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– A shortcut to higher productivity and expansion in smaller firms?

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Abstract

The purpose of this paper is to analyze the effects of foreign acquisitions on the productivity of acquired Swedish firms. However, because an acquisition is an opportunity to restructure a business and because such changes, in turn, can result in increased productivity, the effects may be observed in other outcome variables. Therefore, we also study the effects after an acquisition on employment, share of skilled labor, and export and import intensities in Swedish firms taken over by foreign multinationals (MNEs). As we examine the effects on both acquired manufacturing and service firms, we also analyze the effects in small firms, e.g., those with one or more employees. To control for the possible endogeneity of foreign direct investment decisions, propensity score matching is combined with a difference-in-difference approach.

The positive effects on productivity, the share of skilled labor, employment and the export and import intensities of foreign acquisitions are most pronounced among small service firms. We also find positive productivity effects of foreign acquisitions in large manufacturing firms. A contributing factor is the investment in human capital, i.e., increasing the share of skilled labor. Foreign acquisitions appear to involve expansion in the acquired firms, particularly with respect to employment increases in small firms. Thus, being acquired by a foreign MNE appears to be a conceivable alternative for small firms with strong future growth potential, especially when dealing with the growth barriers that such firms usually encounter.

Keywords: foreign acquisition, restructuring, cherry-picking, labor productivity, skilled labor, export and import intensities

JEL: D22, F21, F23, J24

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1. Introduction

At the end of the 1990s, the share of employees in foreign-owned firms in the Swedish business sector increased dramatically, a phenomenon that was part of an international wave of cross-border mergers and acquisitions. However, this event gave rise to concern and debate about the effects it would have on research and development and other qualified activities in Sweden. One explanation for why this development triggered such strong sentiments was that some of the flagships in the Swedish business sector were now foreign-owned, such as the Astra and Volvo Cars. In recent years, foreign acquisitions have been less spectacular, and the share of employees working in foreign-owned companies has remained constant for a longer period. Nonetheless, there are still many firms in the Swedish business sector that are taken over every year by foreign companies.¹

The purpose of this paper is to analyze the effects of foreign acquisitions on the productivity of the acquired Swedish firms. An acquisition is an opportunity to restructure the business, and such changes, in turn, can result in increased productivity. This may include increased investments in human capital, better utilization of economies of scale in connection with expansion, and increased exports and imports. In addition to the effects on productivity, we also investigate whether the share of skilled labor changes in the acquired companies after the acquisition and if employment and export and import intensities are affected.

It is generally known that productivity is higher in foreign-owned firms, or multinational enterprises (MNEs), than that in national firms in the same industry, as MNEs have a productivity premium.² The productivity premium in foreign-owned firms may be because, when they acquire national firms, they choose to buy firms with high productivity or because the acquired firms become more productive after acquisition. These explanations, however, are not mutually exclusive.

¹ Notice that there are also foreign-owned firms being acquired by Swedish companies.

² See, for example, Doms and Jensen (1998) for the US and Criscuolo and Martin (2009) for the UK.

In this paper, we examine the characteristics of acquired firms. For example, are the acquired firms ones that have been underperforming and mismanaged before the acquisition but are still considered to have good prospects, or are they relatively successful firms whose business complements the acquiring firms, which then allows the acquiring firms to exploit synergies? In other words, are low or high productive firms the target of acquisitions? Do these acquired firms conduct activities that require a high share of skilled labor?

We also analyze whether productivity grows faster in acquired firms than in similar firms that are not taken over. For this purpose, we use a matching approach, which means that we estimate the causal effect of foreign acquisitions on productivity in the acquired firms. Matching means that, with respect to firms that have been acquired by foreign companies at one point in time, we construct a control group among firms that have not been acquired by foreign-owned companies at the same time but whose observed characteristics are, to as great a degree as possible, similar to the characteristics of the acquired firms. The development of productivity after the acquisition of the acquired firms is then compared with the development of the firms in the control group. However, we do not just limit ourselves to productivity, but rather, we also study the effects on other outcome variables in the acquired firms that are related to restructuring.

Compared with previous studies, which quite often focus on foreign acquisitions in the manufacturing industry, we analyze the effects on both acquired manufacturing and service firms. This is motivated by the fact that most of the firms that are now being taken over are service companies. Unlike previous studies, we also have, due to access to register data, opportunity to carefully analyze the effects in small firms, i.e., those with one employee or more.

This paper is structured as follows. Section 2 provides an overview of related studies, whereas Section 3 describes how foreign ownership has developed in the Swedish business sector and examines differences in productivity between multinational (foreign-owned firms and Swedish MNEs) and national companies.

Section 4 describes the econometric method and the data set used in this study. Section 5, which includes three subsections, presents the results of the econometric analysis. First, Section 5.1 discusses, based on the estimates of a probit model, the characteristics of firms that are acquired and become foreign owned. Section 5.2 then presents the matching estimates of the effects of foreign acquisitions on productivity, while Section 5.3 discusses the effects on other variables related to the restructuring. Section 6 offers concluding and summary comments.

2. Previous studies

There are two particular studies published in recent years, Arnold and Javorcik (2009) and Guadalupe et al. (2012), that show great similarities to the approach we use in this paper. In both studies, the researchers examine what happens in firms after they are acquired by foreign companies. In addition to the direct effect on productivity, other changes that occur after acquisition that contribute to explaining productivity growth and expansion are also being studied.

The study by Arnold and Javorcik (2009) is the most closely related to this study with respect to issues and methodology. They study the effects of foreign acquisitions in manufacturing plants with at least 20 employees in Indonesia by analyzing the extent to which foreign acquisitions lead to increased productivity in the acquired plants and whether the productivity improvements after acquisition are the result of restructuring within the acquired firms. The latter is achieved by examining other outcome variables expected to affect productivity, such as investments in physical capital and the share of skilled labor. In addition, they investigate whether foreign acquisitions involve increased employment in the acquired firms and whether the acquired firms become more internationalized, i.e., do their exporting and importing activities increase following the takeover.

Arnold and Javorcik (2009) conclude that acquired plants are highly productive prior to their takeover. Thus, as problems with endogeneity arising from productivity before acquisition are a factor that determine which firms are acquired, to estimate the causal effect of foreign acquisitions, they used propensity score matching combined with a difference-in-difference approach.

Arnold and Javorcik (2009) find that although foreign acquisitions lead to higher productivity in the acquired plants and that these acquisitions lead to increased investments in machinery, the share of skilled labor remains unaffected. Moreover, employment increases in the acquired plants as do the exporting and importing activities after the acquisition.

The analysis in Guadalupe et al. (2012) is based on a theoretical model that illustrates there are mechanisms at play that guide foreign-owned companies as they seek to acquire the most productive companies in an industry, i.e., a practice known as cherry-picking. This also explains why firms acquired by foreign companies are more likely to invest in new technology and implement better organizational strategies than firms that are not acquired. In both cases, access to a larger market plays an important role as the larger market makes it particularly profitable to acquire high productivity firms, and it also results in increased returns on productivity, thereby enhancing investments following a takeover.

Guadalupe et al. (2012) conducts an empirical analysis of data for the Spanish manufacturing industry and confirms that firms acquired by foreign companies exhibit greater productivity before acquisitions than do non-acquired firms in the same industry. Furthermore, their study claims that productivity of acquired firms increases faster after a takeover, partly due to investments in new technology and organization (innovations).

Karpaty (2007) studies the effects of foreign acquisitions in the Swedish manufacturing sector during the 1990s. Employing a matching approach, his results indicate that firms taken over by foreign companies, on average, exhibit greater productivity after the acquisition than the 'twin' firms in the control group.

