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THE CONTRIBUTION OF MULTINATIONALS TO WAGE INEQUALITY: FOREIGN OWNERSHIP AND THE GENDER PAY GAP

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The Contribution of Multinationals to Wage Inequality: Foreign Ownership and the Gender Pay Gap

Priit Vahter, Jaan Masso*

Abstract

While an abundance of studies exists documenting the significant wage premium of multinationals (MNE) and the effects of foreign direct investments (FDI) on wage inequality, much less is still known about how foreign ownership affects the gender wage gap of employees in firms. Based on employer-employee level data from Estonia – a country with the largest gender wage gap in the EU – this study highlights the regularity that foreign owned firms display on average a substantially larger gender wage gap than domestically owned firms. Among different occupation groups, this result is especially evident among managers. Furthermore, this difference is also evident if we focus on acquisitions of domestic firms by MNEs and estimate its effects based on propensity score matching. The resulting increase in gender wage gap is due to men capturing a higher wage premium from working at foreign owned firms than women, although both tend to gain in terms of wages from being employed at MNEs. We find evidence (albeit limited) suggesting that one of the explanations of the difference in the gender wage gap between foreign-owned and domestically-owned firms could potentially be that MNEs require more of a continuous commitment from their employees compared to other firms.

JEL Classification: F10, F23, J16, J31

Keywords: FDI, foreign ownership, wages, gender wage gap

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1. INTRODUCTION

It is a well-known fact from empirical research in both international economics and international business literature that foreign owned firms have on average higher average wages than domestically owned firms (e.g. Heyman et al. 2007, Aitken et al. 1996, Taylor and Driffield 2005). This reflects foreign firms selecting into high-wage industries and regions, taking over local firms with higher performance and wages, or foreign ownership itself having an effect on wages through a variety of channels (Fosfuri et al. 2001, Budd et al. 2005, Arnold and Javorcik 2009). There is also an abundance of studies on foreign direct investments (FDI) and wage inequality (e.g. Taylor and Driffield 2005, Figini and Görg 1999) and extensive literature on the various drivers of the male-female wage gap (e.g. see Blau and Kahn 2000, OECD 2012, and Altonji and Blank 1999 for an overview), but still limited evidence and explanations concerning the links between FDI and the gender wage gap (Oostendorp 2009, Kodama et al. 2016, and a conceptual overview of the mechanisms of the effects in Aguayo-Tellez 2011).

This paper addresses in particular this last issue. We document the robust relationship between FDI and the gender wage gap based on employer-employee data from Estonia, and account for various other relevant firm and individual level covariates. Prior analysis on FDI and the gender wage gap includes an econometric investigation of aggregate country level data (Oostendorp 2009) to outline general country-level correlations, the use of a combined household survey and province level data (Braunstein and Brenner 2007), modelling the effects of liberalized FDI policies and the resulting FDI inflow in a general equilibrium model (Chaudhuri and Mukhopadhay 2014), and also some relevant evidence on labour market outcomes for women in foreign and domestically owned firms based on firm-level (Chen et al. 2013) or more recently also employer-employee level data (Kodama et al. 2016 on Japan). The study using such data from Japan (Kodama et al. 2016) points to foreign owned firms having more female friendly work practices than local firms, suggesting a significant transfer of human resource practices and corporate culture through FDI. These findings would also suggest a lower gender wage gap among foreign owned firms.[1]

Our contribution to the prior literature linking foreign ownership and wages is to provide evidence of a persistently larger male-female wage gap among foreign owned firms compared to domestically owned firms, even if we account for a number of employer and employee specific characteristics. This difference is also evident if we focus on the effects of acquisitions of domestic firms by multinationals and estimate its effects using a propensity score matching approach. We show that a change in ownership from domestic to foreign owned firm is associated with higher rewards for men than women in terms of wages, resulting in a larger gender wage gap in foreign owned firms.

There are several channels for how foreign ownership can either increase or decrease the gender wage gap. The net effect is likely to depend on the institutional background of the host country and how it differs from the home country of the investors. Following recent contributions in labour economics (Goldin 2014), our evidence indicating a larger gender wage gap among foreign owned firms is consistent with the reasoning that differences in the gender wage gap

[1] Kodama et al. (2016) investigate the effects of foreign ownership on female employment and on various work practices at the firm. Their results are also consistent with a larger gender wage gap among domestic owned firms. However, their econometric analysis does not directly estimate the effects of foreign ownership on gender wage gap.

between MNEs and domestically owned firms are likely to reflect the differences in work commitment and flexibility requirements from employees (e.g. working overtime, availability for afterhours work, working longer days). Differences in commitment or flexibility requirements across different occupation categories have been suggested in Goldin (2014) as one of the primary explanations of the significant remaining gender wage gap in the US and likely also in other advanced economies. Arguably, such differences in commitment requirements may depend a lot on the competitive environment the firm functions in, or firm characteristics such as size, trade orientation (Boler et al. 2015), or most likely also the type of ownership. For example, Goldin (2014) points out that even within the same occupation, such as lawyers, the importance of working long hours and other requirements of commitment to work are likely to be quite different in a small firm that may allow short and discontinuous hours at little wage penalty and large law firms where there is likely to be a disproportionate premium for contributing longer and continuous hours and effort. A recent paper on exporting and the gender wage gap in Norway by Boler et al. (2015) shows clear evidence that is most relevant to this study—that being an exporter is associated with a higher gender wage gap and that higher commitment requirements among exporters is a plausible explanatory factor of this difference. We investigate whether similar results to Boler et al. (2015) in the context of exporters can be observed in the case of the effects of foreign ownership.

Our study is based on employer-employee level data from Estonia. Estonia is a good example for investigating both the effects of foreign direct investment (FDI) and the determinants of the gender wage gap. Estonia has historically attracted considerable foreign investment. A very large proportion of FDI inflows stem from neighbouring Sweden and Finland, countries with a strong emphasis on gender equality in their home countries. At the same time, Estonia has the largest male-female wage gap among European Union countries (Anspal 2015, Eurostat 2017), estimated to be close to 30% across different data-sets and periods.

FDI in Estonia has been to a large extent traditionally either the market or efficiency seeking type of FDI (Varblane et al. 2010). It is of significant interest, how the Swedish and Finnish multinationals, which have dominated FDI in Estonia, apply personnel practices and remunerate men and women in their local affiliates compared to the Estonian capital based firms. We clearly observe that the regularities observed in the data do not accord with the expectation of the home country's personnel practices being transferred unchanged to the host economy of FDI.

The analysis covers a population of firms and employed individuals in Estonia, and is mostly based on estimations of Mincerian wage equations and propensity score matching. The matched employer-employee panel data of firms and employees used in this paper covers the period 2006–2012. Four different datasets were linked for our analysis. These included, firstly, an Estonian Tax and Customs Office dataset on payroll taxes for individuals and firms that includes information on individual level wages and some controls. The second matched dataset was the Estonian Housing and Population Census 2011, providing various individual level control variables, such as education, occupation, indicators for underage children, and others. The third matched dataset was the Estonian Business Registry, covering the financial information of firms. Firm ownership variables were further added from the Statistics Estonia Statistical Profile for Enterprises. Analysis of the relationship of wages and variables like working overtime, availability of employees for working afterhours, working longer days on the gender wage gap is based on the Estonian Labour Force Survey, covering the period 2007–2013.

The rest of this paper is structured as follows. Section 2 provides a literature review and explains the expected relationships. Section 3 discusses data and descriptive statistics. Section 4 outlines the methods of analysis. Section 5 provides the key econometric results. Section 6 discusses some potential explanations of the key regularities found. Section 7 concludes.

2. LITERATURE REVIEW

2.1. Channels of the Effects of FDI on Gender Wage Gap

There are a number of channels through which FDI can affect the gender wage gap. As in the case of the general effects of FDI on wages, there can be, firstly, direct effects on the wages of foreign affiliates that may vary for men and women. These are our focus of interest in this paper. In addition, there may be structural and spillover effects that affect the gender wage gap in the whole economy, including among domestically owned firms.

The first reason why foreign owned firms may have a different gender wage gap compared to domestically owned ones works through different levels of actual discrimination. On the one hand, following Becker's (1957) theory of taste-based discrimination, more profitable firms might be more able to engage in costly discrimination. As foreign owned firms have higher productivity and higher profitability, they could be better able to engage in such discrimination. On the other hand, MNEs are likely to be exposed to a tougher competition environment. Tougher competition, again along the lines of Becker (1957), restricts the firm's ability and incentives to engage in costly discrimination and leads to a more efficient allocation of talent within the firm. The entry and presence of MNEs in a host economy can also mean a tougher competition environment for domestically owned firms, and thus could lead to a lower gender wage gap also among them.[2]

Focusing only on the discrimination-based explanation would assume that men and women have similar skill sets, are equally productive and perfect substitutes in all sectors. If different sectors use male and female labour at different intensities, if men and women have different levels and types of skills, and foreign owned firms require different skill sets or levels than domestic firms, then FDI inflow will result in important inter-industry reallocation effects with implications for the gender wage gap (Juhn et al. 2014, Oostendorp 2009, Agauyo-Tellez 2011, Pieters 2014). FDI inflow (e.g. into export-oriented comparative advantage sectors) affects then the growth of different sectors in different ways, leading to changes in the relative demand for male and female labour and accordingly affecting relative male and female wages. For example, if a developing country has a comparative advantage in female labour-intensive sectors (e.g. textiles) and FDI flows predominantly into this sector, FDI could increase women's relative wages in the economy.[3]

An important type of effect of FDI on gender wage gap works through technology transfer. Foreign owned firms in developing and transition economies tend to adopt more skill and capital intensive production technologies than domestic firms. These technologies may complement female labour by lowering the need for physical skills at the workplace, and

[2] In a related context of effects of trade liberalization, Black and Brainerd (2004) show that US firms that faced larger increases in competition also experienced larger decrease in gender wage gap.

[3] Another macro level indirect effect of foreign owned firms on gender wage gap functions through effects of FDI on economic growth (Agauyo-Tellez 2011). FDI may enhance the economic growth, whereas economic growth is likely to be associated with improvement of public services. As a consequence of that, gender differences in education and other types of human capital may fall, lowering also the gender wage gap.

therefore raise the relative demand for women and their relative wages. As an example of the complementarities of new technologies and female labour, Weinberg (2000) has shown based on US data that the growth of female employment is positively associated with the adoption of information technology at the workplace. Indeed, women's skill set tends to have relatively more cognitive skills and less physical skills compared to men (Weinberg 2000).

Another potential effect, especially relevant to our empirical study, may function through the transfer of management practices, and in particular human resources management (hereinafter HRM) practices from the home economy of the investor to the affiliate (e.g. Kodama et al. 2016). As Bloom and van Reenen (2010, 2012) have shown based on the World Management Survey, the quality of management practices varies a lot across countries and is strongly related to firm productivity. Their results also highlight that multinational firms tend to have more similar management practices across countries than domestic firms. MNEs appear to be able to transfer good management practices to their affiliates in host countries (Bloom et al. 2012). Potentially this may include HRM practices as well. For example, Swedish and Finnish MNEs stem from societies that put a stronger value on the equal treatment of men and women than in most other countries. This might perhaps be expected to be reflected in the HRM practices adopted in their affiliates abroad.

A significant counterargument to the expectation of the transfer of HRM practices is that personnel practices can be among the less centralized functions in such MNEs. Local affiliates in the host economy can still have substantial autonomy in these decisions, although the autonomy vs. centralization in terms of HRM practices can vary a lot depending on the mandate of the subsidiary and a variety of institutional and other factors (Belizon et al. 2013). The existing literature on this issue points out a number of possibilities.[4] Some MNEs do not give their subsidiaries any significant level of local autonomy at all. This reflects the view of HRM practices as a central component of a firm's overall strategy (e.g. Schuler and Rogovsky 1998, Pudelko and Harzing 2007). From another perspective, some MNEs allow subsidiaries full autonomy in setting their HRM policy (e.g. Ferner et al. 2011). The HRM decisions on remuneration are also shaped very much by the local labour market conditions, local traditions and management practices (especially if the affiliate's managers themselves come from the host economy) and to a significant extent by the motives and strategies of the MNE/role of the subsidiary in the networks of the MNE.

