**The Why of More or Less:**
**Evidence from Spain on Gender Segregation at the Establishment Level of the Firm***

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**Abstract To:**


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*This paper examines the determinants of gender composition at the establishment level of the firm. Motivation for this examination is two-fold. First, an increasing concern of policymakers about the gender biased labour market outcomes. Second, the well-known stylized fact that in many dimensions {occupation, industry and establishment} the proportion of women has a tendency to widen the gender wage gap. While much is known world-wide about the gender wage gap effects, little evidence exists about why we observe the gender biased employment outcomes. This paper will contribute to this understanding using a new matched worker-establishment data set (Wage Discrimination and Job Characteristics Survey, 2002) from Spain to identify regularities in the gender composition across 460 private sector establishments.*

*To accomplish our goal we use as our measure of gender composition in the establishment the proportion of females among full-time employees, which is the standard measure used in the wage gap literature. We show that this distribution is positively skewed with an average proportion of females of 0.26 that is six points larger than the median and argued this distribution is characterised by a high degree of gender segregation. To examine the validity of factors that can explain this distribution we use both unconditional and conditional (Two-Limit Tobit) forms of analysis.*

*Not surprisingly we find that the industrial structure is an important determinant in the way most researchers would expect but also that regional-cultural differences' within Spain play no role in this distribution. There is strong evidence presented that human capital investment by the establishment has the effect of reducing the proportion of females in the establishment. This is consistent with the theory of human capital in the context of lower labour force attachment by women relative to males. The evidence also suggests that establishments that are more dynamic in their decision-making in other dimensions have significantly more females in their establishment. Taken together we argue that this evidence is strongly suggesting that both supply and demand for labour aspects must be considered in formulating policy in this area. (JEL: J16, J71, J78)*

*While one of the main objectives of the Lisbon agenda is to increase the employment rate of women, gender segregation remains a structural problem in the labour market. Gender segregation has a negative effect on labour market functioning, by excluding many well suited and skilled people from working in sectors and occupations where they could be more productive. Reducing segregation could help address other problems on the labour market, such as bottlenecks and the gender pay gap.*

European Economic and Social Committee (2003: 52)

## Section I: Introduction

As this quote illustrates there is a concern among policymakers about the negative effects in the labour market that segregation of women into certain occupations and industries is having. They point to the problems of labour supply deficiencies in certain markets and the, not unrelated, potential for widening the gap in wages between males and females (Sattinger 1996). The widening effect on the gender wage gap of occupational, industry and establishment gender segregation is well documented (Bayard, Hellerstein, Neumark and Troske 2003; Amuedo-Dorantes and De la Rica 2005).[1] What is not so well understood is why we observe these gender distributions across occupation, industry and establishment. While discrimination in the labour market is an obvious explanation, it is not the only one. The conditions under which individuals enter the labour market and the demand for labour can be part of the explanation of these gender distributions. These alternatives suggest different mechanisms for the gender distribution we observe that are not mutually exclusive explanations to the standard labour market discrimination hypothesis.[2] Understanding the factors that are generating these distributions is important information policymakers need to develop effective policy if the goal is to alter the observed outcomes. The purpose of this paper is to contribute to this understanding by examining the determinants of gender composition at the establishment level using a sample of Spanish establishments from the year 2002.

The European Union's (EU) concern about gender segregation is in part generated by Article 3 of the European Community Treaty which states that an aim of the EU is to promote equality between men and women (European Union, 2000: 26). Further, Article 141 makes it explicit that men and women should receive equal treatment and opportunities in the labour market. These treaty obligations require EU directives to develop the mechanisms for

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[1] Wages are not the only area of interest in the gender segregation literature in that characteristics of jobs can differ across males and females. We will not pursue this gender differential literature in this paper but see Sloane, Grazier and Jones (2005) for a review of this aspect of the problem.

[2] See Reilly and Wirjanto (1999b) for a detailed discussion of this point.

enforcement. The implementation of the equal treatment principle at the European Union level was made operational in a 1976 directive (76/207/ECC) and amended in September 2002 by Directive 2002/73/EC, this latter directive came into force in October 2005. These directives require member countries of the EU to eliminate all laws and regulations that are deemed to offend the equal treatment principle.

At this point in time the EU has no positive discrimination legislation to increase female employment opportunities but is concentrating on policies that alter constraints women face (e.g. childbirth-maternity leave).[3] As part of the Amsterdam Treaty (Declaration 28, October 1997) it was agreed that member countries should implement measures to make it easier for women to participate in the labour market and to set targets to measure progress. The Lisbon European Council (March 2000) set the objective that the female employment rate in the Union should rise to 70 percent by the year 2010 in member countries (European Economic and Social Committee, 2000: 2). The target was reduced to 60 percent in 2003 (Council of the European Union 2005: 3) and the change in part reflects the wide gap between the target and existing employment rates.[4] While setting an economy-wide a target employment rate is an important indicator of the state of equal treatment for men and women in the labour market, it does not address the distributional problems, as the quote acknowledges. If opportunities for women are limited due to segregation effects it will be harder to achieve the aggregate target. It is important to understand the operation of the labour market if effective policy is to be developed to address the distributional problems and achieve the female employment rate target of the EU in countries such as Spain.

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[3] Although it is permissible under Article 141(4) to introduce measures of positive discrimination to achieve the goal of addressing past inequalities (Simon 2004; Employment and Social Affairs 2005) so far the EU has not implemented directives in this area. However, recently the Spanish government has proposed a law which would allow that unions and employers to establish in their collective agreements positive discrimination measures and in the conclusion we will return to this proposal. Other governments in the world have taken a more pro-active position in this area. In particular the United States government since the mid-60's after the passage of the Equal Rights Act and enactment of Executive Order 1450 which mandates a limited programme of affirmative action for federal government contractors has seen an increase focus on gender outcomes in the labour market. See Blau, Ferber and Winkler (2002: 243-246) for a review of these initiatives and the academic debate on their effectiveness. See Reilly and Wirjanto (1999b) or Simon (2004) for a discussion of the Canadian case in terms of affirmative action. Gunderson (1989) provides a comprehensive discussion of the potential policy responses in this area.

