

WORKING PAPER 10-21



WP

Roger Bandick

Foreign Acquisition, Wages and Productivity

Department of Economics

ISBN 9788778825162 (print)

ISBN 9788778825179 (online)

Foreign Acquisition, Wages and Productivity^{*}

Roger Bandick[□]

*Institute of Business and Technology and Aarhus School of Business,
University of Aarhus, Denmark*

Abstract

This paper studies the effect of foreign acquisition on wages and total factor productivity (TFP) in the years following a takeover by using unique detailed firm-level data for Sweden for the period 1993-2002. The paper takes particular account of the potential endogeneity of the acquisition decision (for example due to “cherry picking”) by implementing an instrumental variable approach and propensity score matching with difference-in-difference estimation technique. Moreover, in line with recent literature on firm heterogeneity in international trade, this paper allows for the acquisition effect to differ depending on whether the targeted firms were domestic multinational or non-multinationals before the foreign takeover. This paper also allows for the acquisition effect to differ depending on whether the acquisition is horizontal or vertical. The result shows that foreign acquisition has no effects on overall, skilled or less-skilled wage growth neither in targeted Swedish MNEs nor in targeted Swedish non-MNEs and neither if the acquisition was motivated by vertical or horizontal motives. However, the results indicate that both targeted Swedish MNEs and non-MNEs have better growth in TFP after vertical foreign acquisition only but no such impact from horizontal foreign acquisition.

JEL Classification: F23, L23, J31

Keywords: heterogeneity, multinational enterprises, acquisitions, wage differentials, productivity, matching, difference-in-difference.

^{*} I would like to thank Pär Hansson for his support and valuable comments on an earlier draft. I would also like to thank David Greenaway, participants at the GEP research lunch meeting in Nottingham, ETSG annual conference in Rome, The CAED conference in Tokyo, Japan, the Aarhus-Kiel workshop, Kiel, Germany for very helpful comments. Financial support from Lars-Erik Thunholm’s Foundation and the Swedish Council for Working Life and Social Research (FAS) is gratefully acknowledged.

[□] E-mail: roger@hih.au.dk, rbandick@asb.dk. Address: Institute of Business and Technology, Aarhus University, Birk Centerpark 15, 7400 Herning, Denmark.

1. Introduction

In the last two decades, international mergers and acquisitions (M&A) have increased substantially worldwide and, as a result, the share of foreign ownership in the total population of firms has grown in many countries. This has partly emerged due to different incentive programs by the host countries to attract foreign direct investment (FDI).¹ From the point of view of the host country, the inward FDI may bring new technology and market access opportunities and thus strengthen the overall competitiveness in the economy. However, the growing importance of M&As has given rise to policy concerns due to the potential downside of foreign acquisition. It is frequently argued that foreign takeovers may have a detrimental effect on the targeted firms' performance since foreign multinationals (MNEs) are less rooted in the local economy and have the possibilities of relocating production among their affiliates in different countries.

In the light of the growing trends in international M&As, there are some important policy implications for governments worldwide to investigate the effects of foreign ownership on takeover targets performance. The objective of this paper is to study the effect of foreign acquisition on the target's performance in the years following a takeover. I use recent unique detailed firm-level data for Sweden to investigate the role of foreign ownership for wages and productivity growth in targeted firms.

Sweden is an interesting case to analyze in this context. Swedish authorities have implemented a number of political reforms to improve the business environment and, as a result, Sweden is one of the most internationally integrated and globalized economies in the world. However, it was not until 1995 in connection with the Swedish membership of the European Union (EU), that there was a substantial increase in foreign ownership². Ever since then, Sweden has witnessed a rapid increase of inward FDI, mainly through mergers and acquisitions. Well-known former Swedish owned firms, such as Astra, Pharmacia, Volvo Car and Saab Automobile, changed ownerships in the 1990s and are nowadays foreign-owned. At the beginning of the 2000s, the employment share in foreign-owned firms in manufacturing was among the highest in OECD.³

¹ Golub (2003).

² Malmberg and Sölvell (1998) stress that due to the Swedish membership of the EU, it has become more attractive to acquire Swedish firms.

³ As compared to 21 other OECD countries in 2002, only Ireland, Luxembourg and Hungary had larger employment shares than Sweden in foreign-owned firms in manufacturing (Hansson *et al.* 2007).

The increase in foreign ownership has given rise to mixed feelings in the Swedish public debate, similar to other countries experiencing high growth of inward FDI. Some fear that foreign acquisitions will lead to job losses in acquired firms since foreign owners are less committed to the host economy. It is frequently argued that, owing to their possibilities of relocating production and employment among their affiliates in different countries, multinationals are more “footloose” than domestic firms (e.g., Bernard and Sjöholm, 2003) and hence more quickly respond to adverse shocks than domestic firms. However, foreign acquisitions can strengthen the competitiveness of the acquired firms if they transfer technology, knowledge and skills to the acquired firms and, hence, contribute to an improvement in the target’s performance, e.g. higher productivity and wages.

From the theory on multinational enterprises (MNEs)⁴, there are strong suggestions that multinationals are more productive than other firms and also might pay higher wages than the predominant wage level. The reason is that MNEs are supposed to possess firm-specific assets – unique products and production processes or intangibles, such as trademarks or reputations for quality – that induce productivity and profitability gaps between MNEs and other firms. This idea builds upon the conjecture that doing business abroad entails higher costs and risks than operating on the domestic market; only the most productive and innovative firms will find it profitable to engage in foreign production.⁵ In addition, due to the firm-specific assets, MNEs have an opportunity to pay non-competitive wages, i.e. in MNEs there exist some rents to be shared. The efficiency wage literature then offers some economic reasons why such a behavior could be profitable and increase productivity: (i) minimization of turnover costs⁶ (ii) motivation on workers’ efforts, (iii) enhancement of workers’ loyalty, and (iv) selection of workers with high quality.⁷

By now there exists a large body of studies analyzing the relationship between foreign ownership and wages and productivity using panel data and the results are mixed. Conyon *et al.* (2002) examine wage and productivity effects of foreign acquisition using company-level panel data for

⁴ See the early contributions by e.g. Hymer (1960) and Dunning (1977). More recently, theories have been formalized and Markusen (2002) provides a thorough and synthesized survey of the modern models on MNEs.

⁵ According to Dunning (1977), Markusen, (2002) and Helpman *et al.* (2004), only firms with a high productivity choose to serve a foreign market and among these only the most productive will choose to establish affiliates abroad. Helpman *et al.* (2004) also provide evidence that MNEs have significant productivity advantages relative to non-MNEs.

⁶ It could be imagined that MNEs are particularly concerned about worker turnover when their firm-specific assets consist of proprietary technologies. Therefore, they may be willing to pay a wage premium to reduce the speed at which these technologies leak out to competitors as employees change jobs.

⁷ Stiglitz (1987) surveys the theoretical literature on efficiency wages.

UK manufacturing for the period 1988-1994. They find that wages and productivity increase after a foreign takeover of a domestic firm, controlling for firm size and fixed-firm and industry-specific effects.

Girma and Görg (2007) investigate the wage effect of foreign acquisitions using panel data of establishments in the UK food and electronics industries for the period 1981-1994. They apply difference-in-difference (DiD) propensity-score matching methods and find sizable, positive post-acquisition wage effects on skilled and unskilled labor following acquisitions by US firms, but no such impact from acquisitions by EU firms. By using the same data and estimation methods, Girma & Görg (2006) find positive productivity effects in foreign-acquired establishments only in the electronic industries.

Huttunen (2007) investigates the wage effect of foreign acquisitions using panel data on Finnish manufacturing establishments in the period 1988-2001, and her results indicate that foreign acquisitions have positive effects on wages. Martins (2004) and Heyman *et al.* (2007) are panel analyses of individual wages and both studies use DiD propensity-score matching methods. Heyman *et al.* (2007) find that the wage level is higher in firms targeted by foreigners than in non-acquired firms in the entire Swedish private sector. However, the wage growth in acquired firms is lower than in firms that do not become foreign-owned. Moreover, Martins (2004) shows wage growth to be lower in firms acquired by foreigners.

Bertrand and Zitouna (2005) and Ilmakunnas and Maliranta (2004) analyze the productivity effect of foreign takeovers in the manufacturing sector in France and Finland, respectively. Both studies find that M&As significantly improve productivity in the targeted firms. Salis (2008), however, finds no effect on productivity as a result of foreign acquisition in Slovenian manufacturing firms. Modén (1998) and Karpaty (2007) use a sample of Swedish manufacturing firms to analyze the productivity effect in targeted firms. Modén (1998) finds mixed results while Karpaty (2007) finds a positive difference in productivity between acquired and non-acquired firms.