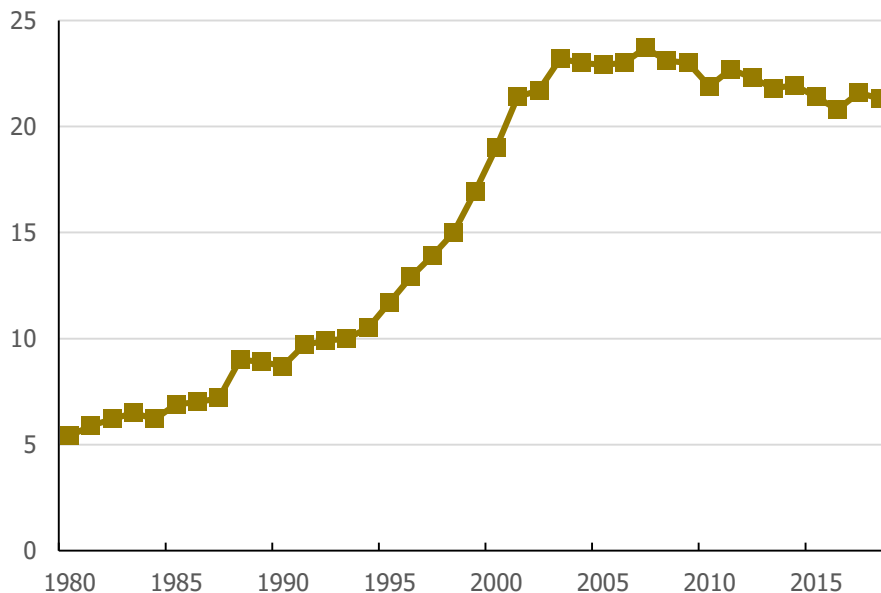
However, it is further noted that the results of previous studies that examined the effects of foreign acquisition on productivity growth after the acquisition are not definitive nor are they consistent. For example, Harris and Robinson (2003) find no effects on the productivity of foreign acquisitions, whereas Conyon et al. (2002) conclude that foreign takeovers have positive effects on acquired firms following acquisition. In both cases, the studies are conducted for acquired firms in the UK.

3. Foreign ownership and productivity

3.1 Foreign ownership in the Swedish business sector

Foreign ownership in Sweden increased continuously from the beginning of the 1980s until shortly after the turn of the millennium. Subsequently, the share of employees in foreign-owned firms has leveled out and even decreased slightly, as presented in Figure 1. In 1980, five percent of the employees in the Swedish business sector worked in foreign-owned firms, in 2003, this number increased to 23 percent, and by 2017, the share had decreased slightly, to 21 percent.

Figure 1 Share of employees in foreign-owned firms 1980-2018 (percent)



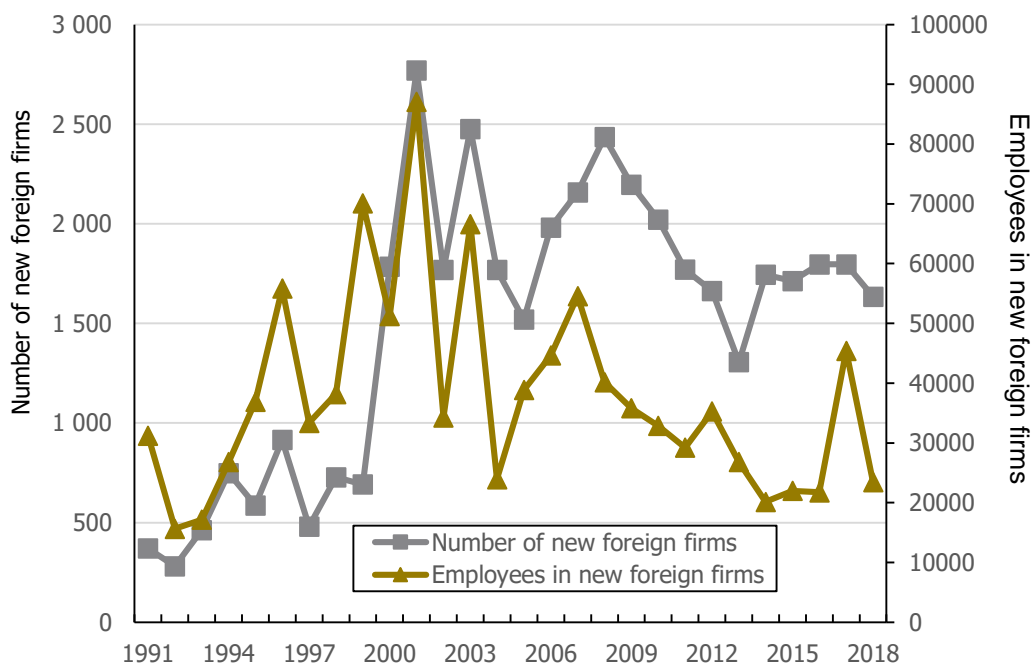
Source: Growth Analysis, Foreign controlled enterprises

The limited foreign ownership up to the mid-1980s is largely explained by the legal obstacles that prevented foreign citizens from owning Swedish firms and property, and in some cases, purely protectionist motives were behind these regulations.

During the late 1980s and early 1990s, barriers for foreign citizens to acquire Swedish firms were dismantled, a definite contributing factor to the sharp increase in foreign ownership in the late 1990s.

Another contributing factor, however, is the general trend in many developed countries towards increasingly more international mergers and acquisitions. The fact that several large Swedish MNEs were taken over by foreign enterprises in Sweden during the late 1990s, which is reflected in the fact that the share of employees in foreign-owned companies increased sharply during this period is, therefore, not a unique Swedish phenomenon but one that characterizes the developments in other developed countries during this period as well. Since 2003, the share of employees in foreign-owned firms has remained relatively constant. Despite this, however, the number of new foreign firms is comparatively high.

Figure 2 Number of new foreign firms and number of employees in new foreign firms 1991-2017



Notes: New foreign firms refers to both acquired and newly established firms.

Source: Growth Analysis, Individual and Firm Database (IFDB)

Figure 2 indicates that the number of foreign firms, i.e., acquired and newly established, increases sharply to approximately 2000 and then remains at a high level for the remainder of the period. The number of new foreign firms averages 585 per year in the 1990s, but increases to an average of 1,910 per year from 2000 onward. However, the number of employees working in new foreign firms, which

rose sharply during the late 1990s, declined during the latter part of the period. This indicates that, in the recent past, smaller firms, i.e., those with fewer than 50 employees, are the ones being acquired by foreign companies in the Swedish business sector. It also appears that new foreign firms are primarily in the service sector. According to Figure 2, of the foreign firms that have been added since 2000, 76 percent are service firms, nine percent are industrial firms and the remaining 15 percent are firms in the primary industries and firms related to electricity, gas, water and construction. In addition to the fact that most of the firms that become foreign owned in the Swedish business sector appear to be in the service sector, there are other characteristics that set acquired companies apart from those that are not acquired.

3.2 Are foreign-owned firms more productive than national firms?

MNEs often have owner-specific assets³ – a unique product or production process, strong brands or a reputation for good quality – and thus can leverage their international production and marketing networks, which suggests that productivity is higher among MNEs. Figure 3 compares the labor productivity of MNEs, both Swedish owned and foreign owned, with national firms⁴.

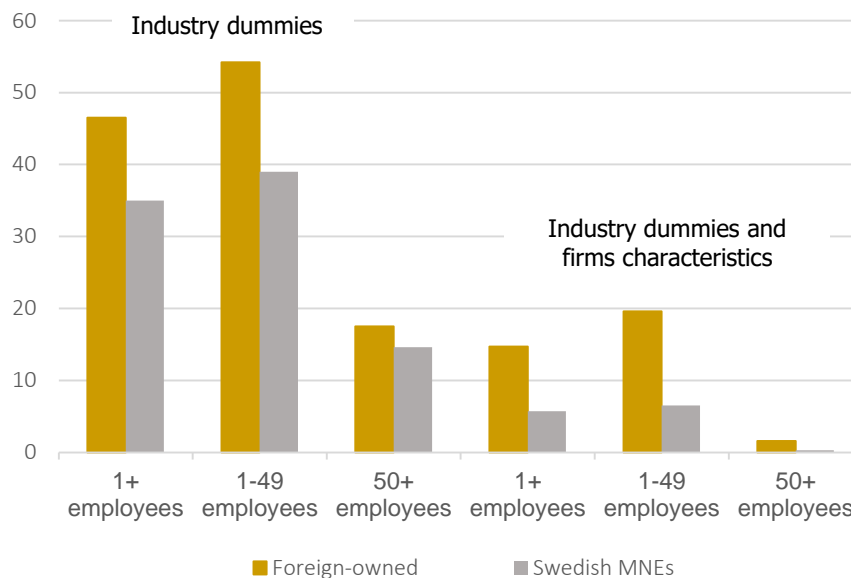
Figure 3 confirms what many previous studies have found with respect to other countries. That is, when we compare productivity between foreign-owned firms and national firms and between Swedish MNEs and national firms in the same industry, labor productivity is clearly higher in foreign-owned firms (46 percent) and in Swedish MNEs (35 percent). Furthermore, if we control for MNEs higher share of skilled labor and the fact that MNEs are larger and more capital-intensive, the differences between MNEs and national firms are reduced significantly. In other words, the markedly higher labor productivity of MNEs can, to a large extent, be explained by the fact that MNEs are more capital intensive both in terms of

³The fact that MNEs have owner-specific knowledge, which means that they have an advantage over local competitors, is fundamental to the OLI theory, which explains the existence and extent of MNEs and direct investment (Dunning 1977). O stands for ownership, L for localization and I for internalization.