[4] As of 2002 even the most advanced economies in the EU did not meet this target:

**Selected EU Country Employment Rate, Age 15 and Over by Gender**

|  | Spain | | United Kingdom | | Denmark | |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Males** | **Females** | **Males** | **Females** | **Males** | **Females** |
| **2002 Quarter 4** | 60.6 | 35.0 | 66.9 | 52.5 | 68.0 | 57 |

*Source: EUROSTAT*

While restricting the sample to prime-age individuals (age 25-54) does improve these ratios countries like Spain, the focus of this paper, remain below the target.

The gender distribution problem that has received the most attention in the literature is occupational gender segregation in the labour market. The theoretical argument is that women are crowded into a few select occupations, driving down the wages therein and increasing the gender wage gap (Bergmann 1974).[5] Beginning with Johnson and Solon (1986), many studies have found a significant negative effect on wages of female-dominated occupations. Further, the effect on male wages is significantly smaller than the effect observed on the wages of females which implies that occupational segregation has the effect of increasing the gender wage gap.[6] Recently, other dimensions of gender segregation have been examined and in particular in the early 1990's it began to be documented that gender segregation at the establishment level had a similar effect of increasing the gender wage gap as occupational segregation (Groshen 1991; Carrington and Troske 1995, 1998b; Reilly and Wirjanto 1999a, 1999b).[7] For example, Reilly and Wirjanto (1999b) report that for a Canadian sample from the late 1970's establishment gender segregation widened the wage gap by 11 percent. Broadly similar effects of establishment gender segregation are found using data from the United States.

A concern with the early establishment segregation literature is that the establishment effect being measured is just a proxy for the occupational segregation effect. The occupational structure of the establishment determines the gender distribution observed. Establishment segregation is just measuring the occupational segregation effect generated by the different occupational mixes across the establishments. All the early studies attempted to control for this through a combination of industry and occupation dummy variables and/or looking at the gender wage gap in narrowly defined industries. The industry-specific studies (e.g. Groshen 1991, who used US industry wage surveys) in which there is a high probability of a common occupational structure lessens the likelihood of confusing occupation and establishment segregation. However, the failure in these studies to control explicitly for both occupational and establishment segregation makes the occupational explanation of the establishment effect plausible. The latest generation of studies, that use large matched worker-employer data sets

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[5] You can also use Becker's (1971) model of employee discrimination; however, while this perspective predicts occupational gender segregation it also predicts that there should have no effect on the gender wage gap, which is a counter-factual prediction. See Arrow (1985a; 1985b) for judicious commentaries on the Economics view of the discrimination problem and Gunderson (2006) for recent discussion of the wage gap evidence and discrimination theory.

[6] See Sorensen (1994, Chapter 2) for a review of the numbers and Baker, Benjamin, Desauliners, and Grant (1995), Macpherson and Hirsch (1995) and Baker and Fortin (2000) for recent North American studies. For the most recent European study see Plasman and Sissoko (2004).

[7] See Reilly and Wirjanto (1999a) for a discussion of the theoretical basis of this effect in the context of an employer discrimination model of the labour market.

(e.g. Bayard, et al 2003; Amuedo-Dorantes and De la Rica 2005), suggest this is not a serious problem. These studies control simultaneously for occupation, industry and establishment segregation effects on wages. In this context if establishment segregation is just a proxy for occupation segregation then it will have no effect on the gender wage gap. The conclusion of these new studies is that establishment gender segregation has an effect on the gender wage gap that is independent of occupation and industry segregation. The Amuedo-Dorantes and De la Rica (2005) paper is important for our study in that they are using data for Spain (the 1995 and 2002 Spanish Wage Surveys) and found establishment gender segregation accounts for between 13 and 20 percent of the gender wage gap, independent of the other segregation effects. The gender distribution across establishments does have the effect of widening the gender wage gap. This, like the policy argument above, suggests that we need to understand this distribution if we are to develop effective policies to mitigate the perceived negatives effects these distributional outcomes have on the labour market.

To accomplish this we will in the next section describe the data set we use, the 2002 Wage Discrimination and Job Characteristics Survey (ISOS) from Spain. Our sample has 460 private sector establishments is from the three largest regions, in population terms, of Spain (Andalusia, Catalonia and Madrid). The measure of the gender composition we use is the proportion of females who are employed full-time in the establishment, which is the same measure of segregation utilized in the gender wage gap literature. The proportion of females in the establishment in Spain is a positively skewed distribution with a median six percentage points below the mean. This, as well as other evidence presented, suggests that gender segregation at the establishment level characterizes the labour market in Spain. This result, while not well documented, is what most researchers and policymakers would expect to find in the data. Next we address the factors that we will use to explain the gender composition across these establishments and why they might be important. We examine three generic categories of variables: location, industry and establishment characteristics. The establishment characteristics are of special interest since it can be argued that policies can be developed that are capable of altering their effect. To begin the analysis we examine in an unconditional framework how establishment female proportion varies across these characteristics. We find that location, industry, establishment size, use of part-time employees, age of the establishments capital stock, on-the-job experience required and the distribution of tenure in the establishment generate significant differences in the dimension of establishment female proportion. However, for yearly variance in full-time employment we find no significant difference in the gender distribution across these types of establishments.