Apart from these effects, foreign ownership may affect the bargaining power of men and women differently (Seguino 2005).[5] If FDI is more footloose than domestic investment, this may lower the relative bargaining power of employees at foreign owned firms. If the export oriented target sectors of FDI employ relatively more women, then this effect of foreign investment may in fact increase the aggregate gender wage gap.

[4] The number of papers investigating the extent to which HRM practices are transferred or not from the headquarters to subsidiaries of MNEs has grown significantly (see e.g. Belizon et al. 2013 for a recent overview). Examples include: Pudelko and Harzing (2007), Fenton-O'Creevy et al. (2008), Ferner et al. (2011), Kodama et al. (2016), among the others. The literature on HRM and internationalisation stresses the 'global-local' tension, which means that there are conflicting pressures for standardization and centrally developed and managed HRM policies on the one hand, and on the other hand there is a clear need to make sure that the choice and management of HRM practices reflects the norms and traditions of the host country (Brewster et al. 2008, Fenton-O'Creevy et al. 2008, Belizon et al. 2013).

[5] Lower bargaining power of women has been identified as one of significant determinants of the aggregate gender wage gap. For example, Card et al. (2016) find that women receive only 90% of the firm-specific pay premiums earned by men, they argue that this reflects to a significant extent the differences in bargaining power.

A more recent addition to theoretical predictions of the relationship between FDI and the gender wage gap is related to work-commitment based explanations of the aggregate gender wage gap. Goldin (2014) shows that the aggregate gender wage gap (at least in the US context) can be explained to a large extent by employers disproportionately rewarding those workers who put in longer working hours, have less need for time off from work and are in general more committed to work than others. For example, this can involve the willingness in the law or media sector to be available for consultations 24/7, willingness to go on business trips during a vacation period and at weekends, less need to leave the office early in the day, and so on. Goldin (2014) shows based on US data that this may be a powerful explanatory factor of the remaining gender wage gap in the US. Unlike many other explanations of the gender wage gap, this explains why some occupations (lawyers, business occupations) have a much higher gender wage gap than others (e.g. compared to the low gender wage gap among skilled employees at US pharmacies) and disproportionately reward being available for work 24/7. Goldin's work commitment based explanation is also more successful than other previously mentioned ones in explaining why women without children have higher wages than women with children, and why childless women in the US often have wage rates almost close to men with comparable characteristics. We note that our usage of the term 'commitment' as denoting an individual's willingness to work longer hours, inconvenient hours and the lower likelihood of having job discontinuities (similar to Boler et al. 2015) is different from how the term may be used in other strands of literature. In our context, the term is not meant to specifically indicate an individual's emotional engagement with the work or workplace.

We could expect, based on the work by Goldin (2014) and a recent related empirical investigation in Boler et al. (2015) that the relationship between FDI and the gender wage gap is likely to be connected to foreign owned firms requiring more commitment and greater flexibility and less job discontinuities, especially from their managerial and other highly paid employees. Differences in commitment requirements across different jobs or to a lesser extent across sectors have been suggested in recent labour economics literature (Goldin 2014) as one of the primary explanations of the significant remaining gender wage gaps in advanced economies. Arguably, such differences in commitment requirements may depend significantly on the competition environment of the firm, or firm characteristics such as size, trade orientation (as investigated in detail in an innovative empirical study by Boler et al. (2015) on exporters and the gender wage gap), or most likely also its type of ownership. For example, Goldin (2014) points out that, even within the same occupation such as lawyers, the importance of working long hours and requirements of commitment to work are likely to be quite different in small firms that may allow short and discontinuous hours at little wage penalty and large law firms where there is likely to be a disproportionate premium for contributing longer and continuous hours and effort.

We could expect here that the wages of individuals working at foreign owned firms are more sensitive with respect to their level of work commitment (as proxied by actual hours worked, overtime, discontinuities in work-life, etc.) than they would be at domestically owned firms. This larger commitment requirement may have to do with foreign owned firms being exposed to a tougher competition environment, and greater need for their high-wage employees to co-operate and co-ordinate their activities with other parts of the MNE and its global value chain. In addition, it may reflect the fact that the high technology and capital intensity at MNEs complement the higher commitment level of its staff. For example, Ben Yahmed (2013) shows in her Melitz-style heterogeneous producer trade model that complementarities between high technology and level of commitment from employees induce firms that have better technology and are able to cover the costs of investing in high technology (exporters in her analysis but

these could be also foreign owned firms) to hire more 'committed' employees and have a higher gender wage gap among similarly skilled employees.[6]

Assuming now, in addition to the higher commitment requirement at MNEs, also that individual level commitment is not something easily observed at the time of hiring, and assuming that firms perceive female employees on average as 'less committed' than men, we can expect foreign owned firms to have more statistical wage discrimination of women and a higher gender wage gap than purely domestically owned firms. We would also anticipate that the commitment requirements matter especially among managerial employees, and consequently result in larger MNE 'negative premium' in the male-female wage gap among managerial occupations. This would be in accordance with Goldin's (2014) evidence that the commitment level (in her analysis especially the number of hours worked and job discontinuities) matters for wages and the gender wage gap more in Business occupations compared to the Technology occupations. In addition, we would expect the more skilled employee groups to include commitment within a stronger role, as there is on average less substitutability possible between high-skilled employees with otherwise similar characteristics. Finally, it is a stylized fact from prior literature that having children increases the male-female wage gap (Goldin 2014). If the commitment based explanation of the MNE vs. domestic firm differences in the gender wage gap makes sense, then we could also expect the wage 'penalty' for women from having young children to be larger among foreign owned firms than among domestically owned firms.

2.2. FDI and Gender Wage Gap: Prior Empirical Studies

Prior analysis on FDI and the gender wage gap includes the econometric investigation of aggregate country level data (Oostendorp 2009) to outline general country level correlations, combined household surveys and province level data (Braunstein and Brenner 2007), modelling of the effects of liberalized FDI policy and the resulting FDI inflow in a general equilibrium model (Chaudhuri and Mukhopadhay 2014), and also some evidence based on firm level (Chen et al. 2013) or more recently also employer-employee level data (Kodama et al. 2016 on Japan). Empirical evidence has concentrated somewhat more on the inter-industry structural change related explanations of the relationship between FDI and the gender wage gap. Evidence from individual and firm level data from Japan (Kodama et al. 2016) points to foreign owned firms having a lower gender wage gap and more female friendly work practices than local firms. This result suggests significant transfer of human resource practices and corporate culture through FDI. A widely cited aggregate level study by Oostendorp (2009) similarly confirms a clear negative correlation between FDI inflow and a lower gender wage gap based on the aggregate level data of a number of countries.

At the same time a paper by Braunstein and Brenner (2007) based on combining a household survey and province level data from China suggests that in 2002 foreign owned firms had a larger male-female wage gap than others. They rationalize their finding with potential explanations based on technological development favouring male-labour intensive sectors in China and based on differences in terms of the productivity and segregation of the employment of men and women.

[6] The higher commitment requirement may be reflected in the managers more frequent need to travel abroad – either to the home country of the investor or to other affiliates; the need to invest more time and continuous effort to the setup of new technology due to its more complex and previously unfamiliar nature; communicating and co-operating by managers and sales staff with a larger variety of clients or clients from geographically or culturally more distant destinations; more need to adapt quickly production, procurement and logistics to any delays or unexpected problems in the rest of the global value chain of the MNE.

An empirical study by Boler et al. (2015) on exporters and the gender wage gap is also highly related to our work here. They expose a related and at first glance perhaps a surprising result, based on an employer-employee level data set from Norway that exporters in Norway have on average a higher gender wage gap compared to non-exporters. This result is evident only once they account for individual specific fixed effects (i.e. unobserved fixed characteristics) in their econometric models.

3. DATA AND DESCRIPTIVE STATISTICS

To analyse FDI and the gender wage gap we have combined different firm and individual level datasets from Estonia, thereby creating and exploiting a matched employer-employee dataset.[7] The primary source of the individual level wage data is the Estonian Tax and Customs Office dataset on individuals' monthly payroll tax payments for the period 2006–2014, which makes it possible to calculate the individuals' gross wages. We focus on wages at the main place of employment of the individual. Monthly wage data is from January of each year. The individuals' background information from this dataset includes a limited set of variables, such as the gender and age. In order to use a wider set of control variables, the Estonian Tax and Customs Office data has been merged with the Estonian Population and Housing Census 2011 at Statistics Estonia (using the individual level anonymous identifiers). The latter data source includes detailed background information on the socio-economic status of individuals (incl. education, occupation, etc.). The two individual-level datasets have been further linked, using the anonymous firm identifiers, with the firm-level datasets to create a matched employer-employee dataset. The primary source of firm-level information is the Estonian Commercial Registry, covering the period 1995–2014 and including financial statements for the population of Estonian firms. While the latter database includes *inter alia* also the ownership information of companies, more detailed data on ownership (e.g. the country of origin of foreign owners) are taken from Statistics Estonia's Statistical Profile for Enterprises 2007–2013. The longitudinal nature of part of the matched employer-employee data enables us to study the effects of foreign acquisitions on the wages of men and women.

A limitation of the above-described matched employer-employee data concerns the shortage of detailed information about the jobs held by the individuals, especially the number of hours worked.[8] In order to investigate the sensitivity of wages at different types of firms to the hours worked by individuals (this is related to the above-discussed commitment-based explanation of

[7] The micro level analysis of linkages between gender pay gap and foreign ownership requires by definition at the same time individual level information on wages of men and women, and information on the firm's ownership structure. This means in practice that, in order to carry out research on the micro level, it is inevitable to focus the analysis to the data of a particular country. The cross-country datasets (e.g. European Union Labour Force Survey, European Working Conditions Survey, etc.) miss at least one of the key variables needed.

[8] That means also that we are not able to adjust the wage in the Estonian Tax and Customs Office data for the hours worked. Still, that should be somewhat less of a problem in the Estonian data, given that the incidence of part-time employment, also among females, has been relatively limited if compared to some Western European countries; for example, in 2016 part-time employment constituted just 9.9% of total employment, and even among females it was just 13.3%. This is in stark contrast with the average in the EU28, which was 19.5% among the total population and 31.9% among women (Eurostat data, 2017). One possible criticism could be that the data on hours in the Estonian Labour Force Survey (as the most often used source of data) is imprecise, as in the distribution of hours there is a very strong peak at 40 hours (e.g. in 2011 75% of all employed reported working 40 hours per week (authors calculations using Estonian LFS data)). It could be argued that the information on working time might be of better quality in other datasets like the European Working Conditions Survey. In the latter in 2016, 64% of employees in Estonia, a percentage higher than in any other country, reported 40 hours per week (own calculations).

the gender wage gap) we have also exploited the Estonian Labour Force Survey (hereinafter LFS) data for 2007–2013. The LFS data is a standard source of labour market information. However, Estonia's LFS data has a key advantage compared to other countries, due to the inclusion of numerical wage information for each individual involved.[9]

The gender gap has been studied in Estonia mostly based on the LFS, but also based on various other datasets[10] (see e.g. Anspal 2015, Krillo et al. 2010). These show consistently high gender pay gaps in the international context, and higher than in other EU countries (e.g. Krillo et al. 2010). The explained part of the gap is generally just about 1/3 of the total gap. Among the different factors explaining the gender pay gap, the most important contributors have been the industry and the occupation of the employee (Anspal 2015).

