

Occupational gender pay gap and segregation in the European Union

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Abstract

We analyze whether female occupations have lower returns and if these are responsible for occupational gender pay gap. We define female occupations as those occupations with more than 72.6% women employed, mixed occupations those occupations where the share of women is between 42.5-72.6% and male dominated occupations as those with a female percent of less than 42.5%. Previous papers find that both men and women earn less in female occupations. Using the European Structure of Earnings 2006, we find that the relationship between the proportion of female in an occupation and occupational average wages for men and women is non-linear. Further the results show that for men being employed in a female occupation yields the lowest returns whereas for women being employed in a mixed occupation has the lowest returns. Our results show that contrary to expectations the gender pay gap seems to be driven by mixed occupations suggesting that once occupational characteristics are fully controlled for, promotion mechanisms in mixed occupations could be detrimental to women.

Keywords: gender segregation, gender wage gap, occupational wages
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1. Introduction

Extensive evidence shows that there is a negative relationship between occupational segregation and gender wage differentials and that women's occupations are paid less. The question this paper asks is *if we increase the percentage female in an occupation is the wage penalty going to increase keeping the profession constant and country characteristics?* Due to lack of comparable data across countries, few studies look at gender differentials due to occupational segregation in an international perspective (Plasman and Sissoko, Hook and Petit 2008, Oostendorp, 2004). Within this literature, the current paper aims to fill in the gap regarding the extent of occupational segregation in the European Union and its importance in explaining gender wage differentials. We explore a unique dataset containing detailed information about occupations in a comparative manner across European countries: European Structure of Earnings Survey 2006.

Despite a significant reduction in the differences in pay between males and female in a number of European Countries over the past decades, the differential in pay is still significant and the occupational segregation large (Plasman and Sissoko 2004). Occupational segregation has been identified as one of the important factors responsible for the persistence of gender pay gap and therefore investigating the relationship between occupational segregation and gender pay gap is important from a policy perspective (Datta Gupta, 1993).

The discussion about occupational earnings identifies two separate reasons for the earnings differential between men and women: a) the unequal distribution of men and women among occupations (horizontal occupational segregation), and b) even within the same occupation women tend to earn less than men (vertical occupational segregation). The relationship between occupational segregation and wage differentials is not so clear cut. First, the direction and strength of the relationship is an empirical matter. Second there is a debate about what occupational segregation proxy actually measures.

Extensive evidence mainly from the US suggests that there is a negative effect of the "femaleness" of occupations on wages. Killingsworth (1990) provides two stylized facts about the femaleness of the occupation: 1) for both men and women there is a negative relationship between the proportion of women and wages 2) the negative relationship between wages and proportion females is stronger among men than women.

However, a few studies seem to suggest that the relationship between occupational segregation and wages is weak and driven by other job characteristics and differences in the unobserved skills of workers in female and male jobs (Baker and Fortin, 2001; Macpherson and Hirsch, 1995). Macpherson and Hirsch (1995) used data on occupational attributes to test whether occupational segregation is an important factor for female/male wage gap for occupational switchers controlling for individual heterogeneity. When they controlled for occupational attributes the estimates of the proportion female became smaller in magnitude however both genders faced quite similar negative effects. Because the magnitude of the effect of occupational segregation is -0.055 on log wages, they concluded that it seems likely that most of the wage gap

is due to different occupational preferences and different levels of human capital between male and female workers. However, Mouw (2000) finds that the strength of the relationship has been undermined by serious miss measurement of occupational codes and spurious occupational switchers. Baker and Fortin (2001) replicate and improve on Macpheson and Hirsch (1995) using better data for Canada purged of measurement bias. Their estimates of the penalty for female jobs are consistently small and not significantly different from zero. The penalty for female work is weak and statistically insignificant for both occupational switchers and the whole sample using Canadian data and the magnitude is consistent between cross-sectional evidence and longitudinal panel data when adding occupational attributes. Their conclusion is that although there is heterogeneity across groups most estimates for women are quite modest and typically statistically insignificant. Oppositely, the estimates for men are uniformly negative, revealing a more substantial penalty for work in female jobs. Contrary to Macpheson and Hirsch (1995) they obtain different relationships between occupational segregation and genders and the results are consistent between cross-sectional and longitudinal specifications. Their results should be interpreted as evidence that comparable worth policies might not be effective for women but they might be effective for men. Their findings show that across female/male/mixed occupations women earn significantly less than men which seems to suggest that occupational segregation is not responsible for the gender pay gap but rather discrimination is.

Sorensen (1990) suggests that the proportion female could be a proxy for unmeasured skill and taste differences among workers or of occupational attributes correlated with wages. In this paper we take a different approach to disentangle the two. We assume that tastes and occupational preferences are similar across countries for each gender and we control for skills and all possible occupational characteristics. Therefore, our approach relies on cross-sectional variation from 10 European Union countries by adding occupational dummies. Our weighted square estimates show that the relationship between occupational segregation and female and male occupational wages is non-linear. Contrary to expectations when one controls for all occupational characteristics, it is actually mixed occupations in Europe where women earn the lowest wage. Even if men are penalized in female occupations this is not enough to offset women's penalty in mixed occupations. Therefore the occupational gender pay gap seems to be driven by the penalty women occur in mixed occupations. This evidence could be interpreted as possible differences in promotion mechanisms for women in mixed occupations.

Section 2 provides a brief overview of the theories and recent empirical findings concerning the relationship between occupational segregation and gender pay gap. Section 3 provides a description of the methodology used in this study, its main assumptions and the implications. Section 4 describes the European structure of earnings data, its strengths and limitations. Section 5 discusses the results. And section 6 concludes discussing the relevance of this study in light of the previous literature.

2. Literature review

There are several explanations for the gender pay gap between occupations. These usually stress: the importance of human capital and discontinuous employment, compensating wage differentials, non-compensating wage differentials, crowding, labour market segmentation and institutions promoting occupational barriers, discrimination or sociological aspects emphasizing the role of culture and socialization in ascribing gender roles. Here we focus mainly on human capital, compensating and non-compensating wage differentials, discrimination and crowding.

2.1 Human capital

Polacheck (1981) extends the basic human capital theory using a hedonic price approach to incorporate occupational choice in order to make predictions about the occupational distribution (occupational segregation). Polacheck argues that women would purposefully choose those occupations with the smallest loss of human capital during periods of out of the labor market career interruptions. There have been several opponents to Polacheck's thesis (England 1982, Corcoran, Duncan and Ponza, 1984, Blau and Ferber 1991). They argued that career interruptions are not responsible for occupational segregation. Even if women seek jobs that require less training, that is not a reason to expect them to cluster in a particular group of occupations since many male occupations also require less training or skills. Furthermore, women's rates of depreciation and wage growth are similar in female and male dominated occupations (England 1982, Corcoran, Duncan and Ponza, 1984). Blau and Ferber (1991) found no effect of planned labor force participation on the expected earnings profiles. This finding shows that the expected returns to experience for continuous employment are not significantly different in jobs chosen by those who plan to spend different amounts of time in paid work, therefore infirming Polacheck's hypothesis. A major drawback of their study is that it concentrates only on graduates from University and has only data on expectations but not on actual occupations. A recent study done by Gorlich and de Grip (2009) using GSOEP data on Germany fills in the gap by looking at occupational depreciation rates by type of occupation (female, male and integrated) and by skill level (low skilled, high skilled). The study takes into account the penalty in the short run and in the long run for maternal leave. The authors find evidence supporting Polacheck's thesis for the short run depreciation in high skilled occupations suggesting that human capital depreciation rates are lower in female occupations than in male occupations. This result does not hold for low-skilled occupations however, suggesting that gender roles may explain segregation in low skilled occupations between men and women. These studies suggest that career interruptions are not the main mechanism behind occupational segregation and that discrimination could be.

2.2 Discrimination

Discrimination can arise from: 1) prejudice, 2) market power (monopsonies or trade unions), and 3) imperfect information. All these are obstacles to perfect competition. The presence of discrimination can be linked to: a) an aversion felt by employer towards a certain group (Becker 1957), b) the unobservability of individual characteristics which can provoke discriminatory

firm's behavior (Arrow, 1973, Phelps 1972), or c) the use of supplementary information or beliefs on the average quality of a demographic group or another.

Discrimination can be higher if one takes into account the life cycle model. It can occur in training, promotion, or pre-market conditions such as schooling and occupational choice. Traditionally, engineering, physics, the judiciary, law and health service administration are considered "male" jobs and library work, nursing and teaching (especially in primary education) are considered "female" jobs (ILO 2004). There is evidence showing that women who choose non-traditional jobs can face special constraints in the workplace, not least of which are isolation, limited access to mentoring and sexual harassment (ILO, 2004).

In discrimination analysis, the method of investigation relies on a residual approach. There are important sources of bias: such as omitting any factor that can cause productivity differentials among men and women, can lead to underestimation of the explained portion and overestimation of the unexplained portion due to discrimination.

The traditional approach in labor economics is to model occupational choice and include it in the wage decomposition to separate between intra-occupational effects and inter-occupational effects. Studies using Brown-Moon-Zoloth¹ occupational decomposition have found that most of the wage gap results from within occupation wage differentials rather than occupational segregation. Dolton and Kidd (1994) and Miller (1987) reported that more than half of the uncorrected wage gap is due to within occupation wage differentials. To some extent this result may be driven by the number of occupations that can be distinguished in the data. Kidd and Shannon (2001) illustrated this effect using Canadian data in which 36 occupations were observed. Given that men and women work in more than 300 occupations, the grouping of occupations into a more narrow range may result in confounding the effects due to within occupation variation with the effects of between occupations variation.

