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Multinational Firms and Job Tasks

Katariina Nilsson Hakkala, Fredrik Heyman and
Fredrik Sjöholm

MULTINATIONAL FIRMS, ACQUISITIONS AND JOB TASKS

Katariina Nilsson Hakkala*

Aalto University and the Government Institute for Economic Research

Fredrik Heyman**

The Research Institute of Industrial Economics

Fredrik Sjöholm***

Lund University and the Research Institute of Industrial Economics

Abstract

We revisit the question how inward FDI and multinational ownership affect relative labor demand. Motivated by the recent literature that distinguish between skills and tasks, we argue that the impact of multinational and foreign ownership on the demand for labor is better captured by focusing on job tasks rather than education. We use Swedish matched employer-employee data and find that changes of local firms to both foreign and Swedish multinationals increase the relative demand for non-routine and interactive job tasks in the targeted local firms. Hence, in a high-income country, both inward and outward FDI have a task upgrading impact on local firms. The effect is primarily driven by wage effects leading to increased wage dispersion for workers with different non-routine and interactive task intensity. We also show that the effect is not the same as skill upgrading since dividing employees by educational attainment does not capture changes in the relative labor demand. Hence, our results suggest a new aspect of the labor market consequences of FDI.

JEL: J23, F16, F21, F23

Keywords: FDI, Cross-Border Acquisitions, Multinational Firms, Foreign Ownership, Job Tasks, Labor Demand, Skill Groups.

* Government Institute for Economic Research (VATT), Box 1279, SE-00101 Helsinki, Finland, katariina.nilsson-hakkala@vatt.fi.

** The Research Institute of Industrial Economics, Box 55665, SE-102 15 Stockholm, Sweden, fredrik.heyman@ifn.se.

***Corresponding Author. Department of Economics, Lund University, Box 7082, SE-220 07 Lund, Sweden, fredrik.sjoholm@nek.lu.se, Phone: + 46 46 222 74 26, Fax: + 46 46 222 46 13.

I. Introduction

The labor market influence of multinational enterprises (MNEs) has unsettled policymakers worldwide. Some argue that MNEs are more inclined than local firms to offshore jobs and downsize inefficient plants – or even shut them down entirely. In developed countries – where multinational firms locate knowledge intensive production while offshoring low-skilled jobs elsewhere – unskilled workers are generally believed to be threatened.

Yet studies on foreign direct investment (FDI) find mixed evidence for the effects of outward investments on home country demand for white- and blue-collar workers (e.g. Slaughter, 2000; Hansson, 2005; Head and Ries, 2002). On a related issue, studies on inward FDI have also found acquisitions of local firms by foreign multinationals to have little impact on the relative demand for skills. For instance, Almeida (2007) shows that foreign acquisitions of Portuguese establishments do not affect the educational composition of workers, and Huttunen (2007) documents a very marginal decrease in share of workers with higher education after foreign acquisitions of local establishments in Finland.

The weak empirical support for labor market effects from FDI may stem from previous studies' focus on the demand for high- and low-skilled labor. Several economists make a point of distinguishing between skills and tasks. Acemoglu and Autor (2011), for instance, argue that such distinction is essential for understanding recent labor market trends. In the international economics literature, the distinction between skills and tasks is highly relevant since it has been argued that characteristics other than skill intensity explain which tasks remain at home and which can be located away from headquarters and main production facilities (Blinder, 2006;

Markusen, 2006). In particular, routine tasks and tasks that do not require personal interaction can more easily be located at a distance from the home country.

Hence, a more appropriate approach to labor market effects of FDI might be to examine the effect on different job tasks. How the employment structure responds to inward and outward FDI in a high-income country remains an open question. Traditional models on vertical and horizontal FDI provide some predictions of the home and host country effects on relative skill demand but how well these translate into predictions for relative task demand remains unresolved. More recent theoretical models, in which production processes are fragmented into separate stages with different factor intensities, explain the increase in trade of intermediates and predict how associated cost reductions may accrue to different type of workers (e.g. Jones and Kierzkowski, 2001; Grossman and Rossi-Hansberg, 2008 and 2012). Still there remains disagreement on the direction of expected effects on the relative labor demand.

Our analysis departs from the approach of the recent literature that makes a point of distinguishing between skills and tasks and examines the employment and wage effects of FDI in a high-income country, Sweden. Previous studies on FDI and relative demand for different job tasks are scarce. One notable exception is the study by Becker et al. (2013) who examine how in-house offshoring, i.e. outward FDI, affects the composition of job tasks in German MNEs' home country operations. Our paper relates to Becker et al., but also differs from it in several respects. First, while they study home country effects of outward FDI, we study the effects of both inward and outward FDI. Second, we are able address some of the questions that remain open in the study by Becker et al. (2013). In particular, by using rich employer-employee data including information both of foreign takeovers and shifts of domestic local firms

to Swedish multinationals, we may scrutinize whether changes in the labor demand take place right after local firms become MNEs. Becker et al. (2013) suggested that these effects may be larger than the effects observed in firms that already are MNEs and make additional outward investments, and the fact that they are not able to capture them in their analysis may explain why they find small effects.

Our approach to examine changes in ownership and firm types does also bring other advantages. We can better address the issues of endogeneity and the identification of relationships as causal. For instance, unobserved firm characteristics might be correlated with the employment mix and thereby bias the results of previous studies that examine changes within a sample of firms remaining MNEs throughout the period. We control for this possibility by examining the changes in employment after a change in ownership or firm type: we would not expect to see an effect after a change if unobserved firm characteristics rather than firm ownership are important for relative labor demand.

An important challenge is to establish the causal relationship between FDI and employment changes since there could be reversed causality. Firms changing employment composition and specialization could more likely become multinational either by acquisitions or by investments abroad. Thus, a shift of a local firm to a multinational firm is presumably not exogenous but determined by firm characteristics. We use propensity score matching to control for this endogeneity and to reduce the bias from differences in firm characteristics, by comparing the outcomes for similar acquired and non-acquired firms, based on the pre-treatment characteristics.

Our detailed worker level data allow us to examine changes in relative labor demand in more detail than what has been done in previous studies. We use

comprehensive Swedish matched employer-employee data for the period 1996 to 2005 to analyze the effects of changes in ownership or firm type on the composition of labor force both in terms of wage costs and employment of different job tasks. The data include all Swedish firms with at least 20 employees and detailed information on occupations for a representative sample of the labor force. We use information on the task content in different occupations to distinguish the workforce between those performing non-routine and those performing routine tasks, as well as distinguishing between workers in occupations with more or less requirement of personal interaction.

We show that MNEs – both Swedish and foreign-owned – have a higher share of employees carrying out non-routine tasks or tasks requiring personal interaction than local firms. Moreover, shifts of local firms to either Swedish or foreign multinational firms, by a change in ownership or firm type, increase the relative demand for employees carrying out non-routine tasks or tasks requiring personal interaction. We do not find any significant changes in the composition of job tasks when both the acquirer and the target are multinational firms. This result provides further support that it is the distinction between multinational and local firms, rather than between local and foreign firms, that is important for differences in the relative demand for tasks. Thus, we find that both inward and outward FDI increase the relative demand for non-routine and interactive tasks in a high-income country like Sweden.

We also find that the changes in relative task demand primarily works through changes in relative wages rather than through changes in employment shares. The increased demand for more advanced tasks is captured by increased wage dispersion for workers with different non-routine and interactive task intensity. In order to scrutinize whether tasks and skills are interchangeable, we estimate the effects of

acquisitions on the skill composition of firms by dividing the labor force according to educational attainment, the standard measure in previous studies. We find no effects of acquisitions on the educational composition of firms' workforces. It suggests that the increased internationalization of production does indeed have an effect on the composition of workers which is not captured by traditional educational skill measures.

The rest of the paper is organized as follows. In the next section, we discuss the related literature, section III describes the empirical approach, section IV presents the data and show descriptive statistics, section V presents the results and section VI concludes the paper.

II. Related literature

The effects of FDI on relative skill demand depend on the type of FDI. The traditional theoretical literature makes a distinction between horizontal and vertical FDI. In the case of horizontal FDI (HFDI), the firm replicates all or part of its activities in a foreign country. In the case of vertical FDI (VFDI), the firm fragments its production and outsources production of components or different stages of production process to countries with other factor prices. In the more recent theoretical models of offshoring, production processes are similarly fragmented into separate stages with different factor intensities (e.g. Jones and Kierzkowski, 2001; Grossman and Rossi-Hansberg, 2008 and 2012).

