

# THE EFFECT OF FOREIGN ACQUISITION ON EMPLOYMENT AND WAGES: EVIDENCE FROM FINNISH ESTABLISHMENTS

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*Abstract*—This paper examines the effect of foreign acquisition on wages and employment of different skill groups using panel data on Finnish establishments for 1988–2001. Exploiting the availability of a rich set of preacquisition controls, we use various regression and propensity-score matching methods. The results indicate that foreign acquisition has a positive effect on wages. The magnitude of this effect increases with the level of schooling of the workers. The wage increase is not immediate, but occurs within one to three years from the acquisition. The results also indicate that the acquisition decreases the share of highly educated workers in the plant's employment.

## I. Introduction

IN recent years, several studies have documented that foreign-owned firms tend to pay higher wages than domestically owned firms.<sup>1</sup> This finding has potentially important implications since the number of foreign-owned firms is growing in many countries, partly as a result of increased globalization. However, the direction of causality between foreign ownership and wages remains unclear. We do not know whether foreign investors acquire skill-intensive firms that pay high wages or whether foreign ownership, in itself, has a genuine positive effect on wages and the skill structure of firms. Moreover, little is known about the heterogeneity of the effect of foreign ownership on wages of workers in different skill groups.

In this paper, we use rich Finnish plant-level panel data with matched information on the worker characteristics of the plants to study the effect of foreign acquisition on employment and wages. This study aims at contributing to the literature in three ways. First of all, we argue that these data allow us to more carefully disentangle the direction of causality than what has been done in previous studies. In particular, we use various propensity-score matching methods in addition to more traditional regression techniques. The central idea in these methods is to base the estimation of the effects on a careful matching of cases and controls by a rich set of observable characteristics. Moreover, we combine the matching methods with a difference-in-differences method, as suggested by Heckman, Ichimura, and Todd (1997) to control for the possible bias that is due to selection on unobservables. Second, the matched information on

employee characteristics by skill groups makes it possible to disentangle the effect of foreign ownership on wages from its effects on the quality of the workforce. Furthermore, this information allows us to examine the heterogeneity of the effect of foreign acquisition on wages and employment. Third, the long timespan of our data, thirteen years, enables us to consider the effects of foreign acquisition in the long run. Hiring and firing costs may delay the effects of foreign acquisition. By looking at the effects of acquisition in several periods after it has taken place, these delays can be taken into account.

We believe Finland to be an interesting case study for the effects of foreign ownership. It is a typical example of a small open economy where foreign investment plays an important role. Furthermore, our data cover the years 1988–2001 when the share of foreign direct investments rose rapidly in Finland. This increase is depicted in figure 1 and it partly reflects the worldwide trend in foreign direct investment. But the years 1988–2001 were also characterized by two phenomena which undoubtedly led to the increase in the share of foreign-owned firms. First, Finland experienced a very severe recession in the early 1990s, and the recovery from this crisis was associated with a rapid restructuring of the economy and a growth of new industries; in particular, the export-oriented high-tech sector.<sup>2</sup> Second, Finland joined the European Union in 1995, which naturally removed a considerable number of barriers to foreign investment in the Finnish economy.

The results derived by both matching and regression methods indicate that foreign acquisition has a positive effect on wages in all skill groups. This wage increase is not immediate, but occurs within one to three years after the acquisition. The magnitude of this effect increases with the level of schooling of the workers. The results indicate that there is a small decrease in the share of highly educated workers after foreign acquisition. The decrease in the share of highly educated workers after acquisition also seems to hold for domestic acquisitions.

The paper is organized as follows: The next section briefly describes the theoretical background for the analysis and reviews some previous empirical findings. The third section describes the statistical framework and the fourth section presents the data sets. The results are provided in the fifth section. The last section concludes the paper.

## II. Background and Previous Evidence

There are several possible reasons why foreign-owned firms pay higher wages than domestically owned firms.

<sup>2</sup> See Honkapohja and Koskela (1999).

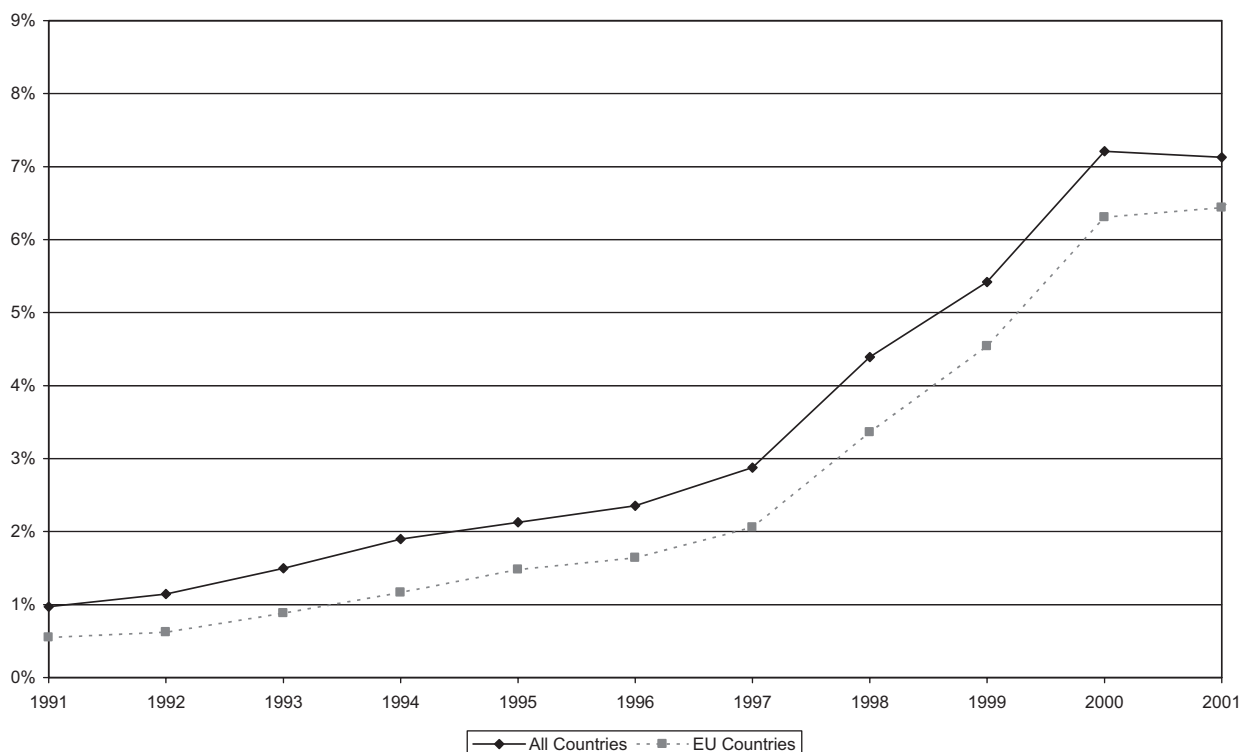
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<sup>1</sup> See, for example, Aitken, Harrison, and Lipsey (1996), Lipsey and Sjöholm (2003, 2004), and Conyon et al. (2002).

FIGURE 1.—FOREIGN DIRECT INVESTMENT IN FINLAND IN 1991–2001, PERCENTAGE SHARE OF THE TOTAL FINNISH CAPITAL STOCK



Notes: "All countries" is the percentage share of the total stock of foreign investment in Finland at the end of the year related to the total Finnish net capital stock. "EU Countries" is the share of investment from other European Union countries related to the total Finnish net capital stock.