The advantage of the unconditional analysis is the ease of interpretation at the cost of potentially over or under-estimating the effect due to the failure to control for other factors that determine the gender composition across establishments. In Section III we use a conditional framework developed in Reilly and Wirjanto (1999b), a Two-Limit Tobit specification which recognises that the proportion of females in the establishment is constrained to be between zero and one. In this analysis location and establishment size no longer help explain the gender distribution across establishments, while within-year variation in full-time employment does. So a first conclusion is that unconditional analysis can generate both false positives and negatives and suggests that policymakers need to be careful about interpreting unconditional results. Our second conclusion is that we find strong evidence that part of the reason we observe a segregated gender distribution is the standard operation of the labour market. Human capital accumulation within the establishment plays a large role in reducing the proportion of females in the establishment. This implies that the operation of the labour market expands inequality due to the gender inequalities in household responsibilities and differences in expected labour force attachment across males and females. Further, changes in the production process have a positive effect in that we document that establishments that make a significant change in their capital have a higher proportion of females than establishments who have not made changes. This suggests markets are capable of eliminating some of the segregation that exists through dynamic changes in the economy. Finally, we find that part-time employment by the establishment yields higher proportion of females working full-time in the establishment; however, evidence is presented that this is an industry rather than an establishment effect. Irrespective of the source of this result it is consistent with the labour market providing a mechanism which mitigates the negative effects generated by the inequality in family responsibilities held by women. Our overall conclusion is that choices made by both establishments and workers, independent of industry, are important determinants in the gender segregation we observe so in the final section we will discuss the policy implication of the results.

*Section II: Data and Interpretation*

To address the issues associated with gender segregation at the establishment level we use the May 3, 2003 release of the 2002 Wage Discrimination and Job Characteristics Survey (ISOS) matched worker-establishment data set for Spain. In this paper we will use the establishment data which has 600 observations from three of Spain's autonomous regions: Andalusia, Catalonia and Madrid. After imposing reasonable missing value restrictions we are left with a sample of 502 establishments in both the private and public sector of Spain. We eliminate the 42 establishments in the public sector since the economic arguments we will use to motivate some of the variables require a profit constraint, lacking in this sector.[8]

The first question is what is the gender distribution across these private sector establishments? Our measure of the gender composition is the proportion of females employed full-time (more than 30 hours per week) in the establishment: the number of females employed full-time in the establishment divided by the total number of full-time employees in the establishment. Table 1 report's that average full-time establishment female proportion is 0.26 or 26 percent of the full-time labour force in the establishment. This number is low relative to the national figure since the proportion of females in Spain's employed population in 2001 stood at 0.37.[9] If we include the public sector establishments, as well as the part-time employees, as the national number does, then the percentage of females rises to 31 percent. Part of this six percent difference could be accounted for by regional differences in Spain but more importantly our 0.31 is identical to the implied average establishment female proportion in Amuedo-Dorantes and De la Rica (2005) who use data from the national 2002 Spanish Wage Structure Survey. This suggests that the ISOS data will yield reasonable and general results for Spain if we can show, as we will, that regional differences do not matter.

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[8] Appendix A outlines in detail how our sample is generated and how all variables used in this paper are calculated. One variable need to be commented on, the variable we use to model the effect of part-time workers has a large number of missing values. For the 460 establishments only 389 of the establishments have valid observations for this variable. In the conditional analysis we use the standard technique of including a dummy variable coded as one for the observations that are missing in this variable. The missing value dummy is statistically insignificant which suggests that it is valid to use these observations in the sample analyzed. As a further check in the Appendix B all the tables in this paper are present using the 389 observations and none of our conclusions are altered using this smaller sample.

[9] This number is calculated using the employment rate, defined as the number employed in the age/gender group divided by the total population in the age/gender group and population numbers for males and females. With these numbers we can recover the number of males and females employed. The Proportion of Females among the Employed is just the females employed divided by sum females employed and males employed. At the national level in 2001 the employment rate for females age 15-64 years was 0.42 and for males it was 0.71 (European Economic and Social Committee, 2003, p. 113). In July 2001 the population in this age group by gender is estimated to be 13,701,065 and 13,605,314 for males and females, respectively (Organization of Economic Co-operation and Development, July 2001 population numbers obtained from the Hydra database).

If no segregation is occurring at the establishment level then we should observe little variation in the establishment female proportion across establishments. As Table 1 indicates this is certainly not the case, the standard deviation is 0.24, almost as large as the mean. Gender segregation also implies a significant number of establishments with preponderance of either males or females. Figure 1 presents a histogram, using deciles, of the full-time establishment female proportion. This is a skewed distribution with the median at 0.20 and a skewness coefficient of 0.75. At one extreme 66 of the establishments (14 percent of our sample) have no females who are full-time employees and at the other 34 establishments (seven percent of our sample) have 70 percent or more female full-time employees, with seven of these establishments (two percent of our sample) have only females.[10] So our result is that Spain's labour market is characterised by a high degree of establishment gender segregation.

The question is what are the factors that can explain this gender segregation we observe? Our analysis will centre on location, industry and establishment variables. Table 1 outlines descriptive statistics on the factors we use and in Table 2 we look at mean differences in establishment female proportion across these variables. This unconditional form of analysis is the simplest method to examine the effect these factors have on full-time establishment female proportion, as well as, introducing the explanation as to why they matter.

Part (A) of Tables 1 and 2 presents our results for our location measures. A justification for using regional dummy variables is that they can reflect the cultural differences across the three regions along with the differing labor market opportunities that are available to females in them. The results on mean establishment female proportion are what you would expect from the underlying industrial structure of the three regions. Madrid being the administrative capital of Spain with its large number of white collar workers has the highest proportion of females in the establishments {32 percent}. The region of Andalusia has a slightly lower proportion {30 percent} that is derived from the service establishments associated with the tourism industry in the region. The small difference {0.03} between these two regions is not statistically significant. Catalonia being the most industrialized area of Spain has the lowest with the average at only 20 percent. The differences between Catalonia and the other two regions are statistically significant. This suggests there might be a location

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[10] These numbers are not dissimilar to those reported in Reilly and Wirjanto (1999b: S76) who are using a 1979 sample of establishments from Maritime Provinces of Canada {Nova Scotia, Prince Edward Island and New Brunswick}. They report 12 percent of the establishments have no females who are in full-time employment and 10 percent of the establishments had seventy percent or more female full-time employees. The question why two different countries, 23 years apart in time, yield such similar establishment segregation numbers is left for future research.

component to the gender segregation across establishments; however, it is not strong. Further, it is more likely to be related to the characteristics of the labour market (e.g. industry) than cultural differences across these regions of Spain.