I extend and improve upon these earlier papers in a number of ways. First, I focus on acquisition by foreign multinationals and use different econometric approaches to identify the causal effect of takeovers in post-acquisition periods. To this end, I first estimate a DiD regression model taking account of the potential endogeneity of the acquisition decision (for example due to “cherry picking”) by implementing an instrumental variable approach. As an alternative estimation strategy,

I use an extended version of the matched DiD method suggested by e.g. Blundell and Costas Dias (2000) by in the first step matching, on a yearly basis, the non-acquired and acquired firms with similar propensity score and in the next step estimate DiD on the matched sample⁸ Second, using the detailed and unique data for Sweden I am not only able to distinguish the differences in wages and productivity between foreign MNEs and local firms, but also to separate domestically owned firms into MNEs and non-MNEs. This is crucial since theoretical heterogeneous firm models in international trade (e.g. Helpman, 2006) predict that the decisive difference should be between MNEs and non-MNEs, i.e. between foreign and domestic MNEs on the one hand, and non-MNEs on the other. I therefore analyze whether the impact of foreign acquisition on wages and productivity differs between takeovers of Swedish MNEs and non-MNEs. Third, I also allow the foreign acquisition effect to differ depending on whether the acquisition is horizontal (i.e within the same industry) or vertical. To my knowledge, this has not been investigated in earlier studies.

To preview my results; I find, after controlling for possible endogeneity of the acquisition dummy and also controlling for a large number of firm specific characteristics, that foreign acquisition has no effect on overall, skilled or less-skilled wage growth in the post acquisition periods neither whether the acquisition is horizontal or vertical or whether the acquired firms were domestic MNEs or non-MNEs before the acquisition. However, I find positive productivity effect from vertical acquisition in targeted Swedish MNEs and non-MNEs, while I do not find evidence for an acquisition effect from horizontal takeovers.

The plan of the paper is as follows. Section 2 presents the data and it shows some descriptive statistics on foreign-owned firms, Swedish MNEs and non-MNEs to see to what extent they differ. It also illustrates the increased importance of foreign ownership in Swedish manufacturing in the 1990s. Section 3 outlines the analytical framework and the econometric specifications. Section 4 reports the empirical findings. Section 5 summarizes and concludes.

⁸ This methodology allows for different vectors of covariates x_t in the matching and in DiD estimations.

2. Data and description

The dataset I employ in this study is from Statistics Sweden (SCB) and the Swedish Institute for Growth Policy Studies (ITPS). The dataset includes information from financial accounts of enterprises and register-based labor statistics for all manufacturing firms with 20 employees and more and for the period 1993 to 2002. For each firm, I have information on sales, labor productivity, capital-labor ratio, employment (skilled and less-skilled)⁹ and various production inputs such as energy and intermediate costs. Moreover, I have information on firms' ownership status (foreign or domestic) and whether a domestic firm is MNE or not. A foreign-owned firm is defined as a firm where foreign investors possess more than 50 percent of the voting rights and a Swedish MNE is a domestically owned firm that is part of an enterprise group with at least one affiliate and one employee abroad.^{10,11} Using this information, I can separate the firms into foreign MNEs, domestic MNEs and domestic non-MNEs.¹² Moreover, by using the information on ownership status I can define foreign acquisition of a domestic MNE as a change in ownership indicator from a domestic MNE to foreign and foreign acquisition of a domestic non-MNE as a change in ownership indicator from a domestic non-MNE to foreign.¹³

The clear distinction into different ownership status before the foreign takeover is a distinct advantage of my data over the previous literature. This is an important dimension to the analysis since the acquisition effect on firm performance, i.e. on wages and productivity, may differ whether the target firms are multinational or not due to their ex-ante different characteristics as highlighted by, for example Helpman *et al.* (2004). Due to data limitation, not many studies that have investigated foreign acquisition have been able to take this into account.

⁹ Skilled labor is defined as employees with some post-secondary education.

¹⁰ This is the definition used in the official statistics on international enterprises from the Swedish Institute for Growth Policy Studies (ITPS) and I can identify Swedish MNEs by linking data from ITPS to the microeconomic data from Statistics Sweden (SCB).

¹¹ My definition of Swedish MNEs differs from, for example, Heyman *et al.* (2007). In their study, Swedish MNEs are firms that report positive exports to other firms within the corporation. Such a measure is obviously deficient since firms might be MNEs even though they are not exporting to their affiliates abroad.

¹² 1993 is the first year I can distinguish Swedish MNEs from non-MNEs and it explains why this analyze begins in 1993.

¹³ Firms that switch between domestic and foreign ownership more than once over the period are not included in the sample. Also, firms that disappear from the sample one year and reappear in later years are excluded.

Another issue that has not been investigated in the previous literature, mainly due to data availability, concerns the nature of the foreign acquisition and whether it is motivated by either horizontal (the acquired firms are within the same industry as the acquirer) or vertical motives. The effects of foreign acquisition on targets may be different depending on these two motives. If, for example, the aim of the horizontal acquisition is to eliminate competition and consolidate the industry, then it is likely that this may have a detrimental effect on the targeted firms' performance following takeover. On the other hand, if the aim of the horizontal acquisition is to create new markets by using the already existing facilities owned by other firm in the foreign markets, i.e., the acquirer intends to "grow by acquisition", then the acquirer may transfer technology and knowledge in order to improve the quality in the acquisition target. In this case, we would expect positive effect on the targets performance in the post-acquisition period. For the acquisition motivated by vertical motives, this is more likely to be the case since the motive of the acquisition is to acquire firms at different stages of the production process. It is then likely that the acquisition is done with a view to integrate the acquired firms into the multinational company structure which may lead to transfer of technology to improve or sustain quality.

In separating the foreign direct investment into horizontal and vertical I use the Swedish data and check the industry classification for the acquired firm before and after acquisition. If the two digit industry code remains constant, I define the acquisition as horizontal and if it changed, I define the acquisition as vertical. Using this definition I classify about 19 percent of all foreign acquisitions in my sample as vertical or non-horizontal.¹⁴

In the 1990s, many countries abolished or reduced their restrictions for foreigners to buy indigenous firms and as a result FDI increased substantially worldwide.¹⁵ During this period, Sweden also introduced a considerable amount of liberalization reforms and as a result, the increase in foreign ownership seems to have been more pronounced in Sweden than in other OECD countries.¹⁶ *Table 1* shows how the numbers of firms and the employment shares have

¹⁴ This is not an ideal measure by any means. In particular, it is likely that the vertical group includes both "true" vertical acquisitions of, say, supplier firms, but also conglomerate mergers where the target and acquirer are in unrelated industries. Unfortunately, I do not have sufficient information to establish industry linkages. Still, the measure allows me to compare horizontal and other types of acquisitions.

¹⁵ Golub (2003).

¹⁶ See Hansson *et al.* (2007). Other explanations put forward for the increased foreign ownership in Sweden in the 1990s are that there were more invitations to acquire Swedish firms after the EU accession, Swedish firms were cheap to buy due to the devaluation at the beginning of the 1990s and the Swedish tax system has favored foreign ownership.

developed among foreign MNEs, Swedish MNEs, and Swedish non-MNEs over the period 1993-2002. The employment share in foreign MNEs increased by almost 23 percent and their share of the firms increased by 6 percent. This trend seems to have evolved at the expense of Swedish MNEs since their employment share dropped by 19 percent and their share of firms has decreased by 5 percent. The employment and firm share for Swedish non-MNEs remained fairly constant over the period, however.

Table 1 here

During the 1990s, several large Swedish multinationals have become foreign-owned due to acquisitions by foreign MNEs, e.g. Pharmacia and Upjohn 1995, Saab Automobile and General Motors 1998, Astra and Zeneca 1999 and Ford and Volvo Car Corporation 1999. *Table 2* reports, by year, the frequencies of foreign acquisitions in the manufacturing sector for firms with at least 20 employees. The number of foreign acquisitions varies considerably between years, from 29 in 1998 to 95 in 2001. In total, there are 464 foreign acquisitions and most of them, around 76 percent, consist of non-MNEs acquired by a foreign MNE.