First, foreign firms need to possess some firm-specific advantages, such as superior technology, to be able to compete with local firms.<sup>3</sup> These assets are assumed to raise the productivity of the firms. Assuming that workers can bargain over any generated surplus, higher productivity would be expected to generate a greater surplus and hence, higher wage rates.<sup>4</sup> Second, workers employed by the multinational enterprise acquire knowledge of the superior technology and can spread their knowledge to local firms by switching employers. Foreign-owned firms might pay higher wages to prevent workers from moving to a local competitor and creating a spillover of this superior knowledge (see Fosfuri, Motta, & Ronde, 2001). Third, the knowledge-based assets that foreign-owned firms are assumed to have require better-trained workers (see Görg, Strobl, & Walsh, 2002). Workers in foreign-owned firms are assumed to receive more training and, as a result, have steeper wage profiles than workers in domestic firms. Fourth, foreign firms might have size and communication problems as compared to domestic firms. They might seek peace in

industrial relations with higher wages (see, for example, Conyon et al., 2002).

The effect of foreign ownership on wages may vary with the worker's skill level. Since foreign-owned firms are more technologically advanced, a foreign acquisition can increase relative demand and wages for highly skilled workers. In addition, foreign acquisition is also assumed to be associated with reorganization of existing capacity and the introduction of new ideas within the new plants. The organizational change is expected to raise the wages of highly educated workers, since skills raise the ability to handle new information and reduce the costs of decentralization (see Bresnahan, Brynjolfsson, & Hitt, 2002). Highly educated workers have larger returns to training than low-educated workers,<sup>5</sup> which also implies that wages increase more for highly educated workers after acquisition. Finally, foreign-owned firms may apply compensation schemes from their home countries. Since Finland is a country with relatively low wage dispersion, a foreign acquisition may increase the wages of highly educated workers in the Finnish plants.

The effect of foreign ownership on the employment of different skill groups is ambiguous. Since foreign-owned firms are more technologically advanced and require better-trained workers, a foreign acquisition may increase the demand for highly educated workers. But acquisition can also reduce the employment of highly educated workers.

<sup>3</sup> Foreign firms operate against disadvantages such as inferior knowledge of local markets and tastes and inferior connections with local politicians and financial institutions; see, for example, Caves (1996), Markusen (1995), and Blonigen and Slaughter (2001).

<sup>4</sup> These assets are assumed to have a within-firm public good aspect, so they can be used across all firm plants. The higher productivity of the multinational parent can also result in higher wages in its foreign affiliates through international profit sharing; see Budd, Konings, and Slaughter (2005).

<sup>5</sup> See Altonji and Spletzer (1991).

Theories of ownership change suggest that acquisition, whether domestic or foreign, results in a reduction in administrative and managerial employment.<sup>6</sup> Takeovers are the most effective way for shareholders to get rid of non-value-maximizing managers, who may be protecting employees from dismissal. The group of employees that top executives may try hardest to protect is their immediate subordinates: managers and administrators.

There exists a growing body of literature that empirically examines the relationship between foreign ownership and wages. Among the first is the study by Aitken et al. (1996), which examines the relationship between wages and foreign investments in Mexico, Venezuela, and the United States using data at the industry-district level. They found that a higher level of foreign ownership in an industry and location were associated with higher wages in all these countries. Feliciano and Lipsey (1999) replicate the results of the significant positive wage premium of foreign ownership for the U.S., also using industry-regional-level data. Lipsey and Sjöholm (2004) use cross-section plant-level data from Indonesian manufacturing and find that foreign-owned firms pay higher wages even after controlling for plant characteristics, such as size, the educational level of the employees, industry, and location.

However, without establishment-level panel data, it is impossible to examine whether this finding is due to unobservable differences between domestically and foreign-owned plants, or whether the ownership status itself influences wages. Foreign-owned establishments might pay higher wages than domestically owned establishments, simply because foreign firms took over high-wage local establishments. Lipsey and Sjöholm (2003) attempt to deal with this problem by using panel data on Indonesian establishments. Their regression results without establishment fixed effects show that foreign-owned establishments paid 29% more for blue collar workers and 43% more for white collar workers than a domestically owned establishment with similar characteristics. If fixed effects were introduced, the differentials would be 10% and 21%.

Conyon et al. (2002) examine the wage effects of foreign acquisitions in the United Kingdom using establishment-level panel data for 1988–1994. They find that firms acquired by foreign companies pay on average 3.4% higher wages than domestic firms. However, when productivity is added to the control variables, this wage premium disappears. Almeida (2003) studies the effect of foreign acquisition on the wages and the skill composition of domestic firms in Portugal using firm-level panel data for 1991–1998. She finds that wages increase after the acquisition. The increase was highest for highly educated workers (13%), compared to that for medium- and low-educated ones (5% and 3%, respectively). Girma and Görg (2003) investigate the effects of foreign takeovers on domestic skilled and

unskilled wages, using establishment-level panel data for the United Kingdom. They find that skilled workers experience an increase in the wage rate following an acquisition by a U.S. firm, while no such effect is found following an acquisition by other nationalities. Martins (2004) examines the effect of foreign ownership on wages using matched worker-establishment panel data for Portugal from 1991 to 1999. Using OLS, he finds that foreign firms pay higher wages, even when firm and worker controls are added. However, the difference-in-differences regression and the matching analysis show that workers in foreign-acquired firms experience lower wage growth than those who were employed in firms that did not change their ownership status.

Studies that examine the effect of foreign acquisition on relative demand for different skill groups are much less numerous and the results are less clear. Blonigen and Slaughter (2001) examine the impact of inward FDI flows and foreign-affiliate presence on U.S. skill upgrading using industry-level data from 1977 to 1994. Their results suggest zero or negative correlation between foreign-affiliate activity and skill upgrading. Taylor and Driffield (2005) use a similar framework with industry-level panel data to examine the effect of foreign direct investment on wage inequality in the United Kingdom. They find that FDI has significantly contributed to the increase in the skilled wage bill share. Interestingly, the studies using establishment-level panel data seem to find either a negative or a zero effect of foreign ownership on demand for highly educated workers. Lipsey and Sjöholm (2003) find a decrease in the number of white collar workers and a strong increase in blue collar workers after takeovers in Indonesia. Almeida (2003) finds no significant changes in the skill composition of the workforce following a foreign acquisition for Portuguese establishments.

### III. Statistical Framework

The goal of this study is to examine the effect of foreign acquisition on the employment and wages of different skill groups in the acquired plants. The terminology is borrowed from the program evaluation literature. We define foreign acquisition as the “treatment,”  $D$ .  $D = 1$  denotes the treatment state, that is, the plant was acquired by a foreign firm, and  $D = 0$  denotes the nontreatment state, that is, the plant was not acquired by a foreign firm.  $Y(D)$  is the outcome associated with each state, for example wages and the employment share of different skill groups. The treatment group consists of plants that were acquired by a foreign firm and the control group consists of plants that remained domestically owned.

#### A. Regression Model

We begin by estimating the effect of foreign acquisition on the postacquisition outcome using a linear regression model. The regression model can be described as

<sup>6</sup> See Shleifer and Vishny (1988), and Lichtenberg and Siegel (1990).

$$Y_{i,t} = X_{i,t}\beta + \sum_{j=0}^2 D_{i,t-j}\delta_{j+1} + \alpha_i + \zeta_t + \mu_{i,t}, \quad (1)$$

where  $Y_{i,t}$  is the variable describing the outcome of plant  $i$  in period  $t$  (such as log wages or the employment share of different skill groups);  $X_{i,t}$  is a vector of the observable plant, industry, and local labor market characteristics;  $D_{i,t-j}$  are dummy variables indicating the plant's foreign ownership status at  $t - j$ ;  $\alpha_i$  is the plant fixed effect; and  $\zeta_t$  is the year dummy.

The reason for including dummies that describe the plant's ownership status in the previous years is that we want to examine how the effects of foreign acquisition evolve over time. There are several reasons why foreign acquisition may not affect wages and employment immediately after the acquisition. First, changes in average wages can be associated with changes in the employment composition of the plant's workforce. Since there are adjustment costs associated with these employment changes, they are not likely to be immediate. Second, the acquisition can involve organizational changes within the plant, and the implementation of new work practices might take time. Third, foreign firms do more on-the-job training and thus, the wage growth in foreign-owned firms is higher. This implies that wages in plants acquired by foreign-owned firms do not immediately increase, but they do within some years after the acquisition. Finally, due to possible measurement problems, the exact timing of the acquisition might be uncertain.

