources: International Trade Administration.

Table 1: Summary Statistics

Variable	Measure	Observations	Mean	Std. Dev.
Regressand				
U.S. NP Wage Bill / U.S. Wage Bill	Levels	1008	0.394	0.116
	First Diffs	952	0.003	0.011
	Long Diffs	56	0.047	0.042
Regressors				
ln (U.S. Plant / U.S. Shipments)	Levels	1008	-1.637	0.331
	First Diffs	952	-0.013	0.072
	Long Diffs	56	-0.221	0.433
ln (U.S. Equipment / U.S. Shipments)	Levels	1008	-1.388	0.483
	First Diffs	952	0.011	0.077
	Long Diffs	56	0.179	0.456
ln (U.S. Shipments)	Levels	1008	10.393	0.854
	First Diffs	952	0.019	0.075
	Long Diffs	56	0.315	0.611
Computer Investment / Total Investment	Levels	1008	0.044	0.043
	First Diffs	952	0.003	0.011
	Long Diffs	56	0.046	0.033
Affiliate Employment / U.S. Employment	Levels	864	0.127	0.178
	First Diffs	767	0.007	0.045
	Long Diffs	42	0.109	0.139
Affiliate Wage Bill / U.S. Wage Bill	Levels	859	0.163	0.217
	First Diffs	763	0.010	0.055
	Long Diffs	42	0.161	0.190
Affiliate Assets / U.S. Capital Stock	Levels	860	0.223	0.263
	First Diffs	763	0.022	0.080
	Long Diffs	37	0.379	0.368
Affiliate U.S. Shipments / U.S. Shipments	Levels	871	0.108	0.108
	First Diffs	773	0.007	0.039
	Long Diffs	42	0.115	0.114
Jap Affiliate Employment / U.S. Employment	Levels	112	0.009	0.013
	First Diffs	N.A.	N.A.	N.A.
	Long Diffs	56	0.013	0.015

Notes: All variables defined in the text. "First Diffs" are one-year differences, "Long Diffs" are full-sample differences (18 years for all variables except the Japanese variable, which is 10 years).
Sources: BEA, JEI, NBER, and U.S. Bureau of the Census.

Table 2: Skill-Upgrading Regressions:
BEA Data, Short Differences, 1977-1994

Regressor	Specification (1)	Specification (2)	Specification (3)	Specification (4)
Measure of FDI Activity	employment	wage bill	capital	shipments
Δ (FDI Activity)	-0.001	-0.002	0.004	-0.009
	(-0.100)	(-0.378)	(0.948)	(-0.915)
Computerization	0.024	0.025	0.028	0.026
	(2.299)	(2.345)	(2.522)	(2.424)
Δ ln (U.S. Plant / U.S. Ship)	0.098	0.096	0.097	0.094
	(4.727)	(4.601)	(4.588)	(4.572)
Δ ln (U.S. Equip / U.S. Ship)	0.009	0.008	0.009	0.010
	(1.189)	(1.087)	(1.145)	(1.250)
Δ ln (U.S. Shipments)	0.053	0.052	0.052	0.051
	(3.091)	(2.988)	(2.939)	(2.981)
Adjusted R-Squared	0.371	0.375	0.400	0.386
# Observations	767	763	763	773

Notes: Each specification is a variation of equation (2) in the text. In all cases the regressand is the change in skilled-labor's share of the wage bill, the wage regressor omitted, and capital disaggregated between plant and equipment. Reported t-statistics (in parentheses) are based on White robust standard errors.

Sources: BEA, U.S. Bureau of the Census, and NBER.

Table 3: Skill-Upgrading Regressions:
BEA Data, Long Differences, 1977-1994

Regressor	Specification (1)	Specification (2)	Specification (3)	Specification (4)
Measure of FDI Activity	employment	wage bill	capital	shipments
Δ (FDI Activity)	0.007	0.011	-0.001	0.076
	(0.134)	(0.303)	(-0.110)	(1.040)
Computerization	0.473	0.480	0.445	0.501
	(2.404)	(2.463)	(3.455)	(2.668)
Δ ln (U.S. Plant / U.S. Ship)	0.054	0.055	0.034	0.061
	(2.204)	(2.194)	(1.693)	(2.372)
Δ ln (U.S. Equip / U.S. Ship)	0.018	0.018	0.020	0.013
	(2.164)	(2.056)	(3.184)	(1.468)
Δ ln (U.S. Shipments)	0.045	0.045	0.016	0.046
	(2.231)	(2.210)	(3.455)	(2.668)
Adjusted R-Squared	0.537	0.538	0.584	0.561
# Observations	42	42	37	42

Notes: Each specification is a variation of equation (2) in the text. In all cases the regressand is the change in skilled-labor's share of the wage bill, the wage regressor omitted, and capital disaggregated between plant and equipment. Reported t-statistics (in parentheses) are based on White robust standard errors.
Sources: BEA, U.S. Bureau of the Census, and NBER.