Table 2 here

Firms taken over by foreigners differ from non-target firms in many respects. *Table 3* points out differences in characteristics and performance between acquired and non-acquired firms before and after acquisition for all manufacturing firms with 20 employees or more. In columns (i), which describe the situation one year before the acquisition ($T = -1$), we can see that Swedish firms taken over by foreigners are larger, have higher sales, are more productive, are skill-intensive and have higher wages than their non-acquired counterparts. Furthermore, acquired firms seem to have a higher capital-labor ratio one year before the acquisition as compared to non-acquired firms. These results provide us with some evidence of “cherry-picking”, i.e. that firms with good characteristics and performance are more likely to be targeted for acquisitions by foreigners. From the other columns in *Table 3* which depict the pattern at the time of acquisition ($T = 0$) and after acquisition ($T > 0$), I infer that the differences between acquired and non-acquired firms appears to be persistent.

Table 3 here

Differences in characteristics and performance between acquired and non-acquired firms in the years before acquisition could bias the estimates of the causal effect of foreign acquisition. To overcome this problem, I use various methods: first, I estimate a regression model controlling for a large number of observable firm characteristics. Second, I estimate a growth rate regression with the implementation of instrumental variable approach using the predicted probability of being acquired as an instrument (see McGuckin and Nguyen, 2001). Third, as a robustness check, I use an extended version of the matched difference-in-difference (DiD) method suggested by e.g. Blundell and Costas Dias (2000).

3. The methodological framework

To come to grips with the direction of causality between foreign acquisition and wages and total factor productivity (TFP)¹⁷, I first estimate the following growth rate regression:

$$\begin{aligned} \Delta \ln y_{jt} = \ln y_{jt+s} - \ln y_{jt-1} = & \beta_0 + \beta_1 \ln y_{jt} + \beta_2 Acq_{jt} + \lambda_1 \Delta Firm_{jt} \\ & + \gamma_1 Industry + \gamma_2 Year_t + \varepsilon_{jt} \quad s \in \{3, 5\} \end{aligned} \quad (1)$$

where $\Delta \ln y_{jt}$ is growth in average wage (w) or TFP in firm j between time period $t-1$ and $t+s$; $s \in \{3, 5\}$. In some specifications, I divide average wage into skilled labor wage, (w_{jt}^s), and less-skilled labor wage (w_{jt}^u). Acq_{jt} is a dummy variable that takes the value of one if firm j is foreign-acquired at time t . $\Delta Firm_{jt}$ is a vector of growth rate of firm-specific characteristics, such as capital-labor ratio $\Delta \ln(K/L)$, shares of medium-skilled $\Delta(MS/L)$ and high-skilled labor $\Delta(HS/L)$, share of female workers $\Delta(Female/L)$ and size $\Delta \ln(employment)$.¹⁸ $Industry_{jt}$ is

¹⁷ TFP is calculated via the Levinsohn-Petrin (2003) method. I have also used TFP that is calculated by means of a non-parametric Divisia Törnqvist approach (see Karpaty, 2007) and value added per employee as different productivity measure. The results, not reported in this study but can be sent upon request, do not qualitatively change using different measure of productivity.

¹⁸ Employees with some post-secondary education are defined as skilled labor. Most likely, such a division into skilled and less-skilled labor is more appropriate than the one which is often used, e.g. in Doms and Jensen (1998), i.e. the non-production/production worker classification. In addition, I divide skilled labor into medium-skilled and high-skilled labor. Employees with a post-secondary education of three years or more are high-skilled labor and employees with a post-secondary education of less than three years are medium-skilled labor.

industry dummy variables¹⁹, $Year_t$ is time dummies, and ε_{jt} is an error term. The control groups in eq. (1) are firms that have not been acquired by foreign MNEs. β_2 then capture the differences in wages and productivity between acquired and non-acquired firms.

The acquisition dummy in equation (1) rests on the assumption that domestic firms taken over by foreign MNEs are randomly acquired. This assumption, as illustrated in *Table 3*, is a strong assumption. If foreign acquirers choose targets with a priori positive characteristics, a practice known as “cherry picking”, then the estimate of the casual effect of foreign acquisition will be biased. In order to control for the possible endogeneity of the acquisition dummy, I construct an instrumental variable as the probability of a firm being taken over by a foreign MNE. This instrumental variable is constructed as the predicted value of the dependent variable from a probit regression for the probability of a foreign takeover, similar to McGuckin and Nguyen (2001) and Conyon *et al.* (2002). The set of instruments, and the probit regression results, are reported in the Appendix.

As an alternative estimation strategy to control for the possible selection bias and to examine whether foreign-acquired firms enjoy a higher wage and productivity growth than non-acquired firms, I use a Difference-in-Difference (DiD) estimation technique on a selected sample that is generated using propensity score matching approach.²⁰

The DiD estimator compares the difference in wages/productivity of the acquired (treated) firms A in the period before ($t-1$) and in the period after ($t+s$) acquisition with our control group of non-acquired firms C . Formally, the parameter I want to estimate is $\lambda_{t+s} = (y_{t+s}^A - y_{t-1}^A) - (y_{t+s}^C - y_{t-1}^C)$ and it can be obtained by regressing data pooled across the treated firms and the firms in the control group:²¹

$$y_{jt-1,t+s} = \beta_0 + \beta_1 Acq_j + \beta_2 After_{t+s} + \beta_3 Acq_j \times After_{t+s} + \varepsilon \quad s \geq 0 \quad (2)$$

¹⁹ Industries are defined at the SNI92 3-digit level (99 industries).

²⁰ The method is frequently used in the evaluation literature on active labor market programs. Heckman *et al.* (1999) give a comprehensive overview of the labor economics literature. Becker and Ichino (2002) constitute a useful guide for handling matching with Stata.

²¹ See Woolridge (2002).

where $y_{jt-1,t+s}$ is my outcome variable (wages or TFP) in period $t-1$ to $t+s$. Acq_j is again a dummy variable taking the value of 1 for acquired (treated) firms, A , and 0 otherwise for non-acquired firms, C . It controls for constant differences in wages/productivity between target firms and firms in the control group before the acquisition. I define the dummy variable $After_{t+s}$ as taking the value of 1 in post-acquisition years $t+s$ and 0 before acquisition $t-1$. This dummy variable captures aggregate period effects that are common between the two groups A and C . Finally, the term $Acq_j \times After_{t+s}$ is an interaction term between Acq_j and $After_{t+s}$. Its coefficient β_3 represents the difference-in-difference (DiD) estimator of the effect of acquisition on the acquired (treated) firms A , i.e. $\beta_3 = y_{t+s}$. An advantage of the DiD estimator is that it eliminates unobserved time-invariant differences in wages/productivity between acquired and non-acquired firms. *Table 4* summarizes the interpretation of the coefficients in the regression in equation (2).

Table 4 here

The DiD is, however, not a valid estimator if the differences between acquired and non-acquired firms are very high in the years before the acquisition. To get a more accurate estimator, I use a sample where acquired firms (treated units) are matched together with similar firms that continue to be domestically owned (non-treated units). Here, the matched non-acquired firms approximate for the non-observed counterfactual event, i.e. what would on average have happened to the wages and productivity in acquired firms had they not been acquired by a foreign-owned firm.

The matched sample is constructed as pairing, on a yearly basis, acquired with non-acquired firms with similar pre-acquisition characteristics X , e.g. skill intensity, age, size etc.²² The method I adapt is a propensity score matching due to Rosenbaum and Rubin (1983). This technique has the advantage of summarizing all observables X into a single index variable. To implement a propensity score matching, I begin by estimating the probability (or propensity score) of being acquired by a foreign firm using the same probit model as in the instrumental variable approach.

²² This description of the essentials in matching techniques draws heavily on Bandick and Karpaty (2008).

Once the propensity scores are calculated, I can (by using the “calliper” matching method) select the nearest control firms in which the propensity score falls within a pre-specified radius as a match for an acquired firm.²³ Moreover, I check whether the balancing condition is verified, that is each independent variable does not differ significantly between acquired and non-acquired firms.

Another condition that must be fulfilled in the matching procedure is the so-called common support condition. This criterion implies that at each point in time, a newly acquired firm is matched with non-acquired firms with propensity scores only slightly larger or smaller than the target firm.²⁴ Furthermore, since my purpose is to study post-acquisition dynamics in wages and productivity, I only include firms that remain at least five years in the panel.²⁵

Since the aim of the matching is to find a group of acquired and non-acquired firms with similar characteristics, I once more report, in *Table A2*, mean variable differences between the groups of firms that were successfully matched. Regarding to factor intensities and to firm size in terms of employment and sales, the matching procedure has been successful in reducing the difference between acquired and non-acquired firms. However, there are still significant differences in wages and total factor productivity. Hence, in the estimation of the DiD I control for a vector of firm characteristics to control for differences in observable attributes between firms. Moreover, to take the remaining differences into account I estimate equation (2) with a firm-fixed effect (FE) model.