2.3 Compensating and non-compensating wage differentials

Occupations differ in many aspects from one another such as: the education and training required, the pleasantness or disagreeability of the work, the status and prestige in which the occupation is held, the probability of success in that line of work and the level of wages in the occupation. Occupational gender pay differentials could be a result of a compensating wage mechanism. According to this theory women prefer occupations with good working conditions

¹ The decomposition of Brown-Moon-Zoloth (1980) argues that previous methods do not take into account different occupational distributions as a source of wage differentials. Therefore they include the probability of attaining a certain occupation in the analysis of wage differentials. They decompose the difference in weighted average log wages across K occupations in an inter-occupational effect and an intra-occupational effect and differentiate further between an endowment effect and a remuneration effect. The main assumption is the existence of an occupational distribution for women which is not subject to discrimination. Brown, Moon and Zoloth (1980) use the predicted distribution of women across occupations in the absence of discrimination. The distribution is predicted using the estimate of a reduced form multinomial logit model for men. Therefore, it is assumed that outcomes for men are not the outcome of discriminatory processes. The innovative aspect of the Brown, Moon, Zoloth (1980) approach is that the wage gap is decomposed across the entire distribution of occupations and that it allows for endogeneity of the distribution of women across occupations.

and therefore they receive less compensating wage premiums or they prefer jobs with good fringe benefits and therefore they receive less pay. This theory makes several predictions: a) the size of the compensating wage differential for a particular occupation depends on the strength of demand for that occupation, b) the productivity of every job is an increasing and concave function of effort and wages increase with effort therefore perfect competition ensures that these differences in difficulty of work will be compensated for by wage differentials c) a competitive market should generate a trade-off between the amount of wages and benefits received by workers of equal productivity if the total dollar value of compensation per hour is to be equal.

Heterogeneity of tastes and abilities ensure that the size of the compensating wage differential for a particular occupation depends on the strength of demand. If there were little demand for an occupation then a small compensating wage differential would be required to induce workers to voluntarily choose those occupations. The higher the demand is, the higher the wage differential to be paid will be to overcome the greater dislike for an occupation or the greater costs of investing acquiring the skills for a certain occupation. The hedonic theory of compensating wage differentials proposed by Rosen (1974) builds on the compensating wage differentials and makes some additional predictions. It allows for differences in workers preferences with respect to the disamenity and for differences in the technological ability of firms to reduce the disamenity. Workers choose how hard a job they are willing to take in view of wage differences created by competition. The productivity of every job is an increasing and concave function of effort and wages increase with effort. There are several dimensions measuring the difficulty of jobs: accident risk, hours of work, environment, and the advantages whether in kind or in status, that flow from holding that particular job. Perfect competition ensures that these differences in difficulty of work will be compensated for by wage differentials.

McPherson and Hirsch (1995) and Baker and Fortin (2001) incorporate in their models controls for occupational physical demands, strength physical demands and environmental hazards in order to control for compensating wage differentials. When McPherson and Hirsch (1995) control for job characteristics, they obtain a substantial reduction in the wage penalty for female jobs in the US and they interpret this as evidence that the relationship between occupational segregation and wages is weak and driven by other job characteristics and differences in the unobserved skills of workers in female and male jobs. Baker and Fortin (2001) replicate and improve on their study and found even more dramatic results for Canada. When they control for occupational characteristics the penalties for female work are driven to zero. In contrast to McPherson and Hirsch who obtain smaller reduction in the wage penalty when they control for unobserved tastes and ability using panel data, Baker and Fortin (2001) obtain similar results when using longitudinal analysis compared to their cross-sectional results. Their estimates for men are consistent with those obtained by McPherson and Hirsch (1995), uniformly negative with a more substantial penalty for female work. However, the fact that their results show that for women on aggregate the relationship between wages and gender composition is zero when controlling for occupation characteristics is interpreted as evidence that if there is systematic discrimination in the labor market it is not against women in female jobs it is against women.

Taking the non-wage aspects into consideration poses two problems: the influence of the unobserved individual characteristics and the importance of heterogeneity of individual preferences. Laborious tasks are likely to be inferior goods, and their consumption diminishes as

income rises. If the income effect is sufficiently strong then the most efficient individuals will choose the less laborious jobs, thereby there will be an underestimation of the negative correlation between wages and the laboriousness of tasks. The second problem arises from the heterogeneity of workers preferences. So the fact there is no agreement concerning the disagreeability of some job characteristics such as repetitiveness, use of physical strength, or flexible schedule. Predictions of hedonic theory of wages can only focus on job elements that are clearly identifiable as drawbacks or advantages for all workers. Furthermore, huge biases can arise from the correlation of non-wage job aspects with unobserved characteristics². However, the problems of information, the costs of mobility and the market power of both individuals and firms influence the compensation mechanism between the wage and non-wage components of earnings and draws caution on grounding results on the assumption of a perfectly competitive market.

2.4 Non-compensating wage differentials

Another market based explanation views gender differentials as a result of non-compensating wage differentials that serve to reflect the changing conditions in the economy. If labor is scarce in particular occupation, then this should be reflected in a higher wage rate, whilst abundance of labor will drive the wages down. If the skills required for a particular occupation can be acquired quickly and easily then the supply of labor will be abundant. Low wages reflect therefore the abundance of supply relative to demand for this particular occupation.

Differences in wage rates between occupations therefore promote flexibility and help the economy to adapt to a changing pattern of consumer demand (Hutt, 1997, 136). The economy will adapt to a changing pattern of consumer demand by reallocating labor away from declining sectors of the economy. The market mechanism will allocate labor between competing uses and in this process wage differentials will narrow.

Non-compensating wage differentials should disappear if labor is sufficiently mobile between occupations. Occupational mobility is difficult to achieve due to: the fact that it takes time to acquire new skills and qualifications, many professions have entry barriers, and some workers may not have the necessary ability to acquire the qualifications for a certain profession. If there are barriers impeding the movement of labor between men's and women's jobs, then the labor market is effectively divided into two sections. Wage differentials cannot perform their allocative function redistributing labor between occupations. Men's higher earnings will persist if their occupation is one in which women find it difficult to move to.

2.5 Crowding

Bergmann's (1974) crowding model is based on the assumption that employers discriminate against women by excluding them from occupations considered men's work. This model does not assume discrimination against the individual but rather against certain types of occupations.

² Hwang et al (1992) show that biases depend on three variables: the heterogeneity in unobserved productivity, the percentage of earnings paid in non-wage form and the dispersion of the preferences of workers when it comes to trading off between remuneration in the form of wages and in other forms.

Given that the demand is limited in “male” occupations they are crowded in “female” occupations thereby increasing the supply and reducing their wage. This model predicts that those doing women’s work earn less than those doing men’s work, despite similar education qualifications, as a result of occupational segregation.

The result of occupational segregation is that the women dominated occupations are overcrowded, in the sense that the marginal productivity of labour is lower in that occupation and the total output could be increased by lowering employment in the female dominated occupations and shifting some labour to the other occupation (Bergmann 1975).

Crowding may occur because individuals prefer a particular occupation as utility maximizers or because employers behave in a way that excludes individuals from a certain type of occupation (Solberg and Laughlin, 1995). If this hypothesis is true, there should be a gap across occupations but no gap within occupations (Solberg and Laughlin, 1995)

This hypothesis has been tested by incorporating the proportion female in human capital earnings reduced form equation. Two levels of analysis of analysis have been used: occupational wage models or individual wage models (Sorensen, 1990). Other tests for this hypothesis had relied on occupational switchers using panel data models, however occupational changes in household panels is often spurious and there is a significant measurement bias which can hide effects.

3. Econometric model

Drawing on human capital theory and compensating wage differentials we include both individual and occupational characteristics in our model of wages. However, contrary to previous attempts which try to distinguish between types of occupational hazards and physical strength, our approach relies on cross-country variation. The assumption made to ensure identification is that at the same moment in time the characteristics that cause women to enter occupations are the same in every country. Therefore we implicitly assume that European countries are similar in terms of technological advances and tools used in an occupation, in other words that being a nurse in Czech Republic is going to be as difficult as being a nurse in Sweden. Further we assume that wages have different starting levels across countries as some countries are wealthier than others. We also assume that the relative position of occupational wages in the occupational structure is the same across European countries, in other words that nurses earn 22% less compared to computer professionals in every European country. These assumptions are verified by the data at hand as can be seen from Graph A1 and A2 in the annexes.

Wages in an occupation can be seen as being depending on both observable and unobservable (to the econometrist) characteristics as follows:

$$\ln W_{of} = \alpha_{of} + \sum \beta_{kf} x_{okf} + \delta FEM_{of} + \sum \lambda CNTRY_{of} + \sum \tau OCC_{of} + e_{of}$$

$$\ln W_{om} = \alpha_{om} + \sum \beta_{km} x_{okm} + \delta FEM_{om} + \sum \lambda CNTRY_{om} + \sum \tau OCC_{om} + e_{om}$$

W_o are the wages in profession O of gender j at time t,

α_o is a constant,

X_o are workers average observable characteristics in occupation O, such as average experience required in an occupation proxied by age, average education, tenure, density of union coverage, average part-time work in an occupation.

β_o are prices related to the remuneration of (observable) characteristics for gender j in occupation O. Prices can be time specific or not, gender specific or not.

FEM_o is the ratio of female total employment in the workers occupation

δ_o is the price related to remuneration of the composition of females in occupation O

$CNTRY_o$ are country dummies

OCC_o are occupational dummies which cover occupational characteristics such as hazards and characteristics of tasks such as physical strength

e_o are errors, including the effects of all unobservable characteristics of Occupation O on wages.

Since wages can be influenced by the occupational size as larger occupations are going to have more precise estimates than smaller size occupations we use a weighted least squares approach in our estimations. We weight female wages by the number of women in an occupation and male wages by the number of men in an occupation³. Occupational gender pay gaps are weighted by the total number of workers in that occupation.

