

Gender Pay Gap Patterns In Domestic And Foreign-Owned Firms*

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Abstract

We investigate differences in the adjusted gender wage gaps between foreign and domestic-owned firms in Poland, a country that has experienced large FDI inflows over the past three decades. We show that while standard estimates of adjusted gender wage gaps reveal they are much higher in size in the foreign-owned companies, as found in several other studies, these estimates cannot be trusted. The domestic-owned firms display considerably higher levels of gender segregation and the OLS estimates of the adjusted gender wage gaps in this sector are more likely to be biased. Using a matching and decomposition technique (Nopo 2008) that allows to capture gender wage differentials over a common support we find that gender wage gaps in the domestic-owned firms are only slightly lower than those in foreign-owned companies. We also find that in the domestic sector, women tend to segregate into low-paid jobs, as opposed to foreign sector, for which we find no such evidence. Foreign-owned companies have, however, much higher within-firm differences in earnings (net out of composition effects) and the earnings they pay differ less across firms. It all shows that the nature of gender wage gaps and the factors standing behind them differ between domestic and foreign sector of ownership.

Keywords: gender wage gaps, domestic ownership, foreign ownership, FDI

JEL: F23, J16, J31, J71, P31

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1. Introduction

Quite a few studies document a much higher gender pay gap in foreign-owned companies compared to domestic firms. This higher gap concerns both raw difference in average wages of men and women and adjusted pay gaps, which account for workers' differences in observable individual, job and firm characteristics. However, neither the theoretical nor empirical research provide convincing explanation on why would women be more disadvantaged in terms of pay if the company they work at is owned by foreign capital.

Our study has two main goals: first, we aim at verifying if gender pay gaps indeed are higher in foreign-owned firms, and if this finding is robust to different methodological approaches to calculating gender pay gaps. Second, we want to shed light on the potential factors that could explain different size of the gender pay gap depending on firm ownership. We use large cross-sectional sample of linked employer-employee data for Poland to establish patterns of gender pay differences in the domestic and foreign-owned firms.

Two main findings emerge from our study. First, the standard OLS estimates of the ownership differences in gender pay gaps may be strongly biased by the fact that domestic-owned firms present a much higher degree of gender segregation in employment than foreign-owned firms do. Male and female employees of domestic-owned firms are less likely to be *comparable* in terms of their individual and workplace characteristics, challenging the assessment of their potential wage gaps. Once men and women are matched and compared over a joint set of individual and job characteristics, it turns out that gender pay gaps are only slightly lower in domestic-owned firms than in foreign-owned ones, contrary to what raw gaps and standard OLS estimates of adjusted pay gaps suggest.

Thus, while domestic and foreign-owned firms display quite comparable levels of gender pay gaps, their determinants appear to differ. Our second contribution relates to these potential different factors contributing to female pay disadvantage depending on ownership sector: while women's employment segregation appears to translate to their lower relative pay in domestic-owned firms, this segregation is much lower in foreign-owned companies. The latter tend to distinguish themselves with much higher levels of within-firm wage inequality, both among men and women, which likely explains part of the average within-firm gender wage gaps.

This paper is organised as follows. In section 2 we review the relevant literature. Section 3 presents data we use. Section 4 describes our methodology, and in section 5 we discuss the results. Section 6 concludes.

2. Firm ownership and gender wage differentials

Theory suggests that we should observe a lower gender pay gap among foreign-owned companies, as compared to domestic ones. This prediction is based on the fact that foreign-owned firms are more likely to operate under strong market competition (stronger than domestic-owned firms) and as such they should display lower levels of discrimination, as – in line with the personal taste hypothesis – discrimination is costly to an employer subject to competition (Becker, 1957; Arrow, 1973). The theoretical arguments are further reinforced by the fact that the weaker product market competition (enjoyed mostly by domestic companies, in particular public ones) could create opportunity for higher rents, likely shared with employees. To the extent that these domestic firms prefer employing men and reward them better (gender differences in rent sharing are confirmed by Nekby (2003)), this would drive up gender wage gaps in domestic firms,

compared to gender pay differences in foreign-owned establishments. Apart from the competition theory, the expectation of lower gender pay gaps in the foreign-owned firms is supported by the considerations around the theory of trade, which reduces firms' ability to discriminate women in terms of pay (Black and Brainerd, 2004). Again, this expectation is based on the fact that foreign-owned firms display a higher degree of openness to imports and exports, compared to domestic companies which are more likely to be oriented towards the domestic market.

The empirical evidence is in this respect inconclusive: the theoretical link between the (higher) degree of market competition and (lower) gender labour market gaps is confirmed by Black and Strahan (2001), Meng (2004), Zweimüller, Winter-Ebner, and Weichselbaumer (2008) and Heyman, Svaleryd and Vlachos (2013); the latter, however, find employment but not wage effects. Li & Dong (2011) find that on the contrary, firms that exhibit larger gender wage premia are more likely to operate in industries subject to fierce competition.

There could be other reasons behind a lower gender pay gap in foreign-owned firms. Firstly, one might assume that these firms differ with respect to firm-level policies that are likely to play a crucial role in shaping the gender wage differentials also because of the impact of childbearing and childcare on earnings of men and women. Workplace support and family-friendly practices can contribute to women earning equal pay (Felfe, 2012) and one might expect the foreign-owned firms to be more likely to introduce both equal pay legislation and family-friendly workplace solutions (Kodama, Javorcik and Abe, 2018). More flexible approach to work-life balance might lead to higher selection of better educated women into the foreign-owned firms, lowering the pay gap. Moreover, domestic and foreign-owned firms vary significantly in the extent of practices such as internal labour markets, organizational structure, job ladders and vacancy-based promotions or standardized wage schedules – all of which impact wage setting mechanism and thus gender pay differentials (Gerber, 2012; Ono 2007).