4. Empirical results

4.1 The result of the growth rate model

The results based on the alternative way of generating the instrument for the acquisition dummies, Acq_{jt} , in equation (1) are reported in *Table 5*, models (1) to (3). In all estimates, I control

²³ The procedure I utilize to match treated (acquired) firms with control (non-acquired) firms is the PSMATCH2 routine in Stata version 9 described in Leuven and Sianesi (2003). In the analysis, the pre-specified radius is set to 0.01.

²⁴ Note that some acquired firms may be matched with more than one non-acquired firm, while acquired firms not matched with a non-acquired firm are excluded.

²⁵ Moreover, firms that switch back and forth between different ownership status and greenfield operations are excluded.

for changes in firm-specific characteristics similar to those included in equation (1).²⁶ To get a rough indicator of whether or not the assumption of exogeneity holds, I use a standard Hausman test. These tests, not reported in the table but available upon request, provide evidence that in all cases we can reject the assumption of exogeneity of the acquisition dummy.

In the first estimation, the results of estimating equation (1) for the period $t-1$ and $t+3$ are reported. In the first three columns the dependent variable is growth in overall wage. In columns (iv) to (vi) the dependent variable is growth in skilled wage and in columns (vii) to (ix) the dependent variable is growth in less-skilled wage. Model (1) uses the instrument generated from the probit regression described in the Appendix, *Table A1*, column (i). The result indicates that three years after the acquisition, the wage growth, especially for skilled labor increased more in acquired firms than in non-acquired firms. On average, the growth in overall wage, column (i), is 0.8 percent higher in acquired firms after the takeover relative to non-acquired firms and the corresponding figure for skilled wage growth, column (iv), is 1.9 percent. However, for the less-skilled wage growth, column (vii), there seems to be no impact of foreign acquisitions three years after the acquisition.

In models (2) and (3), the findings are based on alternative definitions of the instrumental variable. Model (2) uses the instrument generated in *Table A1*, column (ii), and the result for the overall, skilled and less-skilled wage growth are similar to those reported in model (1). In model (3), however, which uses the instrument generated in *Table A1*, column (iii), there seems to be no impact of foreign acquisitions on the wage growth.

In the last three columns of *Table 5* I report the result from estimating equation (1) having growth in TFP as dependent variable. The estimations in all three models are positive and highly significant which suggest that foreign acquisition have had a positive effect on total factor productivity in the years following acquisition. Depending on the alternative IV models, the difference in productivity growth between acquired and non-acquired firms is between 3 and 9 percent three years after the acquisition.

²⁶ Note that, in order to get accurate standard errors for the estimators using generated IV I compute bootstrapped standard errors.

In the next estimation I examine the growth rate for the period $t-1$ and $t+5$. From these estimations I infer that up to five year after the acquisition, acquired and non-acquired firms have had same development in overall, skilled and less-skilled wages. As to the result for the productivity growth, it seems that foreign acquisition has lead to increase the productivity by roughly 2 to 4 percent for the acquired firms five years after the acquisition.

To allow for different impacts of foreign acquisitions on wages/productivity depending on whether a Swedish MNE or Swedish non-MNE is acquired, I add in equation (1) interaction variables, $SMNE \times Acq_j$ and $NonMNE \times Acq_j$. The first interaction variable captures the DiD between acquired Swedish MNEs and non-acquired firms while the second interaction variable captures the DiD between acquired non-MNEs and non-acquired firms. Also to allow the acquisition effect to differ for horizontal and vertical acquisition in equation (1), I add an interaction variable between a dummy for horizontal acquisitions and the foreign acquisition dummies and similar for vertical acquisitions.

The results of estimating equation (1) with these modifications are reported in *Table 5*, estimation (3) and (4). Again the results are based on alternative IV models. I use similar probit models as in the basic model of equation (1) to generate the IV for the dummies *vertical acquired Swedish MNEs*, *vertical acquired Swedish non-MNEs*, *horizontal acquired Swedish MNEs* and *horizontal acquired Swedish non-MNEs*. Estimation (3) reports the result for the period $t-1$ and $t+3$ and estimation (4) reports the result for the period $t-1$ and $t+5$. From these two estimations I find no impact from foreign acquisition on the wage growth neither in targeted Swedish MNEs or non-MNEs and neither if the acquisition was motivated by vertical or horizontal motives. The results, however, indicate that both targeted Swedish MNEs and non-MNEs have better growth in TFP after vertical foreign acquisition only but no such impact from horizontal foreign acquisition. Based on the first IV model in column (x), a vertical foreign acquisition leads to an improvement in TFP growth by 3.5 percent for targeted Swedish MNEs after three years and 2.7 percent after five years. The corresponding figures for targeted Swedish non-MNEs are 3.1 percent after three years and 1.1 percent after five years.

Table 5 here

4.2 Difference-in-difference matching results

For a further robustness check, I first implement a propensity score matching procedure to generate a sample of acquired and non-acquired firms which can serve as a valid counterfactual. I then estimate equation (2) on this matched sample, similar to Greenaway and Kneller (2007). Once again I extend the basic model of equation (2) to allow for different acquisition impact depending on the ownership statuses of the takeover targets before the foreign acquisition and also depending on whether the acquisition was motivated by either vertical or horizontal motives. To do so, I replace the dummy variable Acq_{jt} in equation (2) with four dummy variables, *vertical acquired Swedish MNEs*, *vertical acquired Swedish non-MNEs*, *horizontal acquired Swedish MNEs* and *horizontal acquired Swedish non-MNEs*. Moreover, to investigate the dynamic pattern of the post-acquisition wage and productivity effect, I replace the four interaction variables for the whole post-acquisition period with year-by-year interaction variables. Furthermore, since the matching procedure did not reduce all the differences between acquired and non-acquired (matched) firms, as shown in *Table A2*, I estimate the modified equation (2) with a firm-fixed effect model and control for a vector of firm characteristics such as capital-labor ratio, share of female workers, high-skill intensity and firm size. *Table 6* reports the results.

The matched sample in model (1) (column (i), (iv) (vii) and (ix)) is generated using the probit model described in the Appendix, *Table A1*, column (i) and the matched sample in model (2) and (3) are generated using the probit model in *Table A1* column (ii) and (iii), respectively. The DiD estimators indicate that foreign acquisition have had, three and five years after acquisition, no effects on wages in acquired firms (Swedish MNEs and non-MNEs). The results appear to be robust depending on whether the foreign acquisition was motivated by vertical or horizontal motives.

The results of the productivity effect in the post-acquisition years are reported in the three last columns of *Table 6*. The result indicates that vertical foreign acquisitions have had a positive effect on productivity growth in the years following takeovers. Three years after the acquisition the productivity in targeted Swedish MNEs and non-MNEs seems to have grown by almost 3 and 2 percent more as compared to non-acquired firms. The productivity seems also to continue to grow five years after the acquisition. The difference in productivity growth between acquired and non-acquired firms is between 1 and 2 percent five years after the acquisition. There is however no

significant impact on productivity from horizontal foreign acquisition, neither in targeted Swedish MNEs or in targeted Swedish non-MNEs.

Table 8 here

5. Conclusions

This paper has studied the effect of foreign acquisition on wages and productivity in the years following a takeover by using unique detailed firm-level data for the Swedish manufacturing during the 1990s. The distinct advantage of my data over the previous literature is that I can categorize all the domestic firms into being domestic multinationals with affiliates abroad or domestic non-multinationals. This means that I can allow the acquisition effect to differ depending on whether the targeted firms were domestic multinationals or non-multinationals before the foreign takeover. This is an important dimension since the acquisition effect on firm performance may differ whether the target firms are multinational or not due to their *ex-ante* different characteristics as highlighted by, for example Helpman *et al.* (2004). Another distinct advantage of my data is that I can separate the foreign acquisition into being either horizontal or vertical acquisition. This means that I'm able to separate the effects of foreign acquisition on targets depending on these two motives.

The results indicate that these two distinctions are indeed important. Foreign acquisitions seems to have no effects on wages neither in targeted Swedish MNEs or in Swedish non-MNEs and neither if the acquisition was motivated by vertical or horizontal motives. However, the results indicate that both targeted Swedish MNEs and non-MNEs have better growth in TFP after vertical foreign acquisition only but no such impact from horizontal foreign acquisition.

Based on these findings, there are important implications of this study. Firstly, the result gives no support to the strong fears that foreign acquisitions may have a detrimental effect on the targeted firms' performance. If anything, a foreign acquisition appears to have positive or neutral effects on wage and productivity growth. Secondly, it is important to consider heterogeneity in the acquisition impact, either by separating the different targets or by separating the acquisition motives, since not all firms benefit equally from foreign takeovers and not all the acquisition motives have the same effects.