To control for industry we will use one-digit level industry dummy variables. Broadly, the variance in the proportion of females in the establishments across industry categories in Table 2 conforms to prior expectation. The Construction industry has the lowest percentage of females at 13 percent while the Finance and Real Estate sector is the largest at almost 40 percent. For Manufacturing the proportion of full-time females is 0.24 and as Table 2 shows this is statistically different from all the other industries with the exception of the Retail and Hotel establishments.[11] This suggests, as we would expect, industry will be an important factor that needs to be controlled for in the conditional analysis.

Results on regional and industry differences can be derived from traditional national sources like the Spanish Wage Surveys but the advantage of data sources like the ISOS is that we have further detailed characteristics of the establishment that are generally not available from these administrative type data sources. Our first question is, is there a relationship between the size of the establishment and gender composition? Larger establishments can have monopsony power in their local labour market which given the more elastic labour supply for females suggests a higher proportion of females in the larger establishments. Table 2 indicates that, contrary to the monopsony argument, there is at best a declining relationship between establishment size and the gender composition. The only significant difference is between small and large establishments and this has the wrong sign. These results are not supportive of the monopsony argument that motivates the use of establishment size; however, the failure to control for industry and location might hide the size effect.

An important issue associated with females participation in the labour market is the constraints that family responsibilities place on them and in particular the cost of child care (Heckman 1974; Kimmel 1998; Hofferth and Collins 2000), which represents a substitute for a women's home-time. Policymakers have targeted a reduction in this constraint by expanding subsidised child care places available so as to lower the cost associated with female labour force participation (European Union 2000: 11; Bergstrom and Blomquist 1996; Blau and Hagy 1998; Morgan 2003). One way of looking at this issue prior to the policy change is to

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[11] For the 42 public sector establishment proportion of females is 0.51 and it can be shown to be statistically different from all the other private sector industries. Further, if we restrict the private sector to a similar service category (Finance and Real Estate establishments only) we have a reduced differential of 11 percent but this difference is statistically significant. This suggests to us that occupation structure is not the only explanation as the gender wage gap evidence would suggest; however, we leave this issue for future research.

examine the employment policies of firms that can reduce the participation costs that women face. If the establishment can offer women an employment contract that minimises the family responsibility costs associated with participating this increases the probability that women can accept employment. From the firm's perspective if they have a requirement to vary employment over the year and/or day costs can be reduced by hiring individuals whose employment preferences are compatible with the firm's demand for labour constraint, a compensating differential need not be paid for the variation from the standard contract. This argument suggests that establishments with this family responsibility consistent labour demand will have higher proportion of female workers.[12] To model this potential effect we will use two variables. First, does the full-time employment of the establishment vary over the year? Table 1 indicates that almost 31 percent of the establishments vary their full-time employment over the period asked about, three-quarters of one year. Table 2 suggests that firms that don't vary their full-time employment have a higher proportion of females {27 percent} than those who do {25 percent} but the difference is not statistically significant. This result is not supportive of the hypothesis in the full-time/full-year employment dimension.

A second variable we use is a dummy variable coded as one if the establishment uses part-time employees. Although we are trying to explain the full-time proportion of females this variable can be interpreted as capturing the employment demand of the establishment which is consistent with the family responsibility constraint women face over their lifecycle. Table 1 show's that 51 percent of the establishments do hire part-timers. Further, as Figure 2 makes clear establishments that hire part-timers tend to hire females into these positions, this gender distribution is skewed towards the all female part-time hires. The average establishment female proportion among the part-timers is 57 percent, 31 percentage points higher than the equivalent full-time employee number. Establishments that hire part-time workers have almost 9 percent more females full-time than those who don't and the difference is statistically significant. This suggests that as a women's family constraint lessen they can convert their part-time position into a full-time position at the same establishment.

While the current policy debate stresses increasing the proportion of females that participate in the labour market, this has not always been true, at least in terms of action. Further, the labour force of an establishment will only change slowly over time, so even if hiring policy changes this will only be reflected in the proportion of females much latter in

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[12] Interestingly for the arguments being made here Morgan (2003: 265) reports that in the mid-90's only two percent of the under-age school children in Spain were enrolled in publicly subsidized child care. This number suggests that alternatives that reduce these costs for women will be important in Spain.

time.[13] A potential point of change in the hiring pattern is if there are significant changes in the production process that may induce changes in the establishment labour force as well. To model this change effect we use the age of the capital stock: a dummy variable that is coded as one if the establishment's capital stock has changed greatly over the last 10 years. In this context we would expect establishments are more open to the changing labour market norms if other dimensions of activity are changing. As Table 2 shows establishments with the newer capital stocks do have a higher proportion of females {12 percent} and the difference is significant, providing support for the change hypothesis that motivates this variable.

Of interest is the role firm-specific human capital accumulation plays in the gender distribution.[14] Firms who invest in the skills of their workers need time to recoup the investment. The lower female labour force attachment relative to males reduces the probability that a female will be hired for an establishment-specific human capital job due to the greater uncertainty on recouping the investment. This suggests that a firm with establishment-specific human capital requirements will have lower establishment female proportion. We use three variables to capture this potential effect. The first is a dummy coded one if the average job in the establishment requires on-the-job experience before the individual becomes proficient and according to Table 1 62 percent of the establishments are classified as such. Although, contrary to the hypothesis establishments that require the experience have a higher proportion of women by almost six percent and this difference is statistically significant. A problem with the modelling the effect as a binary variable in this investment context is that it treats the difference between no investment and all positive investment as the same. If the amount invested by the employer is increasing in weeks it takes for the employee to achieve proficiency this implies that the tenure required to recoup the investment is also increasing in weeks of proficiency. So the hypothesis is that as investment by the establishment increases the differences in expected turnover between males and females will becomes more important in the hiring decision. The establishment is indifferent or for cost reasons prefer women, an indirect effect of the gender wage gap, at low levels of investment. As the required investment increases the preference shifts to men due to the expected turnover differences and its effect on structuring the contract to yield the required tenure profile to recoup the investment. This argument suggests the investment effect of weeks to proficiency is non-linear and a concave set of parameters on a quadratic function

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[13] See Erosa, Fuster and Restuccia (2002) for a discussion of the turnover literature which has a strong gender focus.