The models for VFDI and HFDI provide some predictions for relative skill demand. However, they lack a comprehensive and coherent set of predictions that apply to relative demand for tasks rather than skills, including both home and host country effects in high income countries, and taking into account the mode of FDI

entry. This last aspect is particularly important in our study since we focus on the adjustments within acquired firms in contrast to effects of greenfield investments or overall general equilibrium effects of FDI.

Despite these limitations, the existing theories give us some guidance what effects to expect. When investing in a cheap-labor country, we would expect multinational firms to outsource routine tasks and tasks without the need for personal interaction, while maintaining other more advanced tasks closer to the headquarters at home. This would increase the share of more advanced tasks in the home country. Several models on vertical FDI provide theoretical backing to this pattern in terms of relative skill demand.¹ The pattern should be the same for relative task demand when the offshorable job tasks are carried out by unskilled labor, which is often, but not always the case. More precisely, it has been argued that offshorable tasks can be described in deductive rules (Levy and Murmane, 2004); are defined by codifiable rather than tacit information (Leamer and Storper, 2001); and do not require physical contact or proximity (Blinder, 2006). MNEs may thus relocate both high and low skill-intensive tasks if they fall within this category. For instance, computer programming and x-ray analysis are well-known examples of offshorable job tasks that require education at post-secondary level. Many Indian radiologists and computer engineers who perform job tasks for US and European firms witness to this effect. On the other hand, maintenance and cleaning work exemplify job tasks that rely on unskilled labor that cannot be carried out from a distance.²

In the case of HFDI the effects of home country should depend on whether all or some activities replicated. Head and Ries (2002) put forward that in the case of horizontal FDI which replicates *all* activities, including assembly, components,

¹ See e.g. Barba Navaratti and Venables (2004).

² See Baumgarten et al. (2013) for an analysis on offshoring and tasks.

product design etc., there is no direct effect on domestic skill intensity, but overseas activities may influence the scale of domestic operations and thereby having an indirect effect on skill composition. For instance, if FDI substitutes for exports from home, skill intensity may raise as the scale of home production is reduced. Similarly, HFDI replicating only production of final goods should result in an increase in skill intensity at home, since the higher output requires additional services by workers performing more advanced tasks.

Taken together, the theoretical literature suggests that both VFDI and HFDI will tend to increase the skill demand in the home country operations, and this should, to some extent at least, translate into an increase in relative task demand. Considering host country effects of FDI on relative labor demand, previous studies have largely focused on the case of developing countries and on the general equilibrium effects on skill premiums.³ For the case of an advanced host country, the empirical evidence using firm-level data indicates that skilled workers are likely to be concentrated in MNEs, but does not explain whether it is a consequence of cherry picking of domestic skill-intensive firms or something else.⁴ This is virtually an empirical issue, since the effects of FDI should depend on the type of activities located in the foreign country, but also on the mode of entry, and, in the case of acquisitions, on the type of existing activities in the target firm.

Empirical studies on FDI and relative demand for different job tasks are scarce. One notable exception is the study by Becker et al. (2013) who examine how in-house offshoring, i.e. outward FDI, affects the composition of job tasks in 490 German MNEs' home country operations between 1998 and 2001. They find that employment in foreign affiliates predicts around 10-15% of the observed changes in

³ See e.g. Barba Navaretti and Venables (2005) for a review.

⁴ See e.g. Griffith and Simpson (2004) and Almeida (2003)

wage-bill shares in the German operations, for both task and skills measures. An interesting finding of Becker et al. is that FDI both to high-income countries in Western Europe and to developing countries increase the share of non-routine and interactive tasks in Germany, whereas the effect of FDI to locations in Central and Eastern European countries is more ambiguous (Becker et al., 2013, Table 7). The result for developing countries is consistent with the theoretical prediction that outward FDI to low-wage countries increase the relative demand for non-routine and interactive tasks in onshore operations, but they argue that the effect is rather small. The result for high-income countries begs the question how the task structure of overseas operations in high-income host countries responds to inward FDI from a high-income country like Germany. This issue, however, goes beyond the study of Becker et al.

Our paper is also related to the extensive literature on acquisitions. Theories of acquisitions often view a takeover as an opportunity to restructure the operations of the target firm (Shleifer and Summers, 1988, and Bertrand and Mullainathan, 2003) and an effective way of reducing administrative and managerial employment (see e.g. Shleifer and Vishny, 1988; and Lichtenberg and Siegel, 1990).⁵ When the acquirer is a multinational firm, we would expect that the takeover also trigger restructurings to fit the operations of the target firm to the international production networks of the acquiring firm.

III. Econometric Approach

Our econometric approach follows the previous literature analyzing the effects of foreign investment on relative labor (see e.g. Slaughter, 2000; Head and Ries,

⁵ Another related paper is by Conyon et al. (2002) who find a significant rationalization in the use of labour after mergers and acquisitions in the United Kingdom.

2002; Hansson, 2005; and Becker et al., 2013). We estimate a reduced-form translog cost function to predict how a change in ownership or multinational status affect the relative demand for work types at domestic firms. The translog function implies that the share of different tasks can be expressed as a linear function of input prices and quasi-fixed factors. The advantage with the translog functional form is that there are fewer restrictions on factor substitutability compared to CES, Cobb-Douglas and Leontief production functions. If capital is a quasi-fixed factor of production and if firms minimize the costs for different tasks according to a translog cost function, we end up with the following expression to be estimated:

$$\psi_{ijt} = \alpha_0 + \alpha_1(\text{owner})_{jt} + \alpha_2 \ln(k)_{jt} + \alpha_3 \ln(Y)_{jt} + \alpha_4 Z_{jt} + \alpha_5 \ln\left(\frac{w_i}{\bar{w}_{-i}}\right)_{jt} + d_j + d_t + \varepsilon_{it} \quad (1)$$

where ψ_{ijt} is the wage cost share of task i in firm j at time t , k_{jt} is the capital-output ratio, Y_{jt} is output, Z_{jt} a variable capturing factor-biased technical change and $(w_i / \bar{w}_{-i})_{jt}$ is the average wage of employees carrying out task i in firm j relative to the average wage of other employees.⁶ d_j , d_t , and ε_{it} are firm-specific time invariant effects, time-specific effects and an i.i.d. error term, respectively.⁷ Equation (1) is estimated separately for each task i .

The dependent variable is defined as the wage cost share for a particular type of job tasks in the total wage bill of a firm. We compute the variable as:

$$\psi_{ijt} = \frac{\sum_s w_{sjt} \delta_{si}}{\sum_s w_{sjt}} \quad (2)$$

⁶ See Table A2 in the appendix for definitions of the variables.

⁷ To allow for within firm correlation over time, standard errors are adjusted for clustering at the firm level.

where w_{sjt} is the wage sum for workers in occupation s in firm j , δ_{si} is the share of the job task i in that occupation, and $\sum_s w_{sjt}$ is the total wage bill of the firm.⁸ We also use an alternative measure of skills defined as cost shares based on employees' level of education, which allows us to compare our results to previous studies and to examine whether the use of job tasks contribute to our understanding of FDI and relative labor demand.

The variable of our main interest, *Owner*, is a dummy variable that equals one if a firm is foreign-owned, and zero otherwise, when we compare foreign and domestic firms. It equals one if the firm is a multinational when we compare multinationals to non-multinationals firms. When we examine ownership changes, *Owner* takes the value one when a change in ownership or firm type is recorded and during the years thereafter. A shift from Swedish owned to a foreign MNE always involves a change in ownership, but a shift from Swedish local firm to Swedish MNE may take place either through an acquisition or through an outward investment.⁹

The estimated equation (1) follows from a conventional system of factor demand with some simplifying assumptions on the cost function. The capital-output ratio captures unobserved user costs of capital in the target firm and accounts for variation in the wage cost share due to changes in capital intensity. We use real value added for Y_{jt} and Z_{jt} is proxied by a sector level measure on ICT capital, defined as capital compensation for computing and communications equipment as a share of

⁸As an illustration, 30 percent of a firm's wages might be allocated to Other Professionals, 50 to Metal workers, 5 to General Managers, and 15 to Customer services clerks. The shares of non-routine tasks (see Table 1) in these occupations are 63, 41.6, 46.6, and 27.1 percent respectively. The figure for the share of non-routine tasks will then be 0.44 ($0.3*0.63+0.5*0.416+0.05*0.466+0.15*0.271=0.44$) for this firm.