References

- [1] Bandick, R. and Karpaty, P. (2008), Foreign acquisition and employment effects in Swedish manufacturing. Chapter 2 in Bandick, R. (2008), *Multinationals, employment and wages. Microeconomic evidence from Swedish manufacturing*. Örebro Studies in Economics.
- [2] Becker, S. and Ichino, A. (2002), Estimation of average treatment effects based on propensity scores. *The Stata Journal*, 2, 358-377.
- [3] Bernard, A. and Sjöholm, F. (2003), 'Foreign owners and plant survival', *NBER working paper 10039*.
- [4] Betrand, O. and Zitouna, H. (2005), Domestic versus Cross-Border Acquisitions: Which Impact on the Target Firms Performance? *Applied Economics*, Taylor and Francis Journals, vol. 40(17).
- [5] Blundell, R. and Costas Dias, M. (2000), Evaluation methods for non-experimental data. *Fiscal Studies*, 21, 427-468.
- [6] Conyon, M., Girma, S., Thomson, S. and Wright, P. (2002), The productivity and wage effects of foreign acquisition in the United Kingdom. *Journal of Industrial Economics*, 50, 85-102.
- [7] Doms, M. and Jensen, B. (1998), Comparing wages, skills, and productivity between domestically and foreign-owned manufacturing establishments in the United States, in Baldwin, R, Lipsey, R. and Richardson, D. (1998), *Comparing wages, skills, and productivity between domestically and foreign-owned manufacturing establishments in the United States*. Chicago: University of Chicago press.
- [8] Dunning, J. (1977), Trade, location of economic activity and the MNE: A search for an eclectic approach, in Ohlin, B, Hesselborn, P-O. and Wijkman, P-M. (eds.), *The international allocation of economic activity*. London: Macmillan.
- [9] Girma, S. and Görg H. (2006). 'Multinationals' productivity advantage: Scale or technology?' mimeo, University of Nottingham.
- [10] Girma, S. and Görg H. (2007), Evaluating the foreign ownership wage premium using difference-in-differences matching approach. *Journal of International Economics*, 72, 97-112.
- [11] Golub, S. (2003), 'Measures of restrictions of inward foreign direct investment for OECD countries', *OECD Economic Studies*, 36, 86-116.
- [12] Greenaway, D. and R. Kneller (2007), Firm heterogeneity, exporting and foreign direct investment', *The Economic Journal* . Vol. 117, Issue 517, pp. F134-161.
- [13] Hansson, P., Karpaty, P., Lindvert, M., Lundberg, L., Poldahl, A. and Yun, L. (2007), 'Svenskt näringsliv i en globaliserad värld (Swedish business sector in a globalized world) ', ITPS A2007:004.

- [14] Heckman, J., LaLonde, R. and Smith, J. (1999), The economics and econometrics of active labor market programs, in Ashenfelter, O. and Card, D. (eds.), *Handbook of labor economics*. Volume 3A. Amsterdam: North-Holland.
- [15] Helpman, E. (2006), Trade, FDI, and the organization of firms, *Journal of Economic Literature*, 94, 589-630.
- [16] Helpman, E., Melitz, M. and Yeaple, S. (2004), Export versus FDI with heterogeneous firms. *American Economic Review*, 94, 300-316.
- [17] Heyman, F., Sjöholm, F. and Gustavsson Tingvall, P. (2007), Is there really a foreign ownership wage premium. *Journal of International Economics*, 73, 355-376.
- [18] Huttunen, K. (2007), The effect of foreign acquisition on employment and wages: Evidence from Finnish establishments. *Review of Economics and Statistics*, 89, 497-509.
- [19] Hymer, S. (1960), The international operations of national firms: A study of direct investment. MIT Ph.D. thesis, published 1976, Cambridge: MIT press.
- [20] Ilmakunnas, P. and Maliranta, M. (2004), Foreign Medicine: A Treatment Effect Analysis of the Productivity Effects of Foreign Ownership.. *Journal of Applied Economics Quarterly*, Vol. 50 No. 1 (2004).
- [21] Karpaty, P. (2007) Productivity Effects of Foreign Acquisitions in Swedish Manufacturing: The FDI Productivity Issue Revisited. *International Journal of the Economics of Business*, vol 14(2).
- [22] Levinsohn, J. and Petrin, A. (2003), Estimating Production Functions Using Inputs to Control for Unobservables. *Review of Economic Studies*, Vol. 70(2), No. 243.
- [23] Leuven, E. and Sianesi, B. (2003), PSMATCH2: Stata module to perform full Mahalanobis and propensity score matching, common support graphing, and covariate imbalance testing. Available at <http://ideas.repec.org/c/boc/bocode/s432001.html>.
- [24] Malmberg, A. and Sölvell, Ö. (1998). Spelar det någon roll? Om ökat utlandsägande i svenskt näringsliv. (Does it matter? About increased foreign ownership in the Swedish business sector) Report from ISA's (Investment in Sweden Agency) Council of Economic Advisors.
- [25] Markusen, J. (2002), Multinational firms and the theory of international trade. Cambridge: MIT-press.
- [26] Martins, P. (2004), Do foreign firms really pay higher wages? Evidence from different estimators. *IZA discussion paper 1388*.
- [27] McGuckin, R. and Nguyen, S. (2001), The impact of ownership changes: A view from labor markets, *International Journal of Industrial Organization*, 19, 739-762.

- [28] Modén, K.M. (1998), Foreign Acquisitions of Swedish companies - effects on R&D and Productivity. ISA 1998/2. Stockholm.
- [29] Rosenbaum, P. and Rubin, D.B. (1983), The central role of the propensity score in observational studies for causal effects, *Biometrika*, 70, 41-55.
- [30] Salis, S. (2008), Foreign Acquisition and Firm Productivity: Evidence from Slovenia. *The World Economy*, Vol. 31, Issue 8.8
- [31] Stiglitz, J. (1987), The causes and consequences of the dependence of quality on price. *Journal of Economic Literature*, 25, 1-48.
- [32] Woolridge, J.M. (2002), *Econometric analysis of cross-section and panel data*. Cambridge: MIT press.

Table 1 Number of firms and employment shares in Swedish manufacturing, 1993-2002.

Year	Foreign MNEs		Swedish MNEs		Non-MNEs	
	Firms (Percent)	Employment Percent	Firms (Percent)	Employment Percent	Firms (Percent)	Employment Percent
1993	347 (13.1)	19.2	608 (22.9)	50.4	1699 (64.0)	30.4
1994	374 (13.5)	19.9	622 (22.4)	52.3	1783 (64.2)	27.8
1995	395 (13.4)	20.6	604 (20.4)	50.6	1955 (66.2)	28.8
1996	443 (13.9)	24.0	556 (17.5)	46.7	2180 (68.6)	29.3
1997	487 (14.8)	24.4	551 (16.8)	48.9	2247 (68.4)	26.7
1998	513 (14.9)	25.8	556 (16.1)	46.4	2380 (69.0)	27.8
1999	538 (15.8)	31.4	587 (17.3)	38.8	2273 (66.9)	29.8
2000	578 (16.6)	35.3	605 (17.4)	35.7	2297 (66.0)	29.0
2001	640 (18.2)	40.9	591 (16.8)	30.2	2278 (64.9)	28.9
2002	654 (19.1)	42.0	606 (17.7)	31.1	2165 (63.2)	26.9

Table 2 Frequency of foreign acquisitions by year, 1993-2002.

	1994	1995	1996	1997	1998	1999	2000	2001	2002	94-02
Acquired Swedish MNE	2 (5.0)	8 (22.9)	53.2 (54.4)	9 (26.5)	8 (27.6)	18 (40.0)	7 (14.3)	6 (6.3)	13 (22.4)	113 (24.4)
Acquired Swedish Non-MNE	38 (95.0)	27 (77.1)	37 (46.8)	25 (73.5)	21 (72.4)	27 (60.0)	42 (85.7)	89 (93.7)	45 (77.6)	351 (75.6)
Total	40	35	79	34	29	45	49	95	58	464

Table 3 Differences in means between foreign-acquired firms and non-acquired firms in the period 1993-2002.