The key descriptive statistics about the gender wage gap in Estonia across various groups defined according to individual and firm-level characteristics are shown in Table 1. These confirm the persistent regularity that foreign owned firms have on average a larger gender wage gap than other firms. During the period 2006–2012, the gender wage gap in our dataset was, on average, 26.6 per cent of men's wages in domestically owned firms and 37.8 per cent in foreign owned firms. This difference between the two groups of firms is large in terms of its economic size.

Concerning different occupations, the difference is especially large in the case of managers. The gender wage gap in the occupation group managers was 39.8% in foreign owned firms compared to 18.8% in domestically owned firms. Despite the fact that the gender wage gap is often found to be higher among groups with higher wages (see e.g. the results of Anspal 2015, however, for example Christofides et al. 2013 do not find any effect of such "sticky floors"), this difference found here is still surprisingly large.

The gender pay gap at foreign owned firms is also higher than in domestically owned firms in the case of professionals (by 6.7 percentage points), craft and related trade workers (9.5 percentage points), plant and machine operators (11.3 percentage points), elementary occupations (3.1 percentage points), and skilled agricultural workers. Notably, this regularity does not appear to be uniform across different occupations. The occupation groups such as technical and associate professionals, and service and sales workers show essentially a similar gender wage gap in the two groups of firms. In the case of the occupation group 'clerical support workers' the gender wage gap is in fact higher among domestic firms by 7% compared to foreign owned firms.

[9] The survey is conducted as a rotation panel with an individual survey for two quarters and then after a two-quarter gap again a survey for another two quarters. Information on all members of the household is included. All the members of the household are surveyed. The various waves have been merged based on the respective household and individual identifiers, forming a longitudinal dataset.

[10] The various databases used include the Structure of Earnings survey, PIIAC survey of skills, online job search portal CV-Keskus dataset, survey of the alumni of the universities (see e.g. Anspal 2015 for an overview of datasets). The study of the gender pay gap in Estonia covers different decomposition techniques (e.g. in addition to Oaxaca-Blinder also Nopo's method), various measures of wages (e.g. in addition to the actual wages of the employees also the desired wages of the job applicants, see e.g. Meriküll and Mõtsmees 2014), and includes improved measurements of skills (Tverdostup and Paas 2017).

Table 1. Gender pay gap in foreign and domestically owned firms, for different categories of employees and industries

	Gender pay gap (ratio)			Share of females (%)			Wages	
Groups of employees	Domestic firms	Foreign firms	All firms	Domestic firms	Foreign firms	All firms	Men in foreign firms, EUR	Foreign premium vs. domestic firms
Total economy (2006-2012)	-0.266	**-0.378**	-0.276	46.9%	55.3%	52.7%	9146	39%
ISCO 1-digit occupations (year 2011)								
Managers	-0.188	**-0.398**	-0.213	31.3%	41.6%	38.0%	17405	76%
Professionals	-0.214	**-0.281**	-0.262	64.2%	54.7%	70.4%	15216	54%
Tech. and associate prof.	-0.316	-0.311	-0.305	56.8%	56.3%	58.8%	11047	45%
Clerical support workers	-0.258	-0.188	-0.227	70.1%	69.9%	72.6%	9300	54%
Service and sales workers	-0.232	-0.228	-0.229	80.1%	81.3%	77.7%	5837	14%
Skilled agricultural, forestry and fishery workers	0.017	**-0.322**	-0.017	53.0%	62.2%	50.9%	8267	33%
Craft and related trades workers	-0.281	**-0.376**	-0.282	15.0%	29.5%	17.8%	7163	17%
Plant and machine operators and assemblers	-0.207	**-0.320**	-0.184	22.6%	55.3%	30.6%	6968	20%
Elementary occupations	-0.307	**-0.338**	-0.310	63.7%	66.0%	66.5%	5262	22%
Blue-collar / white-collar								
Blue-collar	-0.322	**-0.390**	-0.327	40.6%	54.7%	46.2%	6142	16%
White-collar	-0.308	**-0.392**	-0.330	52.0%	54.1%	59.5%	12510	47%
Education								
Primary education	-0.305	**-0.372**	-0.309	32.4%	44.0%	38.0%	6002	19%
Secondary education	-0.311	**-0.399**	-0.322	46.3%	56.2%	51.9%	7475	23%
Higher education	-0.303	**-0.407**	-0.335	53.0%	55.2%	60.8%	13656	46%
Skill intensity groups								
Skill intensity 1st quartile	-0.198	**-0.288**	-0.201	58.2%	73.1%	60.2%	6392	17%
Skill intensity 2nd quartile	-0.260	**-0.333**	-0.255	35.1%	49.6%	40.0%	8308	26%
Skill intensity 3rd quartile	-0.305	**-0.338**	-0.311	45.4%	39.2%	54.5%	10261	46%
Skill intensity 4th quartile	-0.190	**-0.359**	-0.224	48.4%	55.3%	56.6%	13622	60%
Sectors (2006-2012)								
Primary sector	-0.180	**-0.210**	-0.182	40.8%	36.8%	42.5%	8238	24%
High-tech manufacturing	-0.278	**-0.415**	-0.396	39.7%	74.3%	69.8%	6479	-12%
Medium high-tech manuf.	-0.294	**-0.417**	-0.359	28.9%	49.9%	41.7%	7690	6%
Medium low-tech manuf.	-0.275	**-0.361**	-0.286	19.5%	30.4%	22.3%	8235	16%
Low-tech manuf.	-0.280	**-0.380**	-0.309	53.8%	60.5%	56.0%	6829	15%
Utilities	-0.259	-0.170	-0.245	28.0%	27.1%	27.9%	9565	33%
Construction	-0.247	-0.146	-0.239	12.0%	10.6%	11.9%	11645	80%
Knowledge-intensive services	-0.289	**-0.354**	-0.313	59.2%	57.9%	59.4%	12376	51%
Less knowledge intensive services	-0.278	**-0.429**	-0.301	53.5%	62.0%	55.2%	8402	42%

Source: own calculations using Estonian matched employer-employee data. The data on occupations is available only for 2011 as it is from the Estonian Population and Housing Census of 2011. Skill intensity measure is calculated based on shares of different occupation groups in employment, the measure is the same as in Davidson et al. (2014).

These comparisons need to acknowledge the compositional differences in terms of shares of female workers in the two groups of firms. As we can see from Table 1, the share of females varies from 17.8% in craft and related trade workers to 77.7% in service and sales workers. The higher share of women in an occupation is, on average, associated with a higher general level of gender pay gap. The aggregate pay gap between the two groups of firms studied here may partly reflect a different gender and occupational structure.

Descriptive statistics in Table 1 confirm the regularity that foreign owned firms have on average a larger gender wage gap than other firms also in the case of the analysis of the different broad sectors of the manufacturing industry and services. The foreign-domestic gender wage gap difference is very small in the primary sector, is substantial in the major groups of manufacturing and mostly also in services. Key exceptions are the utilities sector (with low numbers of foreign owned affiliates) and the construction industry, where the gender wage gap is larger among the domestically owned firms. These are also sectors where the share of women employed is small.

The higher gender wage gap in foreign owned affiliates is evident also if we divide sectors based on their levels of skill intensity. Skill intensity is calculated here based on the share of different occupation categories in the workforce of the firm, following the methods in Davidson et al. (2014).[11] The grouping of firms according to the firm's level of skill intensity reveals that in this case the differences between domestic and foreign owned firms are the largest in the case of the lowest and highest quartile of skill intensity. There is evidence of the tendency of the gender wage gap at foreign owned firms increasing with the skill intensity level at the firm. Concerning education level, there is some tendency of higher education being associated with a somewhat larger gender wage gap in foreign owned firms. However, the differences between the three education-based groups in Table 1 are not large.

Many of these statistics hide significant heterogeneity depending on other employee, firm and sector characteristics. In general, a tendency seems to exist whereby employees with higher income (and more skills, education) tend to have somewhat larger gender wage gap difference when comparing MNEs and local firms.

[11] The skills index is calculated by first ranking all occupations (either at the 1-digit or at 2-digit ISCO occupations classification) by (1) their average wages or (2) the size of coefficient on the occupational variable in the Mincerian wage regressions. Formally, the estimated regression equation looks like $\ln(Wage)_j = \alpha + \beta \times OCC_j + \varepsilon_j$, where the dependent variable is the log of the real monthly wage for individual *j*, OCC*j* is the vector of the 1-digit or 2-digit ISCO occupational codes, β is the vector of the coefficients associated with the latter (returns to respective occupation used for ranking the occupations) and ε_j is the error term. Next, the skills index is calculated for each firm as the weighted average according to its occupational mix. The index is bounded between 0 and 1, and a value of 0.5 of the index would indicate that the employment is evenly distributed across the occupations.

4. EMPIRICAL APPROACH

4.1. Mincerian wage equations

The comparison of these unconditional differences does not enable us to make conclusions about the effects of FDI on the gender wage gap, as the results in Table 1 could simply also reflect a number of other observed and unobserved drivers of wages than FDI. To account for this, we proceed at first with a 'conditional mean analysis' and estimate Mincerian wage equations with an FDI dummy, female dummy and their interaction term included among other standard drivers of wages. Then we apply propensity score matching to investigate whether the acquisition of a firm by a foreign MNE results in different effects on the wages of men and women. The empirical analysis concludes with a further simple estimation of Mincerian wage equations to address some potential explanations of the difference of the gender wage gap in foreign and domestically owned firms.

The large unconditional difference between the gender wage gap in foreign owned and domestically firms may still reflect a multitude of other observed and unobserved factors, including male and female segregation in terms of sector, occupation, skills and education, among others. We account for a host of firm and also individual level factors by estimating a Mincerian wage equation at employee level. The dependent variable is the log of real monthly wages lnW_{ikt} in January of the year, and a set of individual and firm-level characteristics are included among the controls. The corresponding wage equations are estimated based on a cross section of employer-employee level data from 2011 (Equation 1, 2011 was the year of the Population and Housing Census) and based on panel data (Equation 2) as follows:

A. Wage equation based on employer-employee level cross-section data from 2011 (with detailed individual level controls from the Population and Housing Census):

$$lnW_{ik} = \alpha_0 + \alpha_1 Female_{ik} + \alpha_2 Foreign_k + \alpha_3 Female_{ik} \times Foreign_k + \alpha_4 Age_i + \alpha_5 Age_i^2 + \alpha_5 R_i + \alpha_6 Z_k + \varepsilon_{ik} \quad (1)$$

B. Wage equation based on the employer-employee level panel data from 2006–2012, with individual level fixed effects (without detailed individual level controls from the Population and Housing Census):

$$lnW_{ikt} = \beta_0 + \beta_1 Foreign_{kt} + \beta_2 Female_{ik} \times Foreign_{kt} + \beta_3 Age_{it} + \beta_4 Age_{it}^2 + \beta_5 R_{it} + \beta_6 Z_{kt} + \upsilon_i + \lambda_t + \varpi_{ikt} \quad (2)$$

In Equation 1 and 2, *i* denotes individual, *t* year and *k* firm; $Foreign_{kt}$ is a dummy variable denoting whether the individual works at an MNE or not; $Female_{ik}$ is a variable denoting a woman, Age_{it} denotes the age of the individual, R_{it} is a vector of other individual-level controls (note that time-invariant controls are not included in the fixed effects specification), Z_{kt} is a vector of firm-level controls. These other controls, depending on specification, include firm size and its squared term, firm age and its squared term, share of managers at the firm (to proxy skill intensity), share of females among employees (to account for differences in gender structure), indicators of

education levels, indicators of whether the individual has changed jobs recently, occupation dummies (ISCO 1-digit level), industry dummies (at 2-digit NACE level), and region dummies for the firm (5 regions). The specifications based on the labour force survey include also hours worked, or a dummy denoting overtime work (more than 40 hours per week), a dummy denoting part-time employment, a dummy for children and its interaction with the $Female_{ik}$ dummy. Dummies for different years λ_t and employee-fixed effects ν_i are also included in the panel data specification in Equation 2. The last term in both equations is an error term, which is assumed to be normally distributed with a zero mean and a constant variance.