Yet, some authors argue that gender pay gaps are likely to be higher in foreign-owned companies due to their higher requirements with respect to working time – which are met mostly by men, who are rewarded for working longer hours and being more flexible (Goldin 2014; Vahter and Masso, 2018). Bøler, Javorcik, and Ulltveit-Moe (2018) follow a similar line, suggesting that exporting firms need more employer-centred working time flexibility to be able to work with customers in different time zones, among other. To the extent that exporting firms are more likely to be foreign-owned, this would also contribute to gender pay gaps observed among the domestic and foreign-owned workplaces.

The empirical literature that refers to gender pay gaps in domestic versus foreign-owned firms *explicitly* is limited. It is widely acknowledged that foreign firms usually offer wage premia, which directly impact the foreign-domestic pay gap (Conyon et al., 2002; Eriksson and Pytlikova, 2011; Hijzen et al., 2013). These wage premia arise due to technology, capital and competition externalities from multinational companies (Bandick 2011, Conyon et al. 2002, Chen, Ge, & Lai, 2011). Yet, it is less obvious if (and why) these foreign-ownership wage premia are higher or lower for men than for women and thus whether the gender pay gap is thus increased or decreased by FDI inflows and ownership structure. Studies in this respect usually investigate China, where – from a microeconomic perspective - many do document higher wage premia for men than for women in the foreign-owned sector and thus higher gender pay gaps in foreign-owned companies, compared to domestic-owned ones (Maurer-Fazio et al., 1999; Liu et al., 2000; Hughes and Maurer-Fazio, 2002; Rickne, 2012). Chen, Ge, Lai, & Wan (2013) claim that higher differences in earnings of men and women in the foreign-owned firms reflect higher productivity gap between men and women, and not discrimination, though it must be noted that their study measures gender pay gaps as the association between firm's female employment share and average wages at firm level. The patterns of gender pay gaps may also change over time: Braunstein and Brenner (2004) also investigate China, though find that while the FDI benefitted

women's wages more compared to men in mid-1990s, this has reversed in early 2000s. It is also worth emphasising that the mechanisms operating in a developing country may not be present in a more advanced one, where the FDI inflow does not necessarily translate into higher inflow of women on the labour market or into women's educational enrolment (Seguino & Grown, 2006). Seguino (2000) finds a positive correlation between total FDI and the gender wage gap in Taiwan but no similar relationship in Korea. Oostendorp (2009) finds that gender wage gaps decrease with trade and FDI inflows, though this evidence concerns richer countries only, with no evidence found for poorer ones. Friedman et al. (2011) investigates Chilean experience and also state that a higher degree of FDI openness is associated with lower gender pay gaps. To the best of our knowledge, there is little evidence for European countries: Zulfiu-Alili (2014) documents higher gender wage gaps in the foreign-owned firms in Macedonia, compared to domestic companies, Vahter and Maaso (2018) observe a similar pattern in Estonia.

We add to the studies on the link between gender pay gaps and firm ownership by linking it to two other distinct strands of literature: on gender occupational segregation and within-firm wage inequality.

The literature on women's segregation in specific, low-paid occupations, industries and establishments is well established (Bayard et al. 2003, Reilly and Wirjanto, 1999). This segregation explains a sizeable fraction of the gender wage gap (even a half, Blau and Kahn 2018) and is likely to reflect – at least partially – wage discrimination rather than differences in job and personal characteristics. It is important to note that occupational sex segregation may already reflect labour market discrimination against women (in employment rather than wages). Recent studies on sex segregation in employment emphasize the potential role of monopsony on the labour market and females' lower labour supply elasticities than males' (Hirsch et al 2014).

We also link our study to the emerging literature on firm-level determinants of wage inequality. Several authors have recently documented the growing contribution of establishment effects to the widening of wage distributions (Antonczyk et al. 2010; Barth et al. 2016, Card et al. 2013, Card et al. 2018; Handwerker et al. 2016). Among the few studies that include the gender dimension of establishment's role in shaping wage inequality, Card et al. (2016) found that both sorting across firms (i.e., women's higher probability of working at firms that pay low wages) and differences in the within-firm bargaining (women receiving less of the wage premium received by men) contribute to the gender wage gap. We aim at adding to this literature the ownership status as another firm characteristic likely having an impact of the shape of wage distribution and their gender dimension.

To the best of our knowledge, there are no studies focusing directly on differences in gender segregation in domestic versus foreign-owned firms, or on the different role of within-firm wage bargaining of men and women depending on firm ownership. Yet, these two issues appear relevant from the perspective of our study and we hope our analysis can help to uncover new potential factors (or a combination of existing explanations) behind gender wage gaps and their variation across workers and firms.