Variable	Acquired vs. non-acquired firms				
	$T = -1$ Difference (t-ratio)	$T = 0$ Difference (t-ratio)	$T = 1$ Difference (t-ratio)	$T = 2$ Difference (t-ratio)	$T = 3$ Difference (t-ratio)
Employment	277 (6.65)***	286 (6.66)***	323 (6.75)***	329 (6.85)***	333 (7.01)***
Sales	277 626 (7.12)***	286 727 (6.78)***	323 784 (6.09)***	329 647 (5.01)***	333 233 (2.28)**
lnTFP	0.55 (10.02)***	0.50 (9.72)***	0.42 (8.43)***	0.46 (9.15)***	0.46 (8.73)***
Capital-labor ratio	150 (2.41)***	138 (2.46)***	146 (2.48)***	164 (2.49)***	165 (2.46)***
Skill intensity	5.4 (5.13)***	5.5 (5.60)***	5.4 (5.73)***	5.0 (5.23)***	5.1 (5.26)***
Average wage	26 (7.48)***	26 (7.45)***	27 (8.95)***	25 (7.94)***	23 (6.93)***
Wages: skilled	71 (9.72)***	68 (9.51)***	64 (9.52)***	61 (9.01)***	55 (7.48)***
Wages: less-skilled	19 (7.10)***	19 (7.06)***	19 (7.78)***	18 (7.46)***	17 (6.41)***
Observations					
Acquired firms	192	192	192	192	192
Non-acquired firms	3,659	3,659	3,659	3,659	3,659

Notes: Sales is in million SEK. Wages and capital-labor ratios are in thousand SEK. Skill intensity and share of employees with a post-secondary education, are in percentages. TFP is calculated via the Levinsohn-Petrin (2003) method.

Table 4 Difference-in-difference (DiD) estimator.

	Before acquisition	After acquisition	Difference
Acquired firms	$\beta_0 + \beta_1$	$\beta_0 + \beta_1 + \beta_2 + \beta_3$	$\beta_2 + \beta_3$
Non-acquired firms	β_0	$\beta_0 + \beta_2$	β_2
Difference between acquired and non-acquired firms	β_1	$\beta_1 + \beta_3$	β_3

Table 5 Post-acquisition effect on wages and productivity, instrumental variable approach.

	Average wage _{t+3}			Average skilled wage _{t+3}			Average less-skilled wage _{t+3}			TFP _{t+3}		
	Model(1)	Model(2)	Model(3)	Model(1)	Model(2)	Model(3)	Model(1)	Model(2)	Model(3)	Model(1)	Model(2)	Model(3)
Estimation (1)	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)	(x)	(xi)	(xii)
Foreign acquisition	0.008 (3.58) ^{***}	0.006 (2.88) ^{***}	0.001 (0.70)	0.019 (3.18) ^{***}	0.014 (2.74) ^{***}	0.011 (0.70)	0.003 (0.62)	0.004 (0.80)	0.002 (0.53)	0.088 (4.12) ^{***}	0.092 (4.49) ^{***}	0.032 (2.33) ^{***}
Observation	13,470	13,470	13,470	13,470	13,470	13,470	13,470	13,470	13,470	13,470	13,470	13,470
Estimation (2)	Average wage _{t+5}			Average skilled wage _{t+5}			Average less-skilled wage _{t+5}			TFP _{t+5}		
Foreign acquisition	0.002 (0.51)	0.002 (0.60)	-0.002 (1.13)	0.005 (0.71)	0.007 (1.13)	-0.003 (0.86)	0.001 (0.11)	0.002 (0.42)	-0.005 (1.03)	0.045 (3.70) ^{***}	0.022 (2.13) ^{**}	0.039 (5.48) ^{***}
Observation	8,207	8,207	8,207	8,207	8,207	8,207	8,207	8,207	8,207	8,207	8,207	8,207
Estimation (3)	Average wage _{t+3}			Average skilled wage _{t+3}			Average less-skilled wage _{t+3}			TFP _{t+3}		
Vertical acquired Swedish MNE	0.002 (1.88) [*]	0.002 (1.82) [*]	0.002 (1.52)	0.014 (2.89) ^{***}	0.012 (2.41) ^{**}	0.009 (1.82) [*]	0.002 (1.64)	0.002 (1.55)	0.002 (1.55)	0.035 (2.91) ^{***}	0.040 (2.26) ^{**}	0.023 (2.40) ^{**}
Vertical acquired Swedish non-MNE	0.002 (1.66) [*]	0.002 (1.49)	0.001 (0.01)	0.006 (1.05)	0.004 (0.83)	0.001 (0.07)	0.001 (0.87)	0.001 (0.63)	0.002 (1.46)	0.031 (2.20) ^{**}	0.036 (2.35) ^{**}	0.019 (1.83) [*]
Horizontal acquired Swedish MNE	0.001 (0.85)	-0.001 (0.28)	0.001 (1.27)	0.001 (0.04)	0.001 (1.43)	0.001 (0.06)	0.001 (1.10)	-0.001 (0.17)	0.001 (1.55)	0.010 (1.57)	0.009 (1.30)	0.006 (1.41)
Horizontal acquired Swedish non-MNE	0.001 (2.15) ^{**}	0.001 (2.19) ^{**}	0.001 (0.38)	0.001 (0.31)	0.001 (0.01)	0.001 (0.13)	0.001 (2.23) ^{**}	0.001 (1.71) [*]	0.001 (0.13)	0.014 (1.28)	0.019 (1.37)	0.011 (1.04)
Estimation (4)	Average wage _{t+5}			Average skilled wage _{t+5}			Average less-skilled wage _{t+5}			TFP _{t+5}		
Vertical acquired Swedish MNE	-0.001 (0.58)	-0.001 (0.64)	0.001 (0.39)	-0.004 (0.53)	-0.004 (0.51)	-0.004 (0.75)	-0.001 (0.49)	-0.002 (0.86)	0.002 (0.88)	0.027 (2.07) ^{**}	0.010 (2.04) ^{**}	0.018 (2.38) ^{**}
Vertical acquired Swedish non-MNE	-0.001 (0.41)	-0.001 (0.48)	-0.003 (0.99)	-0.006 (0.82)	-0.003 (0.50)	-0.008 (1.24)	-0.001 (0.03)	-0.001 (0.54)	-0.001 (0.09)	0.011 (1.89) [*]	0.012 (1.65) [*]	0.010 (2.12) ^{**}
Horizontal acquired Swedish MNE	-0.001 (0.09)	-0.001 (0.47)	-0.001 (1.28)	0.001 (0.63)	0.001 (2.31) ^{**}	0.001 (0.12)	0.001 (0.76)	0.001 (0.05)	0.001 (1.20)	0.009 (1.23)	0.007 (1.03)	0.003 (0.80)
Horizontal acquired Swedish non-MNE	0.002 (2.12) ^{**}	0.001 (2.08) ^{**}	0.001 (1.35)	0.001 (0.29)	0.002 (1.44)	0.001 (0.01)	0.002 (1.97) ^{**}	0.001 (2.08) ^{**}	0.001 (1.21)	0.008 (1.19)	0.007 (0.94)	0.006 (1.09)

Notes: Standard errors within the parentheses are bootstrapped. ***, **, * indicate significance at the 1, 5 and 10 percent levels, respectively. Estimations in Model 1 use an instrument generated from the probit regression reported in Table A1, column (i). The estimation in Model 2 uses an instrument generated from column (ii) in Table A1; estimations in Model 3 use an instrument from column (iii) in Table A1. In all the estimates, I control for changes in firm-specific factors similar to these included in Table 4. The Hausman tests, not reported but available upon request, reject the assumption of exogeneity of the acquisition dummy.

Table 6 Effects of foreign acquisition on post-acquisition average wage and TFP. DID on matched sample with firm fixed effect.