⁴National firms are firms that are not multinational, i.e., they are neither Swedish MNEs nor are they foreign-owned firms.

human capital and physical capital, and they are generally larger. Nonetheless, there is still a significant productivity premium among foreign-owned firms (15 percent) and Swedish MNEs (six percent) after taking into account various firm characteristics. If the companies are then divided into small firms (1 to 49 employees) and large firms (50 employees or more), it is determined that the premium is higher in the smaller firms and that when firm characteristics are controlled, it is clear that there is no longer a premium among firms with more than 50 employees.

Figure 3 Productivity premia in Swedish MNEs and foreign-owned firms 2017 (percent)



Notes: Control variables include real capital per employee (logarithmically calculated), the share of highly educated employees at the firm level, and the size of the firm measured as the number of employees (logarithmically calculated). The dependent variable, value-added per employee (labor productivity), is logarithmically calculated. The industries are defined as NACE Rev. 2 at the 2-digit level. In the estimates, all estimated coefficients for the control variables have expected signs and are significant.

The fact that foreign-owned firms are more productive than national firms does not necessarily mean that firms acquired by foreign-owned companies have a better productivity performance after the acquisition than firms that remain Swedish owned. The reason may well be due to selection, given that the most productive firms are taken over by foreign-owned firms. Therefore, establishing a causal link between foreign acquisitions and productivity growth of the acquired firms is a

challenging task. In Section 4, we discuss the method used to estimate the effects of foreign acquisitions on productivity and on other variables to determine whether significant restructuring of the acquired firms is occurring after the acquisition. We also examine whether the effects differ between large and small firms and between firms in the manufacturing sector and those in the service sector.

4. Data, definitions and econometric approach

The econometric analysis is based on linked firm level data from Statistics Sweden's structural business statistics, foreign trade statistics, and register-based labor market statistics, together with data on foreign controlled enterprises in Sweden and Swedish MNE groups from the Swedish Agency for Growth Policy Analysis. The data include all firms in the Swedish business sector with at least one employee for the period 1999 to 2017.

To be included in the analysis, we require that a firm must be observed in the data each year over a nine-year time window, defined as $t-3$ to $t+5$. Based on information on ownership status, we classify a firm as acquired by a foreign company if it is domestically owned in year $t-2$ and year $t-1$, but changes status to foreign owned in year t . Non-acquired firms are those that remain domestically owned in all years $t-2$ to t . In the econometric analysis, acquired firms are the treatment group and non-acquired firms are the comparison group. Both groups of firms are observed each year over the interval $t-3$ to $t+5$, i.e., three years before and five years after potential acquisition. Given that the data cover the period 1999 to 2017, we are able to construct a panel of eleven cohorts of firms that we follow during the nine-year window. The first cohort is observed during the period 1999 to 2007, with possible acquisition occurring in year 2002. The last cohort is observed during the period 2009 to 2017, with potential acquisition occurring in year 2012.

In the analysis, we report separate results for firms belonging to the service sector and the manufacturing industry as well as for each sector broken down into small firms (fewer than 50 employees) and large firms (50 employees or more). Table 1 presents how the companies included in the analysis are distributed among the different groups. It is clear that most acquisitions occur in the service sector, especially among smaller service firms, which account for more than 60 percent of the total number of acquisitions. In absolute terms, the number of acquisitions is relatively evenly distributed over the remaining groups. However, if we relate the number of acquisitions to the total number of firms in each category, a different

pattern emerges. The proportion of acquisitions is clearly higher among the larger companies. We note the highest figure for large manufacturing firms, where the share of acquisitions amounts to about 2.5 percent.

Tabell 1 Acquired and non-acquired firms by sector and size

	Services		Manufacturing	
	1-49	50+	1-49	50+
Number of acquired	1,368	301	338	227
Number of non-acquired	650,884	17,549	120,535	8,696
Share of acquired (%)	0.21	1.69	0.28	2.54

To investigate the effect of foreign acquisitions on different outcome variables, we use a type of conditional difference-in-differences propensity score matching approach (see, e.g., Heckman et al. 1998). The principal idea is that we for each acquired firm try to identify a comparison firm that is not acquired and that has the same (or similar) values of variables that are assumed to affect both the probability of acquisition and the outcome of interest. The outcome for firms in the comparison group is used as an approximation of what outcome the firms in the treatment group would have experienced if they had not been acquired, i.e., the so-called counterfactual outcome.

If the acquisition occurs in period t , the matching method means that firms acquired in year t are compared to firms that are not acquired in year t , but which are similar in period $t-1$ with respect to important variables and which also show the same historical development for the outcome variable in question during periods $t-3$ to $t-1$. To handle bias due to time-invariant non-observable differences between acquired and non-acquired firms, the different outcomes are analyzed in differentiated form, that is, for a given outcome variable, the difference before and after acquisition in the treatment group is compared with the corresponding difference in the comparison group.

In the analysis, we match on the propensity score, which, in our specific case, is the predicted probability of being acquired, rather than on the pre-treatment variables

themselves. Rosenbaum and Rubin (1983) demonstrate that if the treatment and comparison groups have the same distribution of propensity scores, they also have the same distribution of all variables included in the specification of the propensity score.

The credibility of the method described depends on whether the matching has been successful in identifying acquired and non-acquired firms that are sufficiently comparable. To analyze and graphically illustrate if this is the case, we will report results from a balancing test. For each of the variables included in the propensity score, we compare the so-called standardized difference between firms in the treatment group and the comparison group before and after matching.⁵

To further reduce bias due to any remaining differences in important observable variables between firms in the treatment group and the comparison group, we follow Abadie and Imbens (2011) and combine propensity score matching with linear regression adjustment on all variables included in the propensity score. Note that regression adjustment on matched samples is far less sensitive to functional form assumptions than model-based adjustment on unmatched samples, where extrapolation bias can be a major concern (see, e.g., Rosenbaum and Rubin 1983 and Ho et al. 2007).

The following variables are included in the model specifications: labor productivity, defined as value added in millions of SEK (2015 prices) per employee; share of skilled labor, defined as the percentage of employees with three years of university education or more; capital intensity, defined as the book value for buildings and machines in millions of SEK (2015 prices) per employee; number of employees; age, defined as the number of years since the company was first registered; Swedish multinational, a dummy variable indicating whether the firm is part of a Swedish multinational group; national enterprise group, a dummy variable indicating if the company is part of a Swedish national group; and foreign

⁵ The standardized difference of a variable is defined as the difference of the sample means in the treatment and comparison groups scaled by the square root of the average of the sample variance in the two groups (Rosenbaum and Rubin 1985).

presence, defined as the proportion of employees in foreign-owned firms in relation to the total number of employees in an industry (at the 2-digit level according to NACE Rev. 2). In the model specifications, we also include dummy variables for the firm's geographical location (Stockholm local labor market, Göteborg/Malmö local labor market, and regional centers⁶, where the rest of Sweden is the reference category), industry (at the 2-digit level according to NACE Rev. 2), and the year a foreign acquisition can occur (cohort dummy). All matching variables refer to the year before a possible acquisition ($t-1$).

In addition to the above variables, the model specifications also include the historical development during the periods $t-3$ to $t-1$ for the respective outcome variables studied. The effects of foreign acquisitions on the following outcome variables are analyzed: labor productivity; share of skilled labor; number of employed persons; export intensity, defined as the export share of the production value; and import intensity, defined as the import share of intermediate consumption.

⁶ Regional centers are local labor market regions with between 100,000 and 300,000 inhabitants and are characterized as usually being regional administrative centers and having a university or university college.