Following previous literature, we first estimate the model without the lagged ownership effects  $D_{i,t-1}$  and  $D_{i,t-2}$ . The estimated coefficient on the foreign ownership dummy,  $\delta_1$ , captures the average effect of foreign acquisition on the outcome in all postacquisition years. When the lagged effects are introduced, the  $\delta_1$  captures the effect of an acquisition that occurred within one year from the observation date. The effect of foreign acquisition for the plants that have remained foreign owned for at least three years is the sum  $\delta_1 + \delta_2 + \delta_3$ . The inclusion of the lag effects allows us to see whether the possible changes in wages and employment of acquired plants occur instantly or after some adjustment period.

### B. Matching Estimators

Next, we estimate the effect of foreign acquisition on employment and wages using different propensity-score matching methods. The central idea in matching methods is that the bias, which arises due to differences in the characteristics of the treatment and the control group, is reduced when the comparison of outcomes is performed using treated and control subjects who are as similar as possible in their observable characteristics,  $X$ . The propensity-score matching method (Rosenbaum & Rubin, 1983) proposes a

way of summarizing the vector of pretreatment characteristics,  $X$ , into a single-index variable.

We begin by estimating the propensity score,  $p(X)$ . In this study, the propensity score is the conditional probability for a plant of being acquired by a foreign firm. The binary-choice model that describes the probability of foreign acquisition for plant  $i$  is of the form

$$D_{it} = \begin{cases} 1 & \text{if } \beta X_{it-1} + \zeta_t + \gamma_j + \eta_r + \varepsilon_{it} > 0 \\ 0 & \text{otherwise} \end{cases}, \quad (2)$$

where  $D_{it}$  is a binary variable that defines the plant's acquisition status at year  $t$ .  $D = 1$  if a plant that was domestically owned in year  $t - 1$  is foreign owned in year  $t$ , and  $D = 0$  if a plant that was domestically owned in year  $t - 1$  is not foreign owned in year  $t$ .<sup>7</sup>  $X_{it-1}$  is a vector of factors that affect the plant's probability of being acquired by a foreign firm. Since the acquisition occurs between  $t$  and  $t - 1$ , we use the characteristics from period  $t - 1$  as the pretreatment variables. To control for unobservable common industry, region, and time effects, the model also includes a full set of controls for fixed industry ( $\gamma_j$ ), region ( $\eta_r$ ), and time effects ( $\zeta_t$ ).

The next step is to use the estimated propensity score to estimate the average effect of foreign acquisition.<sup>8</sup> The idea is to use the outcome of the nontreated observations (plants that remained domestically owned) with a similar propensity score to proxy, to observe what would have happened to treated observations (acquired plants) in the nontreatment situation. To control for the possible bias that is due to selection on unobservables, we compute the effect using the difference-in-differences matching estimator (Heckman et al., 1997). This estimator compares the difference in the outcome before and after the treatment of treated units with the difference in the outcome of the nontreated units in the same period.<sup>9</sup> It allows for the existence of unobserved time-invariant factors that affect the selection. The Average Effect of Treatment on Treated (ATT) for all types of difference-in-differences matching estimators can be written as

$$\widehat{ATT}(S) = \frac{1}{N_T} \sum_{i \in T \cap S_p} \left[ (Y(1)_{it} - Y(0)_{it-1}) - \sum_{j \in C \cap S_p} \omega_{ij} (Y(0)_{jt} - Y(0)_{jt-1}) \right], \quad (3)$$

<sup>7</sup> The sample used in matching analysis only consists of plants that were domestically owned in the first observation years, that is, before period  $t$ .

<sup>8</sup> This is after testing that the balancing property holds, in other words, whether observations with the same propensity score have the same distribution of observable characteristics independent of treatment status. We use an algorithm similar to that of Ichino and Becker (2002).

<sup>9</sup> Traditional cross-section matching estimator compares the level of the outcome of the treated units with the level of the outcome of the nontreated units with a similar propensity score.



where  $Y(1)_i$  is the treatment outcome for unit (plant)  $i$ ,  $Y(0)_j$  is the nontreatment outcome for unit  $j$  (comparison group outcome),  $t$  is the postacquisition time period and  $t - 1$  is the preacquisition time period,  $N_T$  is the number of units in the treatment group,  $T$ ,  $C$  denotes the set of control units,  $S_P$  denotes the region of common support,<sup>10</sup> and  $\omega_{ij}$  is the weight used to match control units with each treatment unit. We use two different methods to match the treatment and the control group observations. These methods differ in the weights,  $\omega_{ij}$ , they attach to members of the comparison group. In the nearest-neighbor matching method, the control unit  $C$  with the value of propensity score that is closest to the value of propensity score of the treated unit is selected as a match. The matching is done with replacement, that is, the same nearest control unit can be used many times (to be matched with several treatment units). The kernel matching estimator matches every treated unit with a weighted average of all control units with weights that are inversely proportional to the distance between treated and control units.

#### IV. Data

##### A. Description of the Data Sources

The main data source in this study is the Plant-Level Employment Statistics Data on Average Characteristics (PESA). It is longitudinal data on Finnish establishments, with linked information on worker characteristics aggregated on the establishment level by skill groups. The linked worker characteristics–establishment data are constructed by linking data on workers in the Employment Statistics database of Statistics Finland to data on plants of Business Registers and Industrial Statistics. The data set covers all private-sector establishments (except traffic and construction) with more than two workers in 1988–2001. The number of establishments is around 50,000 each year. Employees are aggregated into seventy different skill groups by education, age, and sex. The data contain information on aggregate worker characteristics for each skill group, such as the number of people, average monthly wage, general working experience, tenure, and education. The data set does not have any specific information on establishment characteristics. However, each enterprise and its plant have a unique identification code, which can be used to match additional information from other registers to the database.

Another major data source used in the analysis is the Longitudinal Data on Plants in Manufacturing (LDPM). For the period 1974–1994, it covers all manufacturing-sector plants with more than five workers, and for the period 1995–2001, it covers the plants of firms employing at least twenty individuals. The number of plants varies between 9,000 and 3,000 each year.

<sup>10</sup> This is the region where the treated and nontreated units have the same support of  $p(X)$ .

For the purpose of our analysis, we create a data set by linking the PESA data set with LDPM data. The linked data set covers manufacturing plants from the years 1988–2001. As the LDPM data set for the years 1995–2001 consists of only the plants of firms that employ at least twenty people, the number of observations per year is considerably smaller after 1994. To obtain a consistent data set, we thus restrict the sample to cover only the plants of firms that employ at least twenty workers. This sample consists of 46,290 plant-year observations.

The variables describing the employee characteristics are obtained from the PESA data set. All these variables are skill-group averages in the establishment. The main variables describing employee characteristics are monthly wage, employment, wage bill share, tenure, age, and education. Employment describes the number of workers in a skill group working in an establishment in the last week of the year. The average monthly wage is calculated as the skill group average of the average monthly wages of individual workers who were employed in the establishment in the last week of the year. The average monthly wage for each individual employed is calculated by dividing the wage income by months of employment. The monthly wage bill for each skill group is formed by multiplying the average monthly wage of the skill group by the number of workers in the skill group employed in the establishment during the last week of the year. Age is the average age of workers in the skill group employed in the establishment during the last week of the year. Average education is the average of the years of schooling for each skill group, and average tenure is the average of the months of tenure in the skill group.

Variables describing the plant characteristics, including the foreign ownership status, are from the LDPM data set. The variable defining foreign ownership status is created using the information on the share of foreign owners of the plant. An establishment is labeled as foreign owned if the share of foreign ownership is at least 20%.<sup>11</sup> The data also contain a unique code for the “owning firm.” This variable is used to identify domestic acquisitions. The other main establishment characteristics used in the analysis are sales, real value added, real capital stock, and exports.