3. Data and descriptive statistics

We use data from the Structure of Wages and Salaries by Occupations (SWSO) conducted by Statistics Poland in 2008, 2010, 2012 and 2014. The SWSO is a large linked employer-employee dataset, which provides information on both yearly and monthly (during the reference month – October) earnings of individuals. It contains also information on the number of hours worked, normal and overhours, and both a set of individuals' characteristics, such as gender, age, education, occupation, experience, tenure, and a set of firms' characteristics, e.g. NACE, type of ownership (public/private and domestic/foreign ownership), firm

size, coverage by collective pay agreement and firm's size. Because we are interested in gender wage gaps in domestic and foreign-owned firms in the private sector, we restrict our sample to these two pure types of ownership only (we exclude mixed ownership). The sample size varies from 278,032 individual observations in 2010 to 343,143 in 2014, with a total of 1,230,945 in a pooled sample of the years 2008, 2010, 2012, and 2014. We use sample weights which reflect the survey's two-stage sampling procedure (at firm and worker's level). We calculate gender pay gaps using data on hourly wages, which we compute as the sum of the yearly salary and the yearly honorarium, divided by the number of hours worked yearly. We count in the salary received from overtime, awards and statutory bonuses..

Table 1. Descriptive statistics of selected variables, 2014

	domestic	foreign
female (share)	40%	43%
age (average)	40	37
primary education (share)	7%	7%
basic-vocational education (share)	30%	18%
secondary education (share)	38%	36%
tertiary education (share)	24%	39%
job experience (average)	16	13
tenure (average)	8	7
firm size (average)	334	1136
fixed term contracts (share)	39%	28%
collective agreements (both firm-level and industry-level)	38%	34%
Men, average hourly wage (PLN)	17.04	30.00
Women, average hourly wage (PLN)	14.99	22.06
Number of observations	222,203	120,940

Notes: For descriptive statistics for years 2008, 2010 and 2012 see Appendix A1. Wages expressed in PLN, 2008 value, deflated with the CPI.

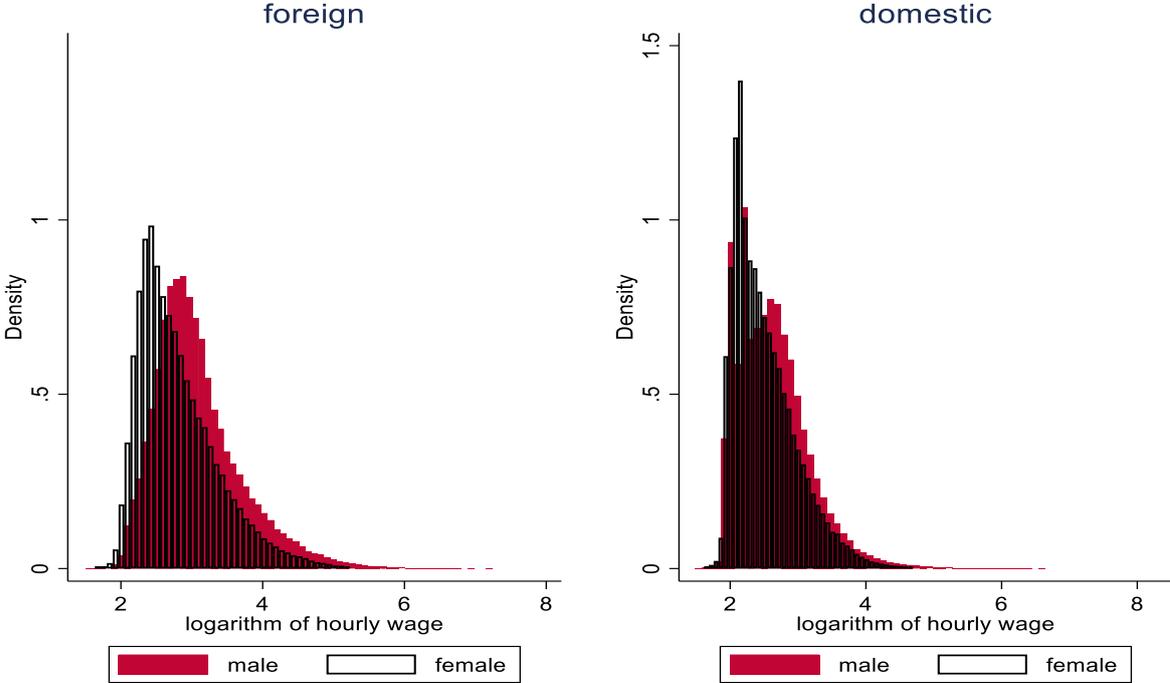
Source: Own calculations based on the Structure of Wages and Salaries by Occupations 2014 data.

Foreign-owned firms constitute 14.3% of all firms in our data, and employ 30% of all workers. Clearly, there are differences in the structure of workforce in the two types of firm ownership (Table 1 and Appendix A1). In both of them, women constitute a minority among the workforce, with their share being slightly higher in foreign-owned companies. Employees in the foreign firms are on average 3 years younger and better educated: shares of workers with primary and secondary education are similar between the two types of ownership, but there are striking differences in the shares of workers with basic-vocational education (12 p.p. more in domestic companies in 2014) and tertiary education share (15 p.p. more in foreign ones). Although the share of workers with tertiary education employed in domestic-owned firms increased over time (Appendix A1), the gap is still remarkable.

Those working in foreign establishments are less likely to be employed on fixed-term contracts and the firms they work in are on average much larger. This contributes to some extent to higher wages they obtain: men in foreign-owned companies earned on average 76% more than men in domestic ones (in 2014). For women, the difference amounted to 47%. Furthermore, in both sectors the distribution of female wages is shifted to

the left of the male distribution, but this shift is higher in the foreign sector. Thus, the Polish data seem to confirm the patterns of higher gender wage inequalities observed in the foreign-owned sector (compared to domestic sector), found for other countries.