⁹Note that the firm fixed-effects in equation (1) are only included in the acquisition estimations where we analyze firms that change ownership/firm type.

total capital compensation.¹⁰ We also use R&D to sales as a proxy for skilled biased technology change as a robustness check. The sign of α_2 shows if capital substitutes for or complements task i , and the sign of α_4 depends on whether technical change is biased towards or away from the usage of labor carrying out task i .

The relative wage term in equation (1) accounts for variation in the wage-cost share ψ_{ijt} , that is explained by changes in relative factor prices for different type of workers. Including the wage ratio may give rise to a potential endogeneity bias, because wages and employment are jointly determined, and because wages also enter in the dependent variable. We therefore follow the praxis of previous studies and omit the relative wage term. To check the robustness of our results, we run regressions including the relative wage term. The role of wages is scrutinized also by estimating regressions with employment shares and by estimating the direct impact of ownership changes on individual wages for different type of workers.

In the first estimations, we examine the relative demand for job tasks in foreign versus domestic firms and in multinational versus non-multinational firms. We divide our sample into three groups: foreign MNEs; Swedish MNEs; and Swedish local firms. A firm is classified as foreign MNE if more than 50 percent of the equity is foreign-owned.¹¹ In the second approach, we analyze the effect of an ownership change. All firms except those that experience multiple ownership changes are included in the estimations. We include firm-specific effects, and also time dummies to control for changes in the relative task demand that are common to all firms. Three different types of changes are examined: from a Swedish local to a Swedish MNE, from a Swedish local to a foreign MNE, and from a Swedish MNE to a foreign

¹¹ Statistics Sweden uses the internationally common 50 percent cut-off in defining foreign ownership. Other studies on FDI do typically not find lower cut-off values to matter for the results (see e.g. Huttunen, 2007 and Barbosa and Louri, 2002).

MNE.¹² The first two allow us to distinguish between effects of foreign ownership and multinational ownership in general. The last allows us to examine if there is an effect on relative labor demand even in acquired firms that are already multinational.

The estimated effect of changes in ownership/firm types may suffer from a potential endogeneity problem if the target firms differ systematically from non-target firms. We use propensity score matching to control for this endogeneity (see e.g. Rosenbaum and Rubin, 1983).¹³ This approach reduces the bias from differences in firm characteristics by comparing the outcomes for similar treated and non-treated observations, based on the pre-treatment characteristics. The matching is based on observable firm characteristics and uses the algorithms provided by Becker and Ichino (2002) and Leuven and Sianesi (2003). We use the Nearest-Neighbor without replacement method.

More specifically, we first calculate the probability that a firm is a target for each of our three different changes in ownership/firm type. Each treated (target) firm is then matched with a non-treated (non-target) firm that is as similar as possible the year preceding acquisition. After ensuring that our matching satisfies the balancing property criteria of the propensity score, we proceed to estimate the impact of different types of changes in ownership/firm type on the relative demand for job tasks on the matched sample of firms.

One potential determinant of relative demand for job tasks is the ability to engage in offshoring. We analyze the direct effect of offshoring by adding a firm-level measure of offshoring, defined as the share of imported intermediate goods in

¹² The data on Swedish local firms acquired by a Foreign MNE consist of firms that are either local during the entire period or being acquired by a MNE at some time during the period. The same structure applies to the other two forms of takeovers. The shift from Swedish local to Swedish MNE may be due to an acquisition or through an outward FDI.

¹³ See e.g. Huttunen (2007), Heyman et al. (2007), and Girma and Görg (2007) for related papers using propensity score matching methods.

total sales.¹⁴ This measure proxies offshoring to the extent as increases in the share of imported intermediate goods are substituting for domestic production.¹⁵ In addition to offshoring, we examine if other firm characteristics, such as size, human capital, profits, firm age and export intensity can explain firm-level differences in the relative demand for job tasks.

Finally, we estimate alternative specifications to further examine the robustness of our results. Most importantly, we will use alternative definitions of job tasks and alternative dependent variables. A description of the included variables is presented in Table A2 in the appendix.

IV. Data and Descriptive Statistics

Swedish Employer-Employee Data

We use register-based matched employer-employee data set from Statistics Sweden covering the period 1996-2005. To ensure that our sample remains consistent over time, we restrict our analysis to firms with at least 20 employees. The financial statistics contain detailed firm-level information on all Swedish firms. Variables such as value added, capital stock (book value), number of employees, wages, ownership status, sales, and industry are included. Moreover, regional labor market statistics contribute information on education and demographics at the plant level, which we aggregate to the firm level. The individual wage statistics database contains information on the full-time equivalent wages, education, occupation, and gender of approximately 2 million individuals per year.

¹⁴ This is a common way to measure offshoring in related literature (see e.g. Feenstra and Hanson (1996, 1999), Falk and Koebel (2002) and Hijzen et al. (2005)). As a robustness check, we make use of a broader measure of offshoring which includes also imports of consumption goods.

All data sets are linked together with unique identification numbers. A Swedish MNE is defined as a firm reporting positive exports to other firms within the corporation. Finally, firms reporting no such exports are classified as local firms.¹⁶ Thus, a switch from local to Swedish MNE takes place through an acquisition or through outward FDI. A switch to a foreign firm always involves a change in the ownership. On average annually, 21 local firms become Swedish MNEs, 32 local firms switch to foreign firms and 20 Swedish MNEs become foreign MNEs in our sample. Table A1 in the appendix displays the number of each type of firms and acquisitions annually between 1997 and 2005.

Data for firm-level imports comes from Swedish Foreign Trade Statistics, collected by Statistics Sweden and available by country of origin for the period 1997-2005. Stemming from compulsory registration in Swedish Customs, data on imports from outside the EU consist of all trade transactions. Trade data for EU countries are available for all firms with a yearly import above 1.5 million SEK. All firm import observations that are below the threshold and therefore not included in the trade statistics are set equal to zero. According to figures from Statistics Sweden, our data covers 97 percent of total trade with EU countries.

Measures of Job Tasks

In line with Autor et al. (2003) and Spitz-Oener (2006), we classify occupations according to the intensity of routine and non-routine tasks. In addition, we classify occupations according to the intensity of tasks that require interaction between individuals. The task content of occupations is derived from a German work

¹⁶ See e.g. Heyman et al. (2007) for a paper using this definition of MNEs. Information on export is available for firms with at least 50 employees and for smaller firms with large sales. A few small multinationals might be classified as local firms because of missing information on exports. We therefore re-run our estimations below on firms with above 50 employees, which do not affect the results.

survey codified by Becker et al. (2013). The German classification can be translated to the international standard classification of occupations (ISCO-88), which is available in our data on individuals.¹⁷

In order to classify job tasks into non-routine and interactive, Becker et al. (2013) codify the survey answers to 81 yes/no questions that ask whether a worker uses a specific workplace tool or not.¹⁸ They distinguish non-routine tasks involving non-repetitive methods from routine tasks, and interactive tasks requiring personal interaction with co-workers or third parties from non-interactive tasks.¹⁹ Non-routine job tasks typically involve a lack of deductive rules and codifiable information, whereas interactive job tasks involve physical and geographic proximity. Becker et al. map the tasks to occupations in three steps. First, they use information on workplace tools in 84 ISCO88 2-digit occupations from the BIBB-IAB work survey and calculate the average number of non-routine (interactive) tasks involved in performing a given 2-digit occupation (based on the codification of responses to the 81 survey questions on workplace tools). Second, they find the maximum number of non-routine (interactive) tasks required to perform any 2-digit occupation. Third, they measure a given 2-digit occupation's degree of non-routine (interactive) tasks as the ratio between the average number of non-routine (interactive) tasks in the occupation and the maximum number in any occupation. Further, they standardize by the maximum and minimum number of tasks in any occupation so that task shares vary between zero and one across occupations. With this standardization, each occupation is

¹⁷ The measures are based on the Qualification and Career Survey for 1998/99 conducted by the German Federal Institute for Vocational Training (Bundesinstitut für Berufsbildung BIBB) and the Research Institute of the German Federal Labor Agency (Institut für Arbeitsmarkt- und Berufsforschung IAB). See Acemoglu and Pischke (1998) and Spitz-Oener (2006) for two other studies using the same work survey.

¹⁸ The workplace tools range from repair tools to machinery and diagnostic devices to computers and means of transport.