We use two different samples in this analysis. In the basic regressions (described in section IIIA), we use all observations from the matched PESA-LDPM data for which we have information on the characteristics needed in regressions. These include information on the plant’s foreign ownership status in the current year and the two previous observation years. This sample consists of plants from the

<sup>11</sup> There are two main reasons for using the 20% threshold. First, most of the previous studies label the establishment as foreign owned if 10% or 20% of its ownership is foreign: see Blonigen and Slaughter (2001), Aitken et al. (1996), and Almeida (2003). Second, most (88%) of the plants in our data with at least 20% of foreign ownership have more than 50% foreign ownership. We use the 50% threshold for robustness checking.

TABLE 1.—NUMBER AND EMPLOYMENT OF FOREIGN-OWNED PLANTS IN THE SAMPLE OF FINNISH MANUFACTURING PLANTS IN 1989–2001

Year	Foreign-Owned Plants						
	All plants	All Foreign Owned		New Plants		Acquired Plants	
	Freq.	Freq.	%	Freq.	%	Freq.	%
Number of Plants							
1989	3,775	154	4.08	32	0.85	8	0.21
1990	3,941	173	4.39	27	0.69	20	0.51
1991	3,758	174	4.63	23	0.61	13	0.35
1992	3,390	148	4.37	13	0.38	15	0.44
1993	3,263	290	8.89	52	1.59	122	3.74
1994	3,364	323	9.60	33	0.98	44	1.31
1995	2,951	294	9.96	20	0.68	13	0.44
1996	2,994	298	9.95	18	0.60	19	0.63
1997	2,966	410	13.82	23	0.78	126	4.25
1998	3,036	467	15.38	47	1.55	122	4.02
1999	3,000	492	16.40	29	0.97	121	4.03
2000	3,016	469	15.55	47	1.56	27	0.90
2001	3,028	585	19.32	65	2.15	108	3.57
Employment							
1989	299,516	14,020	4.68	3,400	1.14	222	0.07
1990	313,516	17,708	5.65	1,492	0.48	3,757	1.20
1991	274,683	13,823	5.03	599	0.22	1,691	0.62
1992	255,073	10,597	4.15	577	0.23	1,389	0.54
1993	244,972	14,982	6.12	1,347	0.55	4,476	1.83
1994	257,383	19,720	7.66	1,524	0.59	3,669	1.43
1995	253,064	19,818	7.83	554	0.22	1,481	0.59
1996	255,878	21,063	8.23	1,036	0.40	3,120	1.22
1997	269,185	43,647	16.21	994	0.37	21,647	8.04
1998	275,450	40,728	14.79	2,051	0.74	11,118	4.04
1999	257,901	49,861	19.33	1,496	0.58	16,268	6.31
2000	263,745	50,370	19.10	2,068	0.78	3,964	1.50
2001	259,915	58,954	22.68	3,377	1.30	7,729	2.97

years 1990–2001. We use a different sample in the matching analysis. The construction of this sample is described below.

### B. Matching Sample Construction

The sample of plants that was used in the matching analysis in this article is constructed as follows. From the overall database, we first identify plants that we can observe in the data set in at least two consecutive years before the current year, and that were domestically owned in all years before the current year. We label the current year as period 1. The previous years are labeled as 0 and  $-1$ , and the following years as 2 and 3. These plants are divided into treatment and control groups. The treatment group is the plants that were acquired by foreign firms in the period between 0 and 1. The comparison group is the plants that remained domestically owned until period 3. All plants for which there is no information on all observational characteristics that are used in matching and regressions are removed from the sample. Since in matching we use information from two years before the acquisition, and examine the outcome until the third year after the acquisition, we can only use information on plants that we can observe for at least five consecutive years. The final matching sample consists of 14,441 observations and covers the years 1990–1999. The number of foreign-acquired plants is 284. The number of observations in the control group is 14,157.

## V. Results

### A. Descriptive Evidence

Table 1 reports the share of foreign-owned plants in the LDPM/PESA in 1989–2001 and the share of workers employed in foreign-owned plants in the data set. The share of foreign-owned plants has increased significantly in Finland during this period. While only around 4% of the plants were foreign owned in the late 1980s, the share in 2001 was 19%. Table 1 also shows to what extent this increase is due to takeovers of domestic plants by foreign firms (acquisitions), and to new plants started up by foreign firms, respectively. Most of the increase in the number of foreign-owned plants is due to acquisitions. The increase in the share in the employment of foreign-owned plants from 5% to 22% has been even more rapid than the increase in the number of plants. Acquisitions contribute to most of this increase.

Before presenting the matching and regression results, it is interesting to see whether there are significant differences between wages and other observable characteristics of foreign-owned and domestically owned plants in Finnish manufacturing. Table 2 reports the mean values of the main characteristics for the foreign-owned and domestically owned plants in the sample. The results imply that foreign-owned plants pay higher wages for both highly and low-educated

TABLE 2.—DESCRIPTIVE STATISTICS FOR THE SAMPLE

Variable	Domestically Owned		Foreign Owned		Difference	
	Obs.	Mean	Obs.	Mean	Mean	Stand. Err.
Plant size	37,297	90.37	3,866	101.91	11.55	3.02
Plant age	17,994	9.33	1,989	9.82	0.49	0.16
Wage	36,998	11,928	3,838	13,617	1,689	56
Wage low ed.	36,806	10,926	3,796	12,125	1,199	40
Wage highly ed.	34,666	15,093	3,587	17,076	1,983	76
Average schooling	36,998	11.56	3,838	11.81	0.25	0.02
Average tenure	36,998	10.53	3,838	11.70	14.11	1.04
Average age of employees	36,998	39.63	3,838	40.50	0.87	0.07
Share of highly educated	36,998	0.21	3,838	0.26	0.05	0.00
Share of high. ed. wage bill	36,998	0.26	3,838	0.32	0.06	0.00
Share of females	36,998	0.31	3,838	0.29	-0.02	0.00
Value added	37,248	654,483	3,858	738,789	84,306	51,320
Export share	35,085	0.20	3,660	0.27	0.07	0.02
R&D unit	37,297	0.00	3,866	0.01	0.00	0.00

workers than do domestically owned plants.<sup>12</sup> But foreign-owned plants also have other observable characteristics that can explain higher wages: they are larger, older, employ more skilled workers, and are more likely to export or have R&D activity. There is also a variation in the average employee characteristics of these plants. Foreign-owned plants employ workers who are older and who have more years of schooling and longer tenure.

Evidently, this does not tell us whether the foreign-owned plants were already different from the domestically owned plants before the acquisition occurred. Table 3 describes the differences in the observable characteristics of acquired and nonacquired plants from the preacquisition period. The sample consists of plants for which we can find information on observable characteristics two years before the possible acquisition and three years after the acquisition. The preacquisition periods are marked as -1, 0, and the postacquisition periods as 1, 2, and 3. The acquisition occurs between 0 and 1. The result shows that the plants that were acquired by foreign firms had characteristics which are associated with higher wages, even before the acquisition occurred. They are larger, have higher sales, have a larger share of exports from their total sales, and employ workers who are older and who have more schooling and longer tenure. In addition, they are more capital intensive and productive.

The next rows in table 3 report the differences in the four different outcome measures from the two periods preceding acquisition until the third year after acquisition. The outcome measures are (i) logarithm of average wage of low-educated workers in the plant, (ii) logarithm of average wage of highly educated workers in the plant, (iii) share of highly educated workers in employment, and (iv) share of highly educated workers in the total wage bill. The result shows that foreign-acquired plants pay higher wages for both highly and low-educated workers, even before the acquisition occurs. The difference in the wages increases

after acquisition and continues increasing until the third year after acquisition. The acquired plants also employ more highly educated workers before they become foreign owned. The difference remains after the acquisition, but decreases over time. The last rows report the number of highly and low-educated workers in different periods. The results show there to be a decrease in the number of workers in both skill groups at the time of the acquisition. However, employment in the acquired plants starts to increase in the second year after the acquisition.