4.2. Propensity score matching

An estimation of the effects of foreign ownership on the wages of employees presents a number of well-known methodological issues. One needs to proxy a 'counterfactual of the acquisition', and so what would have happened to the wages at the firms in the treatment group if they had not had the 'treatment' – if there had been no foreign acquisition (Rosenbaum and Rubin 1983, Caliendo and Kopeinig 2008). We apply propensity score matching (PSM) (Rosenbaum and Rubin, 1983) to come up with a proxy of this counterfactual, to investigate the effects of FDI on the gender wage gap. We will investigate the wage changes that follow from the acquisition of the domestically owned firm by foreign owners, comparing the 'treated' firms' and their employees' wages with the control group created by applying the PSM. Here, the treatment variable takes the value 1 at time *t* if $Foreign_{kt} = 1$ and $Foreign_{kt-1} = 0$. Therefore, the treated unit is a firm. As the first step in the matching exercise, the probit model for foreign acquisitions will be estimated, where the explanatory variables are all measured one period before the foreign acquisition – at time *t-1*. The sample used for analysis includes domestically owned firms and firms that change ownership from domestic to foreign over the period 2006–2012. The list of controls in estimating the propensity score for the acquisition is a rather standard one and considers the stylized factors of foreign owners selecting firms with higher growth potential and performance, and therefore the variables include productivity (value added per employee), firm size (log number of employees), firm age, age and size squared (to improve the success of matching, see Woolridge 2002), capital-labour ratio, cash-to-assets ratio, dummy for the capital region (Tallinn and Harju county), 2-digit industry dummies and the year dummies.

The probit model thereby helps to aggregate the relevant information into a single variable, the propensity score, based on which for each treated firm *k* the two best matching non-treated firms will be selected – this is the nearest neighbour matching with two neighbours. For the robustness check we also undertook nearest neighbour matching using 5 neighbours and Kernel matching; in the case of the latter, weighted averages of all firms in the comparison group are used to construct the counterfactual. After that we calculate the average treatment effect on the treated (ATT) on total wages, male wages and female wages at the firm over the post-treatment periods. Formally, the ATT will be calculated as

$$ATT_{PSM} = \overline{\Delta^s \pi_{t+s}^{treated}} - \overline{\Delta^s \pi_{t+s}^{control}}, \qquad (3)$$

where the first term on the right-hand side is the mean growth of the outcome variable (denoted hereby as π, e.g. average wage at the company) treated firms (new multinationals), and the second term is a weighted mean of growth of the outcome variable for the counterfactuals over the same period. The symbol *s* denotes the time over which the change is calculated; for example, $\Delta\pi_t =$

$\pi_{t+2} - \pi_t$. We have hereby considered the growth in the outcome variables relative to the pre-treatment (time *t=1*) values at time *t*, *t+1* and *t+2*. As the outcome variables, we have used the firm's average wage, the average wage of male employees, and the average wage of female employees

While the first part of the matching exercise is undertaken with the firm level average of wages for men and women, we have additionally carried out the PSM to investigate the effects on individual level wages. For that purpose we have used the propensity scores generated from above for each firm (and each of its employees). The matching analysis uses the individual level wages before and after the acquisition. Note that this individual level analysis focuses on employees who work at the acquired firm both before and after its acquisition.

Given the discussion of the effects of FDI in our literature review, we would expect positive wage changes following the foreign takeover, but would expect the effect to be larger for men compared to women. In order to understand in more detail the post-acquisition developments in the workforce structure and its potential contribution to wages we have also included the share of females in the workforce as an additional outcome variable.

5. RESULTS

5.1. Results on Mincerian wage equations

Our estimation of the Mincerian wage equations based on employer-employee level data from year 2011 is shown in Table 2. We find that foreign owned firms have a significantly higher male-female wage gap than domestically owned firms, even after accounting for a variety of other factors of male and female wages, such as occupation groups and the education of individuals. The individual level education and occupation group information is available only for 2011, from the Population and Housing Census of Estonia. Hence, we use a combination of the Census data from 2011 with individual level wage information from the Tax and Customs Office dataset and additional firm level covariates from the Business Registry in Tables 2, 3 and 4. We have also performed robustness tests of these cross-section based estimates, using Tax and Customs Office panel data from 2006–2014 that omits education and occupation proxies but enables us to account for individual level fixed effects (see columns 5 and 6 in Table 2).

We observe that women have on average 19 per cent lower wages than men in domestically owned firms (see column 2 in Table 2), once we account for the different occupation groups, age and education levels of employees, sector dummies of the firm (at 2-digit level), some other firm level covariates such as size and age, skill intensity and share of female employees in the firm. Within the group of foreign owned firms, the gender wage gap is even larger. Although both men and women gain in terms of wages from working at a foreign owned firm, the gains for men (+14.9 per cent higher wages, in column 2 of Table 1) are significantly larger, on average, than gains by women (+5.4 per cent), resulting in an overall increase in the gender wage gap in this group of firms. To provide a benchmark for assessing the economic significance of these percentages, the average gross wages in 2016 in Estonia were 1,146 EUR (839 EUR in 2011). Therefore, for an individual that earned average Estonian wages in a domestic enterprise, the effect of being alternatively employed in a foreign owned firm would be wages of 171 EUR higher for a man and

62 EUR in the case of a woman in 2016, and correspondingly 125 EUR and 45 EUR in 2011. These effects and their difference between the two groups of firms are considerable. We further confirm this result based on manufacturing sector data (see column 3 of Table 2).

The coefficients of other variables are as expected. There is a positive association between wages and an individual's age and firm size, skill intensity at the firm (proxied here using the share of managers at the firm), and higher education level. The coefficients of occupation groups follow the skill intensity based pattern: the highest wage premiums are among managers (ISCO category 1), followed by professionals (ISCO category 2) and other occupation groups. In order to differentiate the foreign ownership effect from exporting, we further account for the exporter dummy and its interaction term with the female dummy in our estimation of the wage equation (see column 4 of Table 2). This is important to include as a robustness test, as Boler et al. (2015), based on their analysis of data from Norway, show that exporting status is a significant predictor of gender wage gap at the firm and ownership status is also usually associated with engaging in exporting. We observe that the general foreign vs. domestic firm difference in the gender wage gap is not significantly explained by the difference in export orientation of these two groups of firms. There is still a similar large difference in the gender wage gap even if we account for the differences in export orientation, as men gain on average 12.6 per cent and women 5 per cent in wages from working at a foreign owned rather than a domestically owned firm.

Table 2. Foreign ownership and gender wage gap

Dependent variable: ln(wage)	(1)	(2)	(3)	(4)	(5)	(6)
Period:	2011	2011	2011	2011	2006-2012	2006-2012
Method:	OLS	OLS	OLS	OLS	Employee level fixed effects	Employee level fixed effects
Sample:	All employees	All employees	Employees in manufacturing sector	All employees, including export controls	All employees	Employees in manufacturing sector
Female (dummy)	**-0.238**	**-0.212**	**-0.257**	**-0.213**		
	(0.004)***	**(0.004)*****	**(0.007)*****	**(0.004)*****		
Foreign owned firm	**0.136**	**0.139**	**0.134**	**0.119**	**0.079**	**0.033**
	(0.005)***	**(0.005)*****	**(0.007)*****	**(0.005)*****	**(0.003)*****	**(0.005)*****
Female × Foreign owned firm	**-0.090**	**-0.086**	**-0.058**	**-0.070**	**-0.063**	**-0.017**
	(0.006)***	**(0.006)*****	**(0.009)*****	**(0.006)*****	**(0.004)*****	**(0.008)****
Age	0.062	0.045	0.038	0.062	0.130	0.132
	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.002)***
Age squared	-0.001	-0.001	-0.000	-0.001	-0.001	-0.001
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
Firm size	0.375	0.396	0.460	0.367	0.262	0.227
	(0.003)***	(0.003)***	(0.007)***	(0.003)***	(0.002)***	(0.005)***
Firm size squared	-0.034	-0.035	-0.044	-0.033	-0.022	-0.018
	(0.000)***	(0.000)***	(0.001)***	(0.000)***	(0.000)***	(0.000)***
Firm age	-0.006	-0.004	-0.012	-0.007	0.002	0.001

Dependent variable: ln(wage)	(1)	(2)	(3)	(4)	(5)	(6)
	(0.001)***	(0.001)***	(0.002)***	(0.001)***	(0.000)***	(0.001)
Firm age squared	0.000	0.000	0.000	0.000	-0.000	-0.000
	(0.000)**	(0.000)	(0.000)***	(0.000)***	(0.000)***	(0.000)***
Share of managers at firm	0.785	0.743	0.917	0.780	0.517	0.680
	(0.005)***	(0.005)***	(0.011)***	(0.005)***	(0.002)***	(0.006)***
Share of female among employees	-0.029	-0.007	0.070	-0.034	-0.068	0.011
	(0.007)***	(0.007)	(0.014)***	(0.007)***	(0.004)***	(0.010)
Tertiary education	0.373	0.166	0.173	0.371		
	(0.004)***	(0.005)***	(0.009)***	(0.004)***		
Secondary education	0.086	0.027	0.036	0.086		
	(0.004)***	(0.004)***	(0.006)***	(0.004)***		
Changed job during the year	-0.200	-0.157	-0.148	-0.201	-0.057	-0.053
	(0.003)***	(0.003)***	(0.006)***	(0.003)***	(0.001)***	(0.002)***
Export dummy				0.101		
				(0.004)***		
Female × export dummy				-0.069		
				(0.006)***		
Industry and region dummies	Yes	Yes	Yes	Yes	No	No
Employee level fixed effects	No	No	No	No	Yes	Yes
Occupation dummies	No	Yes	Yes	No	No	No
Constant	6.555	6.641	6.771	6.550	4.593	4.044
	(0.016)***	(0.026)***	(0.048)***	(0.016)***	(0.021)***	(0.044)***
Number of observations	288,847	265,786	68,348	288,847	1,655,507	442,618
R-squared	0.350	0.382	0.369	0.351	0.113	0.130

Note: dependent variable is log of the monthly wage in January of each year. OLS and fixed effects models, with robust standard errors in parentheses. *significant at 10%; ** significant at 5%; *** significant at 1%. Employer-employee level data. Datasets that are merged for the analysis: Estonian Commercial Registry data on financial indicators of firms (at firm level), Population and Housing Census of Estonia (at individual level), Tax and Customs Office data on wages (at individual level).

The analysis so far has shown significant differences in the gender wage gap between our studied two groups of firms, while we control for a number of observable factors of wages. To account for potential unobserved factors (e.g. general level of abilities, etc.) that could bias our findings, we also estimate a specification of Equation 3 with employee level fixed effects included. The individual level fixed effects will account for time-invariant differences between employees. Note that this means that we cannot estimate separately the effect of gender on wages. Still, we can estimate the effect of an interaction between the gender dummy and the dummy for being employed at a foreign owned firm. The coefficient of this interaction term will show the different gender wage gap between foreign owned and domestically owned firms, once accounting for the unobserved time-invariant characteristics of the employee and time-varying firm and employee level controls in the estimated equation. The estimates in columns 5 and 6 in Table 2 confirm that there is still a difference between the two studied groups in the gender wage gap even if we account for the time-invariant employee-specific fixed effects.