Figure 1. Men’s and women’s distribution of log wages in foreign and domestic-owned firms



Notes: Wages expressed in PLN, 2008 value, deflated with the CPI.

Source: Own calculations based on the Structure of Wages and Salaries by Occupations 2008, 2010, 2012, and 2014 data.

4. Research methodology

In the first step, we calculate raw gender wage gaps, that is a simple difference in average hourly wages of men and women, expressed as the percentage of men’s wages. We do it separately for the two types of firm ownership: domestic and foreign. Then, in order to obtain adjusted gender wage gaps, we use a traditional Mincer wage regression with the logarithm of hourly wage as a dependent variable. We estimate it using OLS. Our basic model contains a set of standard control variables, including gender, the type of ownership (domestic or foreign), and additionally individual (age, education, experience, tenure), job (occupation, type of job contract, part-time/full-time position) and firm-level characteristics (firm’s size, NACE sector, collective bargaining coverage, a set of characteristics of co-workers which allows us to better capture firm heterogeneity). We also include an interaction term between gender (female) and type of ownership (foreign). For the purpose of comparison between OLS model and Ñopo decomposition (see below), we build a second OLS model with restricted set of covariates. We exclude here tenure, collective bargaining and some of co-workers characteristics (for detailed list of variables, see Table A2 in the Appendix). In all our models, we cluster standard errors at firm level.

The second part of our analysis is based on a novel, different approach to estimating gender wage gaps, introduced by Ñopo (2008). This approach is a non-parametric method, based on a matching algorithm. Its

main advantage is that it allows us to capture gender differences in the common support, that is, between these men and women, for whom their at least one “statistical twin” (based on the observable characteristics) could be found in the sample. The Ñopo decomposition also provides information about the distribution of the differences in wages of men and women that remain unexplained by the characteristics of comparable male and female individuals. It has been successfully applied to studies of the wage gap by, for example, Görzig, Gornig, and Werwatz (2005); Nicodemo and Ramos (2012); Ñopo, Daza, and Ramos (2012); and Anspal (2015).

Following the Ñopo procedure, we calculate average differences in hourly wages of men and women in the domestic and foreign-owned firms (separately) and then we decompose this average wage gap into four main components. Denoting the gender wage gap in sector j – the average difference in wages between men and women – by Δ_j , we decompose the gap as:

$$\Delta_j = \Delta_{X_j} + \Delta_{O_j} + \Delta_{M_j} + \Delta_{F_j},$$

where the specific components take the form of:¹²

$$\Delta_X = E_{F,matched}[Y|F] - E_{M,matched}[Y|F]$$

$$\Delta_O = E_{M,matched}[Y|F] - E_{M,matched}[Y|M]$$

$$\Delta_M = \mu^M (E_{M,matched}[Y|M] - E_{M,unmatched}[Y|M])$$

$$\Delta_F = \mu^F (E_{F,unmatched}[Y|F] - E_{F,matched}[Y|F])$$

and $E[Y|\cdot]$ denotes the expected value of earnings Y conditional on being male (M) or female (F), calculated for a subsample given in the subscript, i.e. matched (being in the common support) or unmatched, males or females. μ^M and μ^F denote the probability of men and women being not matched, respectively. The first component Δ_X reflects thus the part of the wage gap that can be explained by the differences in the distribution of observable characteristics of comparable men and women; i.e., those individuals who are in the common support. In contrast, Δ_O stands for the “unexplained” part; that is, the part that cannot be attributed to the differences in the characteristics of men and women over the common support. This part of the gap is usually attributed to unobservable characteristics (that determine earnings), which may also include discrimination. The last two components, Δ_M and Δ_F , capture the gender-specific gap between individuals who are in and out of the common support. The two components are computed as the difference between the expected wage of men/women out of the common support and the expected wage of men/women in the common support, weighted by the probability measure (under the distribution of characteristics of males/females) of the set of characteristics that females/males do not have. For example, Δ_F captures the part of the gap that would disappear if there were no women with the combination of characteristics X that remain unmatched by men; or, in other words, if every woman had at least one combination of the set of characteristics that men have. It would also disappear if all unmatched females were paid, on average, the same as all matched females.

¹ For simplicity, in the formulas that follow we omit the subscript j .

² The formulas presented here differ from the ones in the original Ñopo (2008) article, because, in order to be consistent with our GWG estimations derived using OLS, we calculate $\Delta = E[Y|F] - E[Y|M]$ instead of $\Delta = E[Y|M] - E[Y|F]$. Put it differently, throughout the paper we express GWG as a percentage of male wage. When applying the Ñopo procedure, we thus compare every male’s wage to the average wage of all matching females, i.e. we resample without replacement for males and with replacement for females.

The characteristics over which matching is performed correspond to the covariates we used in the Mincer wage regression, with previously continuous variables being categorized now. Thus we include age (divided into five groups), education (four levels), experience (3 groups), occupation (at ISCO 1 level), firm size (3 groups), full time/part time indicator, type of job contract (permanent/fixed), NACE sector and type of firm ownership (domestic or foreign), share of female workers in a given firm (3 levels: less than 20%, 20-60%, more than 60%), as well as year dummy.