#### B. Regression Results for the Whole Sample

As shown in table 2, foreign-owned plants in Finland pay higher wages than domestically owned plants, but also have other characteristics that are related to higher wages. Now, we ask whether foreign-owned plants pay higher wages given these characteristics, industry, and location. We begin our analysis by running an OLS regression on the wages of different skill groups. The results are reported in table 4. The first column (model 1) is an OLS specification, where we control for various plant and worker characteristics.<sup>13</sup> In addition, the specification includes controls for common time, region, and two-digit-industry effects. Consistent with previous studies, the pooled OLS result shows that foreign-owned plants pay higher wages even after controlling for plant and worker characteristics, and for industry, region, and common time effects. The foreign wage premium is higher for highly educated than for low-educated workers. Foreign-owned plants pay low-educated workers 3.6% more than domestically owned plants, while highly educated workers receive 5.2% higher wages at foreign-owned plants.

A regression analysis with a rich set of controls for plant and worker characteristics within regions and within industries is likely to eliminate some of the bias arising from the result of the possible selection of high-wage establishments for acquisition by foreign-owned firms. However, there may be some

<sup>12</sup> "Low educated" refers to people with basic, vocational, and lower secondary education. "Highly educated" refers to people with educational qualifications from colleges, polytechnics, or universities.

<sup>13</sup> The worker characteristics are skill-group averages at the plant level.

TABLE 3.—DIFFERENCE IN THE CHARACTERISTICS OF ACQUIRED AND NONACQUIRED PLANTS BEFORE AND AFTER ACQUISITION

Variable	Acquired Plants		Nonacquired Plants		Difference	
	Obs.	Mean	Obs.	Mean	Mean	Stand. Err.
Preacquisition characteristics (from $t = 0$ )						
Size_0	284	153.18	14,157	115.40	37.79	12.39
Log(sales)_0	284	9.50	14,157	8.91	0.59	0.08
K/L_0	259	216.67	12,682	145.09	71.57	113.03
Y/L_0	284	19,845	14,110	10,650	9,196	5,555
Export/sales_0	284	0.33	14,157	0.24	0.09	0.03
Average age_0	284	40.43	14,112	39.64	0.79	0.22
Average school_0	284	11.74	14,112	11.46	0.28	0.05
Average tenure_0	284	12.42	14,112	11.15	1.27	0.28
Wages of low-educated workers from $-1$ to $+3$						
Log. Wage low ed._1	282	9.33	14,127	9.25	0.08	0.01
Log. Wage low ed._0	280	9.34	14,083	9.27	0.07	0.01
Log. Wage low ed.1	284	9.36	14,127	9.28	0.08	0.01
Log. Wage low ed.2	284	9.42	14,126	9.30	0.11	0.01
Log. Wage low ed.3	284	9.42	14,116	9.32	0.10	0.01
Wages of highly educated workers from $-1$ to $+3$						
Log. Wage high ed._1	278	9.64	13,613	9.57	0.07	0.01
Log. Wage high ed._0	274	9.63	13,631	9.58	0.05	0.01
Log. Wage high ed.1	266	9.65	13,694	9.59	0.06	0.02
Log. Wage high ed.2	280	9.70	13,713	9.60	0.09	0.01
Log. Wage high ed.3	279	9.71	13,688	9.61	0.10	0.01
Share of highly educated workers in employment from $-1$ to $+3$						
Empl.share_1	284	0.23	14,157	0.19	0.04	0.01
Empl.share_0	283	0.24	14,112	0.20	0.05	0.01
Empl.share1	284	0.24	14,157	0.20	0.03	0.01
Empl.share2	284	0.24	14,157	0.21	0.03	0.01
Empl.share3	284	0.23	14,157	0.21	0.02	0.01
Share of highly educated workers in total wage bill from $-1$ to $+3$						
Wb.share_1	284	0.28	14,157	0.24	0.04	0.01
Wb.share_0	283	0.29	14,112	0.24	0.05	0.01
Wb.share1	284	0.29	14,157	0.25	0.04	0.01
Wb.share2	284	0.29	14,157	0.25	0.04	0.01
Wb.share3	284	0.28	14,157	0.26	0.03	0.01
Number of low-educated workers from $1$ to $+3$						
Number of low ed._1	284	127.36	14,157	90.85	36.51	9.54
Number of low ed._0	284	113.76	14,157	90.47	23.30	9.51
Number of low ed.1	284	110.70	14,157	89.64	21.06	9.42
Number of low ed.2	284	120.93	14,157	88.35	32.57	9.29
Number of low ed.3	284	121.05	14,157	87.40	33.65	9.22
Number of highly educated workers from $-1$ to $+3$						
Number of high. ed._1	284	41.54	14,157	23.95	17.59	3.41
Number of high. ed._0	284	39.42	14,157	24.93	14.49	3.65
Number of high. ed.1	284	38.87	14,157	25.82	13.05	3.92
Number of high. ed.2	284	41.35	14,157	26.45	14.90	4.22
Number of high. ed.3	284	41.27	14,157	26.92	14.35	4.41

Note: The sample consists of plants which were domestically owned in all observation years before period 1. Acquired plants became foreign owned between  $-0$  and  $1$ . Nonacquired plants remained domestically owned until period 3.

unmeasured characteristics associated with both high wages and foreign ownership that bias the results. To control for these characteristics, model 2 includes plant-specific fixed effects. When fixed effects are introduced, the foreign ownership wage premium is reduced to 1.3% for low-educated workers and 1.5% for highly educated workers.

The last columns in table 4 report the results for a specification that includes foreign ownership dummies for

the current period and the two previous periods. The results indicate that the average wages of low-educated workers had risen to 2.6% by the third postacquisition year, and by 3.7% for highly educated workers.

Table 5 reports the results of the effect of foreign ownership on the share of highly educated workers in the plant's employment and total wage bill. The results of the first specification indicate that foreign-owned plants employ



TABLE 4.—EFFECT OF FOREIGN OWNERSHIP ON AVERAGE WAGES

	Wages of Low-Educated Workers						Wages of Highly Educated Workers					
	Model 1		Model 2		Model 3		Model 1		Model 2		Model 3	
	Coef.	t-stat.	Coef.	t-stat.	Coef.	t-stat.	Coef.	t-stat.	Coef.	t-stat.	Coef.	t-stat.
Foreign	0.036	(11.32)	0.013	(4.14)	0.001	(0.31)	0.052	(12.19)	0.015	(2.28)	0.001	(0.12)
Foreign_1					0.021	(5.13)					0.014	(2.02)
Foreign_2					0.004	(1.10)					0.022	(3.39)
Plant size	0.000	(25.75)	0.000	(6.75)	0.000	(6.78)	0.000	(9.44)	0.000	(7.92)	0.000	(7.94)
Average school	0.472	(9.11)	0.471	(9.12)	0.466	(9.02)	1.594	(19.30)	1.044	(11.07)	1.052	(11.16)
(Av. school) <sup>2</sup>	-0.019	(-7.97)	-0.021	(-8.79)	-0.021	(-8.69)	-0.048	(-17.44)	-0.031	(-9.87)	-0.031	(-9.96)
Average age	0.022	(6.69)	0.021	(7.12)	0.020	(7.07)	0.061	(20.08)	0.044	(14.04)	0.044	(14.08)
(Av. age) <sup>2</sup>	-0.000	(-6.49)	-0.000	(-6.84)	-0.000	(-6.77)	-0.000	(-15.98)	-0.000	(-10.50)	-0.000	(-10.54)
Average tenure	0.000	(4.57)	0.000	(2.05)	0.000	(2.12)	0.001	(11.10)	0.001	(11.30)	0.001	(11.30)
(Av. tenure) <sup>2</sup>	0.000	(6.34)	0.000	(2.52)	0.000	(2.45)	-0.000	(-6.17)	-0.000	(-7.61)	-0.000	(-7.58)
Female-share	-0.264	(-56.33)	-0.144	(-13.62)	-0.145	(-13.75)	-0.130	(-20.66)	0.013	(0.69)	0.013	(0.66)
K/L	0.000	(3.66)	-0.000	(-2.93)	-0.000	(-2.90)	0.000	(1.34)	0.000	(1.06)	-0.000	(1.08)
Export-share	-0.004	(-1.32)	-0.000	(-0.16)	-0.000	(-0.12)	0.004	(1.05)	-0.008	(-1.67)	-0.008	(-1.62)
Constant	6.222	(22.02)	6.217	(22.83)	6.249	(22.96)	-4.815	(-7.71)	-0.210	(-0.30)	-0.273	(-0.39)
Time effects	Yes		Yes		Yes		Yes		Yes		Yes	
Industry effects	Yes		No		No		Yes		No		No	
Region effects	Yes		No		No		Yes		No		No	
Plant effects	No		Yes		Yes		No		Yes		Yes	
Number of obs.	22,216		22,216		22,216		21,320		21,320		21,320	
R-sq	0.471		0.848		0.849		0.431		0.744		0.745	