In Table 1 we showed evidence of substantial differences in the gender wage gap on the basis of both occupation group and FDI. To investigate this in more detail, we estimate wage equations separately for all nine ISCO 1-digit level occupation groups. The results are shown in Tables 3 and 4, based on data on employees from i) all firms and ii) firms from the manufacturing industry.

We find that almost all occupation groups, apart from services and sales workers, appear to gain from working at an affiliate of an MNE. The largest wage gains are among managers (ISCO group 1), as could be expected. However, the estimated association of FDI with wage gains and especially with the gender wage gap is rather heterogeneous depending on the occupation group investigated. We find in Table 3 that there is a significantly higher gender wage gap in foreign owned firms in the case of managers, professionals (though not in the manufacturing sector), technicians and associated professionals, craft and related trade employees, elementary occupations (not in manufacturing sector), but not in the case of services and sales workers and clerical support workers and not in the case of plant and machine operators in the manufacturing sector. This heterogeneity across occupations is an important finding that is difficult to explain based on one specific type of the potential reasons for the gender wage gap alone. We note that the estimates in Table 3 and 4 take into account sector level heterogeneity and include 2-digit level sector dummies among the controls.

The foreign owned vs. domestic firm difference in the gender wage gap is by far the largest among managers (ISCO group 1) in Tables 3 and 4. On average male managers gain 44 per cent (the same per cent in the manufacturing industry) in wages from working at a foreign owned firm, and female managers 17.9 per cent (26.5 per cent in manufacturing industry), resulting in a larger gender wage gap despite the positive effects of FDI on wages for both sexes. [12]

This key result concerning the managers shows that the 'negative premium' of the gender wage gap from foreign ownership may be more present in occupations that require more commitment in terms of being continuously available for work purposes and working longer hours when needed by the firm. These are also occupations where standardization and substitutability between employees is simply less possible. The result concerning the gender wage gap among managers at foreign and domestically owned firms corresponds well to the ideas of Goldin (2014) about the role of commitment and job flexibility variations in explaining the aggregate gender wage gap. Goldin (2014) demonstrated, using data from the US, a larger gender wage gap among business occupations compared to others. However, the commitment-based explanation would not easily explain the heterogeneity of results among other occupation groups (see Table 3 and 4). Obviously, various other unobserved factors may matter here as well.

[12] We note that this finding of the largest gap among managers is not driven by the inclusion of top managers from abroad into our analysis. We have performed robustness tests by excluding individuals of Finnish and Swedish nationality (the key home countries of FDI in Estonia) from the analysis. The estimated gap persists and is not in any significant way affected by the omission of this rather small number of employees. We thank Dr Tiia Vissak for bringing out attention to this potential issue.

Table 3. Foreign ownership and gender wage gap, all firms: by standard ISCO occupation groups of employees

Dep. var.: ln(wage)	**Managers**	**Professionals**	**Technicians and ass. Professionals**	**Clerical support workers**	**Service and sales workers**	**Craft and related trade**	**Plant and machine operators**	**Elementary occupations**
Female (dummy)	-0.167	-0.143	-0.236	-0.193	-0.177	-0.257	-0.244	-0.260
	(0.012)***	(0.011)***	(0.008)***	(0.012)***	(0.010)***	(0.010)***	(0.011)***	(0.012)***
Foreign owned firm	0.365	0.180	0.137	0.100	-0.014	0.082	0.071	0.105
	(0.014)***	(0.015)***	(0.011)***	(0.018)***	(0.016)	(0.009)***	(0.011)***	(0.018)***
Female × Foreign owned firm	-0.200	-0.050	-0.031	0.016	0.001	-0.074	-0.042	-0.050
	(0.020)***	(0.019)***	(0.014)**	(0.021)	(0.019)	(0.015)***	(0.015)***	(0.021)**
Other controls as in Table 2, industry and region dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	30598	26888	40537	18062	34636	47570	43009	20580
R-squared	0.457	0.376	0.371	0.342	0.260	0.295	0.282	0.280

Note: dependent variable is the log of monthly wage in January of year 2011. OLS, with robust standard errors in parentheses. *significant at 10%; ** significant at 5%; *** significant at 1%. Employer-employee level data. Datasets that are merged for the analysis: Estonian Commercial Registry data on financial indicators of firms (at firm level), Population Census of Estonia (at individual level), Tax and Customs Office data on wages (at individual level).

Table 4. Foreign ownership and gender wage gap in manufacturing: on the basis of standard ISCO occupation groups of employees

Dep. var.: ln(wage)	**Managers**	**Professionals**	**Technicians and ass. Professionals**	**Clerical support workers**	**Service and sales workers**	**Craft and related trade**	**Plant and machine operators**	**Elementary occupations**
Female (dummy)	-0.238	-0.158	-0.244	-0.228	-0.165	-0.287	-0.251	-0.278
	(0.029)***	(0.027)***	(0.017)***	(0.029)***	(0.061)***	(0.012)***	(0.014)***	(0.023)***
Foreign owned firm	0.365	0.177	0.191	0.088	0.038	0.084	0.084	0.091
	(0.028)***	(0.032)***	(0.020)***	(0.035)**	(0.088)	(0.011)***	(0.015)***	(0.030)***
Female × Foreign owned firm	-0.130	-0.039	-0.050	0.050	-0.085	-0.082	-0.026	0.011
	(0.045)***	(0.038)	(0.024)**	(0.040)	(0.094)	(0.017)***	(0.018)	(0.035)
Other controls as in Table 2, industry and region dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	5412	3648	8098	2734	1484	22860	18519	5207
R-squared	0.443	0.361	0.371	0.316	0.211	0.310	0.273	0.239

Note: dependent variable is the log of the monthly wage in January of year 2011. OLS, with robust standard errors in parentheses. *significant at 10%; ** significant at 5%; *** significant at 1%. Employer-employee level data. Datasets that are merged for the analysis: Estonian Commercial Registry data on financial indicators of firms (at firm level), Population and Housing Census of Estonia (at individual level), Tax and Customs Office data on wages (at individual level).

5.2. Results of the propensity score matching

We apply standard propensity score matching here to learn more about the potential effects of an ownership change at firm level on the gender wage gap. The previous sections describe correlations that suggest the potential effects of FDI. However, there is a possibility that these results may still indicate selection effects, FDI gravitating more towards those firms that would have had increases in wages anyway and more increases of male wages, even in the absence of their acquisition by an MNE.

Using a pooled probit model, we have estimated propensity scores of firm level ownership change from domestic to foreign for each treated firm and also for each domestically owned firm (the pool of control units, i.e. the ones not acquired by foreign investors). Note that firms that are always foreign owned in the sample period are left out of this analysis. The control variables used in estimating the propensity score include the firm's productivity, size, size squared, age, age squared, liquidity ratio and its squared term, capital-labour ratio, capital region dummy and sector dummies. All the controls are from one period before the actual period of the ownership change. These are standard variables used often in the application of PSM to the analysis of the effects of FDI or exporting on productivity.

We have implemented PSM and the corresponding estimation of the ATT for: i) all firms, ii) firms in manufacturing, and iii) separately also for the services sector. Table A2 in Annex 2 shows the estimated probit models. Our matching analysis allocates the two or five nearest neighbours to each treated unit, based on the similarity of their and the treated unit's propensity score of treatment. The third matching algorithm used was Kernel matching with Epanechnikov kernel; the bandwidth has been set at 0.06 (the default value in the psmatch2 Stata program). As shown by the results of the balancing test in Annex 3, we can confirm that the matching has been successful and has balanced the pre-treatment key predictors of an ownership change between the two groups of firms. PSM has been able to match the treatment and control groups also based on indicators of pre-treatment average wages, including average male and female wages at the firm during the pre-treatment year.

The ATT is calculated based on Equation 3 in the Methods section. Table 5 as the baseline estimation presents the estimates for the outcome variables at firm level. The firm level outcome variables are the firm's average wages, as well as the average wages of male and female employees. Table 6 presents the individual-level estimates, where the outcome variables are individual level wages for men and women. Here the individuals at different firms are matched with each other using the firm-level propensity scores calculated from the probit models.

The ATT estimates in Table 5 confirm the previous general finding from the Mincerian wage equations. We find that an acquisition by a foreign owned firm is associated with a rapid post-acquisition wage growth compared to the counterfactual case. In the services sector the effect also seems to grow over time, to 23.7% in the year *t+2* (see Table 5). There is clear evidence of a stronger increase in wages among male employees compared to female employees. For example, at period *t+2* after acquisition, the ATT on male wages is (based on matching with the 2 nearest neighbours) +22.9% versus +14.5% in the case of female wages. The analysis in Table 6 of the effects of the ownership change on the wages of individuals who are employed at the firm both before and after the acquisition indicates that there are stronger effects on the wages of men among the incumbent employees especially in the services sector. The stronger effects on men compared to women in the manufacturing sector that we showed in Table 5

appear to be not driven by effects on the incumbents' wages, but seem to function through changes in the workforce – through the entry-exit of employees.

Given the admittedly very restrictive assumptions of PSM, these estimates may show the effects of change in ownership, and not only correlations. We note that as these are effects on the average wages of men and women at the firm and these estimates may include effects on existing (incumbent) employee wages and also wage effects due to hiring new employees. However, when we apply the propensity scores to estimating ATT using individual level wages and to the sample of employees staying in the firm (Table 6), broadly similar results are found.

Table 5. Propensity score matching at firm level: ATT, effects of inward FDI on average male and female wages at the firm, matching based on pre-treatment period data

Group of firms	**Dependent variable**	**ATT**		
		t	**t+1**	**t+2**
All industries, NN2	Log wage	0.087	0.127**	0.148**
	Log wage of fem.	0.032	0.079	0.135**
	Log wage of males	0.129*	0.195***	0.206***
	Share of fem. man.	-0.056	0.008	-0.026
	Share of females	0.009	0.041	0.035
All industries, NN5	Log wage	0.108*	0.148**	0.167***
	Log wage of fem.	0.056	0.121**	0.168***
	Log wage of males	0.146**	0.199***	0.193***
	Share of fem. man.	-0.065	-0.001	-0.012
	Share of females	0.009	0.018	0.017
All industries, Kernel	Log wage	0.078	0.093	0.136*
	Log wage of fem.	0.015	0.053	0.130*
	Log wage of males	0.137	0.149*	0.163*
	Share of fem. man.	-0.074	-0.003	0.014
	Share of females	0.049	0.043	0.044
All industries, NN5, share of females>=0.1 & share of females<=0.9	Log wage	0.129**	0.164**	0.183***
	Log wage of fem.	0.065	0.131**	0.177***
	Log wage of males	0.165**	0.220***	0.213***
	Share of fem. man.	-0.086	-0.025	-0.017
	Share of females	-0.003	0.009	0.005
Manufacturing, NN5	Log wage	0.138	0.135	0.160*
	Log wage of fem.	0.064	0.075	0.146
	Log wage of males	0.225*	0.290**	0.296***
	Share of fem. man.	-0.161	-0.077	-0.151
	Share of females	0.011	0.047	0.041
Services, NN5	Log wage	0.119	0.148*	0.213**
	Log wage of fem.	0.041	0.097	0.197**
	Log wage of males	0.126	0.183**	0.221**
	Share of fem. man.	-0.097	-0.058	-0.045
	Share of females	-0.041	-0.036	-0.036

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%. NN2(5): nearest neighbour matching with 2(5) matches; ATT: Average Treatment Effect on the Treated (ATT), t-statistics are in parentheses. Post-entry years 1–3, period 1 denotes the year of ownership change. Period: 2006–2012. Abbreviation 'Fem.man.' denotes female managers.