[14] See Leuven (2005) for a recent review of the training literature.

will be obtained. In the next section we will examine this variable, since a conditional framework can capture this non-linear relationship. Table 1 report's a reasonable low average of 5 weeks of experience required for the typical employee in the establishment to become proficient but a large standard deviation (9 weeks) that indicates a large amount of variation across establishments in the sample.

Specific human capital investments by the employer are more than just weeks of proficiency so we will use a third variable, whether more than 75 percent of the establishment has tenure that exceeds five years. Tenure is a standard measure of establishment-specific human capital investment and we would expect a negative differential. Establishment with the longer tenure profile of employees do have the lower proportion of females in the establishment and this average difference of seven percent is statistically significant, so is supportive of the argument that motivates the variable.

*Section III: The Why of More or Less*

Our unconditional analysis of the data found relationships between the gender composition across establishments and location, industry, establishment size, the requirement of on-the-job experience, age of the capital stock, use of part-time workers and the tenure distribution of the establishment. The problem with this analysis is that we don't observe the effect holding other factors constant and as a result the unconditional analysis can be misleading. A regression technique avoids this by assuming full-time establishment female proportion is a function of various factors. However, the standard linear technique is not appropriate because establishment female proportion is a variable bounded between zero and one. To account for this structure we follow Reilly and Wirjanto (1999b) by using a Two-Limit Tobit technique.

In Table 3 we report four specifications of the establishment female proportion relation and the differences across the columns are two-fold. First, in our unconditional analysis we used one-digit industry dummies since any further disaggregation would have resulted in a confusing array of numbers. However, in a conditional framework it can be argued to model the industry fixed effect using one-digit industry dummies is too broad to properly distinguish between establishment and industry effects. Establishment structures differ dramatically within these broad industrial groups. This suggests establishment effects in the conditional framework using just one-digit industry dummies will reflect narrow industry effects and not establishment\worker choices that we are trying to capture. This implies if we use two-digit industrial sector dummies then our results on the establishment variables should change in a significant way from those obtained using one-digit dummies. To ensure that our results are robust to this argument Table 3 columns (1) and (2) present results using one-digit industry dummies and columns (3) and (4) are the results we obtain using two-digit industry dummies. While the measures of fit (Pseudo $R^2$ and Likelihood Ratio Test) point to using the two-digit industry dummy variable structure, it as is also clear that results for the establishment variables are invariant to the aggregation used to model the industry fixed effect, except in one case, which we will comment on below.

The second difference centers on how we model the worker on-the-job experience effect. In columns (1) and (3) of Table 3 we treat it as a dummy variable or intercept shift effect which is how it was specified in the unconditional analysis of Section II. In the second specification we model it as a quadratic function of the actual number of weeks the worker needs to be proficient on the job and these results are in columns (2) and (4) of Table 3. Our

measures of fit (Pseudo $R^2$ and Likelihood Ratio Test) suggest a preference for the weeks of experience specification; however, in terms of the other variables used there is no qualitative or quantitative difference. Given the conclusion here and for the industry fixed effect our discussion will range over all the columns of Table 3.

The results for the two location parameters {Catalonia and Madrid} are that they are individually and jointly statistically insignificant parameters in all four specifications. So the weak evidence that we observed for regional differences in Spain using the unconditional analysis disappears in this conditional framework. As was discussed in the previous section our unconditional results were in all likelihood related to the industrial structure of the regions. The results in Table 3 support this in that for all four specifications the industry dummy variables are jointly significant. The individual coefficients reported for the one-digit industry effect specifications [columns (1) and (2)] are consistent with the results in Table 2 but there are quantitative differences in the implied effects using this conditional framework. Relative to manufacturing the construction industry has around 15 percent fewer females working full-time in the establishment as opposed to the implied 13 percent difference reported in Table 2.[15] We also find no statistically significant difference in establishment female proportion between retail and manufacturing in Spain, like Table 2. While not a definitive conclusion we would argue the regional and industrial sector results strongly suggest that regional social difference in Spain play no role in the gender segregation issue. The differences that are observed are related to the underlying industrial structure of the region that does play a large role in establishment gender segregation. This is not an unexpected conclusion but of more interest from a theoretical and policy perspective is the role establishment characteristics play in the gender composition across establishments, holding the industry effect constant.

In the unconditional analysis we were unable to find support for the discriminating monopsonist in the establishment size variable and this continues to be the conclusion in this framework. Using column (1)'s results the parameter estimate on the number of full-time employees is an extremely small negative number {-0.000009} which is the wrong sign for this hypothesis. It is statistically insignificant {probability value of 0.248} and so should be treated as having no effect.[16] The poor results on establishment size should not be surprising

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[15] Note we are treating the coefficients in Table 3 as marginal effects as we can, unlike the standard two-limit Tobit. In our case the probability that an observation lies between the bounds is one and so the marginal effects and coefficients are identically equal.

[16] We did experiment with non-linear specifications of the establishment size effect (quadratic and natural log) but our conclusion remained unchanged so settled for this simpler specification of the size effect.

for two reasons. First, Reilly and Wirjanto (1999b: S83) came to the same conclusion using Canadian data. Second, in the context of industry-level contract agreements, which in Spain apply to all establishments in the industry (Card and De la Rica 2004), the ability to implement a discriminating monopsonnist strategy is constrained.

Our argument that establishments that deviate from the full-time/full-year employment contract will have a higher proportion of females since the establishments demand for labour constraint matches the family responsibility constraint yields poor results in Table 3. The results on our variance dummy variable imply that the establishment whose full-time employment does vary over the year have five percent fewer females than those who do not vary their full-time employment, contrary to the motivating hypothesis. This is a disappointing result in that previous evidence on this hypothesis was supportive (Reilly and Wirjanto 1999b). In part this result could be related to the centralized bargaining and industry wide contracts which constrain establishment's ability to structure a local deal to take advantage of the potential cost savings, which is the key to the argument from the establishment's perspective. Further, the prevalence of the August economy-wide holiday period reduces the opportunities available for the establishment to exploit the within-year variation in full-time employment since this corresponds with the school system's summer holidays.