4. Data

We use the European Structure of Earnings Survey (ESES) data for 2006 which is a comparative matched employer-employee survey carried on by national member states of the European Union. The data collection follows a common methodology which makes the comparative dimension very appealing and especially the common denomination of occupations that follows ISCO 88 classification. To our knowledge, to date only ILO data contains detailed occupational data for 161 occupations following a common classification system however this data contains different measurements and definitions of wages which are not comparable across countries. In addition the ILO dataset does not have information about the proportion of women in an occupation. Other researchers have tried to surmount the data problem by using national datasets and cross-checking with the European Labor Force Survey data⁴ (Grimshaw and Rubery, 1997).

The common methodology employed by the European Structure of Earnings makes international comparisons easier. The information is collected from the management of the establishments which makes it highly reliable. The information for the following countries is available for detailed 3 digits occupational level: Czech Republic, Hungary, Poland, Slovakia, Lithuania, Spain, Luxembourg, France, Norway and Sweden.

³ We also tried specifications using total occupational sizes but the results did not differ significantly when changing the weight.

⁴ European Labor Force survey uses a common classification system of occupations but lacks information about wages.

The fact that ESES is an employer survey means that individual effects are expected to be very small and that occupational and employer variation are expected to provide an explanation for the wage variation (Groschen, 1996)⁵. Hamermesh (2007) emphasizes that this effect could be due to the sampling design and how much information is available about workers and firms and how much variability there is in this information. His argument is that if we have very little information about workers but a lot about firms it will look like firms' characteristics matter a lot and workers' matter little. Previous papers using ESES data found exactly what Hamermesh predicted that the firm's characteristics and industry matter a lot for the gender pay gap (Ganon et al., 2007, Simon, 2008).

The data has the following strengths: large sample sizes, comparable methodology useful for international comparisons, detailed information about wage components and establishments, and high reliability.

There are two truncations in ESES data: the firm sizes smaller than 10 are missing (for France, Italy, Portugal and Sweden). The second truncation is the missing data on L sector of public administration and compulsory social security contributions (for Spain, France, Italy, Portugal, Norway, Luxembourg). The first truncation on small firms, could have an impact for the estimates of some countries particularly if more women are sorting into small firms. Schmitt and Lane (2009) provide an indication of the importance of small firms across European countries. Based on the figure below, this truncation is expected to be important especially for firms from Italy, Spain and Portugal. Evidence from ECHP seems to suggest that this would bias downward the estimate of gender pay gap for these countries (Dupuy, Fouarge and Buligescu, 2009). The second truncation on public administration sector could bias the estimates upwards. This is because those jobs are predominantly occupied by women and the gender pay gap is smaller in the public sector as wages are fixed for positions. In 2006, in Hungary this sector represented 26% of employees and for Czech Republic, this sector was about 13%, for Lithuania 8%, Poland 7%, and Slovakia 7%. We would expect that the effect would be quite big in Hungary as a large part of the population is employed in public administration. However, for analytical purposes excluding the public administration jobs should not matter that much as we still have information about public sector jobs such as nurses, doctors or teachers.

The data has been aggregated at ISCO level 3 digits level and represents occupational averages, the unit of analysis is the profession. We use aggregated data as we are not able to control for individual heterogeneity since we only have a cross-section available for 2006. Therefore to diminish the importance of individual heterogeneity we use aggregated data. The data retrieved occupational averages by gender and it offers a picture of European Union professions.

Table 1 provides descriptive statistics of the data used in the analysis. Wages are deflated by the exchange rate and transformed in Euros and they represent average hourly wages without

⁵ As Groschen (1996) notes using Current Population survey for the US, human capital characteristics are expected to explain about 25% of the variation, occupation 15%, gender race and union add about 4-7% and industry broadly defined would add another 6%. These figures might be different for European countries. And they are dependent on the level of disaggregation of the industry and occupation, the more disaggregated the data is the higher the impact expected to have.

overtime and shift work bonuses. Overall men earn significantly more than women do and this difference is statistically significant. On average women are 1 year older than men across occupations. The average employment of women in an occupation seems to be higher than the average employment of men, which could also be due to the fact that women are employed in fewer occupations compared to men. Men have a higher human capital for ISCED level 3-4 compared to women, however for ISCED level 5-6 this difference is not statistically significant. Contrary to expectations the average tenure of women in an occupation is higher than men's tenure over the European Union countries investigated. There are slightly more women covered by national agreements, by industrial agreements and by other agreements. There is no statically significant difference between men and women covered by enterprise agreements and individual agreements. On average there are more men not covered by union agreements than women. Women tend to work more in part-time jobs than men and because the part-timers are counted in the average hours worked women work on average fewer hours than men. When overtime is included we see that men also tend to work more hours overtime than women. Men tend to be overrepresented in smaller firm sizes compared to women and women tend to be overrepresented in larger firm sizes. We further try to see whether these associations hold by looking at the variation by proportion female within occupations.

Table 1. Descriptive statistics

	Men	Women	T test	P value
Logarithm of average wage	1.87	1.71	-25.03	0.00
Average employment in an occupation	1709	1948		
Age	31	32	7.44	0.00
ISCED 0-1	.057	.057	-2.27	0.02
ISCED 2	.140	.153	-5.94	0.00
ISCED 3-4	.479	.451	5.64	0.00
ISCED 5-6	.322	.338	-0.02	0.97
Tenure	7.02	7.39	6.07	0.00
National agreement coverage	.015	.019	-3.03	0.00
Industry agreements coverage	.209	.211	-3.27	0.00
Individual agreements coverage	.046	.046	0.92	0.35
Enterprise agreements coverage	.284	.287	-1.01	0.31
Local agreements coverage	.002	.003	-0.73	0.46
Other agreements coverage	.014	.011	2.55	0.01
No agreements coverage	.321	.316	3.46	0.00
Average Part-time	.07	.15	18.28	0.00
Average Private sector	.74	.70	6.61	0.00
Average Fixed contract	.127	.134	-1.33	0.18
Average actual Hours worked without overtime	163	159	14.57	0.00
Average actual Hours worked including overtime	166	161	16.81	0.00
Average Firm size 10-49	.266	.233	7.00	0.00
Average Firm size 50-249	.296	.288	1.97	0.04
Average Firm size 250-449	.103	.109	-2.45	0.01
Average Firm size 500-999	.097	.105	-3.44	0.00
Average Firm size >1000	.235	.264	-5.86	0.00
Average Percent women in employment	.420	.465		
N sample	889	837		

Note: occupational averages calculated from ESES 2006 data

Table 2 provides the means of variables by gender and occupational composition. As we can see from the table on average women earn less than men across occupation types except in women dominated professions when on average they earn more. Averages can hide important information, therefore we also provide evidence from kernel densities plots which show the distribution of wages. As seen in graph 1-4 Panel A, women have on average lower starting wages in both male and female dominated professions compared to men. Despite the fact that women have higher modal wages in mixed occupations, across the distribution more men earn higher wages compared to women in this type of professions. In female dominated professions, the difference between men and women is predominant at the tails of the distribution and not so much at the average. That is to say, that in female dominated professions women earn a lower starting wage compared to men and they earn a lower top wage compared to men. The differences between men and women remain consistent even when bonuses for shift work are taken into account and overtime bonuses (See Panel B graph 1-4). This suggests that glass ceilings and floor effects cannot be accounted for by access to fringe benefits. Therefore, this evidence does not offer support for the hypothesis that women have lower wages which are compensated for by access to fringe benefits. However, one must note that not all the fringe benefits are present in the ESES data, but the ones that are present are valuable as very few datasets collect information about the amount of fringe benefits.

Going back to table 2, we see that male dominated professions seem to require a lower level of educational attainment as the two highest frequencies are ISCED level of education 2 and ISCED level of education 3-4. Mixed and female dominated professions seem to require quite a high level of education, as more than 50% of men and women have ISCED level 3-4 or above. On average women have a higher tenure than men and interestingly mixed occupations have a lower tenure compared to female and male dominated professions. There is a higher proportion of non-coverage by unions in female dominated professions and the lowest non-coverage is in male dominated professions. The pattern of union density coverage looks quite similar for men and women. Therefore it seems that trade union power benefits more male dominated professions than female dominated ones. Across professions, women take up more part-time employment compared to men suggesting that household responsibilities are not equally shared. The incidence of part-time is higher particularly in female dominated professions and in mixed professions. Not surprisingly male dominated professions are more in the private sector whereas female dominated ones are more in the public sector. We see however a difference between men and women as less women work in the private sector across professions compared to men. Even for female dominated professions, around 55% of men are in the private sector compared to 48% of women. In terms of working hours, male dominated professions require more hours of work compared to mixed occupations and the lowest hours of work are in female dominated professions. Men work on average more hours and do more overtime hours compared to women across types of professions except in female professions where overtime hours is on average 2 hours for each gender.