When we look at the share of females in the foreign owned company, the ATT's are mostly not significant, except in services for period *t* with ATT= - 5.9%. These additional findings suggest that the above results are only to a limited extent due to the changes in the gender mix at the firm after acquisition. As concerns the latter, the acquisition's effects are mostly statistically insignificant, except in the services sector at period *t* – 5.9 percentage points lower share of

females. In conclusion, based on both PSM and the wage regression analysis, we confirm that both men and women gain in terms of wages from working at a foreign owned firm. However, the gains for men are significantly larger than for women and take place faster, resulting in an increase in the gender wage gap at foreign owned firms.

Table 6. Propensity score matching at the individual level: ATT, effects of inward FDI on individual male and female wages, matching based on pre-treatment period data

Group of firms	Dependent variable	ATT		
		t	t+1	t+2
All industries, NN2	Log wage	0.07	0.019	0.086
	Log wage of females	-0.102	-0.053	-0.016
	Log wage of males	0.11	0.168*	0.273***
All industries, NN5	Log wage	0.053	0.078	0.105**
	Log wage of females	-0.147	-0.148	-0.116
	Log wage of males	0.067	0.133**	0.192***
All industries, Kernel	Log wage	0.052	-0.023	0.086
	Log wage of females	-0.109	-0.043	-0.037
	Log wage of males	0.181*	0.273*	0.413***
	Log wage of males	0.082	0.135	0.135
All industries, NN5, share of females>=0.1 & share of females<=0.9	Log wage	0.120**	0.161***	0.202***
	Log wage of females	-0.121	-0.078	-0.008
	Log wage of males	0.128**	0.133**	0.184***
Manufacturing, NN5	Log wage	0.022	0.108	0.102
	Log wage of females	-0.03	0.046	-0.044
	Log wage of males	-0.088	-0.078	0.000
Services, NN5	Log wage	0.002	0.085	0.124*
	Log wage of females	-0.218	-0.182	-0.138
	Log wage of males	0.122*	0.169**	0.218***

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%. NN2(5): nearest neighbour matching with 2(5) matches; ATT: Treatment Effect on the Treated (ATT), t-statistics are in parentheses. Post-entry years 1–3, period 1 denotes the year of ownership change. Period: 2006–2014.

5.3. Potential explanations of the effects and robustness checks

As we have argued in previous sections, one explanation of the higher gender wage gap among foreign owned firms might be the higher continuous commitment requirement from employees compared to the domestic owned firms. This may be especially relevant for efficiency seeking FDI[13], and past investor surveys have shown that efficiency seeking has been a key traditional motive of FDI in Estonia, in addition to the standard market seeking motive (Varblane et al. 2010). The difference in commitment requirement between foreign and domestically owned firms may partly reflect firm size differences between these two groups, differences in market power and toughness of competition the firms are exposed to, complementarities between more

[13] We would like to stress that the effects of FDI on gender wage gap could potentially vary a lot by the type (motive) of FDI: efficiency seeking, market seeking, resource and strategic asset seeking FDI. Understanding how the different types of FDI shape the gender related effects of MNEs would be a useful extension of the analysis in this paper. Past research has, for example, shown that the host economy firm performance effects differ depending on motivation of FDI (Driffield and Love 2007).

advanced technology of foreign owned firms and the commitment requirement from employees. In this section we endeavour to address in more detail this potential explanation of our key findings.

To that end, we use the data from the Labour Force surveys from Estonia and estimate wage equations (with weekly wages as the dependent variable) with an indicator of the number of working hours, a dummy for overtime work, a dummy for part-time work, and interaction terms of the dummy for underage children and the female dummy among the controls. If the 'commitment' and performance requirement is more important for foreign owned firms, then we should observe that the elasticity of wages with respect to working hours and the wage premium for overtime are higher among this group of firms rather than among domestically owned ones. We could also expect, following Goldin (2014), that discontinuities in women's work/career as proxied by the interaction of the female dummy and the dummy for having underage children could potentially explain a significant proportion of the gender wage gap. Disproportional rewarding by firms for working longer hours and particularly during inconvenient hours could also be reflected in the disproportionate penalty for women with children, compared to both their male colleagues with similar characteristics or women without children. If the commitment requirement is stronger in foreign owned firms, then the negative effects of children on wages for women should also appear stronger at foreign owned firms.

As our estimates of the wage equations based on Estonian Labour Force Survey data from 2007–2013 in Table 7 confirm, foreign owned firms reward the willingness to work longer hours and to do overtime (working more than 40 hours per week) more compared to domestic firms. In other words, working less hours and not doing overtime is associated with a stronger 'punishment' in foreign owned firms in terms of lower wages. If we combine these results with the well-known regularity that men on average tend to find it easier to work longer hours and to do overtime than females (see also regressions in Table 7), a larger work commitment requirement and higher reward for 'additional or continuous effort' appear to be among the factors that lead to a larger gender wage gap among MNE subsidiaries than among domestic firms.

Further descriptive statistics from the Labour Force Survey for 2007–2013 clearly indicate that the employees at foreign owned firms tend to do more overtime than domestically owned firms: 4.6 (2.5) % of men (women) at foreign owned firms, 3.5 (2.3) % of men (women) at domestically owned firms (Masso et al. 2017). Also, perhaps surprisingly, foreign owned firms use on average the flexible work practice of teleworking less than domestically owned firms: 6.7 (4.1) % of men (women) at foreign owned firms, whereas 11.7 (10.5) % of men (women) at domestically owned firms use teleworking according to the Labour Force Survey of Estonia (Masso et al. 2017).

One way to investigate the role of continuous work commitment is to study how the wages and gender wage gap at foreign and domestically owned firms are affected by the fact of an employee having young children. Work-discontinuities for women due to having children have been shown as a major driver of the aggregate gender wage gap (Goldin 2014). However, we acknowledge that, on the other hand, in the Estonian data these have tended to explain only a relatively small share of the gender wage gap (Anspal 2015, Meriküll and Mõtsmees 2017). The gender wage gap is traditionally found to be much higher for women with children below the age of 18. This is a common finding in labour economics (e.g. see Goldin 2014 from USA, or Anspal 2015 on statistics from Estonia). We study at first how a woman's wages develops over time at foreign and domestically owned firms depending on the ages of the children. Figure 1 below depicts the females' average wages according to the age of her youngest child. We can

see that especially among foreign owned companies there is a rather strong association between the age of the youngest child and the average wages. The wages in the case of up to five-year-old children are clearly below the wages before childbirth. This finding holds in the case of working both in a domestic and foreign owned company. However, the immediate effect of having 1–3 year-old children seems to be much stronger in the case of foreign owned firms (see Figure 1). For example, while in the total sample of manufacturing firms women earn 35.5% higher wages in foreign owned companies compared to domestic companies, in the case of women with 1–3 year old children this FDI premium in wages falls to 23.7%. A notable additional finding from Figure 1 is the relatively faster adjustment back in the case of foreign owned firms to higher wage levels after the initial strong fall in wages during the child's first 1–3 years of life. Hence, Figure 1 shows a stronger short-term penalty in terms of wages at foreign owned firms, but a weaker penalty in the long term. Therefore, the conclusion about the role of childcare related work-discontinuities in shaping the gender wage gap for different groups of firms remains ambiguous based solely on Figure 1.

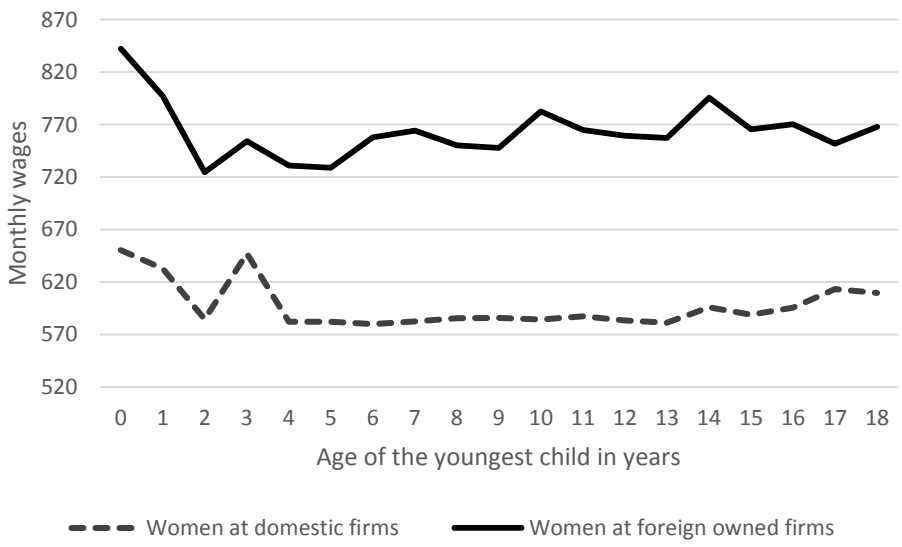

Figure 1. Average females' wages according to the age of their youngest child in 2011

Note. The Estonian Population and Housing Census 2011 data provides information only on the number of children and the year of birth of the first child; therefore, the age of the youngest child was estimated conservatively by using one year between the birth of children and thus it is likely to overestimate the age of the youngest child.
Source: own calculations from Estonian Population and Housing Census 2011 data

Further investigation of this issue in Mincerian wage regressions shows the role of children as a potential explanatory factor of the differences between the gender wage gap at foreign vs. domestically owned firms (see the interaction term 'female×children'). There is evidence based on our matched employer-employee datasets, once we account for other detailed controls, including detailed size dummies and sector dummies (see Table 8), of a stronger wage penalty for women from career discontinuities due to having children among MNEs compared to Estonian capital based firms. Hence, this lends some support to the work-commitment based explanation to our key finding in the first part of the paper.

Our key empirical results in Tables 2–4 are robust to a variety of individual and firm level controls, and for example also robust when excluding Swedish, Finnish or other foreign managers from the analysis (note: results not reported here to save space, available upon

request). The reason for this robustness check was to be sure that some of the results are not driven by the higher share of foreign managers and professionals at foreign owned firms.

We conduct some further robustness tests, as shown in Table 9. An alternative interpretation of foreign owned firms having a higher gender wage gap could be, following Becker's (1957) theory of taste based discrimination, that more profitable firms might be more able to engage in costly discrimination. Based on the robustness tests in Table 9, where we use interactions between the female dummy and ROE as an additional control in the separate estimation of models for foreign and domestically owned firms, our results concerning the gender wage gap appear to be not driven by foreign owned firms being more profitable. Therefore, it seems likely that it is probably not Becker's taste based discrimination (i.e. costly discrimination by MNEs having higher profits and thus an ability to engage more in taste based discrimination) that would be the key explanation of the findings here.

The linear regression is a standard tool to investigate the average relationship between the endogenous variable and a set of regressors. However, it is well known that it provides only a partial outline of the relationship. A more detailed and robust view can be shown using a quantile regression that investigates the relationship between the endogenous outcome variable and regressors at different points of the conditional distribution of the outcome variable. We further note that the negative interaction term of the female dummy and FDI dummy is still significant if we estimate a quantile regression with the 25th, 50th and 75th percentile of wages as dependent variables (see Table 10).

Finally, apart from our focus on the direct effects of FDI on the gender wage gap at foreign owned firms, it is of interest whether men and women gain to a different extent when they move from foreign owned firms to domestically owned firms. The table in Annex 4 uses employer-employee data to track such mobility and to show its correlations with individual wages at the recipient firm. The interaction term 'female×person has worked in foreign firm' in the regression models in Annex 4 enables us to distinguish between the effect of prior experience from MNEs for men and women. We can clearly observe that women also gain less than men from moving from foreign owned to domestically owned firms, even if we compare employees with broadly similar observable characteristics. This is consistent with recent evidence from labour economics by Card et al. (2016) from Portugal that women gain less from changing jobs than men and receive only 90 per cent of the firm-specific wage premiums earned by men that they associate with the bargaining effect. Meriküll and Mõtsmees (2017) find similarly from Estonia that weaker bargaining skills among women may explain part of the aggregate gender pay gap.