¹⁹ To assess the robustness they create two measures, one based on a more restrictive interpretation of what is non-routine and interactive and another with a more liberal interpretation. See Becker et al. (2013) for more details about the survey and the construction of measures.

assigned a number between 0 and 1 that measures its intensity in non-routine and interactive tasks.

Table 1 presents the shares of non-routine and interactive job tasks in different occupations at the 2-digit level of ISCO-88. There is an overlap—albeit imperfect—in the measures of non-routine tasks and tasks requiring personal interaction. The share of non-routine tasks is highest in science-based occupations and lowest in occupations in services, agriculture, mining, construction, manufacturing, and transport. Interactive tasks are highly represented in science-based occupations as well, but also in educational occupations. The share of interactive tasks is low for occupations with a low share of non-routine tasks but also in for instance machine operating, handicraft, and some sales oriented occupations.

--Table 1 about here--

--Table 2 about here--

Table 2 shows the composition of job tasks and education in firms with different ownership.²⁰ Standard deviations are large, which means that the differences between ownership types are not statistically significant. Bearing this in mind, multinational firms, both Swedish and foreign, have higher shares than Swedish local firms of non-routine tasks and tasks that require personal interaction. In terms of non-routine tasks, the differences are rather large, about seven percentage points (0.48-0.41). The differences between shares of interactive tasks and of higher education are

²⁰ Job tasks and education are expressed in term of wage cost shares as defined in equation (2) to make figures consistent with the core of the econometric analysis. Using employment shares yields very similar differences but the levels are typically about 2 percentage points lower.

smaller than the difference in non-routine tasks. Finally, the difference between Swedish and foreign MNEs is very small for all different measures, suggesting that the relevant distinction occurs between multinational and non-multinational firms rather than between domestic and foreign firms. The correlation between the wage cost shares of higher education and non-routine tasks is 0.655, and between the wage cost shares of higher education and interactive tasks 0.619. This suggests that task and education measures are overlapping to some extent but that the mapping is far from one-to-one.

V. Results

Examining a possible link between firm type and job tasks

Table 3 shows job tasks and education in foreign versus domestic firms and in multinational versus non-multinational firms controlling for observable firm characteristics. Our first estimation shows that foreign firms have on average about 3.7 percentage points higher share of non-routine tasks than domestic firms, even after controlling for industry and time effects. Differences in firm characteristics can partly explain the high share of non-routine tasks; the inclusion of firm characteristics in column two reduces the coefficient of the foreign dummy variable, but the difference is still 2.4 percentage points and statistically significant.

--Table 3 about here--

Estimations in columns seven to twelve in Table 3 distinguish between Swedish local firms and Swedish and foreign MNEs. A difference in the task composition between different firms arises again: multinational firms have around 2.6

percentage points more non-routine tasks compared to local firms when we control for firm characteristics. Table 2 showed that non-routine tasks on average constitute about 44 percent of total tasks. Related to this total average share, the 2.4 – 2.6 percentage points higher share of non-routine tasks in foreign firms and all MNEs, is equivalent of a 5 percent difference.

Estimations in columns three, four, nine, and ten in Table 3 use our second measure, the share of tasks requiring personal interaction. Foreign MNE have more job tasks requiring personal interaction than domestic firms, and multinational firms have more than local firms. Firm differences in the share of tasks requiring personal interaction are smaller than those for non-routine tasks.

Table 3 also shows estimations where we replace our dependent variable with a more conventional wage cost share based on educational skills. As seen in columns five, six, eleven, and twelve, foreign and multinational firms have a higher share of employees with tertiary education in some, but not in all estimations. Hence, there is a correlation between higher education and non-routine/interactive job tasks, although the size of the coefficients indicates that measures of non-routine tasks identify larger differences between firms than the measure on education.

The group of comparison in columns one to six includes both domestic local firms and domestic MNEs. We also examined how the results are affected if we use only local firms as group of comparison (not shown). By changing the group of comparison, the coefficient for foreign ownership increase from about 0.024 to 0.029 in the estimations for non-routine tasks, from 0.008 to 0.01 in the estimations for interactive tasks, and from 0.003 to 0.01 in the estimations for education.

Finally, we made estimations where we included additional firm characteristics, such as firm size, share of employees with lower secondary education,

share of employees with tertiary education, firm age, sales per employee, profits per employee, share of women, share of blue-collar workers, and share of exports in sales. The coefficients and statistical significance of the ownership variables were changed only marginally.²¹

Examining the effect of changes in firm type on job tasks

The results above might be explained by unobservable firm characteristics. A standard approach to control for such bias is to examine the effect of changes in the ownership/firm type. However, as discussed in Section III, the observable characteristics of target firms may differ in many respects from non-target firms. Not controlling for this selection effect will also bias the estimates. Our subsequent analysis follows the approach of analyzing the effect of changes in firm type on a propensity score matched sample of firms.²²

We estimate the effect of an ownership change from local to foreign MNE, from local to Swedish MNE, and from Swedish MNE to foreign MNE on the relative demand for tasks. The results in columns 1 and 4 in Table 4 indicate that a shift from local firm to Swedish MNE increases the relative demand for non-routine tasks by 2 percentage points and for interactive tasks by 1 percentage points. The results in columns 2 and 5, tell us that the effect of a change in ownership from local firm to foreign multinational is also positive but slightly smaller. This suggests that the effect of inward FDI is similar to, rather than a mirror image of, the effect of outward FDI on the relative demand of tasks. Finally, the results in columns 3 and 6 are in line with our expectation that the ownership change from domestic multinational to foreign

²¹ The results are available upon request. Similar robustness estimations were conducted for all estimations in the paper, and with similar small effects on the main results.

²² Table A3 in the Appendix shows that the bias in the control variables is substantially reduced after the matching, but a statistically significant difference remains for some of the variables.

multinational does not change the relative demand for tasks, since the ownership is only changed from one type of MNE to another.

--Table 4 about here--

What are the quantitative effects of the results in Table 4? Consider the result in column 1 for a shift from local firm to Swedish MNE. The estimated coefficient of 0.02 implies that a shift from local firm to Swedish MNE is associated with a five percent increase in the wage cost share for non-routine tasks.²³ The corresponding figure for interactive wage cost shares is three percent. The quantitative effect is somewhat smaller for a shift from local firm to Foreign MNE: two percent for both non-routine tasks and interactive wage cost shares.

An important question becomes thus: does dividing labor according to job tasks contribute anything new to our understanding about the effects of FDI on labor demand? To examine this issue, we again replace our dependent variable with a wage cost share variable defined in terms of educational attainment. There is less support for a change in relative labor demand when we use education: only the ownership change from local to Swedish MNE has a positive and statistically significant coefficient.

As previously discussed and as seen in Table A3, there remains a difference in firm characteristics between acquired and non-acquired firms even after our matching. We therefore conducted various robustness estimations to try to control for a possible bias. Firstly, we used alternative matching algorithms. The differences in firm characteristics remained but it is worth stressing that the results on changes in

²³ The magnitude is evaluated at the mean wage cost share for non-routine tasks so $0.05=0.02/0.41$ where 0.41 is the mean wage cost share for non-routine tasks in local firms.

ownership/firm type were robust. This was also the case when we experimented with alternative specifications of the matching estimation: no specification removed all differences but the effect of ownership on tasks remained robust across all specifications. Moreover, we have, as mentioned previously, repeated our estimations with a large number of additional firm variables with no impact on the result. It seems likely that the remaining differences after the matching have a limited bias on the results, if inclusions of a large number of important observable firm characteristics do not have any impact on the results.

On a related note, it is possible that firms that experience a technology change will change their employment mix and that they simultaneously will become interesting targets. We try to control for this by lagging our *Owner* variable. The results, seen in Table A4 in the appendix, are very similar, to the previous ones: shifts of local firms to Swedish and foreign MNEs increase the demand for non-routine and interactive tasks, and there is no effect on relative labor demand when Swedish MNEs are being acquired by foreign firms.

Why do firms differ in their relative demand for tasks?

The results above suggest that multinational firms have higher shares of non-routine tasks, and that acquisitions of local firms by MNEs increase the relative demand for non-routine tasks and tasks requiring personal interaction, that is, tasks that are less easily offshored. However, there is no different effect between Swedish and foreign MNEs. This suggests that there might be other mechanisms at work than offshoring of routine tasks to host countries while maintaining non-routine tasks in the home country. To examine the effect of offshoring further, we include proxies for

offshoring, defined as the share of imported intermediate goods in total sales, to the acquisition estimations.