In the third part of our analysis, we investigate the issue of gender segregation in employment, supposing that this may explain inter-sectoral differences in the level of GWG. Thus, first, we calculate Duncan dissimilarity index (Duncan & Duncan, 1955), with the formula of the following form:

$$D = \frac{1}{2} \sum_{i=1}^N \left| \frac{m_i}{M} - \frac{f_i}{F} \right|,$$

where M and F denote total male and female population, respectively, and m_i and f_i denote the population of males or females in the i^{th} category (i.e. occupation, occupation x education, occupation x education x age group, etc.). N is the total number of analysed categories. We calculate the index separately for domestic and foreign firms. Second, we define a 'job' variable as an intersection of NACE (18 categories), occupation (9 categories) and firm's size (3 categories) and investigate the correlation between the share of women and the average male wage in a given job. We use both Pearson's correlation coefficient and OLS regression. Third, we define which jobs are low-paid, on the basis of their mean male wage being equal to or below 80% of median of all mean male wages (per job). Then we apply a logistic regression in order to model the probability of women sorting into low-paid jobs.

Finally, to address the issue of within-firm and between-firm wage inequality in domestic and foreign-owned firms (cf. Barth et al. 2016), we decompose the variance of residual wages (net out the influence of the differences in individual and firm-level characteristics as in Model 2 in Table A2 in the Appendix) separately for men and women in domestic and foreign-owned companies:

$$\text{Var}(X_{ij}) = \text{Var}(\text{within}) + \text{Var}(\text{between}) = \text{Var}(X_{ij} - \underline{X}_j) + \text{Var}(\underline{X}_j)$$

where, in our case, X_{ij} is the logarithm of residual wage of individual i in the establishment j , and by \underline{X}_j we denote the weighted mean residual wage of all individuals in establishment j . We calculate the total variance of residual wages and between-firm variance, and derive the within-firm variance as the difference between the two.

5. Results

Raw gender wage gaps (GWG) in Poland differ in size between domestic and foreign-owned firms. By 'raw gender wage gap' we understand the difference in average wages of men and women, expressed as the percentage of men's wages. We calculate the raw GWG separately for domestic and foreign-owned firms and conclude that although women have lower wages than men in both sectors, the raw gender wage gap is twice higher in the foreign-owned firms than in domestic ones (27.3% and 13.6% respectively, Table 2).

Table 2. Raw and OLS adjusted gender wage gaps in domestic and foreign-owned firms

Ownership	Raw GWG	Adjusted GWG (restricted set of explanatory variables)	Adjusted GWG (full set of explanatory variables)
domestic	13.6%	12.1%	12.3%
foreign	27.3%	23.3%	19.3%

Notes: The full set of estimates of adjusted wage gaps is available in Appendix, Table A2: Model 1 for restricted set of explanatory variables and Model 3 for the full set.

Source: Own calculations based on the Structure of Wages and Salaries by Occupations 2008, 2010, 2012, and 2014 data.

As already explained in the Introduction, raw GWG is not the most suitable measure of gender wage inequality. These differences in the size of the gender pay gaps across sectors, although striking, might partly be explained by the different composition of male and female workers in the domestic and foreign-owned firms. To eliminate this effect, we calculate GWG adjusted for workers', jobs' and firms' characteristics. In the first step we use a standard OLS regression, as discussed in the Methodology section. We consider two sets of explanatory variables, a full and restricted one: the latter will allow us to compare the results with the ones from the Ñopo decomposition, which we will perform in the next step. Regardless of this choice, it turns out that the adjusted GWG are smaller than raw ones and the difference in the size of the GWG by firm's ownership type persists: the adjusted GWG in domestic-owned firms is around 12%, whereas in foreign ones it amounts to 19-23% (Table 2). It tells us two things: first, men and women differ in terms of individual, job and firm characteristics and this explains a part of the raw gap. Second, even once differences in workers' characteristics are accounted for, the GWG is much higher in the foreign-owned sector than in the domestic one and this confirms the large discrepancy between the two ownership sectors observed with raw mean wages. Interestingly, adjusting GWG for workers', jobs' and firms' characteristics significantly matters for the foreign sector, lowering the gap, while it seems not to be very important for the domestic one. We suspect that the nature of the GWG and mechanisms underlying it differ between the two sectors and using the OLS methodology we are not able to uncover it. In particular, the difference in the size of the GWG between the two sectors may stem from unobservable differences among workers and from the fact that the OLS fails to capture gender segregation into different types of jobs.

While we are unable to deal with unobserved heterogeneity with our data (though we try to minimize it using a set of co-workers characteristics), we re-run our analysis of the gender pay gaps using the Ñopo methodology presented in the previous section. Compared to the OLS, this approach allows us to better control for the fact that women and men may not share the same sets of observable characteristics, and that the shares of men and women in the common support may be different in the foreign versus domestic-owned companies.

Table 3. Gender wage gaps in domestic and foreign-owned firms, adjusted for firms' and workers' characteristics: summary of the Ñopo decomposition results

	Gender wage gap	Percentage of matched women	Percentage of matched men
domestic	16.8%	79.8%	62.5%
foreign	18.5%	84.7%	75.5%

Source: Own calculations based on the Structure of Wages and Salaries by Occupations 2008, 2010, 2012, and 2014 data.

The results of the Ñopo estimates are presented in Table 3. Once workers are matched over the common support, the differences in the size of the GWG between the domestic and foreign-owned sector are considerably lower. Interestingly, this lower sectoral difference is driven mainly by a large increase in the

estimated size of gender pay gaps in the domestic sector. All in all, it turns out that the size of the gender pay gap is only slightly higher in the foreign-owned sector compared to the domestic one, contrary to what raw pay gaps and OLS estimates would suggest. Moreover, it appears that men and women are less likely to be “similar” in domestic-owned companies. This is confirmed by the summary of the matching results, presented in columns 3 and 4 of Table 3. While 85% of women and 76% of men in the foreign-owned sector had a “twin” observation in the dataset, these shares were significantly lower in the domestic-owned firms.