5 Effects of foreign acquisitions

In Section 3.2, it was concluded that foreign-owned firms are more productive than national firms and that the productivity premium, i.e., the difference in productivity between foreign-owned firms and national firms in the same industry is particularly high in small companies (fewer than 50 employees). However, this does not imply that national firms necessarily become more productive when they are acquired by foreign-owned companies, as at least part of the higher productivity is explained by selection given that it is particularly productive companies that are taken over. Hence, because it is important to ascertain what specific characteristics acquired firms exhibit, Section 5.1 is dedicated to addressing this issue.

In section 5.2, the results, which are obtained with the help of the matching approach described in section 4, are presented, and an attempt to establish a causal link between foreign acquisitions and the development of productivity in the acquired firms is detailed. The productivity improvements that arise in connection with foreign acquisitions may be the result of restructuring processes implemented in the acquired firms. Therefore, in section 5.3, we examine what happens to the investments in human capital after acquisition. Specifically, does the share of skilled labor in the acquired firms increase? Does the firm experience expansion after acquisition? Does employment increase after acquisition? Are the acquired companies more internationalized? Do the export and import intensities increase in firms that are acquired by foreign companies?

5.1 Characteristics of acquired firms that become foreign owned

Two different outcomes are plausible. Either the acquisition candidates are firms that have above-average productivity in the industry (cherries) or they are firms that are currently underperforming (lemons) but may have future potential. In the latter case, these are firms that exhibit relatively low productivity before the acquisition, but where restructuring and organizational changes are assumed to lead to significant productivity improvements (Lichtenberg and Siegel 1987). If the motive for the acquisition is to gain access to new knowledge and technology, i.e.,

technology sourcing, that complements and strengthens one's own technological competence, there is reason to expect that the acquirer already has relatively high productivity and a high share of skilled labor prior to the acquisition.

To investigate which factors affect the likelihood of a firm being acquired by a foreign-owned company, we estimate a probit model, which is also the propensity score described in the previous section. The dependent variable assumes the value 1 if a firm in t is classified as acquired and 0 if a firm in t is classified as not acquired. Table 1 presents the results of these estimates on firm data for the Swedish business sector and includes any acquisitions during the period 2002 to 2012. With respect to explanatory variables, those that have previously appeared in the literature are used to explain foreign acquisitions and refer to the year before any acquisitions are made, i.e., $t-1$. When the probability of a firm being acquired by a foreign company is estimated, it is performed separately for firms in the service sector and those in the manufacturing sector, as well as for small firms (1 to 49 employees) and large firms (50 employees and more).

Table 2 indicates that foreign companies tend to take over firms that have high labor productivity and a high share of skilled labor before the acquisition, a phenomenon that is especially true for small firms. The fact that foreign-owned companies have a preference for acquiring relatively high-productivity national firms is a pattern that is repeated in several similar studies with respect to Sweden as well as other countries,⁷ thus suggesting that the higher productivity of foreign-owned firms in Sweden, and other countries, is partly explained by selection, i.e., foreign buyers are likely to cherry-pick.

⁷ See Bandick and Karpaty (2011) for results for Sweden; Arnold and Javorcik (2009) for Indonesia; Balsvik and Haller (2010) for Norge; Damijan et al. (2015) for ten new EU-members in Central and Eastern Europe; and Ascani (2018) for 14 old EU-members.

Table 2 Estimated probability of foreign acquisition in the Swedish business sector

	Service		Manufacturing	
	1-49	50+	1-49	50+
Labor productivity	0.0651*** (3.12)	0.1042* (1.76)	0.1631*** (4.82)	0.1803 (1.59)
Share of skilled labor	0.2437*** (6.82)	0.2566 (1.45)	0.8037*** (8.64)	1.8035*** (6.51)
Capital intensity	0.0033 (1.17)	-0.2619** (-2.55)	0.0030 (0.25)	-0.0058 (-0.83)
Number of employed	1.9104*** (21.69)	0.0086*** (4.26)	2.2498*** (14.32)	-0.0002 (-0.09)
Age	-0.0389*** (-11.70)	-0.0051 (-0.61)	-0.0269*** (-4.12)	-0.0288** (-2.39)
Swedish multinational	0.1985*** (3.23)	-0.3204*** (-2.66)	-0.0287 (-0.27)	-0.8829*** (-5.73)
National enterprise group	0.7836*** (30.78)	0.5495*** (5.99)	0.6010*** (11.85)	0.4695*** (4.28)
Foreign presence	0.1476 (0.53)	-0.4550 (-0.92)	0.6053 (1.50)	0.1449 (0.21)
Stockholm	0.1406*** (3.73)	0.2047* (1.90)	-0.0482 (-0.73)	-0.0240 (-0.20)
Göteborg/Malmö	0.0364 (0.93)	0.0480 (0.43)	-0.0590 (-1.00)	0.1018 (1.06)
Regional center	-0.1491*** (-3.64)	-0.1242 (-1.09)	-0.1019* (-1.91)	-0.0863 (-1.02)
Pseudo R ²	0.189	0.128	0.168	0.173
Wald chi ²	3,258.4	326.3	801.4	202.4
Prob > chi ²	0.000	0.000	0.000	0.000
Number of observations	625,636	16,045	120,257	8,882

Notes: The model specifications also include dummy variables for the industry (at the 2-digit level according to NACE Rev. 2) and for the year a foreign acquisition can take occur (cohort dummy); t-ratios are within the parentheses. ***, ** and * indicate significance at the 1, 5 and 10 percent levels, respectively.

It is expected that the basic observable characteristics of a firm are what a potential investor relies on when searching for potential acquisition candidates. Accordingly, in addition to productivity and the share of skilled labor, the size of the firm and the firm's participation in a Swedish national enterprise group positively impact the probability of being acquired. However, the age of the firm and the firm's

participation in a Swedish MNE has a negative impact on the probability of acquisition. The latter only applies to large firms.

Interestingly, the probability of acquiring Swedish service firms is higher if the firms are located in Stockholm, and this is especially true for small firms. This may be because knowledge-intensive service firms are, to a greater extent, operating in large cities such as Stockholm. Hence, the motive for acquisitions, in part, may be to gain access to the knowledge available to the acquired firms and to exploit the knowledge available in the surrounding firms in the region given that such knowledge spillovers occur more frequently in dense regions. Proximity to a large city also exposes potential acquisition candidates to potential foreign acquirers and offers a better positioned platform for foreign companies intending to enter the Swedish market.⁸

Finally, the capital intensity of a firm appears to have no effect on whether a firm is acquired, except with respect to large service firms. Furthermore, the presence of foreign firms in the same industry has no bearing on the probability of a firm being acquired.

5.2 How is the productivity of firms acquired by foreign companies affected?

An additional explanation as to why foreign firms exhibit higher productivity than do the national firms in Sweden could be due to the knowledge and technology transfers within a multinational enterprise group, i.e., from the parent company abroad (with its owner-specific assets) to the acquired or newly established firms in Sweden. In other words, productivity grows faster in firms acquired by foreign companies than in similar Swedish-owned firms. However, faster productivity growth may also be the result of restructuring processes within the acquired firms that begin in connection with the acquisition itself. This may include increased

⁸ Andersson and Xiao (2016) find that the probability of the acquisitions of new technology-based firms is higher if they are localized in Stockholm.

investments in human capital, increased exports and imports, and better utilization of economies of scale in connection with expansion (see Section 5.3).

We are first interested in determining whether there is a positive relationship between foreign acquisitions and productivity growth in the acquired firms. To systematically investigate the causal effect of foreign acquisition on the labor productivity of acquired firms, the matching method previously described in Section 4 is used, which also addresses the problem of selection. Firms that become foreign owned in year t (treated firms) are compared with firms that do not become foreign owned in year t and thus are equal in period $t-1$ with respect to, among other things, the share of skilled labor, capital intensity, number of employed, age and industry, and they also exhibit similar labor productivity in periods $t-3$ to $t-1$.⁹ The parameter estimated using this method for firms acquired by foreign companies is expressed as the average effect on the future labor productivity of firms acquired by a foreign company compared to firms not acquired by foreign companies.

Figure 4 illustrates the estimated effect of foreign acquisitions on labor productivity in acquired companies. The companies are divided into two groups, namely, small companies, i.e., fewer than 50 employees and large companies, i.e., 50 or more employees, and we make a distinction between acquired service sector firms and acquired manufacturing firms.