-- Table 5 about here--

The results for the estimations on non-routine tasks including a firm-level measure of offshoring (Table 5) are unambiguous: the coefficient of offshoring is statistically insignificant in all estimations, and the coefficient for *Owner* remains positive and statistically significant in ownership changes from local to Swedish and foreign MNE. We also distinguished between offshoring to high-income and low-income countries (not shown), to study whether offshoring to low-wage countries increase the relative demand for non-routine tasks.²⁴ The results remained unchanged with no evidence of a direct effect of offshoring, whether it is to low-income or to high-income countries.

We conclude that even after controlling for the direct impact of offshoring, shifts of local firms to MNEs increase the relative demand for non-routine tasks. To analyze further whether the impact of offshoring may go hand in hand with the change in ownership/firm type, we include an interaction variable between the ownership variable and offshoring. The statistically insignificant interaction variables do not provide any evidence that changes in ownership/firm type together with offshoring would explain the changes in the relative task demand. Using our measure of tasks requiring personal interaction as a dependent variable generates qualitatively the same results as in Table 5 (not shown).

²⁴ High-income countries are OECD countries and low-income countries are non-OECD countries.

The result that offshoring following a change in ownership/firm type does not explain changes in relative demand for tasks raises the question if the use of intermediate inputs changes after a change in ownership or firm type. We estimated regressions with firm-level offshoring as dependent variable and *Owner* as one of the explanatory variables to examine this issue (not shown).²⁵ Only the acquisitions of local firms by foreign multinationals had a positive and statistically significant impact on offshoring.

To sum up our results so far, we find that both inward and outward FDI increase the relative demand for non-routine and interactive tasks in a high-income country like Sweden. This result may strike as paradoxical in relation to the finding of Becker et al. (2013) that outward FDI to high-income countries increase the share of more advanced tasks at home. Taken together with our results, it suggests that operations in high-income home and host countries are complements rather than substitutes, and an increase in non-routine and interactive job tasks in a home country like Germany could be associated with a similar increase in a high-income host country. Since offshoring certain tasks cannot explain this increase, we can only speculate about the reasons. For instance, upgrading production with more sophisticated technologies could explain an upgrading in tasks. However, it should be noted that the estimations already control for many aspects of the production technology, such as capital, output, and investments in computing and communications.

²⁵ The estimations also included value added, capital stocks, ICT and year dummies.

Employment vs. wage effects

We have seen that shifts of domestic firms to multinational firms increase the relative demand for non-routine and interactive job tasks in the target firms. Changes in relative demand could, of course, depend on both declines and increases in the demand for different tasks. Moreover, the demand changes reflected in wage cost shares can be caused both by changes in employment and by changes in the wages.

To gain further insights into the mechanism at work, we first estimated regressions on ownership/firm type switches like above but with total employment as dependent variable. An ownership change from Swedish local to MNE increased total employment but there were no statistically significant effects from the other types of changes (not shown).

We then continued to examine wage and employment effects separately for different task categories. Whether the effects are primarily shown as employment or wage effects may, for instance, depend on labor market institutions. Previous literature has argued that the more rigid the labor market is and the more powerful the wage-setting institutions are, the more likely it is that an increased relative labor demand would appear in employment shares rather than wages (e.g., Machin and Van Reenen, 1998; Anderton and Brenton, 1999; Strauss-Kahn, 2003; Hijzen et al., 2005).

--Table 6 about here--

Table 6 shows the results from regressions using employment shares instead of labor cost shares as a dependent variable. The estimated effects show the impact of ownership on factor demand net of wage effects. As seen in columns one and two in Table 6, foreign and multinational firms still have higher shares of non-routine job

tasks. More interestingly, columns three to five show that changes in ownership/firm type do not affect employment shares of routine and non-routine tasks. The same insignificant effect is found when we use employment shares by education in columns six to eight, and when we use interactive non-interactive tasks (not shown). Hence, the results suggest that the effect of changes in ownership/firm type on task composition may be driven by wage effects.

We therefore continue by examining the impact of changes in wages. We estimate wage regressions at individual-level rather than at firm-level as in the estimations above. This is in accordance with more recent studies on related topics where matched employer-employee data are available.²⁶ Data on individuals and firms allow us to take into account worker heterogeneity and within firm variation. We distinguish the effects of task intensity of occupations by grouping occupations into three groups, high, medium and low, according to the distribution of the task intensity (non-routine and personal interaction, respectively). We then interact dummy variables for the three job task groups with our *Owner* variable. The estimated augmented Mincer wage regression also includes control variables for work experience (squared), log firm size, and capital intensity. The wage analysis will be based on the following individual-level regression:

$$\log(w)_{ijt} = \alpha_0 + \alpha_1(Task_high)_{ijt} * (Owner)_{jt} + \alpha_2(Task_med)_{ijt} * (Owner)_{jt} + \alpha_3(Task_low)_{ijt} * (Owner)_{jt} + \alpha_4(Task_high)_{ijt} + \alpha_5(Task_med)_{ijt} + X'_{ijt} \beta + \mu_i + \lambda_t + \varepsilon_{ijt}$$

(3)

²⁶See e.g. Heyman et al. (2007) on FDI and wages; Schank et al. (2007) on export and wages; Martins (2011) on foreign firms, worker mobility and wages; Heyman et al. (2011) on FDI and wage dispersion, and Munch et al. (2011) and Baumgarten et al. (2013) on offshoring and wages.

where w_{ijt} is the full-time equivalent monthly wage for worker i in firm j at time t .²⁷ The variables $Task_high_{ijt}$, $Task_med_{ijt}$ and $Task_low_{ijt}$ are dummy variables for whether the individual's occupation belongs to high, medium or low task intensity category, $Owner_{jt}$ is our ownership/firm type dummy variable taking the value of one after a change is recorded, and zero otherwise. The interaction variables capture the impact of an ownership/firm type change on individual wages for different job task groups. X_{ijt} contains time-varying control variables such as squared labor market experience, (log) firm size and capital intensity. The interaction variables may also capture an effect of individuals changing occupations and not only the effect of ownership changes. To control for the effect of occupational mobility, we add dummy variables for high- and medium tasks (low tasks being the omitted category). We also include individual fixed-effect (μ_i) and time fixed-effects (λ_t). To allow for within firm correlation, standard errors are clustered at the firm level. The wage regressions are carried out for the employees in the propensity score matched sample of firms.

--Table 7 about here--

The results from our individual wage regressions are reported in Table 7. The results indicate that ownership changes from local to Swedish or Foreign MNE tend to increase the relative demand for non-routine tasks but the exact mechanisms differ between the two types of ownership changes. Acquisitions of local firms by Swedish MNEs decrease the wages for workers in occupations with medium shares of non-routine or interactive job tasks with about 1.6 and 1.9 percent, respectively.²⁸ The effect on workers with high shares of non-routine tasks is positive and on the workers

²⁷ See Table A2 in the appendix for descriptive statistics on wages.

²⁸ Estimated coefficients on the additional control variables are omitted from the table. They all have expected signs (available upon request).

with low shares of non-routine tasks is negative, but these effects are statistically insignificant. The acquisitions of local firms by foreign MNEs seem to decrease wages in all categories with the largest negative impact for workers carrying out the most routine type of tasks (columns 2), thereby increasing wage dispersion between workers with different shares of non-routine tasks. Further, the results in columns 3 and 6 indicate that there are no statistically significant effects on wages when Swedish MNEs are acquired by foreign MNEs. This result is in line with previous results for wage cost shares and with our expectations.

One important question is whether the changes in wages are related to changes in the composition of the work force rather than to changes in the wages for the existing workers. We examined this issue by including only individuals who were working in the target firms at least one year before the ownership changes. The results were very similar to the ones in Table 7 suggesting that the effect is caused by changes in wages for the existing workers.²⁹

Thus, we conclude that the shifts of domestic firms to MNEs increase the wage dispersion across occupations within target firms by either decreasing wages for the workers with the medium level of non-routine and interactive task intensity or by decreasing wages for the workers with the lowest non-routine and interactive task intensity.