Which estimates to trust? The difference in the average size of the gender pay gap between the domestic and foreign sectors depending on the estimation methodology (OLS versus matching-based Ñopo decomposition) and the various degrees of “twin” matching in the two sectors suggest there is a different degree of gender segregation between the domestic and foreign-owned firms. If this is the case, the matching-based methodology is likely to better reflect differences in the size of the gender pay gap between the two sectors. Therefore, we focus on the issue of gender segregation in domestic and foreign-owned firms in the remaining part of our analysis.

For a start, to verify whether there are different degrees of gender segregation in the domestic and foreign-owned firms, we calculate Duncan dissimilarity index (Duncan & Duncan, 1955; see Methodology section). The value of Duncan index (when multiplied by 100) may be interpreted as the percentage of labour force that should change its occupations in order to bring about perfect correspondence between the share of females within each occupation and the overall share of female workers. The results, presented in Table 4, provide evidence of a higher degree of workers dissimilarity by gender in the domestic sector, as compared to the foreign one. This observation holds strong regardless of the combination of individual, job and firm characteristics we take into account³. Therefore, it lends support to the strategy of comparing gender pay gaps in the domestic and foreign-owned firms using Ñopo matching methods, rather than OLS estimates.

³ It is also robust to the unequal number of non-empty intersections of categories in the two sectors of ownership. Since foreign sector is in general less numerous in our sample than domestic one, the more variables we add to the dissimilarity index, the more empty intersections appear in the foreign sector and thus the number of intersections taken into account while calculating the index separately for the two types of ownership differs between them. This could potentially bias downwards the results for foreign sector or bias upwards the results for domestic one, thus making them not comparable. However, when we restrict our sample to only these intersections that are present in both types of ownership, the results hold: they only differ for the last row of the table, with the index for domestic ownership being equal to 0.49.

Table 4. Duncan dissimilarity index (gender segregation index)

Duncan dissimilarity index		Included variables							
domestic	foreign	occupation (9 categories)	education (4 categories)	age group (5 categories)	fixed term contract (binary)	part-time (binary)	years of experience (3 categories)	firm's size (3 categories)	NACE (18 categories)
0.36	0.20	X							
0.38	0.23	X	X						
0.40	0.25	X	X	X					
0.40	0.26	X	X	X	X				
0.41	0.27	X	X	X	X	X			
0.41	0.27	X	X	X	X	X	X		
0.42	0.29	X	X	X	X	X	X	X	
0.51	0.37	X	X	X	X	X	X	X	X

Notes: Numbers range on a scale from 0 to 1, where 0 = perfect similarity and 1= perfect dissimilarity.

Source: Own calculations based on the Structure of Wages and Salaries by Occupations 2008, 2010, 2012, and 2014 data.

The much higher values of gender dissimilarity in the domestic sector compared to foreign one likely stand behind the large gap in the estimates of GWG in the two sectors based on OLS and matching techniques. At the same time, since the Ñopo decomposition shows much closer size of the GWG in domestic and foreign-owned firms (and the OLS and Ñopo estimates are similar for the foreign-owned sector, but not for domestic), it is likely that there are different determinants of the gender pay gaps in the two sectors. To shed more light on this issue, we focus on two points: (1) sorting of workers into low-paid jobs in domestic and foreign-owned firms, and (2) wage inequality within domestic and foreign-owned firms.

With respect to the first of these issues, we ask a question whether the higher gender segregation evidenced in the domestic sector reflects women selecting to low-paid jobs, and whether such a selection is present in the foreign sector as well. In order to answer these questions, we first investigate the correlation between the share of women and the average male wage in a given job. We define 'a job' as an intersection of NACE (18 categories), occupation (9 categories) and firm's size (3 categories). We exclude cells with less than 10 observations and thus end up with 443 'jobs' in our sample. We further assume in a conservative manner, that 'a job' may be classified as domestic if the share of foreign ownership in it is less than 10%. For foreign ownership, we say that 'a job' is foreign if the share of foreign ownership exceeds 30%⁴. Even with such conservative definitions, the relationship between the share of women and the average male wage⁵ in a given job is negative (the higher the share of women in a particular job, the lower the average male wage in this job) and significant in the domestic sector and insignificant in the foreign one (Table 5). We run both an OLS regression without any controls and calculated Pearson's correlation coefficient.

⁴ The results hold strong if we assume 50%.

⁵ As a robustness check, we also use mean women's wage and mean general wage in a given job. The findings remain consistent. We opt for using men's wage, because if women are paid less and their share in a given job is bigger, then naturally mean wage in this job is lower.

Table 5. Correlation between the share of women and mean male wage in a given 'job', domestic and foreign ownership separately

Ownership	OLS regression Coef. (Std. Err.)	Pearson's Correlation Coef.	p-value	Number of observations ('jobs')
domestic	-0.054 (0.024)	-0.15	0.024	224
foreign	0.089 (0.094)	0.09	0.349	109

Notes: A job is classified as domestic if the share of foreign ownership in it is less than 10%. A job is classified as foreign if the share of foreign ownership in it exceeds 30%. OLS regression with dependent variable "share of women in a given job", independent variable "mean male wage" and a constant.

Source: Own calculations based on the Structure of Wages and Salaries by Occupations 2008, 2010, 2012, and 2014 data.