The variable on the use of part-time employees comes to the opposite conclusion on the family responsibility hypothesis, establishments that who use part-time workers have around six percent more full-time female employees than those who don't. This is consistent with the market process idea of a bargain between establishments and women that satisfies their individual constraints. However, the part-time parameter is only statistically significant at the more generous eight percent level when we control for two-digit industry dummies [columns (3) and (4)] as opposed to standard significance levels when using one-digit [columns (1) and (2)] industry dummies. This suggests caution in applying a conclusion that the part-time characteristic of the employment contract is an establishment level decision in the explanation of the full-time gender composition across establishments.

The largest determinant of establishment female proportion reported in Table 3 is our capital change variable which implies that establishments that have seen great changes in their capital stock in the last 10 years have between six [column (4)] and seven [column (1)] percent more females working full-time. This suggests that establishments that are subject to change in other dimensions of their activities are shifting the gender composition of the establishment towards equality. The effect of dynamic adjustment in this capital dimension

results is a more dynamic labour force policy consistent with the changing attitudes. So labour markets do make adjustments to the changing environment in which they operate.

Turning to our establishment specific human capital controls both specifications of the establishment female proportion equation imply that establishments with 76 percent of workers having tenure of more than five years have five percent fewer females. This is consistent with the idea that establishments are less likely to hire a woman if the job contains a significant establishment specific human capital component. However, the experience required dummy variable parameter reported in Table 3 columns (1) and (3) is, unlike the unconditional analysis, not statistically significant at standard confidence levels. As discussed in the previous section this might not be the correct specification of the effect. Columns (2) and (4) report this model using a quadratic function in weeks of experience needed. Jointly both terms are significant and the coefficients imply a result consistent with the establishment specific human capital hypothesis discussed in the previous section in that we find a concave relationship between weeks to proficiency and gender composition of the establishment. Using the column (2) results, less than 38 weeks of experience required has a positive effect on establishment female proportion but after 38 weeks it has a negative effect on the establishment gender composition. As the scale of investment grows the difference in expected turnover across males and females have the effect of increasing gender segregation across establishments. Both of the variables, tenure and experience, are pointing to an important role for establishment specific human capital in the gender distribution we observe.

*Section IV: Conclusion*

This paper addresses a simple question: what are the determinants of the gender composition across establishments? The motivation is two-fold. First, policymakers around the world are concerned with the gender imbalance across establishments and the negative effects on employment and wages of women. Second, the academic literature has documented that the establishment gender imbalance results in a widening of the male-female wage gap and that it is independent of the traditional occupation and industry segregation effects on the gender wage gap. If these imbalances and their effects are to be addressed it requires knowledge of why they occur and not just a documentation of their negative effects. Following on work by Reilly and Wirjanto (1999b) this paper has contributed to this documentation by analyzing the determinants of the full-time establishment female proportion of 460 private sector Spanish establishments in 2002.

We found that the full-time establishment female proportion is a positively skewed distribution and that Spain's labour market is characterized by a high degree of gender segregation at the establishment level of the labour market. We show that this distribution can be explained by industrial and establishment characteristics. First, we find, not surprisingly, that industrial sector is an important determinant of this gender distribution. More importantly the results show that characteristics of the establishment play a large role in the determination the gender composition across establishments and their effects are independent of industrial sector.

The results on the role of the hours' contract between the worker and the establishment are disappointing in that they fail to tell a consistent story. In the dimension of full-time employment that is not full-year, the establishment does not appear to follow the hypothesis that the establishment's specific demand for labour and women's family responsibility constraint can generate a higher proportion of women working full-time in the establishment. We find come to the opposite conclusion in this case. Consistent with this hypothesis is our result on part-time employment in the establishment in that we find that the use part-time workers generates a higher proportion of full-time employment of females. However, in this case while the sign is correct there are questions on whether it is an industry or establishment effect. Our results on the role of establishment specific human capital are consistent with the perspective it brings to the gender segregation issue. The results suggest a subtle mechanism in that the effect on the gender composition is a function of the size of the investment being made by the establishment. Finally, we show that change in other

dimensions of the establishment's activity induces reductions in the gender segregation across establishments. This suggests that market processes beyond the labour market will play a role in the solution of the gender segregation problem.

Our establishment specific human capital results suggest that legislative initiatives being proposed by the EU will impact the gender distribution across establishments through the changing of the opportunity cost of female labour supply that will reduce the differential turnover rates across the males and females. These policies (e.g. extending the availability of public kindergartens, support for families with a live-in dependent person, extending the maternity leave period {beyond the current 16 weeks in the Spanish case}) will have the effect of broadening the employment opportunities available to women and reduce the segregation we observe. So our conclusion is that these policy initiatives will have important labour market effects beyond increasing female labour force participation.

This is important in the context of the recently proposed positive discrimination law by the Spanish government. This law mandates that employers and unions are to establish within their collective agreements provisions that would allow for target quotas and preferential hiring of women in areas of employment where women are underrepresented in the establishment (El Pais 2006). Initially the proposed provisions in the law will be voluntary; however, the quota clauses and preferential hiring procedures will become mandatory after law has been in operation for four years. Our results suggest that measures that eliminate constraints faced by both women and establishments are needed for this law to be effective. In particular we would suggest that targeting the resources to reduce costs to employers to invest in specific human capital will be important if this law is to achieve its long-run equality goal in face of the gender differential in expected turnover.

Finally, our capital result suggests that establishments that are subject to change in other dimensions of their activities are shifting the gender composition in the establishment. This is a novel result and suggests that renovated firms are less prone to gender segregation than those who are not. To the extent that the entrepreneurial network of the economy is renewed one could expect a falling degree of segregation over time and that industrial policy will play a role in solving the problem in the long-run.

In conclusion we offer a rather eclectic mix to the policymakers in this area, as it should be. The fundamental point of this paper is that we need to know more about the gender segregation process since as we have shown it is a multi-dimensional process. Single causal views will not generate a solution to the problem.