Estimations with additional measures of tasks

To examine whether our results are valid for alternative measures of job tasks, we first use a more conservative dependent variable in which fewer tasks are regarded as non-routine and interactive (Becker et al., 2013). The results remained largely

²⁹ The results are available upon request.

unchanged when we used the wage cost share of non-routine tasks as a dependent variable, although the estimated coefficients declined marginally. The results for the wage cost share of personal interaction tasks changed: the coefficients were not statistically significant in the estimations comparing foreign and domestic firms and multinational and local firms (not shown). The coefficients for MNE and foreign ownership in the ownership change estimations remained positive, but at a lower level of statistical significance.

Second, we use definitions of job tasks based on Spitz-Oener's (2006) study of technological change, job tasks, and rising educational demand. Spitz-Oener's definitions originate from the same German survey as we use for our main tasks measures, but she uses a different classification of job tasks.³⁰ In Table 8, we present results for wage costs share estimations using Spitz-Oener's definition of non-routine tasks. Foreign and multinational firms have relatively more non-routine job tasks, but shares are lower than for our main measure of non-routine job tasks. Similarly, ownership changes from local to foreign MNE, and local to Swedish MNE have a positive effect. As expected, acquisitions of domestic MNEs by foreign MNEs have no effect on the relative demand for non-routine tasks. To sum up, our main results are robust when considering alternative definitions of job tasks, though the size of the ownership effects differs slightly.

--Table 8 about here--

We have not, unlike the study by Becker et al. (2013), found any robust effect of FDI on skill groups measured by education. It is of course possible that the effect

³⁰ We thank Alexandra Spitz-Oener for sharing her definitions with us.

of FDI on skills (education) is more complex than what can be captured in our estimations above. For instance, Baumgarten et al. (2013) examine the effect of offshoring on individual level wages and find a negative effect on low-skill workers, but the effect is mitigated with the degree of non-routine and interactive tasks. We followed their approach and estimated our wage regressions with interaction variables for ownership changes and non-routine task shares separately for samples of high and low educated workers. However, we did not find any clear pattern of effects in these estimations.

Finally, we have tried alternative specifications of the set of independent variables. Unlike our study, most previous studies do not include a variable for technology. Our variable on ICT is a sector level variable and therefore implicitly assumes that technologies are similar across firms within sectors. Dropping our variable on ICT variable did not impact the results. We also used firm-level R&D expenditures as an alternative technology variable, but, again, it had no major impact on the results.³¹ Following previous studies, we excluded the relative wage from the main estimations because of the obvious risk of an endogeneity problem. Including the relative wage increases the coefficients on the ownership variables slightly, but has no qualitative effect on the results (not shown). The relative wage variable is negative, as expected.

VI. Concluding Remarks

In this paper, we have examined the effect of FDI on relative labor demand, defining employment in terms of job tasks and educational skills. Our paper

³¹ Data on R&D expenditures is not available for all firms with below 50 employees and is not available for the years 2003-2005, which is why it is not included in the default specification.

contributes to the previous literature in several respects. In particular, by using rich employer-employee data including information on both foreign takeovers and shifts of local firms to domestic multinational, we analyze how the composition of tasks and skills is affected when local firms become MNEs.

We find that the operations of multinational firms, both foreign and domestic, involve higher shares of non-routine tasks and tasks requiring personal interaction than the operations of Swedish local firms. For instance, the share of non-routine tasks is around 2.6 percentage points higher in MNEs than in local Swedish firms, compared to the aggregate share of non-routine tasks of about 44 percent in the Swedish industry. We also find that switches of local firms to both foreign and Swedish MNEs tend to increase the relative demand for non-routine and interactive job tasks. Acquisitions of Swedish MNEs by foreign MNEs have no effect on the composition of skills and job tasks in the target firms, which provides further support that it is the distinction between multinational and local firms, rather than between local and foreign firms that is most relevant.

Moreover, our findings suggest that changes in the relative demand for job tasks primarily work through changes in relative wages rather than in employment shares, leading to increased wage dispersion for workers with different non-routine and interactive task intensity. Repeating our analysis for educational skill measures suggests that the task measures reveal effects of FDI on the relative labor demand that conventional skill measures fail to capture.

Hence, we find a difference between multinational firms and local firms in their relative demand for tasks, whereas foreign and Swedish MNEs seem to have a very similar relative demand for tasks. The results of Becker et al. (2013) indicated that outward FDI to both high- and low-income countries tend to increase the demand

for non-routine tasks in the home country. Together with our results, this suggests that FDI increase the demand for non-routine and interactive tasks in high-income home and host countries, and that home and host country operations therefore tend to be complements rather than substitutes.

When the demand for non-routine and interactive tasks increases in both countries, there might be more factors at work than offshoring of specific tasks. We can only speculate about the reasons. One plausible explanation is that the type of goods produced by multinational firms and local firms differ. If MNEs produce more advanced products or use more sophisticated production methods than local firms, then acquisitions by MNEs could change production and labor composition of the local target firm while leaving the production of multinational target firms unchanged. It remains for future studies with detailed information on output and inputs of intermediate goods to shed further light on this issue.

These unresolved issues notwithstanding, we believe that by shifting focus from traditional distinctions of workers according to educational skills to the type of job tasks conducted, we have contributed with new knowledge on how increased inward FDI affects the relative demand for labor.

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Table 1. The shares of non-routine and interactive tasks in different occupations (%).

	Non-routine	Interactive
Physical, mathematical and engineering science professionals	100.0	65.9
Life science and health professionals	90.4	57.9
Soldiers	84.5	100.0
Physical and engineering science associate professionals	79.7	48.0
Corporate managers	78.4	61.0
Other professionals	63.0	49.3
Teaching professionals	61.2	65.7
Life science and health associate professionals	56.3	32.3
Legislators and senior officials	54.4	38.4
Other associate professionals	52.7	33.4
Office clerks	52.1	26.4
General managers	46.6	46.5
Stationary-plant and related operators	43.6	39.7
Metal, machinery and related trades workers	41.6	44.3
Precision, handcraft, printing and related trades workers	39.8	14.7
Teaching associate professionals	36.1	61.6
Personal and protective services workers	32.0	26.5
Customer services clerks	27.1	15.8
Extraction and building trades workers	21.4	34.6
Machine operators and assemblers	18.8	10.8
Other craft and related trades workers	17.7	14.7
Market-oriented skilled agricultural and fishery workers	10.8	23.8
Models, salespersons and demonstrators	8.1	15.1
Drivers and mobile-plant operators	6.3	30.3
Laborers in mining, construction, manufacturing and transport	2.5	12.4
Agricultural, fishery and related laborers	0.9	10.1
Sales and services elementary occupations	0.0	0.0

Table 2. Ownership and job tasks.

	Share in total number of firms	Non-routine	Personal interaction	Higher education
All firms		0.44 (0.20)	0.34 (0.12)	0.20 (0.20)
Swedish local firms	0.66	0.41 (0.20)	0.34 (0.12)	0.20 (0.21)
Swedish multinational firms	0.12	0.48 (0.18)	0.35 (0.12)	0.20 (0.19)
Foreign multinational firms	0.22	0.49 (0.18)	0.36 (0.11)	0.20 (0.17)

Note: Higher education is employees with tertiary education. Non-routine tasks, personal interaction, and higher education are all defined as cost (wage) shares. Standard deviations are shown within brackets.

Table 3. The effect of ownership on the demand for job tasks and educational skills. Firm-level estimates 1996-2005.

	1	2	3	4	5	6	7	8	9	10	11	12
	Foreign Firms vs. Domestic Firms						Multinational Firms vs. Non-Multinational Firms					
	Non-routine Tasks		Interactive Tasks		Educational Skills		Non-routine Tasks		Interactive Tasks		Educational Skills	
Dependent variable: Wage cost share												
Ownership dummy	0.037 (0.004)***	0.024 (0.004)***	0.014 (0.003)***	0.008 (0.003)***	0.013 (0.004)***	0.003 (0.004)	0.043 (0.003)***	0.026 (0.004)***	0.017 (0.002)***	0.008 (0.002)***	0.026 (0.004)***	0.011 (0.004)***
Capital	--	-0.009 (0.001)***	--	-0.003 (0.001)***	--	-0.009 (0.001)***	--	-0.009 (0.001)***	--	-0.003 (0.001)***	--	-0.008 (0.001)***
Value added	--	0.017 (0.001)***	--	0.008 (0.001)***	--	0.017 (0.002)***	--	0.015 (0.001)***	--	0.008 (0.001)***	--	0.015 (0.002)***
ICT	--	0.019 (0.007)***	--	0.008 (0.005)	--	0.005 (0.007)	--	0.019 (0.007)***	--	0.008 (0.005)	--	0.005 (0.007)
Year dummies	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included
Industry dummies	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included
R ² adj.	0.52	0.54	0.45	0.46	0.49	0.50	0.52	0.54	0.45	0.46	0.49	0.51
No. of observations	28,567	27,746	28,567	27,746	25,788	25,008	28,567	27,746	28,567	27,746	25,788	25,008

Notes: The dependent variable is the wage cost share of non-routine tasks, interactive tasks or the educational skill of employees. Robust standard errors, adjusted for clustering at the firm level within parentheses. *** indicate significance at the 1 %-level, ** significance at the 5 %-level and * significance at the 10 %-level.