The results suggest that sorting of women into low-paid occupations is an important determinant of gender pay gaps in domestic-owned firms in Poland. This is not the case in foreign-owned firms. In order to reinforce this finding, we take a different approach and run a logistic regression with a binary indicator "works in a low-paid job" as a dependent variable. We use the previously defined jobs and we consider a job as being low-paid if its mean male wage is equal to or below 80% of median of all mean male wages (per job). It gives a total of 29.6% of workers assigned to low-paid jobs⁶. We then regress this variable on female dummy, a dummy for foreign ownership and the interaction between these two variables. We also control for the age of a worker, his/her education, tenure, type of contract, part-time employment, workplace characteristics and the year of the study (for full regression results, see Appendix, Table A2).

The results show that in domestic-owned firms, women's probability of sorting into a low-paid job is by almost 4% higher than among men. In foreign-owned firms, this difference is not statistically significant (Table 6).

Table 6. Average marginal effects in logistic regression of gender and firm's ownership on the probability of working in a low paid job

	dy/dx	Std. Err.	p-value
male (base)			
female, domestic	0.038	0.004	0.000
female, foreign	-0.003	0.007	0.610
Number of observations	1,230,945		

Notes: Full list of control variables and their coefficients can be found in the Appendix, Table A2. Standard errors clustered at the firm level and computed using Delta-method.

Source: Own calculations based on the Structure of Wages and Salaries by Occupations 2008, 2010, 2012, and 2014 data.

Wage inequality within domestic and foreign-owned firms may be another dimension of sectoral differences in gender pay gaps determinants. Recent literature emphasizes the role that firms play in shaping wage inequality and investigates between- and within firm wage inequality (Card et al. 2013, Barth et al. 2016). We follow this approach and decompose wage inequality in domestic and foreign-owned establishments into within and between-firms component. We base our analysis on residual wages, that is wages after netting out the compositional effects that we are able to account for (i.e. the individual and firm-level characteristics

⁶ Defining the threshold at the level of 60% of median would result in only 3.6% of workers in low-paid jobs.

of individuals in our sample). We find that for the residual wages, the share of within-firm variance is higher than the share of between-firm variance in both domestic and foreign-owned companies, though it is much higher in the latter (Table 7). Thus, foreign-owned companies have much higher within-firm differences in earnings and the earnings they pay differ less across firms⁷. In the domestic sector these two components are more balanced. It is also interesting to see that there is again a gender difference in the role of within-firm wage inequality. In particular, women experience higher shares of within-firm wage inequality than men in the domestic sector, but not in the foreign sector.

Table 7. Variance of residual wages (error terms in linear regression of logarithm of wages) within and between firms [% of within-firm variance in total variance]

Year	Domestic			Foreign		
	all	men	women	all	men	women
2014	53%	48%	53%	71%	67%	67%
2012	53%	47%	53%	70%	67%	66%
2010	53%	48%	52%	72%	69%	68%
2008	51%	45%	51%	70%	69%	64%

Notes: The list of control variables in the regression used to obtain the residuals is the same as in the Model 2 (Appendix, Table A2), excluding female and year variables.

Source: Own calculations based on the Polish SES 2008, 2010, 2012, and 2014 data.

To sum up, our analysis shows that there is no substantial difference in the size of the adjusted gender pay gaps in the domestic and foreign-owned firms. The difference observed with raw data or with OLS estimates stems from a much higher degree of job segregation in the domestic sector, which suggests its lower pay gap. We also observe that the main factors behind gender wage gaps in the two sectors are different. Women appear to be more likely to sort into low-paid jobs in the domestic sector, but not in the foreign one. At the same time, the foreign ownership distinguishes itself with much higher shares of within-firm wage inequality, translating into higher gender wage inequality.

6. Conclusions

We study gender pay gaps in domestic and foreign-owned firms in Poland, analysing the differences in their size. We first evidence why the OLS estimates may be a misleading indicator of the differences in the size of the gender wage gaps between the foreign and domestic-owned sector, pointing to a much higher degree of gender segregation in the latter. Female employees are much less “comparable” to male employees in the domestic-owned firms, in contrast to the foreign-owned sector, where men and women are more likely to share the same sets of individual, job and firm level characteristics. This makes the comparison of the sizes of gender pay gaps in the two sectors more challenging.

⁷ The investigation of the reasons behind the sectoral gap in the role of within-firm wage differentials is beyond the scope of our paper – we are unable to state how much of this difference could stem from higher heterogeneity of workers’ productivity. We note, however, that firm characteristics do play a higher role in determining wages in the domestic sector, as compared to foreign one. Results of a simple OLS regression with standardized coefficients, run separately for domestic and foreign-owned firms, show that e.g. the coefficient associated with firm size is much higher for the domestic firms. What is more, when we compare R^2 for the regressions with and without firm size variable (separately for domestic and foreign ownership) we can see that adding this variable to the regression results in 0.035 increase in R^2 for domestic firms and no increase for foreign firms.

Responding to this challenge we use a novel approach by Ñopo (2008). We decompose the observed differences in average wages of men and women, in the foreign and domestic-owned sector separately, into a component that reflects differences in observable characteristics of men and women over the common support, and the components that reflect unexplained differences in and out of the common support. We thus show that the size of the gender pay gap is slightly higher in the foreign-owned firms compared to domestic-owned firms, but the difference is much smaller than the OLS estimates would suggest. Yet, the gender wage gap is by no means lower in the foreign-owned firms, contrary to what competition theory would imply.