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**Table 1**
**Establishment Descriptive Statistics**

| Variable | Mean | Standard Deviation |
|---|---|---|
| **Establishment Female Proportion** | 0.263 | 0.237 |
| **(A) Location Characteristics** | | |
| **Madrid Establishments** | 0.276 | 0.448 |
| **Catalonia Establishments** | 0.420 | 0.494 |
| **Andalusia Establishments** | 0.304 | 0.461 |
| **(B) Industry Characteristics** | | |
| **Manufacturing and Energy Establishments** | 0.341 | 0.475 |
| **Construction Establishments** | 0.124 | 0.330 |
| **Retail and Hotel Establishments** | 0.333 | 0.472 |
| **Transport, Storage and Communication Establishments** | 0.043 | 0.204 |
| **Finance and Real Estate Service Establishments** | 0.320 | 0.319 |
| **(C) Establishment Characteristics** | | |
| **Full-time Employees (FTE)** | 119.965 | 1501.667 |
| **Small Establishments: 10-19 FTE** | 0.676 | 0.468 |
| **Mid-Size Establishments: 20-99 FTE** | 0.228 | 0.420 |
| **Large Establishments: 100 or More FTE** | 0.096 | 0 .294 |
| **Full-time Female Employees (FTFE)** | 21.387 | 157.507 |
| **Establishment's FTE Does Vary During the Year** | 0.413 | 0.493 |
| **Establishment's Employees Require On-the-Job Experience** | 0.617 | 0.487 |
| **Weeks of Experience Employees Require On-the-Job** | 4.599 | 9.218 |
| **Establishment's Capital Stock Greatly Changed in last 10 Years** | 0.313 | 0.464 |
| **76% of Establishment's Workers have Tenure 5 Years or More.** | 0.285 | 0.451 |
| **Establishment Hires Part-time Employees[a]** | 0.509 | 0 .501 |
| **Number of Establishments** | **460** | |

*Notes: {a} These numbers are based on 389 establishments only.*

**Table 2**
**Establishment Female Proportion, Difference in Mean Tests[a]**

**(A): Location**

| Characteristic | Establishment Female Proportion | Standard Error on Difference | Probability Means Differ (Two-Sided) |
|---|---|---|---|
| **Madrid Establishments (N=140)** | 0.324 | | |
| **Catalonia Establishments (N=193)** | 0.197 | | |
| **Andalusia Establishments (N=127)** | 0.296 | | |
| **Difference Madrid-Catalonia Establishments** | **0.100** | **0.026** | **0.000** |
| **Difference Madrid-Andalusia Establishments** | **0.028** | **0.030** | **0.360** |
| **Difference Andalusia-Catalonia Establishments** | **0.127** | **0.025** | **0.000** |

**(B): Industry**

| Characteristic | Establishment Female Proportion | Standard Error on Difference | Probability Means Differ (Two-Sided) |
|---|---|---|---|
| **Manufacturing-Energy Establishments (N=157)** | 0.240 | | |
| **Construction Establishments (N=57)** | 0.129 | | |
| **Retail-Hotel Establishments (N=153)** | 0.269 | | |
| **Transport, Storage & Com. Establishments (N=20)** | 0.359 | | |
| **Finance and Real Estate Service Establishments (N=53)** | 0.399 | | |
| **Difference Manufacturing – Construction Establishments** | **0.111** | **0.032** | **0.000** |
| **Difference Manufacturing – Retail Establishments** | **-0.029** | **0.026** | **0.257** |
| **Difference Manufacturing-Finance Establishments** | **-0.160** | **0.036** | **0.000** |
| **Difference Manufacturing-Transport Establishments** | **-0.119** | **-0.056** | **0.034** |

**Table 2**
**Establishment Female Proportion, Difference in Mean Tests[a]**

**(C): Establishment Characteristics**

| Characteristic | Establishment Female Proportion | Standard Error on Difference | Probability Means Differ (Two-Sided) |
|---|---|---|---|
| **Small Establishments: 10-19 FTE (N=311)** | 0.272 | | |
| **Mid-Size Establishments: 20-99 FTE (N=105)** | 0.264 | | |
| **Large Establishments: 100 or More FTE (N=44)** | 0.198 | | |
| **Difference Small and Mid-Size Establishments** | **0.008** | **0.027** | **0.763** |
| **Difference Mid-Size and Large Establishments** | **0.066** | **0.042** | **0.121** |
| **Difference Small and Large Establishments** | **0.074** | **0.038** | **0.050** |
| **Establishment's FTE Does Not Vary During the Year (N=270)** | 0.273 | | |
| **Establishment's FTE Varies During the Year (N=190)** | 0.248 | | |
| **Difference Establishments Do Not and Do Vary FTE During the Year** | **-0.025** | **0.022** | **0.263** |
| **Establishment Does Not Hire Part-time Employees (N=191)** | 0.210 | | |
| **Establishment Hires Part-time Employees (N=198)** | 0.301 | | |
| **Difference Establishments that Do Not and Do Hire Part-time Employees** | **-0.091** | **0.024** | **0.000** |
| **Establishment's Capital Stock Greatly Changed in last 10 Years (N=144)** | 0.342 | | |
| **Establishment's Capital Stock Not Greatly Changed in last 10 Years (N=316)** | 0.227 | | |
| **Difference Establishments Capital Stock Changes in Last 10 Years** | **0.115** | **0.023** | **0.000** |

**Table 2**
**Establishment Female Proportion, Difference in Mean Tests[a]**

| Characteristic | Establishment Female Proportion | Standard Error on Difference | Probability Means Differ (Two-Sided) |
|---|---|---|---|
| **Establishment's Employees Do Not Require On-the-Job Experience (N=176)** | 0.227 | | |
| **Establishment's Employees Do Require On-the-Job Experience (N=284)** | 0.285 | | |
| **Difference Establishment's Do Not or Do Require On-the-Job Experience** | **-0.058** | **0.023** | **0.010** |
| **76% of Establishment's Workers have Tenure Less than 5 Years (N=329)** | 0.283 | | |
| **76% of Establishment's Workers have Tenure 5 Years or More (N=131)** | 0.212 | | |
| **Difference Establishments Tenure Stock Less Than- Greater Than 5 Years** | **0.071** | **0.024** | **0.004** |