Table 4. The effect of ownership changes on the demand for non-routine and interactive job tasks. Firm-level estimates 1996-2005 on a propensity score matched sample of firms.

	1	2	3	4	5	6	7	8	9
	From local to Swedish MNE	From local to foreign MNE	From Swedish MNE to foreign MNE	From local to Swedish MNE	From local to foreign MNE	From Swedish MNE to foreign MNE	From local to Swedish MNE	From local to foreign MNE	From Swedish MNE to foreign MNE
	Non-routine			Interactive			Educational Skills		
Dependent variable: Wage cost share									
Acquisition	0.020 (0.009)**	0.010 (0.005)**	0.007 (0.007)	0.010 (0.006)*	0.006 (0.004)*	0.005 (0.005)	0.010 (0.005)*	0.000 (0.004)	0.000 (0.006)
Capital	-0.003 (0.005)	-0.002 (0.003)	-0.003 (0.007)	-0.004 (0.004)	-0.000 (0.002)	-0.003 (0.004)	-0.001 (0.003)	-0.001 (0.002)	0.001 (0.006)
Value added	-0.009 (0.007)	-0.005 (0.005)	-0.018 (0.007)**	-0.006 (0.005)	-0.003 (0.003)	-0.009 (0.005)*	-0.000 (0.005)	-0.001 (0.004)	-0.008 (0.005)
ICT	0.027 (0.017)	0.019 (0.018)	0.007 (0.014)	0.008 (0.013)	0.015 (0.014)	-0.002 (0.009)	-0.016 (0.019)	0.011 (0.014)	0.022 (0.011)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R ² (within)	0.02	0.01	0.03	0.02	0.01	0.02	0.20	0.18	0.20
No. of observations	1,634	2,566	1,492	1,634	2,566	1,492	1,568	2,352	1,474

Notes: The dependent variable in columns 1-3 is the wage cost share for employees with non-routine tasks, in columns 4-6 the wage cost share for employees with interactive tasks and in columns 7-9 the wage cost share for employees with tertiary education. Acquisition takes the value of one in the acquisition period and thereafter, zero before. Robust standard errors, adjusted for clustering at the firm level within parentheses. *** indicate significance at the 1 %-level, ** significance at the 5 %-level and * significance at the 10 %-level.

Table 5. The effect of ownership changes on the demand for non-routine job tasks controlling for offshoring.

	1	2	3	4	5	6
	From local to Swedish MNE		From local to foreign MNE		From Swedish MNE to foreign MNE	
Dependent variable: Wage cost share						
Acquisition	0.015 (0.007)**	0.016 (0.008)**	0.013 (0.005)**	0.012 (0.005)**	0.007 (0.006)	0.007 (0.008)
Offshoring	0.071 (0.046)	0.073 (0.047)	-0.024 (0.057)	-0.044 (0.061)	-0.031 (0.048)	-0.030 (0.048)
Offshoring* Acquisition	--	-0.034 (0.050)	--	0.032 (0.030)	--	-0.002 (0.039)
Firm controls	Included	Included	Included	Included	Included	Included
Year dummies	Included	Included	Included	Included	Included	Included
Firm fixed-effects	Included	Included	Included	Included	Included	Included
R ² (within)	0.02	0.01	0.01	0.02	0.03	0.03
No. of observations	1,634	1,488	2,414	2,414	1,377	1,377

Notes: The dependent variable is the wage cost share for employees with non-routine tasks. An acquisition takes the value of one in the acquisition period and thereafter, zero before. Included firm controls are the same as in Table 4. The estimations are based on the propensity score matched sample. Robust standard errors, adjusted for clustering at the firm level within parentheses. *** indicate significance at the 1 %-level, ** significance at the 5 %-level and * significance at the 10 %-level.

Table 6. The effect of ownership changes on the demand for non-routine job tasks and educational skills. Employment shares as dependent variables.

	1	2	3	4	5	6	7	8
	Foreign firms vs. Domestic firms	MNEs vs. Swedish local firms	From local to Swedish MNE	From local to foreign MNE	From Swedish MNE to foreign MNE	From local to Swedish MNE	From local to foreign MNE	From Swedish MNE to foreign MNE
	Non-routine		Non-routine			Educational skills		
Dependent variable: Employment share								
Foreign Firms	0.021 (0.004)***	--	--	--	--	--	--	--
Multinational	--	0.023 (0.004)***	--	--	--	--	--	--
Acquisition	--	--	0.009 (0.008)	0.006 (0.005)	0.007 (0.006)	0.005 (0.005)	0.003 (0.003)	-0.001 (0.004)
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	No	No	No	No	No	No
Firm fixed-effects	No	No	Yes	Yes	Yes	Yes	Yes	Yes
R ²								
No. of obs.	0.56 27,746	0.56 27,746	0.02 1,634	0.01 2,566	0.01 1,492	0.24 1,641	0.18 2,572	0.26 1,493

Notes: The dependent variable in columns 1-5 is the share of employees with non-routine job tasks and in 6 to 8 the share of employees with tertiary education. Acquisition takes the value of one in the acquisition period and thereafter, zero before. Included firm controls are the same as in Table 4. The acquisition estimations in column 3-8 are based on the propensity score matched sample. Robust standard errors, adjusted for clustering at the firm level within parentheses. *** indicate significance at the 1 %-level, ** significance at the 5 %-level and * significance at the 10 %-level.

Table 7. The effect of ownership changes on wages by task category. Individual wage regressions 1996-2005 on a propensity score matched sample of firms.

	1	2	3	4	5	6
	Non-routine			Interactive		
	From local to Swedish MNE	From local to foreign MNE	From Swedish MNE to foreign MNE	From local to Swedish MNE	From local to foreign MNE	From Swedish MNE to foreign MNE
Dependent variable: Log monthly wage						
High non-routine* Acquisition	0.004 (0.009)	-0.008 (0.008)	0.011 (0.014)	0.006 (0.008)	-0.007 (0.008)	0.011 (0.014)
Medium non-routine* Acquisition	-0.016 (0.008)**	-0.001 (0.009)	-0.008 (0.011)	-0.019 (0.007)**	-0.014 (0.011)	-0.009 (0.012)
Low non-routine* Acquisition	-0.005 (0.007)	-0.018 (0.010)*	-0.010 (0.014)	-0.000 (0.008)	-0.009 (0.008)	-0.009 (0.014)
High non-routine	0.008 (0.004)*	0.015 (0.007)**	-0.007 (0.005)	0.006* (0.003)	0.009 (0.006)	-0.005 (0.004)
Medium non-routine	0.006 (0.004)*	-0.001 (0.007)	-0.004 (0.004)	0.005 (0.003)	-0.000 (0.006)	-0.002 (0.003)
Year dummies	Included	Included	Included	Included	Included	Included
Individual fixed-effects	Included	Included	Included	Included	Included	Included
R ² (within)	0.74	0.68	0.71	0.74	0.68	0.71
No. of observations	547,303	1,147,766	1,339,394	547,303	1, 147,766	1,339,394

Notes: The dependent variable the log monthly full-time equivalent monthly wages at the individual level. An acquisition takes the value of one in the acquisition period and thereafter, zero before. All regressions include controls for squared labour market experience, log firm size and capital intensity. Robust standard errors, adjusted for clustering at the firm level within parentheses. *** indicate significance at the 1 %-level, ** significance at the 5 %-level and * significance at the 10 %-level.

Table 8. The effect of ownership changes on the demand for non-routine job tasks. Spitz-Oener's task measures.