Table 2. Means of selected variables by Gender composition

Variable	Value of proportion female				
	0-.25	.25-.50	.50-.75	.75-1.0	All
Means for women					

Logarithm of average wage	1.84	1.78	1.73	1.43	1.71
Average employment in an occupation	386	1032	2338	4734	1948
Age	32	32	32	32	32
ISCED 0-1	.097	.064	.034	.019	.057
ISCED 2	.235	.162	.109	.080	.153
ISCED 3-4	.472	.417	.386	.541	.451
ISCED 5-6	.194	.356	.469	.358	.338
Tenure	7.55	7.24	6.90	7.94	7.39
National agreement coverage	.010	.013	.023	.033	.019
Industry agreements coverage	.246	.239	.202	.138	.211
Individual agreements coverage	.066	.045	.046	.022	.046
Enterprise agreements coverage	.309	.286	.260	.292	.287
Local agreements coverage	.003	.004	.003	.002	.003
Other agreements coverage	.009	.008	.016	.012	.011
No agreements coverage	.211	.328	.358	.401	.316
Average Part-time	.110	.137	.180	.178	.15
Average Private sector	.824	.768	.679	.489	.70
Average Fixed contract	.138	.139	.139	.116	.134
Average actual Hours worked without overtime	161	159	157	156	159
Average actual Hours worked including overtime	164	161	159	158	161
Average Firm size 10-49	.192	.239	.255	.254	.233
Average Firm size 50-249	.274	.283	.295	.303	.288
Average Firm size 250-449	.129	.112	.099	.089	.109
Average Firm size 500-999	.127	.110	.093	.083	.105
Average Firm size >1000	.275	.254	.255	.269	.264
N sample	245	205	212	175	837

Means for men

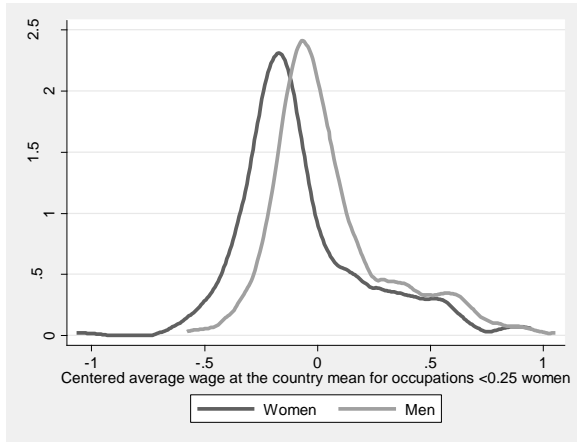
Logarithm of average wage	2.00	1.90	1.84	1.55	1.87
Average employment in an occupation	2469	1684	1330	754	1709
Age	32	32	31	31	31
ISCED 0-1	.090	.055	.037	.022	.057
ISCED 2	.203	.139	.098	.075	.140
ISCED 3-4	.542	.461	.392	.498	.479
ISCED 5-6	.163	.344	.471	.404	.322
Tenure	7.71	6.98	6.60	6.26	7.02
National agreement coverage	.004	.010	.021	.033	.015
Industry agreements coverage	.245	.224	.191	.141	.209
Individual agreements coverage	.058	.050	.043	.022	.046
Enterprise agreements coverage	.295	.283	.267	.288	.284
Local agreements coverage	.003	.002	.003	.001	.002
Other agreements coverage	.011	.012	.019	.014	.014
No agreements coverage	.241	.342	.363	.396	.321
Average Part-time	.033	.069	.102	.124	.07
Average Private sector	.849	.792	.695	.555	.74
Average Fixed contract	.111	.129	.132	.149	.127
Average actual Hours worked without overtime	166	163	161	158	163
Average actual Hours worked including overtime	170	166	163	160	166
Average Firm size 10-49	.274	.281	.263	.237	.266

Average Firm size 50-249	.292	.294	.3026	.300	.296
Average Firm size 250-449	.110	.107	.095	.092	.103
Average Firm size 500-999	.107	.096	.090	.092	.097
Average Firm size >1000	.214	.219	.249	.277	.235
N sample	313	205	212	159	889

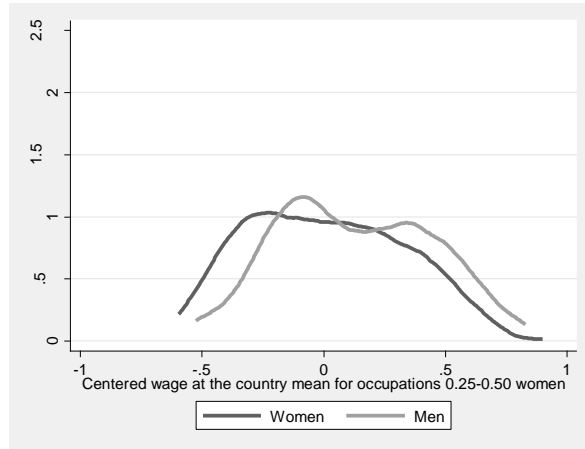
Note: occupational averages calculated from ESES 2006 data

PANEL A: AVERAGE OCCUPATIONAL WAGES CENTERED AT THE COUNTRY MEAN

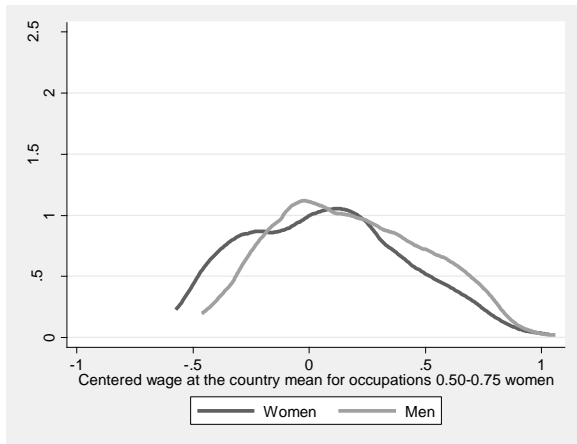
Graph 1. Kernel densities for Men and Women wages in male dominated occupations



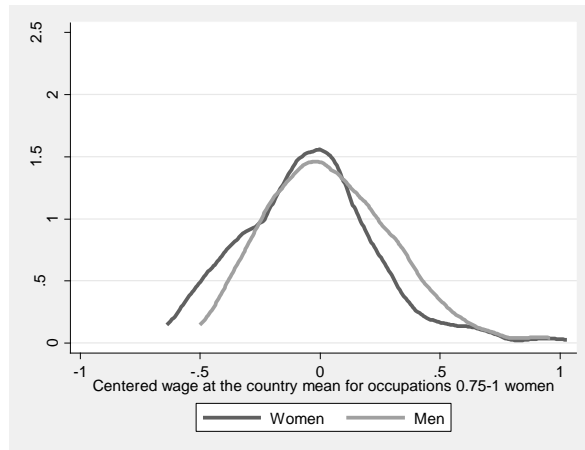
Graph 2. Kernel densities for Men and Women wages in moderately mixed occupations



Graph 3. Kernel densities in mixed occupations

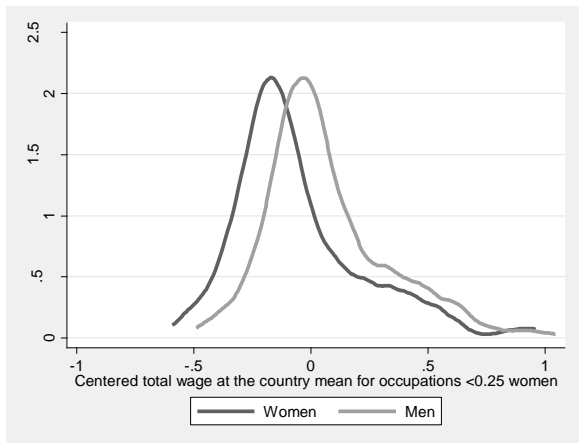


Graph 4. Kernel densities in female dominated occupations

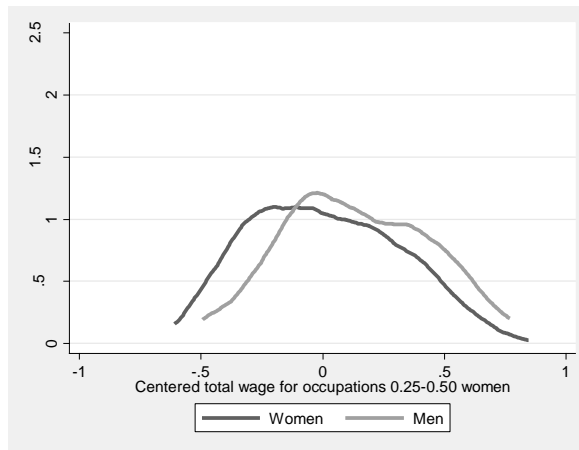


PANEL B: AVERAGE TOTAL OCCUPATIONAL WAGES INCLUDING OVERTIME AND SHIFT WORK BONUSES CENTERED AT THE COUNTRY MEAN

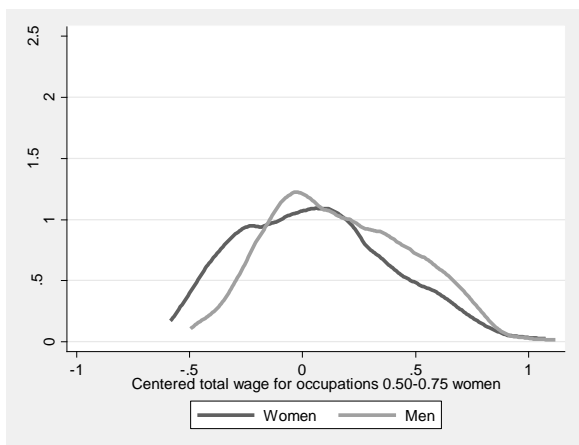
Graph 1. Kernel densities for Men and Women wages in male dominated occupations



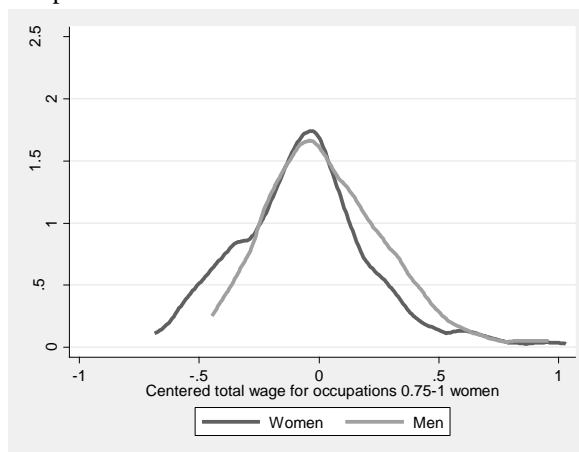
Graph 2. Kernel densities for Men and Women wages in moderately mixed occupations