Table 4: Skill-Upgrading Regressions:
BEA Data, Various Differences and Subperiods

Regressor	Specification (1)	Specification (2)	Specification (3)	Specification (4)
Δ (FDI Activity)	-0.004	-0.150	0.015	0.004
	(-0.323)	(-0.392)	(1.216)	(0.085)
Computerization	0.017	0.080	0.055	0.288
	(0.773)	(0.662)	(2.648)	(2.215)
Δ ln (U.S. Plant / U.S. Ship)	0.048	0.054	0.131	0.095
	(1.496)	(1.355)	(2.926)	(3.560)
Δ ln (U.S. Equip / U.S. Ship)	0.006	0.005	0.027	-0.001
	(0.865)	(1.190)	(0.885)	(-0.042)
Δ ln (U.S. Shipments)	-0.021	-0.006	0.092	0.072
	(-0.615)	(-0.229)	(3.336)	(3.535)
Time Period	1986-1991	1986-1991	1977-1985	1977-1985
Time Differences	Short	Long	Short	Long
Adjusted R-Squared	0.149	0.185	0.492	0.563
# Observations	219	47	346	40

Notes: Each specification is a variation of equation (2) in the text. In all cases the regressand is the change in skilled-labor's share of the wage bill, the FDI regressor is in terms of employment, the wage regressor omitted, and capital disaggregated between plant and equipment. Reported t-statistics (in parentheses) are based on White robust standard errors.

Sources: BEA, U.S. Bureau of the Census, and NBER.

Table 5: Skill-Upgrading Regressions:
BEA-ITA Data, Short Differences, 1977-1994

Regressor	Specification (1)	Specification (2)	Specification (3)	Specification (4)	Specification (5)
Type of Inward FDI	MA	JV	NP	PE	MA+NP+PE
Δ (FDI Activity)	0.001	-0.019	-0.009	-0.009	-0.001
	(0.068)	(-0.490)	(-0.462)	(-0.315)	(-0.124)
Computerization	0.023	0.023	0.023	0.023	0.023
	(2.074)	(2.089)	(2.047)	(2.071)	(2.071)
Δ ln (U.S. Plant / U.S. Ship)	0.102	0.101	0.102	0.102	0.102
	(4.671)	(4.675)	(4.669)	(4.676)	(4.676)
Δ ln (U.S. Equip / U.S. Ship)	0.009	0.009	0.009	0.009	0.009
	(1.123)	(1.140)	(1.131)	(1.128)	(1.128)
Δ ln (U.S. Shipments)	0.057	0.057	0.058	0.058	0.058
	(3.143)	(3.144)	(3.143)	(3.148)	(3.146)
Adjusted R-Squared	0.368	0.368	0.368	0.368	0.368
# Observations	678	678	678	678	678

Notes: Each specification is a variation of equation (2) in the text. In all cases the regressand is the change in skilled-labor's share of the wage bill, the BEA part of the FDI regressor is in terms of employment, the wage regressor omitted, and capital disaggregated between plant and equipment. Reported t-statistics (in parentheses) are based on White robust standard errors. "MA" refers to mergers and acquisitions, "JV" joint ventures, "NP" new plants, and "PE plant expansions."
Sources: BEA, ITA, U.S. Bureau of the Census, and NBER.

Table 6: Skill-Upgrading Regressions:
BEA-ITA Data, Long Differences, 1977-1994

Regressor	Specification (1)	Specification (2)	Specification (3)	Specification (4)	Specification (5)
Type of Inward FDI	MA	JV	NP	PE	MA+NP+PE
Δ (FDI Activity)	-0.170	0.117	0.045	0.123	0.007
	(0.098)	(0.218)	(0.230)	(0.499)	(0.121)
Computerization	0.461	0.476	0.479	0.492	0.472
	(2.375)	(2.475)	(2.359)	(2.512)	(2.397)
Δ ln (U.S. Plant / U.S. Ship)	0.054	0.056	0.054	0.055	0.054
	(2.204)	(2.149)	(2.198)	(2.203)	(2.207)
Δ ln (U.S. Equip / U.S. Ship)	0.020	0.018	0.019	0.018	0.018
	(2.152)	(2.131)	(2.033)	(1.997)	(2.168)
Δ ln (U.S. Shipments)	0.045	0.046	0.045	0.045	0.045
	(2.263)	(2.160)	(2.203)	(2.176)	(2.230)
Adjusted R-Squared	0.537	0.537	0.537	0.541	0.537
# Observations	42	42	42	42	42