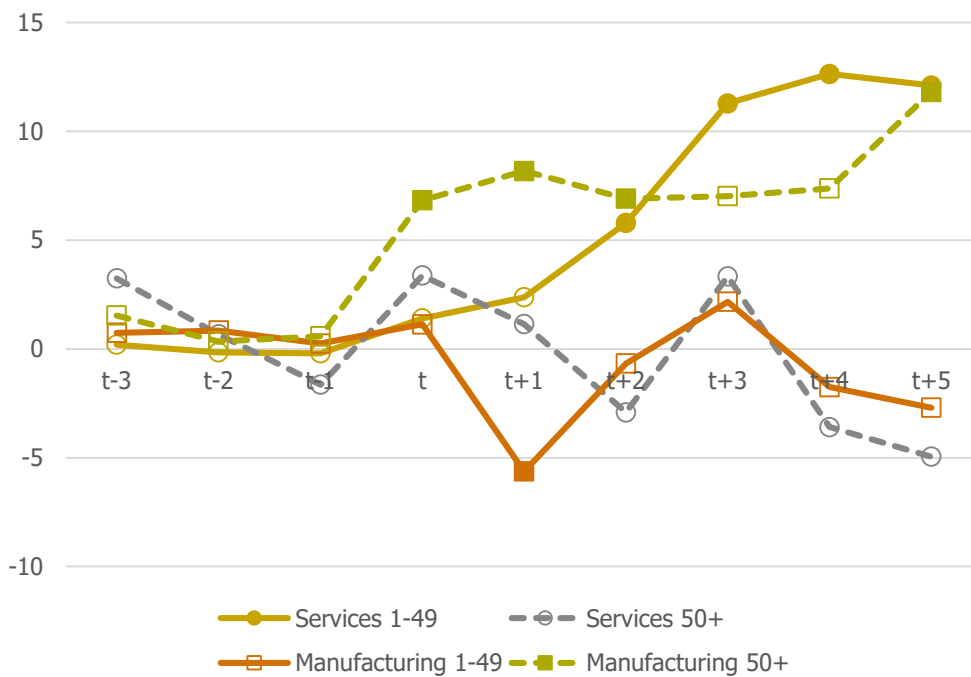
Initially, no significant differences are identified in productivity between acquired and non-acquired firms during the periods before acquisitions. However, it is evident that productivity in acquired small service firms and large manufacturing firms increases faster following the acquisition.

Particularly prominent is the effect in small service firms, where a significant positive productivity effect is evident two years after acquisition compared to firms that remain Swedish-owned at time t . Small service firms are also the group of

⁹ See Section 4 for definitions of all variables included in the matching.

firms in which most foreign acquisitions occur.¹⁰ In the large manufacturing firms that are taken over, the positive productivity effect is not as pronounced,¹¹ and in the case of acquired large service firms and small manufacturing firms, no effects on productivity are found.

Figure 4 Estimated effects of foreign acquisitions on labor productivity in acquired firms (percent)



Notes: Based on reported results in Table 3 in the Appendix where more details can be found. Filled markings indicate significance at the 10 percent level or lower.

Section 4 emphasizes that the reliability of the method used rests on the fact that the matching succeeds in identifying sufficiently comparable acquired and non-acquired firms. Figure 9 in the Appendix presents a graphical presentation of the balancing before and after matching for some of the key variables included in the propensity score specification. The measure used is the standardized difference for each of the variables.¹² In the applied literature, a standardized difference within a

¹⁰ The number of acquisitions of small service firms in our dataset is over 1,300, while the acquisitions in the other groups are approximately 300 in each. See Table 1.

¹¹ Although the productivity effect five years after the acquisition is about the same and is significant, it is insignificant in the intermediate periods $t + 3$ and $t + 4$. See Table 3 in the Appendix.

¹² See footnote 5 for a definition.

range of +/- 0.1 is usually considered negligible (see, for example, Austin 2009). The figure also suggests that before matching, there is generally a substantial difference between acquired and non-acquired firms with respect to variables such as historical labor productivity, share of skilled labor, number of employed, participation in a national enterprise group, and foreign presence. After matching, the standardized difference between acquired and non-acquired firms is significantly less and clearly within the acceptable range. This applies both to the variables reported in the figure and to other unreported variables included in the propensity score specification. Thus, it is concluded that the reported estimated effects of foreign acquisitions on labor productivity in acquired firms are based on a treatment group and a comparison group that are sufficiently comparable with respect to all underlying variables included in the model specification.¹³

5.3 Restructuring effects in acquired firms

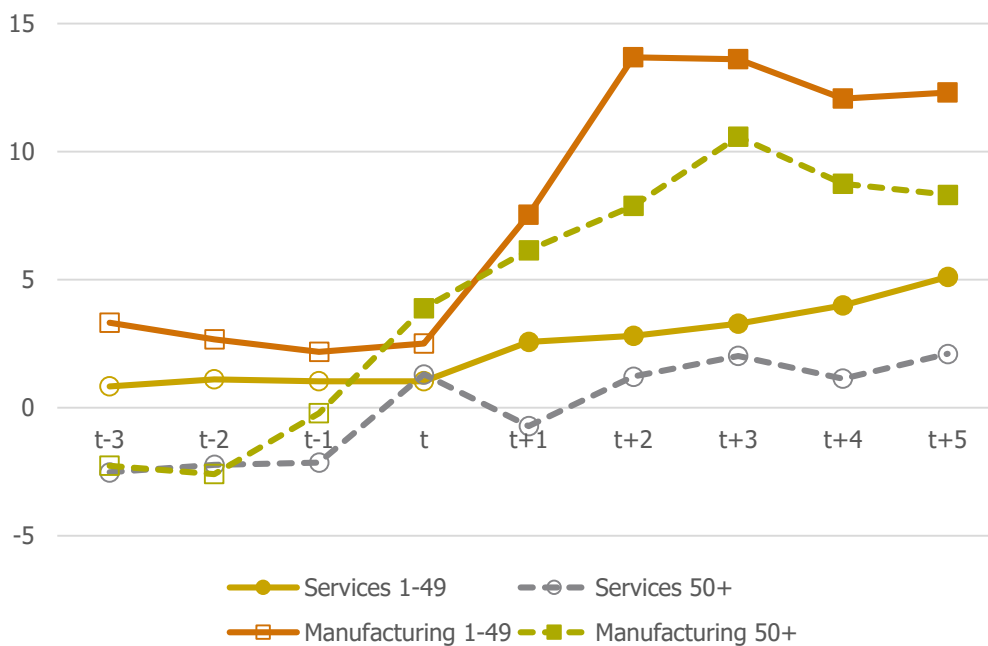
Figure 4 indicates that labor productivity after acquisitions increases in acquired small service firms and large manufacturing firms and that this development may be explained by certain underlying factors. We examine this in the same way that we estimated the effect of foreign acquisitions on labor productivity. That is, we estimate the effects on the share of skilled labor, employment, and export and import intensities in the acquired firms. A visual graph of the estimated effect of foreign acquisitions on the share of skilled labor in acquired firms in Figure 5.

Figure 5 indicates that the share of skilled labor increases in acquired firms after acquisitions in all groups of firms, except large service firms. The largest increases relative to firms that are not acquired at time t occur in manufacturing firms. The increase in the share of skilled labor in small service firms and large manufacturing firms after acquisitions indicates that the positive productivity effect in these firms may be due to increased investments in human capital. An interesting observation is that in both groups of firms, acquisition results in the employment of skilled

¹³ The fact that the estimated effects are based on a treatment group and a sufficiently comparable comparison group also applies to the results presented in Section 5.3. However, for these, we do not report figures on balancing.

workers increasing faster in acquired firms than in non-acquired firms. However, the employment of less-skilled workers in acquired large manufacturing firms tends to decrease compared to that in the firms in the control group.¹⁴ Thus, the driving forces behind the increased share of skilled labor appears to differ between small service firms and large manufacturing firms.