Graph 3. Kernel densities in mixed occupations



Graph 4. Kernel densities in female dominated occupations



5. Results

We have three wage measures: female occupational average wages, male occupational average wages and the occupational gender pay gap which is a logarithmic ratio of female wages divided by male wages. Our results show that the relationship between the proportion of female in an occupation and occupational wages for men and women is non-linear. Further the results show that for men being employed in a female occupation yields the lowest returns whereas for

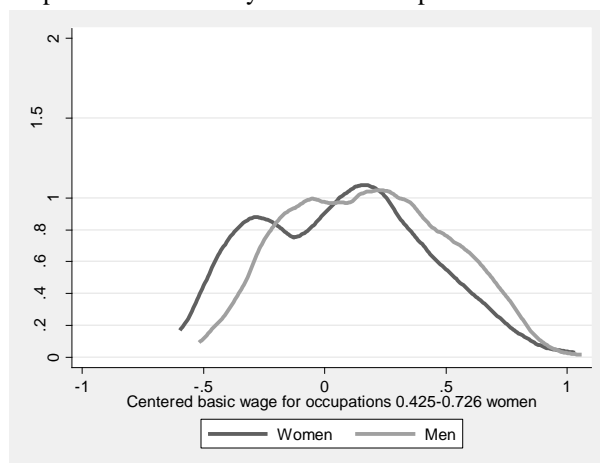
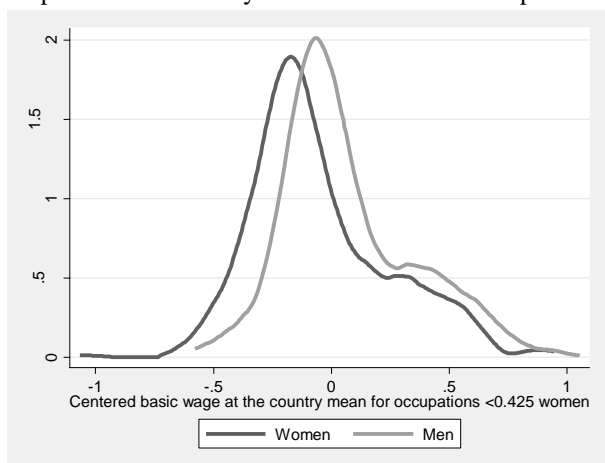
women being employed in a mixed occupation has the lowest returns. Our results also show that the gender pay gap seems to be driven by mixed occupations.

Following Baker and Fortin (2003) we define mixed occupations with respect to the average women labour force participation in the European Union as those occupations where the share of women employed is between 57.6-15 (42.5%) and 57.6+15 (72.6%). Panel C presents the distribution of the average occupational wages, basically for analysis purposes we have just one category of mixed occupations. The patterns follow closely the patterns described before in the descriptive section where we did not have a predefined reference standard for classifying occupations. Panel A3 in the Annex presents the same graphs for total wages including overtime and shift work and it shows that the difference between men and women is preserved and accentuated.

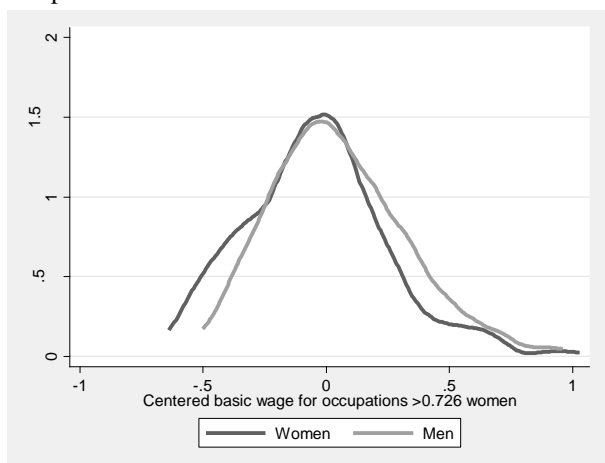
PANEL C. OCCUPATIONAL BASIC AVERAGE WAGES CENTERED AT THE COUNTRY MEAN AND USING THE CLASIFICATION WITH RESPECT TO EUROPEAN UNION LABOUR FORCE PARTICIPATION

Graph 1. Kernel density of male dominated occupations

Graph 2. Kernel density of mixed occupations



Graph 3. Kernel density of female dominated occupations



In the models in which we do not control for occupational characteristics, the proportion female on female wages and male wages has the higher impact in the middle of the distribution, that is for mixed occupations both men and women earn higher wages, with men earning relatively

more than women (See Panel D Graph 1 and 1, Panel F Graph 9 and 10). This specification implies that starting wages in each occupation are the same which is quite a tenuous assumption. We relax this assumption, by allowing for different starting wages in each occupation adding occupational dummies which capture all occupational characteristics. Keeping occupation constant, the non-linear relationship between percentage female and female and male occupational wages becomes inverted (See Panel D Graph 1 and Graph 2), with mixed occupations having lower wages for men, and female occupations having lower wages for women (See table 3F and 3M). When occupational dummies are added as controls, we see that female wages are lower than male wages across the distribution, the gender pay gap being larger in female occupations. However, part of these differences could be caused by human capital investment differences between men and women. We measure human capital as educational investment and experience, proxied by age and tenure. When we control for human capital investment, the effect of proportion female on female and male wages becomes rather similar in magnitude (Table 3F and Table 3M Model 2), however differences between men and women are quite wide for female dominated occupations (Panel D Graph 2 and 3). Controlling for human capital, men earn less than in male dominated occupations but significantly more than in mixed occupations (Panel D Graph 3). Controlling for human capital, women earn less than women working in mixed or male dominated occupations (Panel D Graph 3). When we control for the percent of women in part-time work and the percent of men in part-time work, we see that the penalty for the feminization of an occupation becomes larger for women and slightly larger for men suggesting that part time is well paid (Table 3F and 3M Model 3). Controlling for part-time, women's returns in male occupations seem to be higher than those of men, but the opposite is true for female dominated professions (Panel D Graph 4). When we control for the percent of women covered by bargaining agreements we see that trade union coverage increases the returns for occupations across the distribution, and particularly women in female occupations seem to be earning more now than in mixed occupations (Panel D Graph 5). Adding bargaining controls for men shifts also the returns across occupational types up, suggesting that men covered also earn more (Panel D Graph 5). The bargaining institutions manage to make the differences between men and women working in female occupations smaller in magnitude compared to models which did not include these variables. Once we control for union coverage for both men and women, mixed occupations are the ones with lower returns and the gender pay gap seems to be larger for male or female occupations (Panel D Graph 5). However, one should also notice that in female and male occupations the variance is higher as there are few males in that occupation and few females in that occupation respectively.

Table 4 shows that the gender pay gap ratio is driven by mixed occupations. Women in mixed occupations earn lower wages than men and the results do not change even if we add more controls. On average women are paid less than men, across the occupational spectrum. This result confirms Baker and Fortin (2003) hypothesis that it is actually mixed occupations that are driving occupational gender pay gaps. Possible explanations could be that women are paid lower than men in mixed occupations because they get less promoted, or that they have more career interruptions, or that women face higher discriminatory practices in mixed occupations.

Table 3F. The effect of proportion female on female wages controlling for country and occupational dummies

Basic women wages				
Model 1	Model 2	Model 3	Model 4	Model 5

Percentage women	-0.306	-0.402**	-0.663***	-0.665***	-0.685***
Sd. Err	(0.207)	(0.201)	(0.210)	(0.203)	(0.200)
Percentage women square	0.070	0.209	0.373**	0.441***	0.499***
Sd. Err	(0.160)	(0.155)	(0.160)	(0.154)	(0.152)
Country dummies	YES	YES	YES	YES	YES
Occupation dummies	YES	YES	YES	YES	YES
Human capital variables		YES	YES	YES	YES
Part-time dummy			YES	YES	YES
Union density dummies				YES	YES
Occupation size					YES
R square	0.980	0.982	0.982	0.984	0.984
N	837	837	837	837	837
Local Minimum	0.22	0.25	0.56	0.66	0.72
EU 25 Women Labor Force Participation	57.6	57.6	57.6	57.6	57.6

Notes: Reference categories are: Czech Republic, computer professionals, ISCED 5-6 level of education, not covered by bargaining agreements. Human capital variables include: age -40-tenure, tenure, ISCED 0-1, ISCED 2, ISCED 3-4 educational categories. Bargaining coverage includes: national, industry, enterprise, local, individual and other agreements. Occupational dummies are defined at ISCO 3 digits level and per country are 108 occupations observed.