Table 7. Sensitivity of weekly wages with respect to hours worked and overtime: foreign owned vs. domestically owned firms

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Dependent variable	Log of Wages	Log of Wages	Log of Wages	Log of Wages	Log of Wages	Log of Wages	Log of hours worked (in a week)	Overtime dummy	Part-time work (dummy)
	Domestic	Foreign	Domestic	Foreign	Domestic	Foreign	All firms	All firms	All firms
Log of hours worked in a week	0.909	0.978							
	(0.018)***	(0.038)***							
Overtime dummy			0.168	0.241					
			(0.016)***	(0.025)***					
Part time dummy					-0.691	-0.593			
					(0.015)***	(0.026)***			
Female (dummy)							-0.053	-0.046	0.059
							(0.002)***	(0.003)***	(0.003)***
Employee level controls: age, nationality, education, occupation	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies, firm size dummies, location dummies, year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	23828	8873	24049	8902	24049	8902	45666	45994	45994
R-squared/Pseudo R-squared	0.826	0.846	0.807	0.837	0.822	0.844	0.122	0.07	0.206

Source: LFS, period 2006-2013. . *significant at 10%; ** significant at 5%; *** significant at 1%. Coefficients from the OLS in columns 1-7, marginal effects from probit model in columns 8 and 9. Standard errors in parentheses.

Table 8. Underage children and gender wage gap at foreign and domestically owned firms, 2011

PANEL A								
Model:	1	2	3	4	5	6	7	8
Sample: Foreign/Domestic	Domestic	Foreign	Domestic	Foreign	Domestic	Foreign	Domestic	Foreign
Sector	All	All	Manuf.	Manuf.	All	All	Manuf.	Manuf.
Female (dummy)	-0.206	-0.272	-0.241	-0.289	-0.224	-0.304	-0.272	-0.329
	(0.004)***	(0.007)***	(0.008)***	(0.009)***	(0.004)***	(0.006)***	(0.008)***	(0.008)***
0-17 year old kids in household (dummy)	0.057	0.105	0.066	0.108				
	(0.004)***	(0.008)***	(0.009)***	(0.011)***				
Female × 0-17 year old kids in household (dummy)	-0.110	-0.169	-0.153	-0.187				
	(0.006)***	(0.010)***	(0.013)***	(0.014)***				
0-2 year old kids in household (dummy)					0.055	0.083	0.056	0.080
					(0.006)***	(0.010)***	(0.012)***	(0.015)***
Female × 0-2 year old kids in household (dummy)					-0.170	-0.227	-0.156	-0.207
					(0.011)***	(0.017)***	(0.025)***	(0.026)***
Industry dummies, other controls as in Table 2	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Occupation dummies	No	No	No	No	No	No	No	No
Number of observations	213204	62407	44642	27174	213204	62407	44642	27174
R-squared	0.322	0.427	0.290	0.366	0.321	0.426	0.289	0.364
PANEL B								
Model:	9	10	11	12	13	14	15	16
Foreign/Domestic	Domestic	Foreign	Domestic	Foreign	Domestic	Foreign	Domestic	Foreign
Sector	All	All	Manuf.	Manuf.	All	All	Manuf.	Manuf.
Female (dummy)	-0.188	-0.249	-0.220	-0.270	-0.206	-0.277	-0.249	-0.303
	(0.004)***	(0.006)***	(0.008)***	(0.009)***	(0.004)***	(0.006)***	(0.008)***	(0.008)***
0-17 year old kids in household (dummy)	0.042	0.080	0.043	0.072				
	(0.004)***	(0.007)***	(0.008)***	(0.010)***				
Female × 0-17 year old kids in household (dummy)	-0.097	-0.139	-0.131	-0.150				
	(0.006)***	(0.010)***	(0.013)***	(0.014)***				
0-2 year old kids in household (dummy)					0.036	0.056	0.028	0.052
					(0.006)***	(0.010)***	(0.012)**	(0.014)***
Female × 0-2 year old kids in household (dummy)					-0.144	-0.196	-0.130	-0.177
					(0.012)***	(0.018)***	(0.027)***	(0.026)***
Industry dummies, other controls as in Table 2	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Occupation dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	196655	57832	41376	25365	196655	57832	41376	25365
R-squared	0.351	0.485	0.328	0.446	0.351	0.484	0.326	0.444

Note: dependent variable is the log of the monthly wage in January of year 2011. OLS regressions. Other controls are the same as in Table 2 and 3. *significant at 10%; ** significant at 5%; *** significant at 1%. Standard errors in parentheses. Employer-employee level data. Datasets that are merged for the analysis: Estonian Commercial Registry data on financial indicators of firms (at firm level), Population Census of Estonia (at individual level), Tax and Customs Office data on wages (at individual level).

Table 9. Various robustness tests of Mincerian wage equations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	High-tech	Medium-high-tech	Medium-low-tech	Low-tech	Interaction with ROE	Interaction with ROE	Without the lowest 10% of wage earners	Without the highest 10% wage earners	Occupation group: lawyers
Female (dummy)	-0.221	-0.305	-0.271	-0.245	-0.212	-0.257	-0.218	-0.210	-0.095
	(0.017)***	(0.019)***	(0.015)***	(0.009)***	(0.004)***	(0.007)***	(0.005)***	(0.007)***	(0.070)
Foreign owned firm	0.096	0.133	0.125	0.139	0.139	0.134	0.122	0.097	0.754
	(0.019)***	(0.015)***	(0.013)***	(0.011)***	(0.005)***	(0.007)***	(0.005)***	(0.007)***	(0.323)**
Female × Foreign	-0.074	-0.019	-0.073	-0.040	-0.086	-0.058	-0.072	-0.027	-0.878
owned firm	(0.027)***	(0.022)	(0.023)***	(0.013)***	(0.006)***	(0.009)***	(0.007)***	(0.009)***	(0.402)**
Return on equity					-0.000	0.000			
(ROE)					(0.000)***	(0.001)			
Female×ROE					0.000	0.003			
					(0.000)	(0.003)			
Other controls (as in Table 2 and 3)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of obs.	9651	10557	16272	38923	265736	68337	62046	61280	573
R-squared	0.331	0.437	0.333	0.349	0.382	0.369	0.456	0.251	0.492
R-squared adjusted	0.329	0.435	0.332	0.348	0.382	0.369	0.456	0.250	0.445

Note: dependent variable is log of monthly wage in January of year 2011. OLS regressions. Other controls are the same as in Table 2 and 3. *significant at 10%; ** significant at 5%; *** significant at 1%. Standard errors in parentheses. Employer-employee level data. Datasets that are merged for the analysis: Estonian Commercial Registry data on financial indicators of firms (at firm level), Population Census of Estonia (at individual level), Tax and Customs Office data on wages (at individual level).

Table 10. Mincerian wage equations estimated using a quantile regression model, year 2011

	(1)	(2)	(3)	(4)	(5)	(6)
Sample:	Manufacturing	Manufacturing	Manufacturing	All firms	All firms	All firms
Dependent variable=ln(wage)						
	Effect on 25th percentile	Effect on 50th percentile	Effect on 75th percentile	Effect on 25th percentile	Effect on 50th percentile	Effect on 75th percentile
Female	-0.249***	-0.258***	-0.274***	-0.182***	-0.219***	-0.246***
	(-32.32)	(-41.09)	(-42.14)	(-42.06)	(-62.37)	(-66.59)
Foreign owned firm	0.137***	0.0955***	0.0837***	0.147***	0.103***	0.0951***
	(17.04)	(14.56)	(12.32)	(27.56)	(23.67)	(20.91)
Female × Foreign owned firm	-0.0451***	-0.0374***	-0.0398***	-0.0987***	-0.0568***	-0.0444***
	(-4.33)	(-4.40)	(-4.52)	(-14.26)	(-10.09)	(-7.51)
Other controls as in Table 2 Column 2	Yes	Yes	Yes	Yes	Yes	Yes
Constant	6.485***	7.106***	7.572***	6.564***	6.988***	7.598***
	(117.25)	(157.41)	(161.83)	(49.51)	(64.74)	(67.08)
Number of observations	68348	68348	68348	265786	265786	265786

Note: dependent variable is log of monthly wage in January of year 2011. Other controls are the same as in Table 2 and 3. *significant at 10%; ** significant at 5%; *** significant at 1%. t-statistics in parentheses. Employer-employee level data. Datasets that are merged for the analysis: Estonian Commercial Registry data on financial indicators of firms (at firm level), Population and Housing Census of Estonia (at individual level), Tax and Customs Office data on wages (at individual level).

6. CONCLUSIONS

We show here evidence that foreign owned firms have a larger gender wage gap than domestically owned firms. This is a rather robust finding across different specifications of the Mincerian wage equation estimated in this paper. Furthermore, we observe that this effect of foreign ownership persists even if we apply propensity score matching to investigate within-firm changes in the gender wage gap as a result of ownership changes.

The difference between the MNE and domestically owned groups in terms of the gender wage gap is large and is not explained simply by accounting for a variety of employer and employee specific control variables. Our empirical results are in accordance with the interpretation that the larger MNE gender wage gap could be partly the result of higher work commitment requirements at MNEs. We find the largest difference in terms of the gender wage gap for foreign and domestically owned firms among managerial occupations – occupations that are more likely to require continuous 24/7 availability for work purposes.

The estimated elasticity of wages with respect to working hours and the wage premium for overtime are larger among foreign owned firms compared to domestic firms. This suggests that individuals more committed to work in terms of more willingness to work longer hours get larger benefits in terms of wages from working in MNEs. As, on average, men tend to be more willing and available to work longer hours and to do overtime or work during inconvenient hours, and MNEs reward such work commitment more, men are the ones who gain more from working at foreign owned firms. Furthermore, we observe that the average wage 'penalty' for women from having young children tends to be (on average) larger among foreign owned than among domestically owned firms. This is again consistent with the interpretation that the ability to be available 24/7 for work purposes is rewarded more in foreign owned firms and discontinuities in the availability for job purposes are more heavily penalized in foreign owned firms.

The results underline the need to promote job flexibility and employee substitutability at workplaces to ensure that employees who need a better work-life balance for family, health or other reasons are less disadvantaged because of their needs and preferences. FDI inflow and foreign ownership or globalization in general will not necessarily by themselves improve the relative position of women on the local labour market. This is evident even if the investor originates from countries with one of the most female-friendly labour market institutions in the world (Sweden, Finland). Arguably, the effects of FDI that we find here depend a lot on the type (motive) of FDI and the institutional background, and may be different in a different institutional context. In particular, the market and efficiency seeking motives have over the years played a very important role in FDI into Estonia. How the effects depend on the strategy and subsidiary's mandate at the MNE is a topic that deserves further and more detailed investigation. We would expect that added studies with a focus on the motivation and strategies of MNEs will help to further understand the effects of FDI on gender related outcomes, similarly as they have helped previously to understand knowledge transfer in MNEs and the host economy effects of FDI on firm performance in greater detail.

One may wonder whether collective bargaining could be a partial solution to the inequalities caused by the MNEs. While on the one hand, unionization is marginally higher among MNEs and unions have found to have some lowering effects on the gender pay gap (Masso et al. 2017), due to the rather low trade union density (less than 10%) and collective agreement coverage

(23% in 2015) that may have only rather limited effects on our documented evidence. There is some anecdotal evidence on the Estonian subsidiaries of Scandinavian-origin MNEs being resistant to union formation in the host country, thus further investigation of this could be of interest. Meardi (2007) provides further discussion on the MNE's role on trade unions in the new EU member states.