Figure 5 Estimated effects of foreign acquisitions on share of skilled labor in acquired firms (percent)

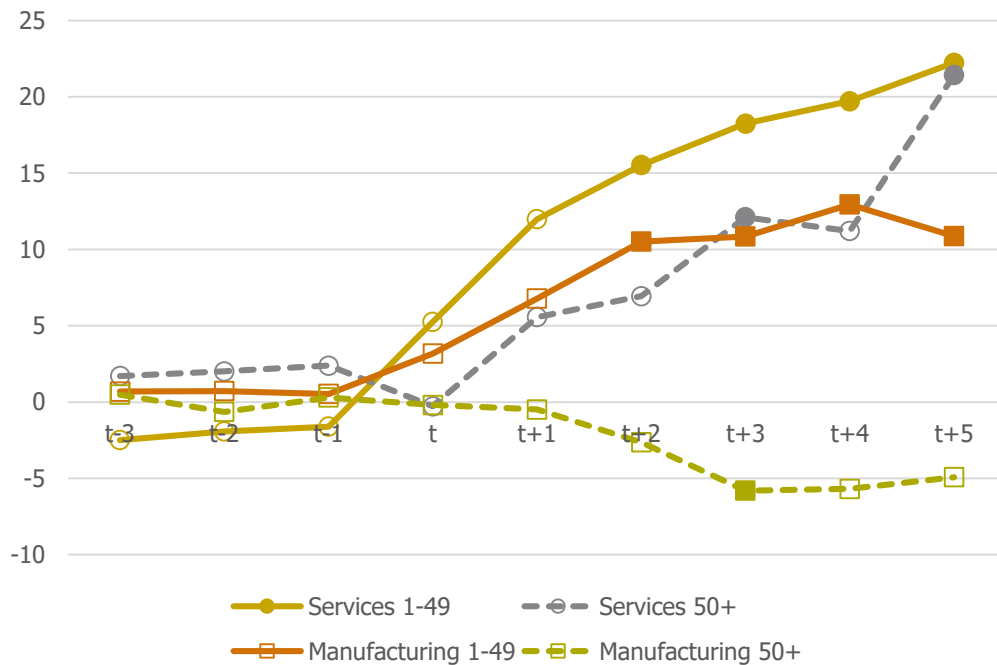


Notes: Based on reported results in Table 4 in the Appendix where more details can be found. Filled markings indicate significance at the 10 percent level or lower.

When a foreign MNE acquires a national firm, the acquired company's ability to expand in the foreign market is enhanced by being able to benefit from the MNE's international network and organization. An acquired firm also becomes less financially constrained and has better access to credit, making it easier for the firm to grow. A sign that an acquired firm is expanding after acquisition is an increase in the firm's number of employees. Figure 6 indicates what happens to employment in the various groups of firms after acquisition.

¹⁴ See Tillväxtanalys (2017) Figure 10 and Figure 11.

Figure 6 Estimated effects of foreign acquisitions on employment in acquired firms (percent)



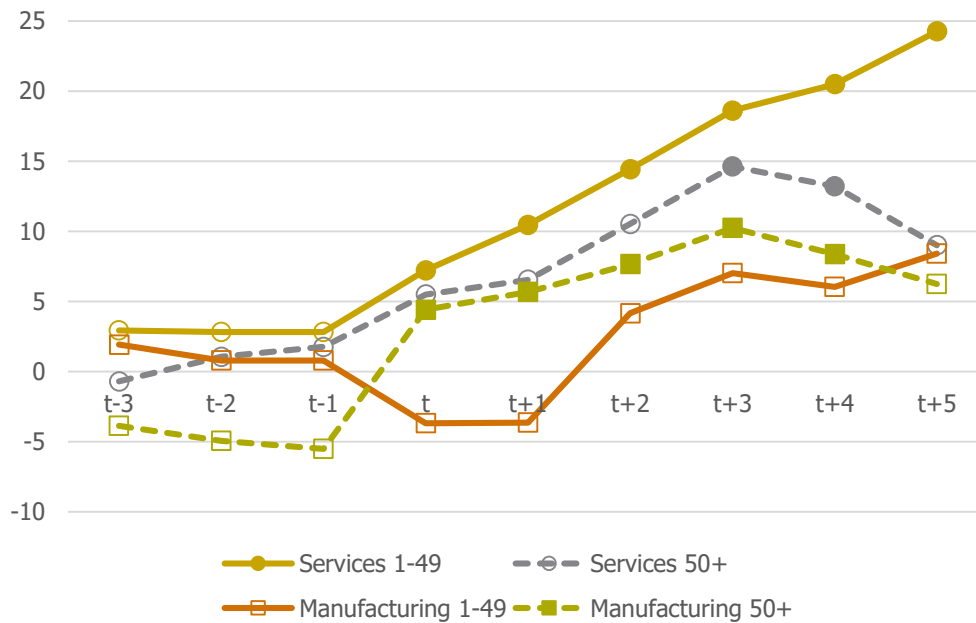
Notes: Based on reported results in Table 5 in the Appendix where more details can be found. Filled markings indicate significance at the 10 percent level or lower.

While positive employment effects after acquisition are found primarily in small service firms, such effects are also noted in smaller manufacturing firms and, to some extent, may even be present in some large service firms. However, not only is there no indication that employment is increasing in acquired large manufacturing firms, but rather, the opposite is observed. Consequently, an expansion resulting in a positive employment effect after acquisition seems to occur, especially in small firms.

An expansion in sales in the acquired firms appears to occur, for the most part, in the foreign market. This is apparent when we estimate the effect of acquisitions on exports' share of production (export intensity). The results of such estimates are illustrated in Figure 7, which shows that the positive effects of acquisitions on export intensity are particularly prominent in small service firms, but there are also

clear positive effects in large manufacturing firms. Less pronounced are the positive effects in small manufacturing firms and large service firms.

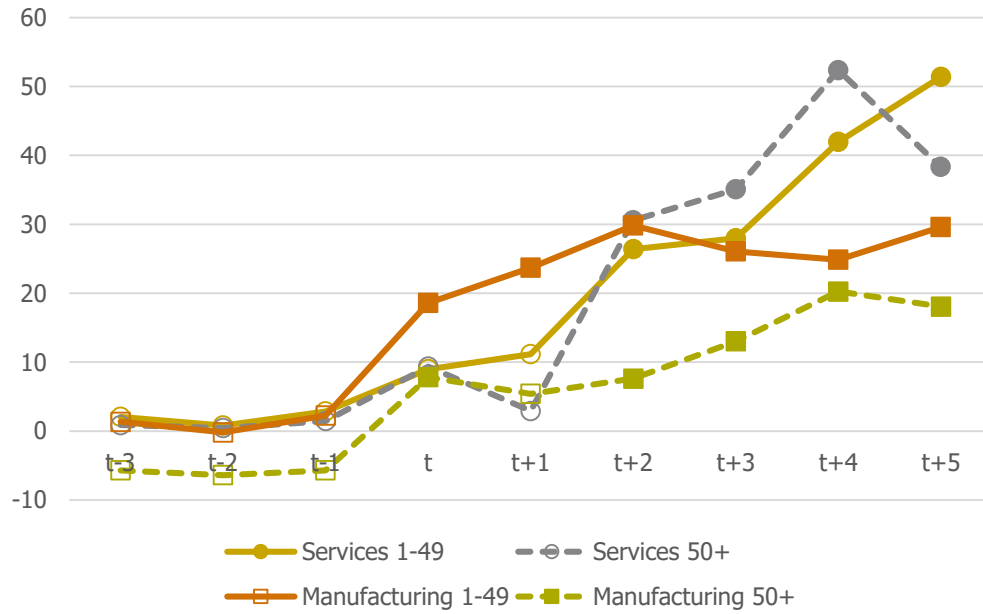
Figure 7 Estimated effects of foreign acquisitions on export intensity in acquired firms (percent)



Notes: Based on reported results in Table 6 in the Appendix where more details can be found. Filled markings indicate significance at the 10 percent level or below.

Another indication that the acquired firms become more internationalized when they are acquired by foreign-owned firms is that the share of imports in intermediate consumption – import intensity – also increases in the acquired firms after the acquisitions. Importantly, import intensity increases after acquisitions in all types of companies. Additionally, access to a higher quality and a more varied range of inputs and services contributes to positive productivity effects.

Figure 8 Estimated effects of foreign acquisitions on import intensity in acquired firms (percent)



Notes: Based on reported results in Table 7 in the Appendix where more details can be found. Filled markings indicate significance at the 10 percent level or below.

6 Concluding comments

In previously held discussions about the effects of increased foreign ownership, the focus has been on larger companies. For example, what happens when large Swedish MNEs become foreign-owned? In recent years, the number of foreign acquisitions has continued to be high, while the share of employees working in foreign-owned firms has remained at approximately the same level since 2000. Our results indicate that nowadays, it is primarily small firms that operate in the service sector that are being acquired. Generally, these are firms that have high productivity and a large share of skilled labor.