	Average wage			Average skilled wage			Average less-skilled wage			TFP		
	Model(1) (i)	Model(2) (ii)	Model(3) (iii)	Model(1) (iv)	Model(2) (v)	Model(3) (vi)	Model(1) (vii)	Model(2) (viii)	Model(3) (ix)	Model(1) (x)	Model(2) (xi)	Model(3) (xii)
$SMNE_i \times Ver_Acq_j \times After_{t+3}$	0.001 [0.07]	0.004 [0.42]	-0.002 [0.21]	0.017 [0.57]	0.011 [0.37]	0.015 [0.57]	0.002 [0.27]	0.004 [0.46]	0.001 [0.03]	0.030 [2.41]**	0.025 [2.15]**	0.023 [2.11]**
$SMNE_i \times Ver_Acq_j \times After_{t+5}$	0.002 [0.20]	0.008 [0.78]	-0.011 [0.98]	0.046 [1.32]	0.044 [1.24]	0.035 [1.09]	0.003 [0.28]	-0.006 [0.53]	0.012 [1.07]	0.021 [2.13]**	0.011 [1.99]**	0.014 [2.01]**
$NonMNE_i \times Ver_Acq_j \times After_{t+3}$	0.009 [1.25]	0.010 [1.46]	0.006 [0.66]	0.010 [0.43]	0.013 [0.56]	0.020 [0.79]	0.009 [1.25]	0.011 [1.47]	0.005 [0.57]	0.024 [2.46]**	0.022 [2.33]**	0.019 [2.08]**
$NonMNE_i \times Ver_Acq_j \times After_{t+5}$	0.010 [1.08]	0.001 [0.13]	-0.009 [0.81]	0.049 [1.72]*	0.045 [1.54]	0.032 [1.06]	-0.002 [0.19]	-0.010 [1.10]	0.013 [1.18]	0.011 [2.20]**	0.010 [2.17]**	0.009 [1.97]**
$SMNE_i \times Hor_Acq_j \times After_{t+3}$	0.002 [0.06]	0.003 [0.07]	0.002 [0.04]	0.011 [0.10]	0.012 [0.10]	0.010 [0.23]	0.020 [0.53]	0.023 [0.63]	0.022 [0.49]	0.010 [1.51]	0.018 [1.58]	0.009 [1.59]
$SMNE_i \times Hor_Acq_j \times After_{t+5}$	0.007 [0.07]	0.009 [0.08]	-0.009 [0.20]	0.059 [0.49]	0.057 [0.57]	0.003 [0.03]	0.004 [0.11]	-0.004 [0.10]	0.004 [0.09]	0.011 [1.62]	0.017 [1.61]	0.014 [1.56]
$NonMNE_i \times Hor_Acq_j \times After_{t+3}$	-0.001 [0.01]	0.004 [0.12]	0.001 [0.05]	0.045 [0.42]	0.069 [0.63]	0.038 [0.42]	-0.007 [0.22]	-0.003 [0.09]	0.005 [0.57]	0.011 [1.50]	0.018 [1.18]	0.010 [1.48]
$NonMNE_i \times Hor_Acq_j \times After_{t+5}$	0.008 [0.23]	0.002 [0.08]	-0.008 [0.25]	0.038 [0.36]	0.041 [0.38]	0.061 [0.66]	0.008 [0.24]	-0.001 [0.03]	-0.009 [0.26]	0.010 [0.24]	0.021 [0.92]	0.028 [0.60]
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2 within	0.700	0.719	0.735	0.215	0.185	0.259	0.673	0.685	0.712	0.049	0.034	0.039
R^2 between	0.287	0.379	0.414	0.022	0.066	0.049	0.291	0.332	0.374	0.031	0.198	0.004
R^2 overall	0.405	0.468	0.484	0.081	0.116	0.129	0.412	0.444	0.467	0.031	0.091	0.002
Observations	4,823	4,823	4,823	4,823	4,823	4,823	4,823	4,823	4,823	4,823	4,823	4,823

Notes: As firm controls I use capital-labor ratio, share of female workers, high-skill intensity and firm size. Square brackets [] give White's heteroskedasticity-consistent t statistics. The matched sample in Model (1) is generated using the probit model in Table A1, column (i). The matched sample in Model (2) and Model (3) are generated using the probit model in Table A1, column (ii) and column (iii), respectively.

Appendix A

The probit model

The instrumental variable is constructed as the predicted value of the dependent variable from a probit regression for the probability of foreign takeover, similar to McGuckin and Nguyen (2001) and Conyon *et al.* (2002). The probit model is

$$p(Acq_{jt} = 1) = F(X_{jt-1}, D_i, D_t) \quad (\text{A.1})$$

where X is a vector of firm characteristics in $t-1$. D_i and D_t control for fixed industry and time effects. The vector of firm characteristics in equation (A.1), in the first instance, includes labor productivity in firm j , a dummy variable indicating whether the firm is a Swedish MNE or not, current employment size (relative to the industry mean), skill intensity, firm age, age-squared and a measure of foreign presence in the industry. The latter measure captures potential spillover effects in an industry.

The results of estimating equation (A.1) are reported in *Table A1*. I find that skill-intensive and high productivity firms are more likely to be acquired by foreign firms. Moreover, firms in industries with a large foreign presence are more often taken over. Finally, it appears that younger firms (non-linear relationship), relatively large firms, and Swedish MNE firms have higher probabilities of being targeted by foreign firms.

I also estimated alternative specifications of equation (A.1), including additional variables in the probit estimation, to check whether my results depend on the process by which the instrument was generated. These results are reported in columns (ii) and (iii) of *Table A1*. The estimations of equation (1) in *Table 5* and equation (2) in *Table 6* are robust to this change in the instrument generating specification.

Table A1 The probit model – probability of foreign acquisition

Variables	(i)	(ii)	(iii)
Labor productivity	0.125 (2.75) ^{***}	0.022 (0.47)	0.083 (1.81) [*]
Swedish MNE	0.116 (2.37) ^{**}	0.055 (1.11)	0.040 (0.78)
Relative employment	0.005 (2.33) ^{**}	-0.002 (0.65)	-0.001 (0.45)
Skill intensity	0.138 (4.75) ^{***}	0.141 (4.64) ^{***}	0.127 (4.28) ^{***}
Age	-0.052 (4.81) ^{***}	-0.052 (4.81) ^{***}	-0.055 (5.06) ^{***}
(Age) ²	0.001 (3.91) ^{***}	0.001 (3.59) ^{***}	0.001 (3.75) ^{***}
Foreign presence	0.052 (2.48) ^{**}	0.046 (2.13) ^{**}	0.046 (2.15) ^{***}
Capital intensity		0.087 (6.17) ^{***}	
Sales			0.028 (6.74) ^{***}
Year dummies	Yes	Yes	Yes
Pseudo R ²	0.037	0.046	0.050
LR chi2	139.58	177.57	181.22
Observations	23,931	23,931	23,931

Notes: The dependent variable $Acq_{jt} = 1$ if a domestically owned firm in year $t-1$ becomes foreign-owned in year t . z-statistics are within parentheses. The explanatory variables are, with the exception of age, age² and relative employment, firm-specific characteristics in year $t-1$. Relative employment is firm employment relative to mean firm employment at the industry level. Labor productivity is value added per employee and skill intensity is the share of employees with post-secondary education at the firm level. The share of foreign employment at the industry level (SNI92 2-digit level) is a proxy of foreign presence in the industry.

Table A2 Differences in means between foreign-acquired firms and non-acquired firms in the period 1993-2002. Matched sample.

Variable	Acquired vs. non-acquired firms				
	$T = -1$ Difference (t-ratio)	$T = 0$ Difference (t-ratio)	$T = 1$ Difference (t-ratio)	$T = 2$ Difference (t-ratio)	$T = 3$ Difference (t-ratio)
Employment	99 (0.98)	88 (0.84)	126 (1.04)	139 (1.15)	156 (1.32)
Sales	380 (1.46)	424 (1.39)	462 (1.29)	280 (0.92)	-166 (0.73)
lnTFP	0.27 (4.73)***	0.19 (3.59)***	0.11 (2.03)**	0.14 (2.65)**	0.18 (3.10)***
Capital-labor ratio	-21 (0.09)	75 (1.15)	81 (1.13)	113 (1.86)*	109 (1.69)*
Skill intensity	1.9 (1.56)	2.0 (1.69)*	1.7 (1.43)	1.2 (1.06)	1.4 (1.22)
Average wage	19 (7.37)***	19 (5.82)***	21 (7.60)***	16 (5.20)***	13 (3.29)***
Wages: skilled	39 (6.76)***	35 (6.26)***	34 (6.09)***	28 (4.65)***	19 (2.13)**
Wages: less-skilled	15 (6.24)***	16 (5.03)***	18 (7.64)***	14 (4.82)***	10 (3.23)***
Observations					
Acquired firms	181	181	181	181	181
Non-acquired firms	372	372	372	372	372

Department of Economics:

Skriftserie/Working Paper:

2009:

- WP 09-1 Tomi Kyyrä, Pierpaolo Parrotta and Michael Rosholm:
The Effect of Receiving Supplementary UI
Benefits on Unemployment Duration
ISBN 9788778824035 (print); ISBN 9788778824042 (online)
- WP 09-2 Dario Pozzoli and Marco Ranzani: Old European Couples'
Retirement Decisions: the Role of Love and Money
ISBN 9788778824165 (print); ISBN 9788778824172 (online)
- WP 09-3 Michael Gibbs, Mikel Tapia and Frederic Warzynski:
Globalization, Superstars, and the Importance of Reputation:
Theory & Evidence from the Wine Industry
ISBN 9788778824189 (print); ISBN 9788778824196 (online)
- WP 09-4 Jan De Loecker and Frederic Warzynski: Markups and Firm-
Level Export Status
ISBN 9788778824202 (print); ISBN 9788778824219 (online)
- WP 09-5 Tor Eriksson, Mariola Pytliková and Frédéric Warzynski:
Increased Sorting and Wage Inequality in the Czech Republic:
New Evidence Using Linked Employer-Employee Dataset
ISBN 9788778824226 (print); ISBN 9788778824233 (online)
- WP 09-6 Longhwa Chen and Tor Eriksson: Vacancy Duration, Wage
Offers, and Job Requirements – Pre-Match Data Evidence
ISBN 9788778824240 (print); ISBN 9788778824257 (online)
- WP 09-7 Tor Eriksson, Valérie Smeets and Frédéric Warzynski: Small
Open Economy Firms in International Trade: Evidence
from Danish Transactions-Level Data
ISBN 9788778823861 (print); ISBN 9788778823878 (online)
- WP 09-8 Dario Pozzoli and Marco Ranzani: Participation and Sector
Selection in Nicaragua
ISBN 9788778823885 (print); ISBN 9788778823892 (online)

- WP 09-9 Rikke Ibsen, Frederic Warzynski and Niels Westergård-Nielsen:
Employment Growth and International Trade: A Small Open
Economy Perspective
ISBN 9788778823908 (print); ISBN 9788778823915 (online)
- WP 09-10 Roger Bandick and Holger Görg: Foreign acquisition, plant
survival, and employment growth
ISBN 9788778823922 (print); ISBN 9788778823939 (online)
- WP 09-11 Pierpaolo Parrotta and Dario Pozzoli: The Effect of Learning by
Hiring on Productivity
ISBN 9788778823946 (print); ISBN 9788778823953 (online)
- WP 09-12 Takao Kato and Pian Shu
Peer Effects, Social Networks, and Intergroup
Competition in the Workplace
ISBN 9788778823984 (print); ISBN 9788778823991 (online)
- WP 09-13 Sanne Hiller and Erdal Yalcin: Switching between Domestic
Market Activity, Export and FDI
ISBN 9788778824004 (print); ISBN 9788778824028 (online)
- WP 09-14 Tor Eriksson and Mariola Pytlikova: Foreign Ownership Wage
Premia in Emerging Economies: Evidence from Czech Republic
ISBN 9788778824035 (print); ISBN 9788778824042 (online)
- WP 09-15 Astrid Würtz Rasmussen: Family Structure Changes and
Children's Health, Behavior, and Educational Outcomes
ISBN 9788778824059 (print); ISBN 9788778824066 (online)
- WP 09-16 Tor Eriksson: How Many Danish Jobs Can (Potentially) Be
Done Elsewhere?
ISBN 9788778824073 (print); ISBN 9788778824080 (online)
- WP 09-17 Lorenzo Cappellari, Claudio Lucifora and Dario Pozzoli:
Determinants of Grades in Maths for Students in Economics
ISBN 9788778824103 (print); ISBN 9788778824110 (online)
- WP 09-18 Yingqiang Zhang and Tor Eriksson: Inequality of Opportunity
and Income Inequality in Nine Chinese Provinces, 1989-2006
ISBN 9788778824127 (print); ISBN 9788778824134 (online)

- WP 09-19 Ricard Gil and Frederic Warzynski: Vertical Integration, Exclusivity and Game Sales Performance in the U.S. Video Game Industry
ISBN 9788778824141 (print); ISBN 9788778824165 (online)
- WP 09-20 Christian Gormsen: Intransparent Markets and Intra-Industry Trade
ISBN 9788778824172 (print); ISBN 9788778824189 (online)
- WP 09-21 Jan Bentzen and Valdemar Smith: Wine production in Denmark Do the characteristics of the vineyards affect the chances for awards?
ISBN 9788778824196 (print); ISBN 9788778824202 (online)
- WP 09-22 Astrid Würtz Rasmussen: Allocation of Parental Time and the Long-Term Effect on Children's Education
ISBN 9788778824233 (print); ISBN 9788778824240 (online)

2010:

- WP 10-01 Marianne Simonsen, Lars Skipper and Niels Skipper: Price Sensitivity of Demand for Prescription Drugs: Exploiting a Regression Kink Design
ISBN 9788778824257 (print); ISBN 9788778824264 (online)
- WP 10-02 Olivier Gergaud, Valérie Smeets and Frédéric Warzynski: Stars War in French Gastronomy: Prestige of Restaurants and Chefs' Careers
ISBN 9788778824271 (print); ISBN 9788778824288 (online)
- WP 10-03 Nabanita Datta Gupta, Mette Deding and Mette Lausten: Medium-term consequences of low birth weight on health and behavioral deficits – is there a catch-up effect?
ISBN 9788778824301 (print); ISBN 9788778824318 (online)
- WP 10-04 Jørgen Drud Hansen, Hassan Molana, Catia Montagna and Jørgen Ulff-Møller Nielsen: Work Hours, Social Value of Leisure and Globalisation
ISBN 9788778824332 (print); ISBN 9788778824349 (online)
- WP 10-05 Miriam Wüst: The effect of cigarette and alcohol consumption on birth outcomes
ISBN 9788778824455 (print); ISBN 9788778824479 (online)

- WP 10-06 Elke J. Jahn and Michael Rosholm: Looking Beyond the Bridge: How Temporary Agency Employment Affects Labor Market Outcomes
ISBN 9788778824486 (print); ISBN 9788778824493 (online)
- WP 10-07 Sanne Hiller and Robinson Kruse: Milestones of European Integration: Which matters most for Export Openness?
ISBN 9788778824509 (print); ISBN 9788778824516 (online)
- WP 10-08 Tor Eriksson and Marie Claire Villeval: Respect as an Incentive
ISBN 9788778824523 (print); ISBN 9788778824530 (online)
- WP 10-09 Jan Bentzen and Valdemar Smith: Alcohol consumption and liver cirrhosis mortality: New evidence from a panel data analysis for sixteen European countries
ISBN 9788778824547 (print); ISBN 9788778824554 (online)
- WP 10-10 Ramana Nanda: Entrepreneurship and the Discipline of External Finance
ISBN 9788778824561 (print); ISBN 9788778824578 (online)
- WP 10-11 Roger Bandick, Holger Görg and Patrik Karpaty: Foreign acquisitions, domestic multinationals, and R&D
ISBN 9788778824585 (print); ISBN 9788778824592 (online)
- WP 10-12 Pierpaolo Parrotta, Dario Pozzoli and Mariola Pytlikova: Does Labor Diversity Affect Firm Productivity?
ISBN 9788778824608 (print); ISBN 9788778824615 (online)
- WP 10-13 Valérie Smeets and Frédéric Warzynski: Learning by Exporting, Importing or Both? Estimating productivity with multi-product firms, pricing heterogeneity and the role of international trade
ISBN 9788778824622 (print); ISBN 9788778824646 (online)
- WP 10-14 Tor Eriksson and Yingqiang Zhang: The Role of Family Background for Earnings in Rural China
ISBN 9788778824653 (print); ISBN 9788778824660 (online)
- WP 10-15 Pierpaolo Parrotta, Dario Pozzoli and Mariola Pytlikova: The Nexus between Labor Diversity and Firm's Innovation
ISBN 9788778824875 (print); ISBN 9788778824882 (online)

- WP 10-16 Tor Eriksson and Nicolai Kristensen: Wages or Fringes?
Some Evidence on Trade-offs and Sorting
ISBN 9788778824899 (print); ISBN 9788778824905 (online)
- WP 10-17 Gustaf Bruze: Male and Female Marriage Returns to Schooling
ISBN 9788778824912 (print); ISBN 9788778824929 (online)
- WP 10-18 Gustaf Bruze: New Evidence on the Causes of Educational
Homogamy
ISBN 9788778824950 (print); ISBN 9788778824967 (online)
- WP 10-19 Sarah Polborn: The Political Economy of Carbon Securities and
Environmental Policy
ISBN 9788778824974 (print); ISBN 9788778824936 (online)
- WP 10-20 Christian Bjørnskov and Philipp J.H. Schröder: Are Debt
Repayment Incentives Undermined by Foreign Aid?
ISBN 9788778825148 (print); ISBN 9788778825155 (online)
- WP 10-21 Roger Bandick: Foreign Acquisition, Wages and Productivity
ISBN 9788778825162 (print); ISBN 9788778825179 (online)