More research is needed to understand the factors that could be driving the foreign/domestic differences in this respect. We shed light on two of them: gender segregation and within/between-firm wage inequality. Occupational sex segregation is well analysed in the literature, but not from the firm ownership angle. It would be interesting to learn why domestic firms appear to display much higher levels of gender segregation and female selection into low paid jobs. In similar vein, we show that in foreign-owned firms wages are much more likely to vary within firms than between, in contrast to domestic firms. Again, understanding the source of these differences and investigating whether these higher within-firm wage inequality translated into higher female disadvantage is a direction for future research.

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Appendix

Table A1. Descriptive statistics of selected variables for years 2008, 2010, 2012

	2008		2010		2012	
	domestic	foreign	domestic	foreign	domestic	foreign
female (share)	40%	43%	39%	42%	40%	41%
age (average)	39	35	39	36	40	36
primary education (share)	8%	6%	7%	5%	7%	5%
basic-vocational education (share)	36%	25%	34%	24%	31%	21%
secondary education (share)	38%	39%	39%	41%	38%	39%
tertiary education (share)	18%	30%	19%	30%	23%	35%
job experience (average)	15	12	16	12	16	13
tenure (average)	6	5	7	6	8	7
firm size (average)	286	1216	308	1274	330	1071
fixed term contracts (share)	42%	35%	41%	33%	39%	28%
collective agreements (both firm-level and industry)	36%	34%	42%	42%	42%	42%
Men, average hourly wage (PLN)	16.32	27.67	15.94	27.32	16.36	26.79
Women, average hourly wage (PLN)	13.54	19.16	13.83	19.64	14.37	20.09
Number of observations	219,170	69,908	200,599	77,433	219,045	101,647

Notes: The sample is weighted so as to represent total population of Polish workforce in private domestic and foreign-owned firms. Wages expressed in PLN, 2008 value, deflated with the CPI.

Source: Own calculations based on the Structure of Wages and Salaries by Occupations 2008, 2010, 2012 data.

Table A2. Regression results: gender wage gap in domestic and foreign-owned firms

	logarithm of wage (OLS, Model 1)	logarithm of wage (OLS, Model 2)	logarithm of wage (OLS, Model 3)	working in a low- paid job (logistic regression)
female	-0.121*** (0.003)	-0.114*** (0.003)	-0.123*** (0.002)	0.210*** (0.023)
foreign	0.266*** (0.007)	0.203*** (0.007)	0.202*** (0.006)	-1.969*** (0.064)
female x foreign	-0.112*** (0.010)	-0.103*** (0.008)	-0.070*** (0.006)	-0.261** (0.104)
age	0.027*** (0.001)	0.025*** (0.000)	0.025*** (0.000)	-0.016*** (0.003)
age2	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)	0.000*** (0.000)
education: basic vocational (base: primary)	0.009* (0.005)	0.009*** (0.004)	0.007 (0.004)	-0.052 (0.037)
education: secondary (base: primary)	0.083*** (0.005)	0.067*** (0.004)	0.063*** (0.005)	-0.640*** (0.039)
education: tertiary (base: primary)	0.336*** (0.008)	0.226*** (0.005)	0.209*** (0.005)	-1.974*** (0.039)
tenure	-	0.006*** (0.000)	0.005*** (0.000)	-0.055*** (0.002)
experience	0.006*** (0.000)	0.004*** (0.000)	0.003*** (0.000)	-0.017*** (0.001)
parttime dummy	-0.017*** (0.004)	-0.008* (0.004)	-0.004 (0.004)	0.171*** (0.024)
fixed-term contract dummy	-0.127*** (0.004)	-0.086*** (0.004)	-0.092*** (0.003)	-0.220*** (0.024)
logarithm of firm size	0.044*** (0.003)	0.045*** (0.002)	-	-
collective bargaining	-	0.026*** (0.005)	0.018*** (0.004)	-0.705*** (0.034)
share of women	-0.002*** (0.000)	-0.002*** (0.000)	-0.002*** (0.000)	-0.024*** (0.001)
share of workers with tertiary education	-	0.007*** (0.000)	0.007*** (0.000)	0.004*** (0.001)
share of workers aged below 35	-	-0.001*** (0.000)	-0.001*** (0.000)	0.018*** (0.001)
share of workers aged 55 or more	-	-0.001*** (0.000)	-0.001*** (0.000)	-0.705*** (0.034)
year: 2010 (base: 2008)	-0.008 (0.008)	-0.023*** (0.007)	-0.022*** (0.006)	0.086* (0.045)
year: 2012 (base: 2008)	-0.018**	-0.050***	-0.047***	0.250***

	(0.008)	(0.007)	(0.006)	(0.046)
year: 2014 (base: 2008)	0.045*** (0.008)	0.002 (0.007)	0.005 (0.006)	0.236*** (0.046)
Other controls:				
occupation dummies	yes	yes	no	no
NACE dummies	yes	yes	no	no
'job' dummies (occupation x NACE x firm size)	no	no	yes	no
Observations	1,230,945	1,230,945	1,230,945	1,230,945
R-squared / Pseudo R- squared	0.522	0.561	0.580	0.235

*Notes: Models with an intercept. Standard errors (in parentheses) clustered at firm level. In the logistic regression, dependent variable defined as a probability of working in a low-paid job, i.e. the one in which mean men's wage equals 80% of median or less of mean men's wages in all jobs.. *** p<0.01, ** p<0.05, * p<0.1.*

Source: Own calculations based on the Structure of Wages and Salaries by Occupations 2008, 2010, 2012, and 2014 data.