Note: The dependent variable is the logarithm of the average monthly wage of the skill group in the plant. Foreign is a dummy variable which indicates whether the plant is foreign owned in the current year. Foreign\_1 is a dummy variable which indicates whether the plant was foreign owned in the previous year, and Foreign\_2 is a dummy variable which indicates whether the plant was foreign owned two periods before. Schooling, age, and tenure are measured as averages in the skill group in the plant.

slightly more highly educated workers than do domestically owned plants, even after controlling for plant characteristics and for industry, region, and common time effects. The inclusion of the plant fixed effects reduces the coefficient on the foreign ownership dummy from 0.014 to 0.005 in the employment share equation, and from 0.018 to 0.005 in the wage bill share equation. The third model shows that the acquisition has no effect on the skill mix for plants that have remained foreign owned for at least three years.

### C. Results for the Matching Sample

The next important issue is whether the effect of foreign acquisition is heterogeneous with respect to observational

characteristics. If this is the case, we must ensure that a suitable comparison group exists. One way of addressing this problem is to use propensity-score matching methods. The central idea in matching methods is to base the estimation of the effects on a careful comparison of outcomes, using treated and control subjects who are as similar as possible on their observable characteristics. We use a rich set of worker, plant, and region characteristics from different preacquisition periods. To take into account the possible bias that is due to selection on unobservables, we combine the matching methods with a difference-in-differences method. Since we want to examine how the effect of foreign acquisition evolves over time, we need to have information

TABLE 5.—EFFECT OF FOREIGN OWNERSHIP ON SHARE OF HIGHLY EDUCATED WORKERS IN EMPLOYMENT/TOTAL WAGE BILL

	Share of Highly Educated Workers in Employment						Share of Highly Educated Workers in Wage Bill					
	Model 1		Model 2		Model 3		Model 1		Model 2		Model 3	
	Coef.	t-stat.	Coef.	t-stat.	Coef.	t-stat.	Coef.	t-stat.	Coef.	t-stat.	Coef.	t-stat.
Foreign	0.014	(4.43)	0.005	(2.14)	0.006	(2.03)	0.018	(5.29)	0.005	(2.11)	0.006	(1.94)
Foreign_1					0.003	(0.93)					0.003	(0.99)
Foreign_2					-0.006	(-1.96)					-0.006	(-1.87)
Log( $W_{\text{hed}}/W_{\text{led}}$ )	0.035	(7.83)	-0.011	(-3.24)	-0.011	(-3.22)	0.177	(36.68)	0.122	(32.56)	0.123	(32.57)
Log(K)	-0.018	(-20.15)	0.000	(0.24)	0.000	(0.23)	-0.018	(-18.78)	0.000	(0.10)	0.000	(0.09)
Log(Y)	0.001	(0.52)	-0.006	(-5.11)	-0.006	(-5.10)	-0.000	(-0.16)	-0.007	(-5.69)	-0.007	(-5.68)
Log(sales)	0.030	(19.08)	0.002	(1.65)	0.002	(1.65)	0.033	(19.45)	0.002	(1.80)	0.002	(1.79)
Export-share	0.020	(5.56)	0.004	(1.06)	0.004	(1.03)	0.022	(5.66)	0.004	(1.09)	0.004	(1.06)
Constant	-0.001	(-0.01)	0.243	(17.19)	0.243	(17.21)	-0.050	(-0.59)	0.261	(17.19)	0.261	(17.21)
Time effects	Yes		Yes		Yes		Yes		Yes		Yes	
Industry effects	Yes		No		No		Yes		No		No	
Region effects	Yes		No		No		Yes		No		No	
Plant effects	No		Yes		Yes		No		Yes		Yes	
Observations	20,424		20,424		20,424		20,424		20,424		20,424	
R-sq	0.194		0.852		0.852		0.238		0.862		0.862	

Note: The dependent variable is the employment or wage bill share of highly educated workers in a plant. Foreign is a dummy variable which indicates whether the plant is foreign owned in the current year. Foreign\_1 is a dummy variable which indicates whether the plant was foreign owned in the previous year, and Foreign\_2 is a dummy variable which indicates whether the plant was foreign owned two periods before.

TABLE 6.—PROBIT MODEL TO ESTIMATE THE PROPENSITY SCORE

Dependent Variable: Probability of Foreign Acquisition			
	Coef.	Std. Err.	$P > z$
Plant size_0	-0.001	0.000	0.035
(Plant size_0) <sup>2</sup>	0.000	0.000	0.229
Log(sales)_0	0.113	0.030	0.000
Export/sales_0	1.063	0.321	0.001
(Export/sales_0) <sup>2</sup>	-0.765	0.345	0.027
Industry exporter-share_0	-1.150	0.213	0.000
Industry foreign-share_0	1.632	0.272	0.000
Log( $Y^{\text{region}}$ )_0	0.014	0.029	0.621
Log(wage)_1	0.084	0.200	0.673
Average school_1	0.076	0.035	0.031
Average age_1	-0.018	0.013	0.163
Average tenure_1	0.104	0.028	0.000
(Average tenure_1) <sup>2</sup>	-0.002	0.001	0.027
Industry dummies	Yes		
Region dummies	Yes		
Year dummied	Yes		
Pseudo $R$ -square	0.151		
LR $\chi^2(31)$	423.41		
Observations	14,441	100.00	
Treated	284	1.97	
Control	14,157	98.03	

Note: The sample consists of plants which were domestically owned in all observation years before the possible acquisition. The explanatory variables are from preacquisition periods.  $_0$  at the end of the variable refers to the period just before the acquisition (0), and  $_1$  to the period one to two years before the acquisition (-1).

on the outcome variables from three postacquisition periods. These requirements mean that the sample that can be used in matching is considerably smaller, as described in section IVB. In this section, we report the regression and matching results for this matching sample.

The propensity score, the conditional probability of being acquired by a foreign firm, is estimated by a parametric probit model. The results of the probit estimations are presented in table 6. The dependent variable gets the value of 1 if the plant was acquired by a foreign firm between periods 0 and 1. The variables used to predict the probability of being acquired by a foreign firm, in other words pretreatment variables, are from the preacquisition periods 0 and -1. The preacquisition characteristics from period 0 include plant size (the number of employees), squared plant size, logarithm of total sales of the plant, the export/sales ratio and its square, the share of exporting plants in a two-digit industry, the share of foreign-owned plants in the two-digit industry, and total sales in the region (to control for the size of the market). The information from plant average characteristics is from period -1. These include the average wage of the plant's employees, average years of schooling of the plant's employees, average age of the plant's employees, average tenure of the plant's employees, and the square of average tenure.<sup>14</sup> In addition, the specification includes two-digit region controls, one-digit industry controls, and a full set of time dummies.