The further investigation of MNEs and the gender wage gap could also look separately at the domestic multinationals, as many of the potential arguments suggesting a higher gender pay gap among foreign owned firms could be applicable also to them. Investigating the particular reason for the higher gender pay gap among foreign owned firms may also benefit from more detailed information about the workplace. In particular, information on business trips might be useful in that respect. Related to this, it is also worth controlling for the distance from the subsidiary to the MNE headquarters as a proxy for the duration of the business trip. In general, the investigation of the linkages between the gender pay gap and internationalization is a promising strand of research.

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Annex 1. Descriptive statistics of variables used in the regression analysis and propensity score matching

Variable name	Mean	Standard Deviation	No. of non-missing obs.
At least 1 female manager (dummy)	0.455	0.498	326 649
Blocking interest	0.012	0.108	499 199
Majority owned	0.081	0.272	499 199
Minority owned	0.012	0.109	499 199
Old foreign affiliate	0.026	0.158	1 219 393
Young foreign affiliate	0.053	0.225	1 219 393
Share of female with kids among employees	0.348	0.385	35 029
Share of female managers	0.379	0.455	326 649
Share of female with underage kids among employees	0.105	0.233	35 029
Log capital intensity	8.352	1.807	483 461
Owners from Finland (dummy)	0.023	0.151	499 199
Owners from Sweden (dummy)	0.008	0.089	499 199
Owners from other countries (dummy)	0.028	0.164	837 008
Firm age (-1)	1.626	0.858	1 124 712
Firm age squared (-1)	3.391	2.596	1 151 369
Share of female among employees	0.432	0.409	326 649
Foreign firm (dummy)	0.079	0.270	1 219 393
Capital-labour ratio (-1)	8.341	1.719	428 801
Liquidity ratio (-1)	0.457	0.530	1 168 876
Northern Estonia	0.421	0.494	1 789 820
Log firm wage	9.798	0.650	290 694
Log wage of females	9.738	0.660	190 816
Log wage of males	9.902	0.660	220 789
Log LPV (-1)	9.464	1.018	377 735
Firm size (-1)	1.300	1.159	504 367
Firm size squared (-1)	3.032	4.318	504 367

Source: own calculations from Estonian matched employer-employee data.

Annex 2. Probit models used in the propensity score matching

Variable	All industries		Manufacturing		Services	
	Coef.	**Z-stat.**	**Coef.**	**Z-stat.**	**Coef.**	**Z-stat.**
Log labour productivity (t-1)	0.046	(0.87)	0.074	(0.50)	0.082	(1.28)
Firm size (-1)	0.033	(0.22)	0.174	(0.36)	-0.020	(-0.11)
Firm size squared (-1)	0.023	(0.82)	0.022	(0.27)	0.033	(0.91)
Firm age (-1)	-0.508	(-2.59)**	-0.853	(-1.91)*	-0.330	(-1.33)
Firm age squared (-1)	0.114	(2.03)**	0.192	(1.44)	0.049	(0.69)
Liquidity ratio (-1)	0.401	(4.07)**	0.476	(1.86)*	0.462	(3.96)***
Capital intensity (-1)	0.018	(0.70)	-0.078	(-1.11)	0.032	(1.06)
Capital region (-1)	0.214	(2.84)**	-0.087	(-0.44)	0.188	(2.00)**
Pseudo R-squared	0.1025		0.1440		0.0933	
No. of obs.	26,607		3,956		17,583	
Log likelihood	-660.01494		-116.55072		-414.09241	

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%.

Annex 3. Balancing property tests – comparison of the mean values of exporters and non-exporters before and after matching

Variable name	Treated	Mean of treated	Mean of control	Bias	T-stat	P-value
Log labour productivity (t-1)	Unmatched	9.9544	9.7516	23.8	2.60	0.009
	Matched	9.9684	9.9755	-0.8	-0.06	0.953
Firm size (-1)	Unmatched	2.649	2.2378	41.6	4.39	0.000
	Matched	2.6452	2.5545	9.2	0.65	0.518
Firm size squared (-1)	Unmatched	8.0514	5.9133	41.6	4.64	0.000
	Matched	8.0396	7.4833	10.8	0.73	0.465
Firm age (-1)	Unmatched	2.0888	2.2861	-27.8	-3.25	0.001
	Matched	2.1091	2.0618	6.7	0.44	0.664
Firm age squared (-1)	Unmatched	4.9843	5.6064	-24.5	-2.67	0.008
	Matched	5.0327	4.8662	6.6	0.45	0.651
Liquidity ratio (-1)	Unmatched	.63465	.48065	40.1	5.06	0.000
	Matched	.60207	.62645	-6.3	-0.45	0.653
Capital intensity (-1)	Unmatched	8.7633	8.7253	2.4	0.24	0.810
	Matched	8.8091	8.8546	-2.9	-0.21	0.835
Capital region (-1)	Unmatched	.60577	.42391	36.9	3.74	0.000
	Matched	.61165	.6165	-1.0	-0.07	0.943
Log average wage (-1)	Unmatched	10.27	10.002	50.1	4.08	0.000
	Matched	10.27	10.2	13.1	0.76	0.448
Log average wage of females (-1)	Unmatched	10.094	9.8764	35.1	3.05	0.002
	Matched	10.094	10.064	4.8	0.28	0.783
Log average wage of males (-1)	Unmatched	10.375	10.066	53.6	4.11	0.000
	Matched	10.375	10.254	21.1	1.22	0.226
Gender pay gap (-1)	Unmatched	-.1374	-.06361	-10.6	-0.63	0.529
	Matched	-.1374	-.06284	-10.7	-0.70	0.483
Log average wage (-2)	Unmatched	10.228	10.018	38.7	2.72	0.007
	Matched	10.228	10.208	3.6	0.19	0.851
Log average wage of females (-2)	Unmatched	10.109	9.8896	41.3	2.67	0.008
	Matched	10.109	10.077	6.1	0.31	0.761
Log average wage of males (-2)	Unmatched	10.318	10.086	38.5	2.65	0.008
	Matched	10.318	10.26	9.5	0.48	0.634

Source: own calculations based on Estonian firm-level datasets. The reported results are for the sample of firms from all industries. The results for other matching exercises are quite similar.

Annex 4. Correlation of prior experience of working at a foreign owned firm and individual's wages at domestically owned firms, men vs women

Dependent variable: log of wage	(1) Domestic firms	(2) Domestic firms, with individual level occupation controls	(3) Domestic firms, manufacturing
Female (dummy)	-0.236	-0.210	-0.251
	(0.004)***	(0.004)***	(0.008)***
Person has previously worked in a foreign owned firm (dummy)	0.061	0.064	0.061
	(0.006)***	(0.006)***	(0.012)***
Female × Person has worked in foreign owned firm	**-0.023**	**-0.020**	**-0.038**
	(0.009)**	(0.009)**	(0.018)**
Constant	6.657	6.773	6.728
	(0.018)***	(0.030)***	(0.061)***
Occupation dummies	No	Yes	Yes
Region dummies	Yes	Yes	Yes
Education level dummies	Yes	Yes	Yes
Other controls	Yes	Yes	Yes
Number of observations	224967	206768	42731
R-squared	0.313	0.341	0.324

Notes: *significant at 10%; ** significant at 5%; *** significant at 1%. Method: OLS. Robust standard errors in parentheses. Data on individuals from domestically owned firms in the manufacturing industry, year 2011. The list of other controls in the table includes age, age squared, firm size, firm size squared, dummy for recent change of workplace, share of females at the firm, share of high-wage employees at the firm, firm age, firm age squared.

KOKKUVÕTE

Hargmaised ettevõtted ja palgatulude ebavõrdsus: ettevõtte välisomanikele kuulumise seosed soolise palgalõhega

Paljud uurimused on dokumenteerinud hargmaistes ettevõtetes töötamisest tulenevat olulise suurusega palgapreemiat, samuti välismaiste otseinvesteeringute seost palkade ebavõrdsusega. Selle kõrval on palju vähem teada sellest, kuidas ettevõtte kuulumine välisomanikele võib mõjutada soolist palgalõhet ettevõtte töötajate hulgas. Käesolev uurimus kasutab antud küsimuse uurimiseks detailseid Eesti töötajate ja tööandjate andmeid. Eesti juhtum on ka rahvusvaheliselt huvitav seoses Euroopa Liidu ja OECD riikide hulgas ühe kõige kõrgema soolise palgalõhega (ligikaudu 30% erinevate uuringute ja andmestike andmetel), teisalt on Eesti majanduses ka väga suur välisomanikele kuuluvate ettevõtete osakaal, ja Eesti välisinvestorid on pärit suures osas just Rootsist ja Soomest, kus tähelepanu soolise võrdsuse saavutamisele on väga kõrge. Niisiis on huvitav uurida, kuivõrd sellises kontekstis välisomanikud kannavad üle päritoluriigi võrdsele kohtlemisele suunatud inimressursside juhtimise praktikaid või mitte. Teoorias on mitmeid selgitusi, miks sooline palgalõhe võib erineda välismaistes ettevõtetes võrreldes kodumaistega. Näiteks, kasumlikud välisosalusega ettevõtted võivad olla enam suutelised osalema nn maitse-põhises diskrimineerimises, välisosalusega kaasnev tehnoloogia ülekanne võib vähendada nõudlust meeste füüsilise jõuga tööjõu järele, välisosalusega ettevõtted võivad töötajatelt vajada suuremat valmidust töötada pikemaid tööpäevi ja töötajatele ebasobivamatel aegadel, mis võib sobida rohkem meestele, jne.

Käesolevas uuringus kasutati empiirilises analüüsis antud küsimuste uurimiseks Maksu-ja Tolliameti 2006-2014 aastate ning 2011 aasta Rahva- ja Eluruumide loenduse andmeid ühendatuna erinevate ettevõttetaseme andmestikega, mida täiendasid Eesti Tööjõu-uuringu andmed perioodist 2007-2013. Uurimus dokumenteeris küllalki stabiilse tulemusena, et välisosalusega ettevõtetes on sooline palgalõhe oluliselt kõrgem kui kodumaistes ettevõtetes. Erinevate ametialade lõikes oli see seos kõige tugevam juhtide hulgas. Selline seos on tõenäoliselt põhjusliku iseloomuga, sest see erinevus ilmneb ka siis, kui uurisime kodumaiste ettevõtete välisomanike poolt ülevõtmiste mõju erinevate töötajate kategooriate – meeste ja naiste – palkadele, moodustades seejuures tõenäosusliku sobitamise tehnikat kasutades ülevõetud ettevõtetele mitteülevõetud ettevõtetest sobiva kontrollgrupi. Tulemused näitasid ettevõtte välisomanikele ülemineku soolist palgalõhet suurendavat mõju. Kuigi ülevõtmise järgselt kasvasid nii meeste kui naiste palgad, oli meeste palkade kasv oluliselt kiirem. Lisaks välisomanduse ja soolise palgalõhe seose tuvastamisele leidsime ka piiratud tõendusmaterjali selle ühe võimaliku selgituse ehk toimemehhanismi kohta, nimelt väliosalusega ettevõtete suurem palgalõhe võib tuleneda sellest, et need ettevõtted vajavad ja premeerivad oma töötajatelt valmidust teha ületunnitööd ja pikemaid tööpäevi (st pidevamat tööle pühendumist), mis ei pruugi samaväärselt meestele sobida naistele, eriti väikeste lastega naistele. Töö tulemused näitavad, et kuigi otsesed välisinvesteeringud võivad olla majanduses mitmel viisil kasulikud (sh tõstes keskmiselt palka), ei pruugi need parandada naiste suhtelist positsiooni palga osas tööturul. Meie uurimustöö osundab vajadusele edendada paindlikke töösuhteid tagamaks seda, et töötajad, kes eriti vajavad töö ja pereelu tasakaalu perekondlikel, tervisega seotud või muudel põhjustel, ei oleks seetõttu tööturul võrreldes teste gruppidega ebasoodsamas olukorras.