It is further determined that the acquired service firms, to a great extent, are located in the Stockholm region due to the availability of a high proportion of knowledge-intensive service firms, which are potential acquisition candidates, and the fact that Stockholm is an attractive region for this type of business.

The positive effects on productivity, the share of skilled labor, employment, and the export and import intensities of foreign acquisitions are most evident among small service firms. Furthermore, it is within this group of firms that most foreign acquisitions occur.

However, positive productivity effects of foreign acquisitions are also realized in large manufacturing firms. One contributing factor to these effects in both the small service firms and the large manufacturing firms is the investment in human capital, which results in increased shares of skilled labor.

Another interesting observation is that foreign acquisitions involve expansion, i.e., employment increases, particularly in small firms, after acquisitions. Thus, being acquired by a foreign MNE seems, for small firms with strong future growth potential, to be a conceivable alternative when confronted with the growth barriers that these companies usually encounter. Such barriers include difficulties associated with obtaining financing, thresholds that impede access to subcontractors and customers in other countries, and lack of capacity to develop

and market their products in connection with entry on the export market. The acquisitions may also result in the acquired firms gaining better access to a greater range of input goods and services, which, in turn, likely leads to increased productivity.

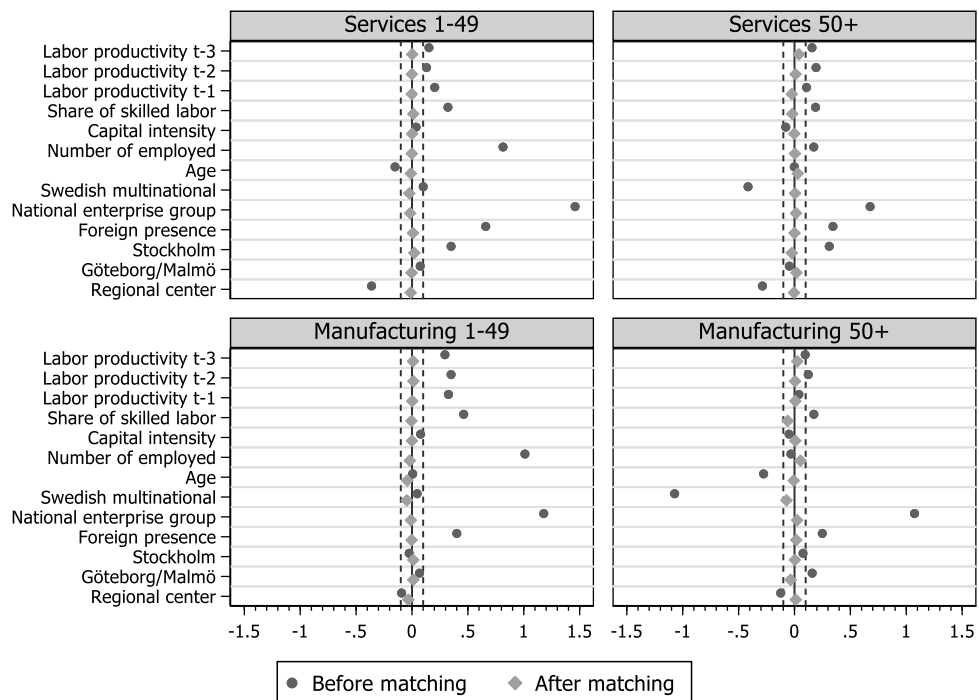
References

- Abadie, A. and G. W. Imbens (2011), Bias-corrected matching estimators for average treatment effect. *Journal of Business & Economic Statistics*, 29(1), 1-11.
- Andersson, M. and J. Xiao (2016), Acquisitions of start-ups by incumbent businesses. A market selection process of “high-quality” entrants? *Research Policy*, 45(1), 272-290.
- Arnold, J. and B. Javorcik (2009), Gifted kids and pushy parents? Foreign direct investment and plant productivity in Indonesia. *Journal of International Economics*, 79(1), 42-53.
- Ascani, A. (2018), The takeover selection decision of multinational enterprises: empirical evidence from European target firms. *Journal of Economic Geography*, 18(6) 1227-1252.
- Austin, P. C. (2009), Balance diagnostics for comparing the distribution of baseline covariates between treatment groups in propensity-score matched samples. *Statistics in Medicine*, 28(25), 3083-3107.
- Balsvik, R. and S. Haller (2010), Picking “lemons” or picking “cherries”? Domestic and foreign acquisitions in Norwegian manufacturing. *Review of Economics and Statistics*, 93(1), 361-387.
- Bandick, R. and P. Karpaty (2011), Employment effects of foreign acquisitions. *International Review of Economics and Finance*, 20, 211-224.
- Doms, M. and B. Jensen (1998), Comparing wages, skills and productivity between domestically and foreign-owned manufacturing establishments in the United States. In Baldwin, R., R. Lipsey and D. Richardson (eds) *Geography and ownership as bases for economic accounting*. Chicago university press, Chicago.
- Conyon, M., S. Girma, S. Thompson and P. Wright (2002), The productivity and wage effects of foreign acquisition in the United Kingdom. *Journal of Industrial Economics*, 50(1) 85-102.
- Criscuolo, C. and R. Martin (2009), Multinationals and U.S. productivity leadership: evidence from Great Britain. *Review of Economics and Statistics*, 91(2), 263-281.
- Damijan, J., C. Kostevc and M. Rojec (2015), Growing lemons or cherries? Pre- and post-acquisition performance of foreign-acquired firms in new EU member states. *The World Economy* 38(4), 751-772.
- Dunning, J. (1977), Trade location of economic activity and the multinational enterprise: a search for an eclectic approach. In Ohlin, B, P-O, Hesselborn and P-M, Wijkman (eds) *The international allocation of economic activity*. Macmillan: London.

- Guadalupe, M., O. Kuzmina and C. Thomas (2012), Innovation and foreign ownership. *American Economic Review*, 102(7), 3594-3627.
- Harris, R. and C. Robinson (2003), Foreign ownership and productivity in the United Kingdom. *Review of Industrial Organization*, 22(3), 207-223.
- Heckman, J, H. Ichimura and P. Todd (1997), Matching as an econometric evaluation estimator: Evidence from evaluating a job training program. *Review of Economic Studies*, 64(4), 605-654.
- Heckman, J, H. Ichimura, J. Smith and P. Todd (1998), Characterizing selection bias using experimental data. *Econometrica*, 66(5), 1017-1098.
- Ho, D. E., K. Imai, G. King, and E. A. Stuart (2007), Matching as nonparametric preprocessing for reducing model dependence in parametric causal inference. *Political Analysis*, vol. 15:3, 199–236.
- Karpaty, P. (2007), Productivity effects of foreign acquisitions in Swedish manufacturing: The FDI productivity issue revisited. *International Journal of the Economics and Business*, 14(2), 241-260.
- Lichtenberg, F. and D. Siegel (1987), Productivity and changes in ownership of manufacturing plants. *Brookings Paper on Economic Activity* 3: 643-673.
- Rosenbaum, P. R. and D. B. Rubin (1983). The central role of the propensity score in observational studies for causal effects. *Biometrika*, vol. 70:1, 41–55.
- Rosenbaum, P. R. and D. B. Rubin (1985), Constructing a control group using multivariate matched sampling methods that incorporate the propensity score. *The American Statistician*, 39(1), 33-38.
- Tillväxtanalys (2017), Utländska uppköp i svenskt näringsliv – hot eller möjlighet? (Foreign acquisitions – threat or opportunity?) *PM 2017:12*.

Appendix

Figure 9 Balancing of variables in propensity score before and after matching



Notes: This representation refers to the model specification for the estimated effects of foreign acquisitions on labor productivity in acquired firms (see Figure 4 and Table 3). The specification of the propensity score also includes dummy variables for the industry and for the year a foreign acquisition can occur. However, these have been omitted due to space limitations. The dashed vertical lines indicate standardized differences in the range ± 0.1 .