The estimation results indicate that plant size has a negative effect on the probability of being acquired by a

<sup>14</sup>  $_0$  at the end of the variable refers to the period just before acquisition (0), and  $_1$  to the period one to two years before acquisition (-1).

foreign firm, once the plant's total sales in the period are taken into account. The plant's sales have a significant positive impact on the acquisition probability. If the sales variable is excluded from the regression, the plant size variable gets a highly positive and significant coefficient. The plant's export/sales ratio is positively related to the acquisition probability. However, the share of exporting plants in an industry is negatively related to the acquisition probability, once the plant's own exports are taken into account. This might indicate that these industries have higher transport costs, and that firms are more likely to acquire plants directly from these industries rather than to decide to trade. The share of foreign-owned plants in the industry positively predicts the likelihood of being acquired. This is expected, since this variable might capture many unobservable industry-specific factors leading foreign firms to acquire plants from these industries. The variable describing sales in the region, that is, market size, gets a positive but insignificant coefficient. Next, we consider the effect of the plant's average employee characteristics on acquisition probability. Plants that pay high wages in period -1 are more likely to end up being foreign owned between 0 and 1. Moreover, plants with highly educated and long-tenure workers seem to be more attractive to foreign firms. Workers' average age decreases the probability of foreign acquisition.

Next, we estimate the effect of foreign acquisition using difference-in-differences matching methods based on the estimated propensity score. The first rows in table 7 show the effects of acquisition on the average wages of low- and highly educated workers in a plant in the period just following the acquisition,  $t = 1$ . The dependent variable is the difference in the logarithm of wages between the preacquisition period (0) and period 1. As a benchmark, we report the results from a regression in the first column, where the change in the logarithm of wages is regressed on all  $X$ s that are used to estimate the propensity score, and on a dummy that explains whether the plant is foreign owned. We impose the common support condition, that is we include only the observations in the region where the support of the propensity score overlaps for treatment and control group observations. The estimated effect of the foreign acquisition is 0.

The next two columns present the estimated effects of foreign acquisition on average wages, using nearest-neighbor and kernel matching estimators. While nearest-neighbor matching uses only those control group observations that are closest to treated units, kernel matching uses all control group observations, but weights each observation according to its distance from the treated unit.<sup>15</sup> The results

<sup>15</sup> We use the Gaussian kernel and the bandwidth 0.06. We have also tried other bandwidths, such as 0.01 and 0.02. The bandwidth choice did not have any significant effect on the difference-in-differences matching estimator.

TABLE 7.—EFFECT OF FOREIGN ACQUISITION ON AVERAGE WAGES IN DIFFERENT POSTACQUISITION YEARS: DIFFERENCE-IN-DIFFERENCES MATCHING RESULTS

Outcome:	Wages of Low-Educated Workers			Wages of Highly-Educated Workers		
	Regression (OLS)	Nearest-Neighbor	Kernel	Regression (OLS)	Nearest-Neighbor	Kernel
Log. average wage at $t = 1$						
ATT	0.000	-0.002	0.001	0.005	-0.002	0.005
$t$ -stat	(-0.08)	(-0.18)	(0.15)	(0.50)	(-0.14)	(0.34)
Log. average wage at $t = 2$						
ATT	0.042	0.043	0.043	0.032	0.026	0.033
$t$ -stat	(7.06)	(3.88)	(5.17)	(3.03)	(1.52)	(2.09)
Log. average wage at $t = 3$						
ATT	0.025	0.026	0.025	0.029	0.023	0.038
$t$ -stat	(4.04)	(2.30)	(3.25)	(2.60)	(1.41)	(2.70)
Obs. Treat/Contr.	13,867	280/268	280/13,637	13,271	261/248	261/12,504

Note: The dependent variable is the difference between the outcome (the logarithm of the average monthly wage of the skill group in the plant) in the year just before the possible acquisition (0) and in the different postacquisition years (1, 2, and 3). The explanatory variables in regressions are exactly the same as used to estimate the propensity score, which is used in the matching analysis. These are reported in table 6. A common support restriction is imposed in all regressions and matching. The  $t$ -statistics are reported in parentheses. For matching results we report the bootstrapped  $t$ -statistic.

TABLE 8.—EFFECT OF FOREIGN ACQUISITION ON SHARE OF HIGHLY EDUCATED WORKERS: DIFFERENCE-IN-DIFFERENCES MATCHING RESULTS

Outcome:	Share of Highly Educated Workers in Employment			Share of Highly Educated Workers in Wage Bill		
	Regression (OLS)	Nearest-Neighbor	Kernel	Regression (OLS)	Nearest-Neighbor	Kernel
Share at $t = 1$						
ATT	-0.011	-0.017	-0.012	-0.010	-0.017	-0.012
$t$ -stat	(-2.20)	(-1.88)	(-1.29)	(-2.07)	(-1.88)	(-1.59)
Share at $t = 2$						
ATT	-0.012	-0.023	-0.013	-0.010	-0.022	-0.012
$t$ -stat	(-2.30)	(-2.43)	(-1.88)	(-1.86)	(-2.31)	(-1.80)
Share at $t = 3$						
ATT	-0.023	-0.034	-0.025	-0.021	-0.032	-0.022
$t$ -stat	(-3.94)	(-3.26)	(-3.62)	(-3.43)	(-3.03)	(-2.68)
Obs. Treat/Cont.	13,972	283/264	283/13,671	13,972	283/264	283/13,671

Note: The dependent variable is the difference between the outcome (employment or wage bill share) in the year just before the possible acquisition (0) and in the different postacquisition years (1, 2, and 3). The explanatory variables in regressions are exactly the same as used to estimate the propensity score, which is used in the matching analysis. These are reported in table 6. A common support restriction is imposed in all regressions and matching. The  $t$ -statistics are reported in parentheses. For matching results we report the bootstrapped  $t$ -statistic.

indicate that the foreign acquisition has no effect on the wages in the period immediately following acquisition.<sup>16</sup>

Changes in employment and wages that are caused by foreign acquisition might not occur instantly. The next rows in table 7 report the effect on the wages in the second and third year following the acquisition. The difference-in-differences matching and regression indicate that the foreign acquisition has a positive and highly significant effect on the wages of low-educated workers in the second year after acquisition. The increase in wages is around 4%. When looking at the wages in the third year following the acquisition, the result remains robust, although the effect decreases a bit, to 2.5%.

The next columns report the results of the effect of foreign acquisition for highly educated workers. Both the matching and regression results indicate that the acquisition has no effect on wages in the year immediately after acquisition. In the second year after acquisition, the effect of foreign acquisition is significant and positive, varying between 2.6% and 3.3%. In the third year, the effect seems to be even stronger, varying between 2.3% and 3.8%. Thus, it

seems that foreign acquisition raises the wages of highly educated workers, but that this increase is not immediate.

Table 8 shows the results of the effect of the acquisition on the share of highly educated workers in the plant's employment and total wage bill. The results indicate that the foreign acquisition has a negative effect on the share of highly educated workers. Moreover, this effect is modest and does not become significant before the third year after the acquisition.

Next, we further investigate the heterogeneity of the wage effects by the educational level of workers. Table 9 reports the difference-in-differences matching results for the effect of foreign acquisition on wages of four different educational categories: basic, vocational, lower university, and higher university. The results show that the magnitude of the effect depends on the worker's educational level. There is a clear increase in the magnitude of the effect by the level of schooling of the workers. For workers with a basic education only, the wage increase is around 2%, while for workers with a higher-university degree, the effect is as high as 5%.

The matching results have shown there to be a clear increase in the wages and a slight decrease in the share of highly educated workers after a foreign acquisition. To verify the robustness of the evidence, we checked a number of issues. First, we ask whether the results reflect general

<sup>16</sup> We also estimated the effect using traditional cross-section matching methods. The results were qualitatively similar to the difference-in-differences matching results, but there was a larger variation in the magnitude of the effect between different estimators.