Notes: Each specification is a variation of equation (2) in the text. In all cases the regressand is the change in skilled-labor's share of the wage bill, the BEA part of the FDI regressor is in terms of employment, the wage regressor omitted, and capital disaggregated between plant and equipment. Reported t-statistics (in parentheses) are based on White robust standard errors. "MA" refers to mergers and acquisitions, "JV" joint ventures, "NP" new plants, and "PE plant expansions."
Sources: BEA, ITA, U.S. Bureau of the Census, and NBER.

Table 7: Skill-Upgrading Regressions: JEI Data, Long Differences, 1980-1990

Regressor	Specification (1)	Specification (2)	Specification (3)
Type of Inward FDI	MA	NP	MA + NP
Δ (FDI Activity)	-0.003	-0.008	-0.007
	(-0.632)	(-3.285)	(-1.619)
Computerization	0.404	0.358	0.411
	(3.327)	(3.179)	(3.816)
Δ ln (U.S. Plant / U.S. Ship)	0.105	0.098	0.094
	(4.039)	(3.367)	(3.270)
Δ ln (U.S. Equip / U.S. Ship)	0.012	0.008	0.009
	(1.668)	(1.440)	(1.684)
Δ ln (U.S. Shipments)	0.061	0.056	0.052
	(3.248)	(2.793)	(2.691)
Adjusted R-Squared	0.660	0.686	0.672
# Observations	56	56	56

Notes: Each specification is a variation of equation (2) in the text. In all cases the regressand is the change in skilled-labor's share of the wage bill, the wage regressor omitted, and capital disaggregated between plant and equipment. Reported t-statistics (in parentheses) are based on White robust standard errors. "MA" refers to mergers and acquisitions, "NP" to new plants.
Sources: JEI, U.S. Bureau of the Census, and NBER.

Appendix Table: The 56 BEA Industries

BEA Industry Name	SIC Industries	BEA Industry Name	SIC Industries
Meat Products	201	Primary Metal Industries, Ferrous	331, 332, 339
Dairy Products	202	Primary Metal Industries, Nonferrous	333 - 336
Fruits & Vegetables	203	Containers, Forgings, & Stampings	341, 346
Grain Mill Products	204	Cutlery, Hand Tools, & Screws	342, 345
Bakery Products	205	Plumbing, Heating, & Structures	343, 344
Beverages	208	Misc. Metal Products	347 - 349
Misc. Food Products	206, 207, 209	Engines & Turbines	351
Tobacco Products	21	Farm & Garden Machinery	352
Textile Mill Products	22	Construction & Mining Machinery	353
Apparel Products	23	Metalworking Machinery	354
Lumber & Wood Products	24	Special Industry Machinery	355
Furniture & Fixtures	25	General Industrial Machinery	356
Pulp, Paper, & Board Mills	261, 262, 263, 266	Office & Computing Machinery	357
Paperboard & Misc. Paper Products	264, 265	Refrigeration & Service Machinery	358
Printing & Publishing	27	Misc. Machinery	359
Industrial Chemicals	281, 282, 286	Household Appliances	363
Drugs	283	Light & Wiring Equipment	364
Soap & Cleaners	284	Radio, TV, & Communication Prods	366
Agricultural Chemicals	287	Electronic Components	367
Paint & Misc. Chemical Products	285, 289	Misc. Electrical Products	369
Integrated Petroleum Products	291 part	Motor Vehicles & Equipment	371
Petroleum Refining	291 part	Other Transport Equipment	372-379
Petroleum and Coal Products	295, 299	Scientific & Measuring Instruments	381, 382
Rubber Products	301 - 306	Optical & Ophthalmic Goods	383, 385
Misc. Plastic Products	307	Medical Instruments & Supplies	384
Leather Products	31	Photographic Equipment & Supplies	386
Glass Products	321 - 323	Watches, Clocks, & Watchcases	387
Stone & Clay Products	324 - 329	Misc. Manufacturing Industries	39

Note: SIC Codes are for the Standard Industrial Classification, Revision 2 (1972)