Table 3 Estimate effects of foreign acquisitions on labor productivity in acquired firms (point estimate present effects in thousands SEK)

	Service				Manufacturing			
	1-49		50+		1-49		50+	
	Estimate	%	Estimate	%	Estimate	%	Estimate	%
t	10.4372 (0.62)	1.4	24.0567 (0.92)	3.4	8.7660 (0.27)	1.1	52.1247* (1.81)	6.8
t+1	17.6381 (0.92)	2.4	8.1275 (0.34)	1.1	-43.5553* (-1.81)	-5.6	62.4094** (1.97)	8.2
t+2	43.1651** (2.15)	5.8	-20.8232 (-0.75)	-2.9	-5.1984 (-0.21)	-0.7	52.6633* (1.70)	6.9
t+3	84.1417*** (3.89)	11.3	23.7505 (0.80)	3.3	16.7560 (0.57)	2.2	53.5789 (1.57)	7.0
t+4	94.2422*** (4.73)	12.6	-25.6262 (-0.69)	-3.6	-13.5462 (-0.38)	-1.7	56.2397 (1.56)	7.4
t+5	90.3222*** (3.91)	12.1	-35.3413 (-1.01)	-5.0	-20.9018 (-0.33)	-2.7	90.1454** (2.35)	11.8
Number of treated	1,334		294		335		224	
Number of untreated	622,450		15,646		119,410		8,609	

Notes: The estimates are based on the so-called conditional difference-in-difference propensity score matching in combination with a regression analysis on the matched sample. In the matching, we use an Epanechnikov kernel estimator with bandwidth based on cross-validation with respect to the mean values of the variables included in the propensity scores. For details on the matching method and the specification of the propensity score, see Section 4. The effects in percentages are calculated as estimates divided by the average labor productivity of acquired firms in years $t - 2$ and $t - 1$ in each group. Within the parentheses, t-ratios based on bootstrap standard errors with 200 replications. ***, ** and * indicate significance at the 1, 5 and 10 percent levels, respectively.

Table 4 Estimated effects of foreign acquisitions on share of skilled labor in acquired firms

	Service				Manufacturing			
	1-49		50+		1-49		50+	
	Estimate	%	Estimate	%	Estimate	%	Estimate	%
t	0.0026 (0.89)	1.0	0.0031 (1.02)	1.3	0.0031 (0.79)	2.5	0.0036** (2.48)	3.9
t+1	0.0065* (1.81)	2.6	-0.0017 (-0.39)	-0.7	0.0093** (2.19)	7.5	0.0057** (2.50)	6.2
t+2	0.0071* (1.78)	2.8	0.0029 (0.61)	1.2	0.0169** (2.53)	13.7	0.0073** (2.51)	7.9
t+3	0.0083** (2.03)	3.3	0.0048 (0.83)	2.0	0.0168*** (2.82)	13.6	0.0098*** (2.58)	10.6
t+4	0.0101** (2.21)	4.0	0.0027 (0.41)	1.1	0.0149** (2.36)	12.1	0.0081** (2.18)	8.7
t+5	0.0129*** (2.61)	5.1	0.0050 (0.75)	2.1	0.0152** (2.10)	12.3	0.0077* (1.72)	8.3
Number of treated	1,332		293		336		225	
Number of untreated	623,093		15,704		119,591		8,622	

Notes: For details on the method underlying the estimates, see Section 4 and notes to Table 3. Effects as a percentage are calculated as estimates divided by the average share of skilled labor in acquired firms in years $t - 2$ and $t - 1$ in each group. Within the parentheses, t-ratios based on bootstrap standard errors with 200 replications. ***, ** and * indicate significance at the 1, 5 and 10 percent levels, respectively.

Table 5 Estimated effects of foreign acquisitions on employment in acquired firms

	Service				Manufacturing			
	1-49		50+		1-49		50+	
	Estimate	%	Estimate	%	Estimate	%	Estimate	%
t	0.7994 (0.54)	5.2	-1.0545 (-0.12)	-0.3	0.7088 (1.59)	3.2	-0.4694 (-0.10)	-0.2
t+1	1.8265 (1.21)	12.0	21.2011 (1.35)	5.6	1.5109 (1.49)	6.8	-1.1669 (-0.15)	-0.5
t+2	2.3689*** (2.80)	15.5	26.454 (1.26)	6.9	2.3478** (2.13)	10.5	-6.3623 (-0.92)	-2.6
t+3	2.7820** (2.46)	18.2	46.0906* (1.78)	12.1	2.4196** (2.00)	10.8	-13.9960* (-1.66)	-5.8
t+4	3.0062** (2.43)	19.7	42.6699 (1.52)	11.2	2.8901** (2.10)	12.9	-13.7315 (-1.26)	-5.7
t+5	3.3901*** (2.89)	22.2	81.5961* (1.71)	21.4	2.4246* (1.76)	10.9	-11.8837 (-1.01)	-4.9
Number of treated	1,330		294		335		223	
Number of untreated	622,809		15,691		119,157		8,634	

Notes: For details on the method underlying the estimates, see Section 4 and notes to Table 3. Effects as a percentage are calculated as estimates divided by the average employment in acquired firms in years $t - 2$ and $t - 1$ in each group. Within the parentheses, t-ratios based on bootstrap standard errors with 200 replications. ***, ** and * indicate significance at the 1, 5 and 10 percent levels, respectively.

Table 6 Estimated effects of foreign acquisitions on export intensity in acquired firms

	Service				Manufacturing			
	1-49		50+		1-49		50+	
	Estimate	%	Estimate	%	Estimate	%	Estimate	%
t	0.0069**	7.2	0.0047	5.5	-0.0079	-3.7	0.0162**	4.4
	(2.11)		(0.85)		(-1.15)		(2.20)	
t+1	0.0100***	10.5	0.0056	6.5	-0.0078	-3.6	0.0209*	5.7
	(2.63)		(1.03)		(-0.88)		(1.94)	
t+2	0.0138***	14.4	0.0090	10.5	0.0089	4.2	0.0282**	7.7
	(3.25)		(1.20)		(0.85)		(2.38)	
t+3	0.0178***	18.6	0.0125*	14.6	0.0150	7.0	0.0377***	10.2
	(3.92)		(1.90)		(1.39)		(2.94)	
t+4	0.0196***	20.5	0.0113*	13.2	0.0129	6.0	0.0308**	8.4
	(4.38)		(1.76)		(1.14)		(2.24)	
t+5	0.0232***	24.3	0.0077	9.0	0.0180	8.4	0.0230	6.2
	(5.01)		(1.04)		(1.61)		(1.62)	
Number of treated	1,152		265		270		196	
Number of untreated	602,966		15,142		114,760		7,904	

Notes: For details on the method underlying the estimates, see Section 4 and notes to Table 3. Effects as a percentage are calculated as estimates divided by the average export intensity in acquired firms in years $t - 2$ and $t - 1$ in each group. Within the parentheses, t-ratios based on bootstrap standard errors with 200 replications. ***, ** and * indicate significance at the 1, 5 and 10 percent levels, respectively.

Table 7 Estimated effects of foreign acquisitions on import intensity in acquired firms

	Service				Manufacturing			
	1-49		50+		1-49		50+	
	Estimate	%	Estimate	%	Estimate	%	Estimate	%
t	0.0057 (1.42)	9.0	0.0064 (1.06)	9.4	0.0305*** (3.59)	18.6	0.0183** (2.21)	7.8
t+1	0.0071 (1.59)	11.2	0.0020 (0.28)	2.9	0.0389*** (4.27)	23.7	0.0126 (1.31)	5.4
t+2	0.0168*** (3.43)	26.4	0.0209** (2.23)	30.6	0.0490*** (4.67)	29.8	0.0178* (1.85)	7.6
t+3	0.0178*** (3.61)	28.0	0.0240** (2.55)	35.1	0.0428*** (3.59)	26.0	0.0305*** (2.76)	13.0
t+4	0.0267*** (5.11)	41.9	0.0358*** (3.12)	52.3	0.0408*** (3.73)	24.8	0.0474*** (4.09)	20.3
t+5	0.0327*** (5.16)	51.4	0.0262*** (2.60)	38.3	0.0486*** (3.87)	29.6	0.0423*** (3.51)	18.1
Number of treated	846		216		270		195	
Number of untreated	542,523		13,400		110,195		8,011	

Notes: For details on the method underlying the estimates, see Section 4 and notes to Table 3. Effects as a percentage are calculated as estimates divided by the average import intensity in acquired firms in years $t - 2$ and $t - 1$ in each group. Within the parentheses, t-ratios based on bootstrap standard errors with 200 replications. ***, ** and * indicate significance at the 1, 5 and 10 percent levels, respectively.