Table 3M. The effect of proportion female on male wages controlling for country and occupational dummies

	Basic male wages				
	Model 1	Model 2	Model 3	Model 4	Model 5
Percentage women	-0.450***	-0.422***	-0.453***	-0.436***	-0.431***
Sd. Err	(0.110)	(0.106)	(0.107)	(0.105)	(0.105)
Percentage women square	0.352***	0.376***	0.408***	0.403***	0.413***
Sd. Err	(0.118)	(0.113)	(0.114)	(0.113)	(0.113)
Country dummies	YES	YES	YES	YES	YES
Occupation dummies	YES	YES	YES	YES	YES
Human capital variables		YES	YES	YES	YES
Part-time dummy			YES	YES	YES
Union density dummies				YES	YES
Occupation size					YES
R square	0.986	0.988	0.988	0.988	0.988
N	889	889	889	889	889
Local Minimum	0.78	0.89	0.9	0.92	0.95
EU 25 Male Labor Force Participation	72.1	72.1	72.1	72.1	72.1

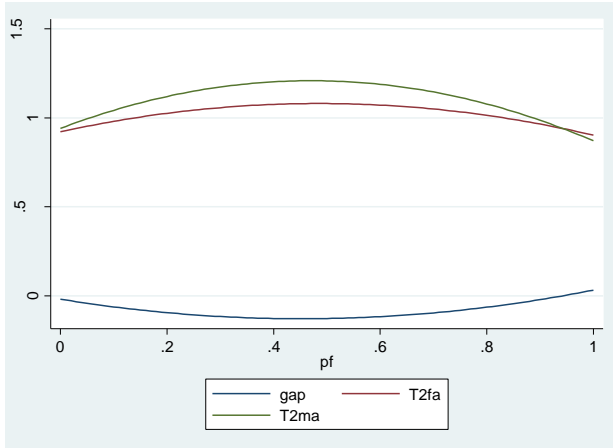
Notes: Reference categories are: Czech Republic, computer professionals, ISCED 5-6 level of education, not covered by bargaining agreements. Human capital variables include: age -40-tenure, tenure, ISCED 0-1, ISCED 2, ISCED 3-4 educational categories. Bargaining coverage includes: national, industry, enterprise, local, individual and other agreements. Occupational dummies are defined at ISCO 3 digits level and per country are 108 occupations observed.

PANEL D. THE EFFECT OF OCCUPATIONAL SEGREGATION ON MALE DOMINATED, MIXED NAD FEMALE DOMINATED PROFESSIONS UNDER DIFFERENT SPECIFICATIONS

Graph 1. The effect of proportion female on female wages, male wages and gender pay gap without

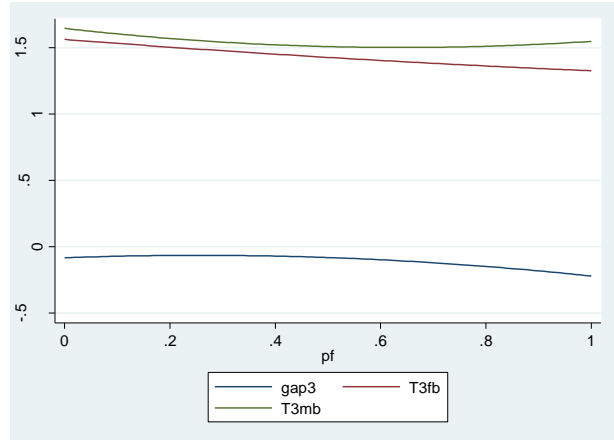
Graph2. The effect of proportion female on female wages, male wages and gender pay gap with

occupational controls

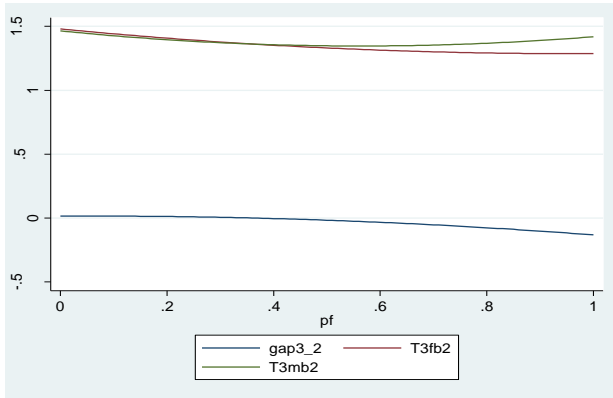


Graph3. The effect of proportion female on female wages, male wages and gender pay gap with occupational and human capital controls

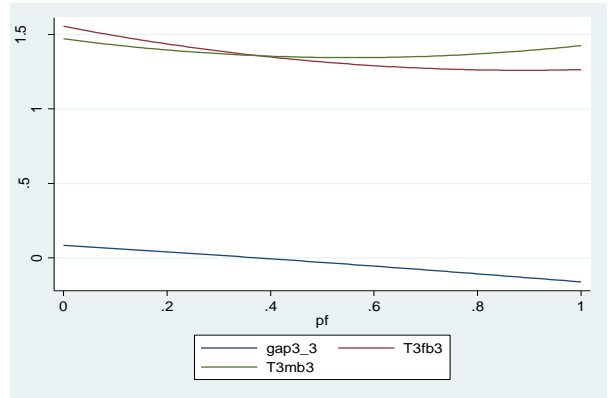
occupational controls



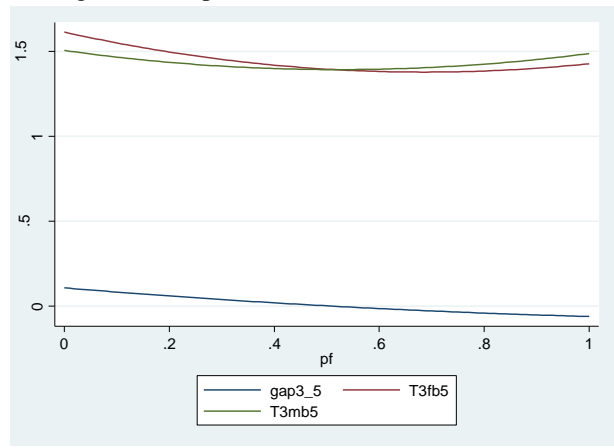
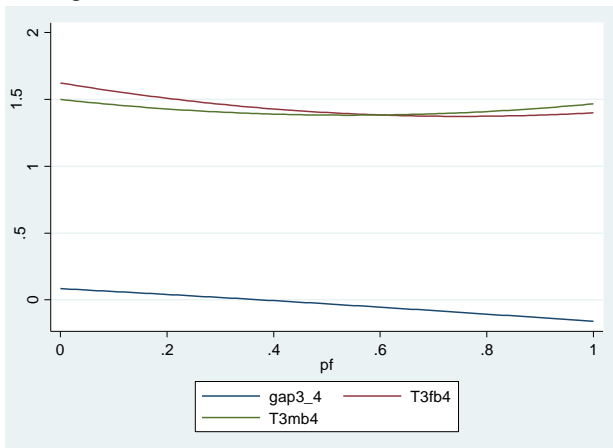
Graph 4. The effect of proportion female on female wages, male wages and gender pay gap with occupational and human capital and part-time controls



Graph 5. The effect of proportion female on female wages, male wages and gender pay gap with occupational, human capital, part-time and bargaining coverage controls

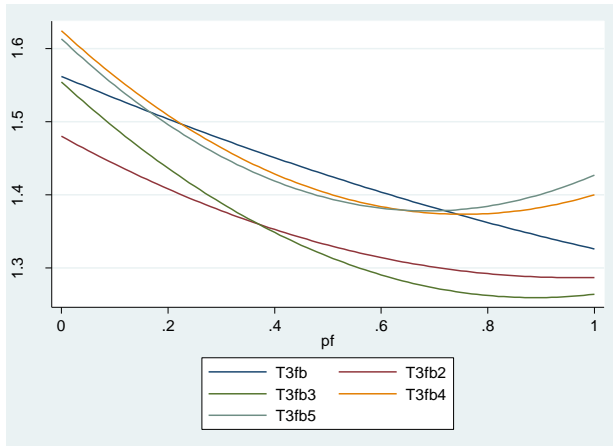


Graph 6. The effect of proportion female on female wages, male wages and gender pay gap with occupational, human capital, part-time, bargaining coverage and occupational size controls

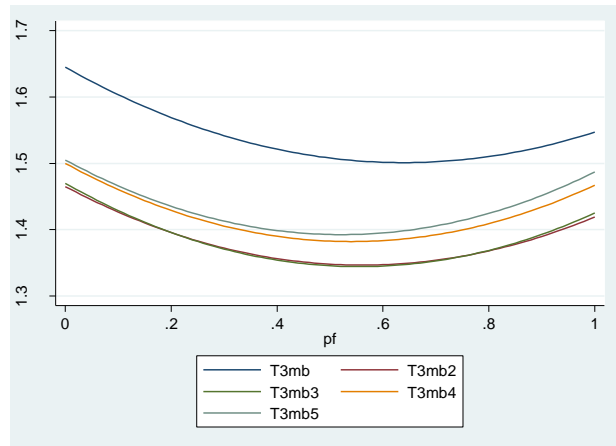


PANEL E. THE EFFECT OF ADDING VARIABLES ON FEMALE AND MALE WAGES CONTROLLING FOR OCCUPATION AND COUNTRY EFFECTS

Graph 7. The effect of proportion female on female wages with occupational, human capital, part-time, bargaining coverage and occupational size controls

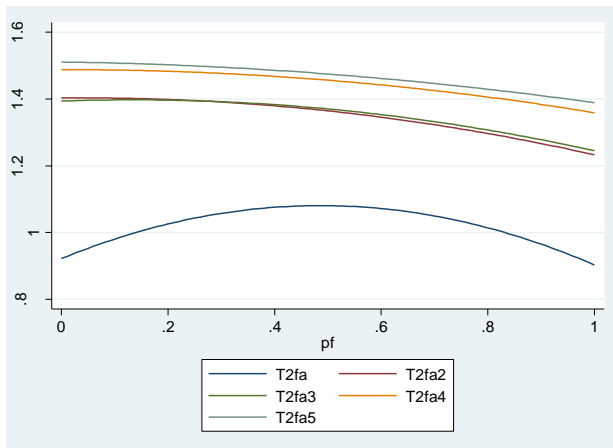


Graph 8. The effect of proportion female on male wages with occupational, human capital, part-time, bargaining coverage and occupational size controls



PANEL F. THE EFFECT OF ADDING VARIABLES ON FEMALE AND MALE WAGES CONTROLLING ONLY FOR COUNTRY EFFECTS WITHOUT OCCUPATIONAL DUMMIES CONTROLS

Graph 9. The effect of proportion female on female wages with all other controls except occupational dummies