TABLE 9.—EFFECT OF FOREIGN ACQUISITION ON AVERAGE WAGES BY EDUCATIONAL CATEGORY: DIFFERENCE-IN-DIFFERENCES MATCHING RESULTS

Difference-in-Differences Matching/Regression Results:						
Education:	Regression (OLS)		Nearest-Neighbor Matching		Kernel Matching	
	ATT	<i>t</i> -stat	ATT	<i>t</i> -stat	ATT	<i>t</i> -stat
Basic education						
<i>T</i> = 1	−0.005	(−0.89)	−0.011	(−1.03)	−0.003	(−0.29)
<i>T</i> = 2	0.035	(5.19)	0.028	(2.68)	0.036	(4.02)
<i>T</i> = 3	0.023	(3.21)	0.022	(1.87)	0.021	(2.12)
Obs. Treat/Cont.	13,500		269/254		269/13,249	
Vocational education						
<i>T</i> = 1	0.003	(0.54)	−0.002	(−0.16)	0.005	(0.42)
<i>T</i> = 2	0.042	(6.61)	0.045	(3.67)	0.044	(3.55)
<i>T</i> = 3	0.025	(3.68)	0.022	(2.00)	0.025	(2.22)
Obs. Treat/Cont.	13,742		275/262		275/13,597	
Lower-university education						
<i>T</i> = 1	0.005	(0.49)	−0.001	(−0.08)	0.005	(0.38)
<i>T</i> = 2	0.032	(3.13)	0.022	(1.18)	0.035	(2.67)
<i>T</i> = 3	0.030	(2.78)	0.018	(1.03)	0.040	(2.99)
Obs. Treat/Cont.	13,145		259/248		259/12,450	
Higher-university education						
<i>T</i> = 1	0.032	(1.80)	−0.000	(−0.01)	0.030	(1.01)
<i>T</i> = 2	0.044	(2.22)	0.011	(0.31)	0.039	(1.29)
<i>T</i> = 3	0.055	(2.56)	0.045	(1.24)	0.054	(1.90)
Obs. Treat/Cont.	6,648		169/163		169/5,850	

Note: A common support restriction is imposed in all regressions and matching. The dependent variable is the pre- and postacquisition difference in the logarithm of the average earnings of the educational category in a plant. *T* = 1 refers to the difference between the preacquisition wages (period 0) and the wages in the period just after acquisition (1). *T* = 2 refers to the difference between the preacquisition wages and the wages in the period one to two years after acquisition (2). *T* = 3 refers to the difference between the preacquisition wages and the wages in the period two to three years after acquisition (3). The explanatory variables in regressions are exactly the same as used to estimate the propensity score, which is used in the matching analysis. These are reported in table 6. Common support restriction is imposed in all regressions and matching. The *t*-statistics are reported in parentheses. For matching results we report the bootstrapped *t*-statistic.

results for all acquisitions, not only for foreign acquisition. To check this, we estimated the effect of foreign acquisition using as a control group the plants that were domestically owned and that were acquired by domestic firms in the same period that the plants in the treatment category were acquired by foreign firms. Plants are classified as “domestic acquisitions” if they changed the “owning plant” code, but did not become “foreign owned.” The results are reported in

table 10 and indicate that foreign-acquired plants increased their wages significantly more than domestically acquired plants after acquisition. The increase in wages is even higher than when using all domestic plants as control groups. Thus, it seems that the increase in wages after foreign acquisition is not simply explained by the acquisition itself, but by the change in ownership from domestic to foreign. The results also indicate that there is no significant

TABLE 10.—EFFECT OF FOREIGN ACQUISITION USING DOMESTIC ACQUISITIONS AS CONTROL GROUP: DIFFERENCE-IN-DIFFERENCES MATCHING RESULTS

	Wages of Low-Educated Workers			Wages of Highly Educated Workers		
	OLS	Nearest	Kernel	OLS	Nearest	Kernel
Wage low ed. <i>t</i> = 1	0.016	0.009	0.017	0.022	0.028	0.005
	(0.93)	(0.32)	(0.71)	(0.85)	(0.62)	(0.14)
Wage low ed. <i>t</i> = 2	0.048	0.052	0.050	0.043	0.057	0.037
	(3.61)	(2.66)	(3.25)	(1.91)	(1.59)	(1.16)
Wage low ed. <i>t</i> = 3	0.028	0.036	0.031	0.043	0.075	0.040
	(2.07)	(1.65)	(1.80)	(1.86)	(1.99)	(1.16)
Num. of obs. treated/controls	846	278/130	278/555	803	259/125	259/533
	Share of Highly Educated Workers in Employment			Share of Highly Educated Workers in Wage Bill		
	OLS	Nearest	Kernel	OLS	Nearest	Kernel
Share at <i>t</i> = 1	−0.003	0.010	−0.006	−0.002	0.012	−0.006
	(−0.17)	(0.39)	(−0.35)	(−0.12)	(0.45)	(−0.40)
Share at <i>t</i> = 2	0.013	0.027	0.011	0.017	0.032	0.014
	(0.91)	(1.12)	(0.85)	(1.15)	(1.36)	(0.98)
Share at <i>t</i> = 3	−0.001	0.017	−0.002	0.003	0.027	0.002
	(−0.09)	(0.62)	(−0.15)	(0.22)	(0.99)	(0.13)
Num. of obs. treated/controls	866	281/133	281/576	866	281/133	281/576

Note: The table reports the difference-in-differences matching results of the effect of foreign acquisitions that occurs between periods *\_0* and 1. The control group is the plants that were acquired by domestic firms between periods *\_0* and 1. The propensity score is the estimated probability of a plant to be acquired by a foreign owner. The following control variables are included in the model from period *\_0*: plant size and its square, log sales, export share and its square, share of exporting plants in the industry, share of foreign owned plants in the industry, log total output of the local labor market. From period *\_1*: log average wage, average age of employees, average tenure and its square. The specification also includes dummies for year, industry, and region effects. A common support restriction is imposed in all regressions and matching. The *t*-statistics are reported in parentheses. For matching results we report the bootstrapped *t*-statistic.



difference in the change in the share of highly educated workers between domestic and foreign acquisitions. This reflects that the decrease in the share of highly educated workers is due to the acquisition, not to foreign ownership itself.

Second, we asked whether the effects of foreign acquisition cease after three periods. We examined the effect on the outcome four and five years after the acquisition. The results provided strong evidence that the effect on wages is very persistent. The effect on the wages of highly educated workers continued to increase. For low-educated workers, the effect remained similar. The effect on the skill mix decreased slightly.

Finally, we wanted to check whether the results are driven by small plants. That is, we estimated the wage regressions using the number of workers in the skill group as weights. The weighting decreased the foreign ownership wage premium, but the decrease was significantly bigger for low-educated workers. The premium for low-educated workers disappeared, which may indicate that the increase in wages of low-educated workers is driven by plants with a small number and share of low-educated workers. This, in turn, might reflect the fact that in plants with a larger share of highly educated workers, low-educated workers may also benefit from an increase in the wages of their coworkers.

## VI. Conclusions

This paper examines the effect of foreign acquisition on wages and employment of different skill groups using panel data on Finnish establishments for the years 1988–2001. Exploiting the availability of a rich set of preacquisition controls, we use various regression and propensity-score matching methods. Both regression and matching results indicate that foreign acquisition has a positive effect on wages. The magnitude of this effect increases with the level of schooling of the workers, which reflects that there is an increase in the wage dispersion after acquisition. The wage increase is not immediate, but occurs within one to three years from the acquisition. This is consistent with the view that acquisition can involve organizational changes within a plant, and that the implementation of new work practices might take time. Adjustment costs may also delay the effects of foreign acquisition. The higher wage growth in foreign-owned firms may be due to the fact that foreign firms do more on-the-job training. This also implies that there is no immediate wage increase, but that wages increase within some years after the acquisition. The results on the skill mix are less clear. While a regression model using the whole data indicates that foreign acquisition has no effect on the skill mix in the long run, a careful matching and regression analysis using the matching sample indicates that there is a small decrease in the share of highly educated workers after acquisition. The decrease in the share of highly educated

workers after acquisition also seems to hold for domestic acquisitions.

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