	1	2	3	4	5
	Foreign firms vs. Domestic firms	MNEs vs. local firms	From local to Swedish MNE	From local to foreign MNE	From Swedish MNE to foreign MNE
Dependent variable: Wage cost share					
Foreign Firms	0.005 (0.003)*	--	--		
Multinational	--	0.005 (0.003)**	--	--	--
Acquisition	--	--	0.014 (0.007)**	0.009 (0.004)**	0.005 (0.008)
Firm controls	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	No	No	No
Firm fixed-effects	No	No	Yes	Yes	Yes
R ²	0.58	0.58	0.02	0.02	0.03
No. of obs.	27,746	27,746	1,634	2,566	1,492

Notes: The dependent variable is the wage cost share for employees with non-routine tasks according to Spitz-Oener's definitions. Acquisition takes the value of one in the acquisition period and thereafter, zero before. Included firm controls are the same as in Table 4. The acquisition estimations in columns 3-5 are based on the propensity score matched sample. Robust standard errors, adjusted for clustering at the firm level within parentheses. *** indicate significance at the 1 %-level, ** significance at the 5 %-level and * significance at the 10 %-level.

Appendix

Table A1. Number of firms and acquisitions by ownership in Sweden 1997-2005.

	Swedish local	Foreign MNE	MNE	From Swedish local to Swedish MNE	From Swedish local to foreign MNE	From Swedish MNE to foreign MNE
	Number of firms			Number of acquisitions		
1996	1,543	385	681	--	--	--
1997	1,540	412	870	46	12	11
1998	1,628	427	804	11	24	21
1999	1,733	488	837	17	27	18
2000	2,096	619	1,050	12	29	15
2001	2,059	741	1,125	13	67	40
2002	2,067	755	1,105	9	27	17
2003	2,127	817	1,086	8	43	23
2004	2,066	770	1,083	24	23	15
2005	2,005	810	1,141	46	36	22

Table A2. Definitions and descriptive statistics (means and standard deviations). Firms with at least 20 employees, 1996-2005.

<i>Firm variables:</i>	Definition	All firms	Swedish local firms	MNEs	Foreign firms
Wage cost share, non-routine tasks	Wage costs for non-routine tasks in total wage costs.	0.44 (0.20)	0.41 (0.20)	0.49 (0.18)	0.49 (0.18)
Wage cost share, personal interaction	Wage costs for personal interaction tasks in total wage costs.	0.34 (0.12)	0.34 (0.12)	0.35 (0.11)	0.36 (0.11)
Wage cost share, tertiary education	Wage costs for employees with tertiary education in total wage costs.	0.20 (0.20)	0.20 (0.21)	0.20 (0.18)	0.20 (0.17)
Capital/sales	(Net property, plant and equipment)/ sales.	0.0004 (.0023)	0.0005 (0.0028)	.0002 (0.001)	0.0002 (.001)
Value added	Sales-operational expenses excluding wages.	216,580 (978,706)	121,722 (618,312)	399,507 (1,420,256)	299,990 (997,740)
ICT	Capital compensation for computing and communications equipment as a share of total capital compensation	0.226 (0.186)	0.219 (0.183)	0.240 (0.191)	0.237 (0.181)
Offshoring	Share of imported intermediate goods in total sales	0.042 (0.104)	0.022 (0.073)	0.081 (0.138)	0.087 (0.151)
Offshoring, high income countries	Share of imported intermediate goods in total sales to OECD countries	0.039 (0.098)	0.020 (0.068)	0.075 (0.130)	0.082 (0.144)
Offshoring, low income countries	Share of imported intermediate goods in total sales to non-OECD countries	0.003 (0.022)	0.002 (0.019)	0.006 (0.027)	0.005 (0.026)
<i>Individual level variables:</i>					
Wages	Full time equivalent monthly wage per employee	21,168 (9,256)	19,956 (8,153)	22,163 (9,963)	21,785 (9,921)
Labor market experience	Age minus number of years of schooling minus seven	22.6 (12.5)	23.2 (12.7)	22.0 (12.3)	21.7 (12.4)

Note: All monetary variables are in 1995 SEK. The task shares are constructed as a share of non-routine (or interactive) job tasks in the total job tasks of an employee with a certain occupation. The firm-level wages cost shares are the sum of the task shares multiplied with the wage costs of the employees in total wages costs. The firm variables are used in the firm-level regressions. The individual variables are included in the individual wage regressions.

Table A3. Control variables in matched and unmatched samples of firms.

	Variable	Sample	Mean		% bias	% reduction in bias	t-statistics
			Treated	Control			
From Swedish local to Swedish MNE ¹	Capital/sales	Unmatched	-9.355	-8.895	-27.9		3.27***
		Matched	-9.355	-9.531	10.7	61.8	0.99
	Value added	Unmatched	11.181	10.495	53.7		9.73***
		Matched	11.181	10.536	50.4	6.1	6.06***
	R&D sales	Unmatched	0.005	0.009	-4.5		0.43
		Matched	0.005	0.007	-2.5	44.9	0.31
From Swedish local to foreign ²	Capital/sales	Unmatched	-9.462	-8.920	-31.6		4.63***
		Matched	-9.462	-9.234	-13.3	58.0	1.54
	Value added	Unmatched	11.244	10.518	54.7		8.65***
		Matched	11.244	10.763	36.2	33.8	3.51***
	R&D sales	Unmatched	0.005	0.009	-5.2		0.58
		Matched	0.005	0.004	1.6	69.5	0.62
From Swedish MNE to foreign ³	Capital/sales	Unmatched	-9.146	-9.009	-10.1		1.22
		Matched	-9.154	-9.161	0.5	94.6	0.04
	Value added	Unmatched	11.744	12.412	-47.3		5.26***
		Matched	11.744	12.297	-39.2	17.2	3.27***
	R&D sales	Unmatched	0.036	0.028	7.1		1.03
		Matched	0.028	0.027	0.9	86.7	0.09

Note: *** indicates significance at the 1 %-level, ** significance at the 5 %-level and * significance at the 10 %-level. The matching variables are chosen to satisfy the balancing property of the propensity score and therefore differ between the three sub-samples. 1) The lag variables used for the matching are value added per employee with one and two lags, firm age, export share, (export share)², R&D intensity, (R&D intensity)², capital/sales, share of tertiary educated and mean level of labor market experience at the firm level. 2) The variables used for the matching are value added per employee with one, two and three lags, firm age, capital/sales, share of employees with upper secondary education, R&D intensity and mean level of labor market experience at the firm level. 3) The variables used for the matching are value added per employee with one and two lags, firm age, export share, (export share)², R&D intensity, capital/sales, (capital/sales)², share of tertiary educated and labor market experience at the firm level.

Table A4: The effect of ownership changes on the demand for non-routine and interactive job tasks and on education skills. Firm-level estimates 1996-2005 on a propensity score matched sample of firms. Regressions of 1-year lagged acquisition variables on cost shares.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	From local to Swedish MNE			From local to foreign MNE			From Swedish MNE to foreign MNE		
	Non-routine	Interactive	Education skills	Non-routine	Interactive	Education skills	Non-routine	Interactive	Education skills
Lagged acquisition	0.018*	0.011*	0.009	0.009*	0.007*	-0.001	-0.004	-0.001	-0.001
	(0.010)	(0.006)	(0.006)	(0.005)	(0.004)	(0.004)	(0.007)	(0.005)	(0.006)
Capital	-0.002	-0.003	-0.000	0.002	0.000	-0.000	-0.006	-0.004	0.004
	(0.005)	(0.003)	(0.004)	(0.003)	(0.002)	(0.003)	(0.007)	(0.004)	(0.006)
Value added	-0.002	-0.003	0.001	-0.004	-0.001	0.003	-0.016**	-0.008	-0.005
	(0.007)	(0.005)	(0.006)	(0.005)	(0.004)	(0.004)	(0.007)	(0.005)	(0.005)
ICT	0.017	0.008	-0.003	-0.002	-0.006	-0.004	-0.009	-0.004	0.017*
	(0.018)	(0.012)	(0.018)	(0.016)	(0.012)	(0.011)	(0.014)	(0.009)	(0.010)
Observations	1,276	1,276	1,232	2,050	2,050	1,901	1,245	1,245	1,235
R-squared	0.015	0.022	0.244	0.010	0.012	0.200	0.028	0.018	0.192

All estimations include year and firm fixed-effects. Acquisition takes the value of one in the acquisition period and thereafter, zero before. Robust standard errors, adjusted for clustering at the firm level within parentheses. *** indicate significance at the 1 %-level, ** significance at the 5 %-level and * significance at the 10 %-level.