Graph 10. The effect of proportion female on male wages with all other controls except occupational dummies

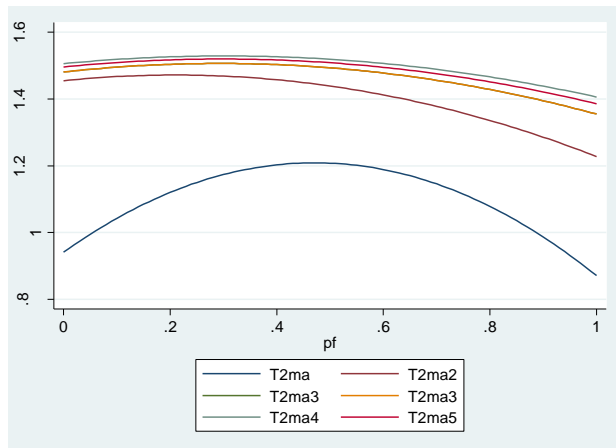


Table 4. The effect of proportion female on gender pay gap ratio controlling for country and occupational dummies

	Gap basic wages				
	Model 1	Model 3	Model 4	Model 5	Model 6
Percentage women	-0.228***	-0.264***	-0.252***	-0.212**	-0.208**
Sd. Err	(0.079)	(0.087)	(0.082)	(0.083)	(0.083)
Percentage women square	0.135*	0.159**	0.132*	0.100	0.100
Sd. Err	(0.069)	(0.079)	(0.073)	(0.073)	(0.073)
Country dummies	YES	YES	YES	YES	YES
Occupation dummies	YES	YES	YES	YES	YES
Human capital variables		YES	YES	YES	YES
Part-time dummy			YES	YES	YES
Union density dummies				YES	YES
Occupation size					YES
R square	0.638	0.692	0.672	0.685	0.686
N	821	821	821	821	821
Local minimum	0.59	0.6	0.52	0.47	0.48

Notes: Reference categories are: Czech Republic, computer professionals, ISCED 5-6 level of education, not covered by bargaining agreements. Human capital variables include: age -40-tenure, tenure, ISCED 0-1, ISCED 2, ISCED 3-4 educational categories. Bargaining coverage includes: national, industry, enterprise, local, individual and other agreements. Occupational dummies are defined at ISCO 3 digits level and per country are 108 occupations observed.

6. Conclusion

The focus of this paper is on whether female occupations have lower returns and whether these returns are driving the gender pay gap. Previous papers suggest that both men and women earn less in female occupations. However this evidence is country specific and little has been done to see if the same holds true for the European Union. Our additions to the literature are two folded: we suggest a new way to test the relationship by relying on cross-country variation and second we use European data.

We use the European Structure of Earnings data for 2006 to retrieve occupational wages at a detailed three digits level and we use the grouped data in a weighted least square estimation. We assume that the relative position of occupational wages in the occupational structure is the same across European countries and that being employed in a certain occupation implies the same tasks in each country. Based on this assumptions we are able to identify the effect of the proportion female on female and male occupational wages exploring the cross-country variation.

Our results show that the relationship between the proportion of female in an occupation and occupational average wages for men and women is non-linear. Most of the literature emphasizes a negative effect of the composition of wages on male and female wages. However, Perales (2010) finds also a non-linear relationship using the British Household Panel Survey augmented with Labour Force Survey and 2006 Skills Survey. His estimations show an inverted U

relationship similar to the one we find when we do not control for occupational characteristics. When we fully control for all occupational characteristics by adding occupational dummies we show that there is a U relationship between occupational segregation and occupational wages. This finding is new in the literature.

Further our results show that for men being employed in a female occupation yields the lowest returns whereas for women being employed in a mixed occupation has the lowest returns. Contrary to Canadian findings where controlling for occupational characteristics drives the penalty for women professions estimates to zero, our estimates show that once we control for all occupational characteristics it is actually mixed occupations that have the lowest returns for women in the European Union. This result could be interpreted as further evidence that female occupations do not always have lower returns. In the European context it is the mixed occupations that hold the lowest returns for women. Possible mechanisms might imply the fact that in mixed occupations men and women compete against each other and that men are promoted more by firms. Therefore our results show that the gender pay gap seems to be driven by mixed occupations. This result is in line with Canadian research findings (Baker and Fortin 2003). However, further work is necessary to establish whether the aggregate relationship holds at individual level and to explore the reasons behind these findings.

References

- Anker, R., (1998), *Gender and Jobs. Sex Segregation in the world*, ILO
- Arrow, K.,J., (1973), “The theory of discrimination”, in *Discrimination in labour markets* ed. O. Ashenfelter and A Rees, Princeton, N.J., Princeton University Press, pp. 3-33.
- Baker, M. and N. M. Fortin, (2001), “Occupational Gender Composition and Wages in Canada, 1987-1988”, *The Canadian Journal of Economics*, vol. 34, no. 2, pp. 345-376
- Becker, G., S, (1957), *The economics of discrimination*, University of Chicago Press, pp. 178.
- Blackburn, R., Jarman, B. and B. Bradely, (2000), “The puzzle of gender segregation and inequality: a cross-national analysis”, *European Social Review*, vol. 16, no.2, pp. 119-135
- Blinder, A., S., (1973), “Wage discrimination: reduced form and structural estimates”, *Journal of Human Resources*, 8(4), p.436– 455
- Blau F., and M. Ferber, (1990), “Career expectations of young women and men: The earnings gap and labor force participation”, *Journal of Human Resources*, vol. 26, no. 4, pp. 581-607
- Blau, F. and L. M. Kahn, (1996), “International differences in male wage inequality: Institutions versus market forces”, *Journal of Political Economy*, vol. 104, no.4, p. 791-837

Blau, F. and L. M. Kahn, (2003), "Understanding International Differences in the Gender Pay Gap", *Journal of Labor Economics*, vol. 21 no. 1, p.106-144

Brown, R. S., Moon M. and B.S. Zoloth, (1980), "Incorporating occupational attainment in studies of male-female earnings differentials", *Journal of Human Resources*, vol. 15, no.1, pp.3-28

Corcoran, M., G.J. Duncan, and M. Ponza., (1984), *Work experience, job segregation, and wages*, Washington, D.C.: National Academy Press.

Data Gupta, (1993), "Probabilities of Job Choice and Employer Selection and Male-Female Occupational Differences," *American Economic Review Papers and Proceedings*, vol. 83, no. 2, pp. 57-61

Dolton, P. J., and M.P Kidd, (1994), "Occupational access and wage discrimination", *Oxford Bulletin of Economics and Statistics*, vol. 56, no. 4, p.457-474

Dupuy, A, Fourage, D., and B. Buligescu, (2009), "Development of econometric methods to evaluate the Gender Pay Gap using the European Structure of Earnings Data", Eurostat publication

England, P., (1982), "The Failure of Human Capital Theory to Explain Occupational Sex Segregation.", *Journal of Human Resources*, vol. 18, pp. 358-70

Freeman, R., and R. H. Oostendorp (2000), "Wages around the world: Pay across occupations and countries", NBER WP, 8058.

Gannon B., Plasman R., Rynex F., and I. Tojerow, (2007), "Inter-Industry Wage differentials and the Gender Wage Gap: Evidence from European Countries", *The Economic and Social Review*, vol. 38, no. 1, pp.135-155

Gorlich, D., and A. de Grip (2009), "Human capital depreciation during family-related career interruptions in male and female occupations, *Oxford Economic Papers*, vol. 61, pp. i98-i121.

Grimshaw D., and J. Rubery, (1997), "The Concentration of Women's Employment and the Relative Occupational Pay. A statistical Framework for analysis", OECD, vol. 26, pp.1-94

Hamermesh, D., S., (2008), "Fun with Matched Firm-Employee Data: Progress and Road Maps", *Labour Economics*, pp.1-25.

Kidd M., and M. Shannon, (2001) "Convergence in the Gender Wage Gap in Australia over the 1980s: Identifying the Role of Counteracting Forces via the Juhn, Murphy and Pierce Decomposition," *Applied Economics*, vol. 33, no. 7, pp. 929-36

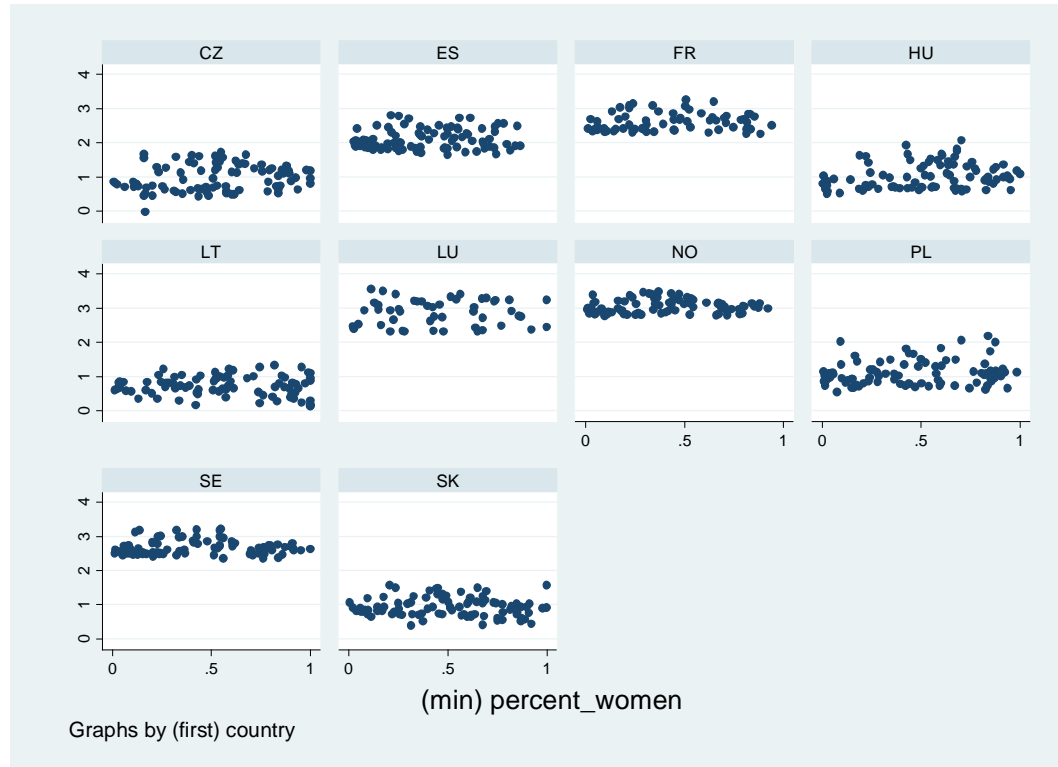
Killingsworth, M.R., (1990), "The economics of comparable worth", Kalamazoo, MI:Upjohn Institute for Employment Research

- Kim, M-K, Polachek, S.,W., (1994), “Panel estimates of male–female earnings functions”, *Journal of Human Resources*, vol. 29, no.2, p. 406–428
- Kunze, A., (2000), “The Determination of Wages and the Gender Wage Gap: A Survey”, *IZA DP.*, 193, p. 1-67
- Kunze, A., (2008), “Gender wage gap studies: consistency and decomposition”, *Empirical Economics*, vol. 35, no.1, pp. 63-76
- Miller, P., (1994), “Occupational segregation and wages in Australia”, *Economics Letters*, vol. 45, no.3, pp. 367-371
- Mouw, T., (2001), “Occupational segregation and the Gender Wage Gap Revisited: The problem of attenuation bias due to occupation coding errors”, *American Sociological Association Papers and Proceedings*, pp. 1-13
- McPherson, D.A., and B. T. Hirsch (1995), “Wages and Gender Composition: Why Do Women’s Jobs Pay Less?”, *Journal of Labor Economics*, vol. 13, no. 3, pp. 426-471
- Oostendorp, R., (2004) “Globalization and the gender wage gap”, Amsterdam Institute for Development, Mimeo.
- Perales, F., (2010), “Occupational feminization, Specialized Human Capital and Wages: Evidence from the British Labour Market”, *ISER Working Paper Series*, No.2010-31, pp. 1-48
- Plassman R. and S. Sissoko, (2004), “Comparing Apples with Oranges: Revisiting the Gender Wage Gap in an International Perspective”, *IZA DP*, 1449
- Phelps, E., S., (1972), "The Statistical Theory of Racism and Sexism". *American Economic Review*, vol. 62, pp. 659–661.
- Polachek, S.W., (1981) “Occupational self-selection: a human capital approach to sex differences in occupational structure”, *The Review of Economics and Statistics* , vol. 63, no.1, pp. 60–69
- Rosen, Sherwin, 1974. "Hedonic Prices and Implicit Markets: Product differentiation in Pure Competition”, *Journal of Political Economy*, University of Chicago Press, vol. 82, issue 1, pp. 34-55.
- Sorensen, E., (1990), “The Crowding hypothesis and comparable worth”, *Journal of Human Resources*, vol. 25, no.1, pp.55-89

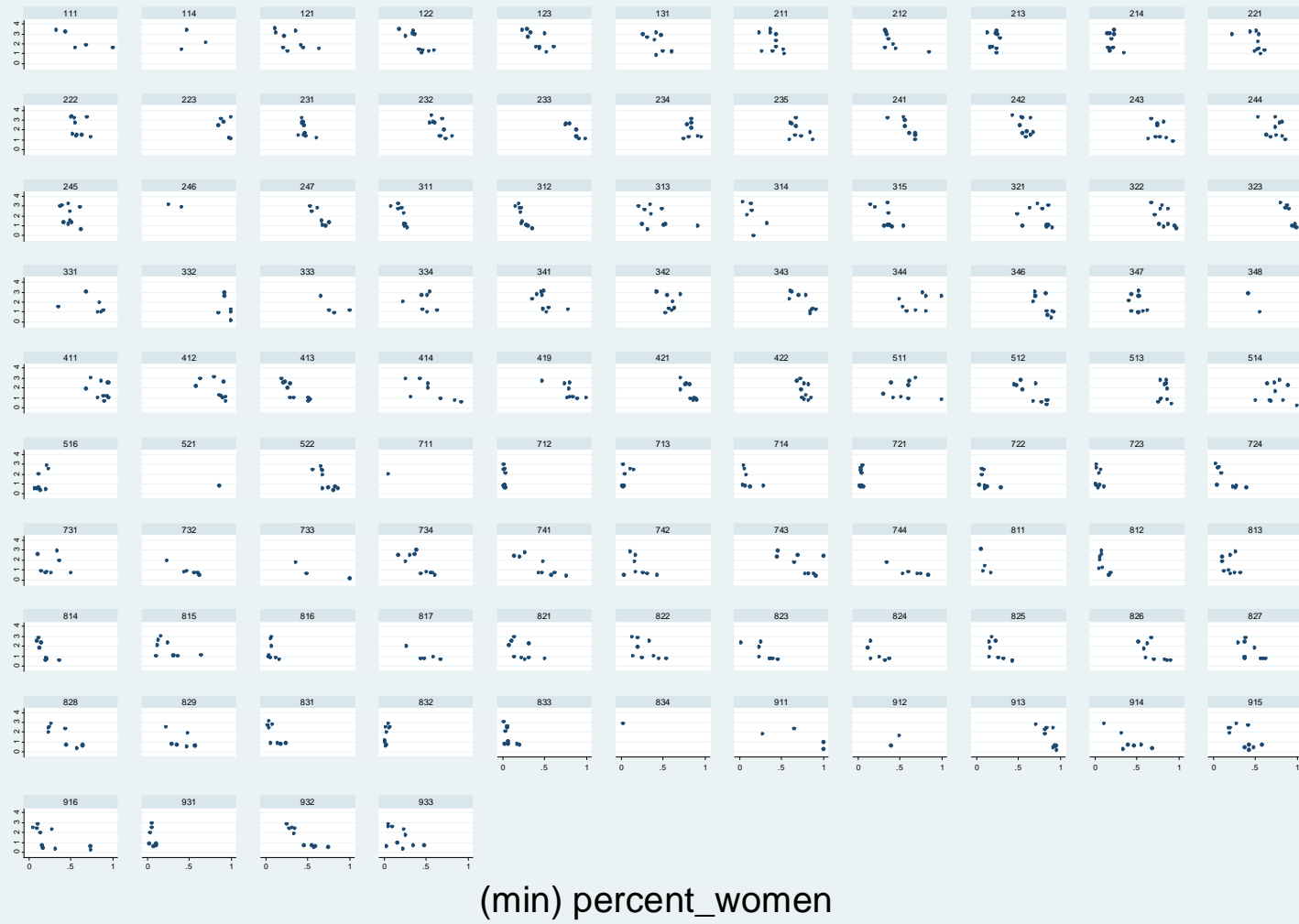
Annexes

Graph A1 shows considerable variability between countries suggesting that different country intercepts are needed in the model. Graph A2 shows that the shape of the relationship between wages and proportion female is negative for each occupation therefore we can assume that there is a different intercept for each occupation but that the slope is the same.

Graph A1. Occupational female wages and percent female by country



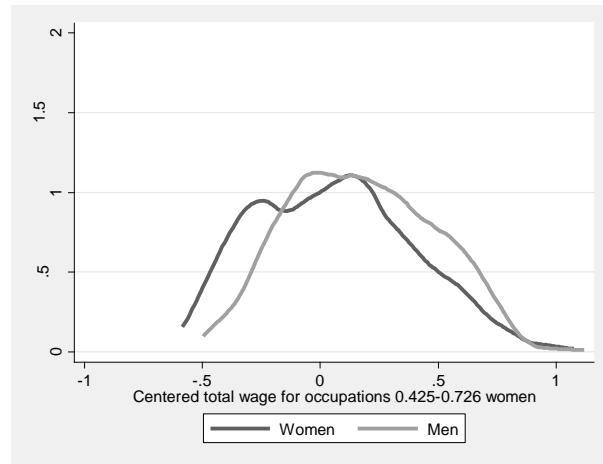
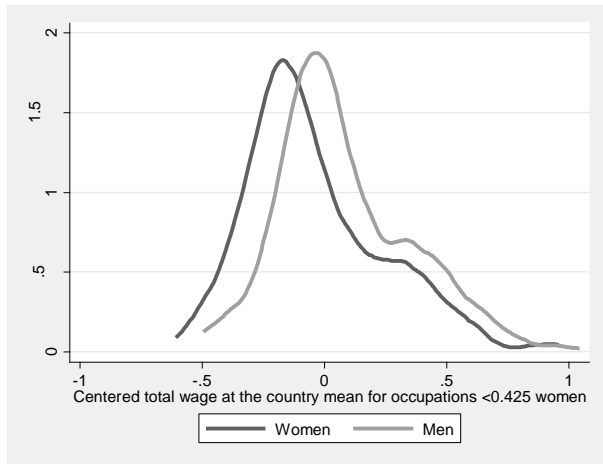
Graph A2.



Graphs by occupation_isco3

PANEL A3. OCCUPATIONAL TOTAL WAGES CENTERED AT THE COUNTRY MEAN AND USING THE CLASSIFICATION WITH RESPECT TO EUROPEAN UNION LABOUR FORCE PARTICIPATION

Graph 1. Kernel density of male dominated occupations Graph 2. Kernel density of mixed occupations



Graph 3. Kernel density of female dominated occupations