*Note: {a} The (N=) is number of establishments with the characteristic.*

**Table 3**
**Two-Limit Tobit Determinants of Establishment Female Proportion**

| Industry Dummy Specification | Dependent Variable: Establishment Female Proportion[a] | | | |
|---|---|---|---|---|
| | One-Digit Dummies | | Two-Digit Dummies[b] | |
| Independent Variables | (1) | (2) | (3) | (4) |
| Full-time Employees (FTE)*(1/1000) | -0.009 (0.008) [0.248] | -0.008 (0.008) [0.334] | -0.010 (0.008) [0.206] | -0.008 (0.007) [0.284] |
| Establishment's FTE Does Not Vary During the Year | -0.058 (0.025) [0.023] | -0.056 (0.024) [0.027] | -0.053 (0.024) [0.029] | -0.051 (0.024) [0.034] |
| Establishment Hires Part-time Employees | 0.056 (0.028) [0.049] | 0.057 (0.028) [0.043] | 0.047 (0.027) [0.083] | 0.047 (0.027) [0.080] |
| Missing Value Control Establishment Hires Part-time Employees | 0.019 (0.041) [0.651] | 0.024 (0.040) [0.553] | 0.027 (0.039) [0.484] | 0.033 {0.039) [0.395] |
| Establishment's Capital Stock Greatly Changed in last 10 Years | 0.069 (0.030) [0.023] | 0.063 (0.030) [0.039] | 0.064 (0.029) [0.028] | 0.056 (0.029) [0.051] |
| 76% of Establishment's Workers have Tenure 5 Years or More | -0.050 (0.028) [0.075] | -0.049 (0.028) [0.074] | -0.056 (0.027) [0.037] | -0.055 (0.026) [0.039] |

*Table 3 Continues on Next Page*

**Table 3**
**Two-Limit Tobit Determinants of Establishment Female Proportion**

| | Dependent Variable: Establishment Female Proportion[a] | | | |
|---|---|---|---|---|
| Industry Dummy Specification | One-Digit Dummies | | Two-Digit Dummies[b] | |
| Independent Variables | (1) | (2) | (3) | (4) |
| **Establishment's Employees Require On-the-Job Experience** | 0.042<br>(0.026)<br>[0.102] | | 0.038<br>(0.024)<br>[0.119] | |
| **Weeks of Experience Employees Require On-the-Job** | | 0.009<br>(0.003)<br>[0.007] | | 0.009<br>(0.003)<br>[0.006] |
| **Square of Weeks of Experience Employees Require On-the-Job *(1/100)** | | -0.013<br>(0.007)<br>[0.053] | | -0.012<br>(0.007)<br>[0.075] |
| **Construction Establishments[c]** | -0.148<br>(0.039)<br>[0.000] | -0.143<br>(0.039)<br>[0.000] | | |
| **Retail-Hotel Establishments[c]** | -0.002<br>(0.029)<br>[0.938] | 0.003<br>(0.028)<br>[0.919] | | |
| **Transport, Storage and Communication Establishments[c]** | 0.127<br>(0.061)<br>[0.037] | 0.119<br>(0.061)<br>[0.051] | | |

**Table 3**
**Two-Limit Tobit Determinants of Establishment Female Proportion**

| Industry Dummy Specification | Dependent Variable: Establishment Female Proportion[a] | | | |
|---|---|---|---|---|
| | One-Digit Dummies | | Two-Digit Dummies[b] | |
| Independent Variables | (1) | (2) | (3) | (4) |
| **Finance and Real Estate Service Establishments**[c] | 0.103 (0.041) [0.013] | 0.102 (0.041) [0.013] | | |
| **Catalonia Establishments**[d] | -0.027 (0.036) [0.459] | -0.005 (0.036) [0.897] | -0.013 (0.035) [0.710] | 0.012 (0.036) [0.742] |
| **Madrid Establishments**[d] | 0.043 (0.032) [0.187] | 0.035 (0.032) [0.274] | 0.031 (0.032) [0.328] | 0.025 (0.032) [0.426] |
| **Constant** | 0.218 (0.044) [0.000] | 0.202 (0.043) [0.000] | 0.206 (0.045) [0.000] | 0.187 (0.044) [0.000] |

**Table 3**
**Two-Limit Tobit Determinants of Establishment Female Proportion**

| Industry Dummy Specification | Dependent Variable: Establishment Female Proportion[a] | | | |
|---|---|---|---|---|
| | One-Digit Dummies | | Two-Digit Dummies[b] | |
| Independent Variables | (1) | (2) | (3) | (4) |
| **Tests** | | | | |
| Joint Significance of Industry Dummies | 7.660 {4, 447} [0.000] | 7.310 {4, 446} [0.000] | 4.640 {18, 433} [0.000] | 4.680 {18, 432} [0.000] |
| Joint Significance of Geographic Dummies | 1.870 {2, 447} [0.155] | 0.780 {2, 446} [0.459] | 0.890 {2, 433} [0.411] | 0.320 {2, 432} [0.728] |
| Joint Significance of Weeks of Experience Variables | | 4.320 {2, 487} [0.014] | | 5.530 {2, 432} [0.004] |
| Pseudo $R^2$ | 0.337 | 0.364 | 0.524 | 0.557 |
| Likelihood Ratio Test | 84.920 {13} [0.000] | 91.630 {14} [0.000] | 131.800 {27} [0.000] | 140.290 {28} [0.000] |
| Number of Establishments | | | 460 | |

Notes: {a} (): Standard Error of Coefficient, []: Two-Sided Probability Value and {}: Degrees of Freedom.
   {b} Industry Coefficients are unreported in the two-digit industry dummy variables case.
   {c} The exclude dummy variable is for manufacturing establishments.
   {d} The excluded dummy variable is for establishments in Andalusia.

**Figure 1**

**Distribution of Establishment Female Proportion, 2002**
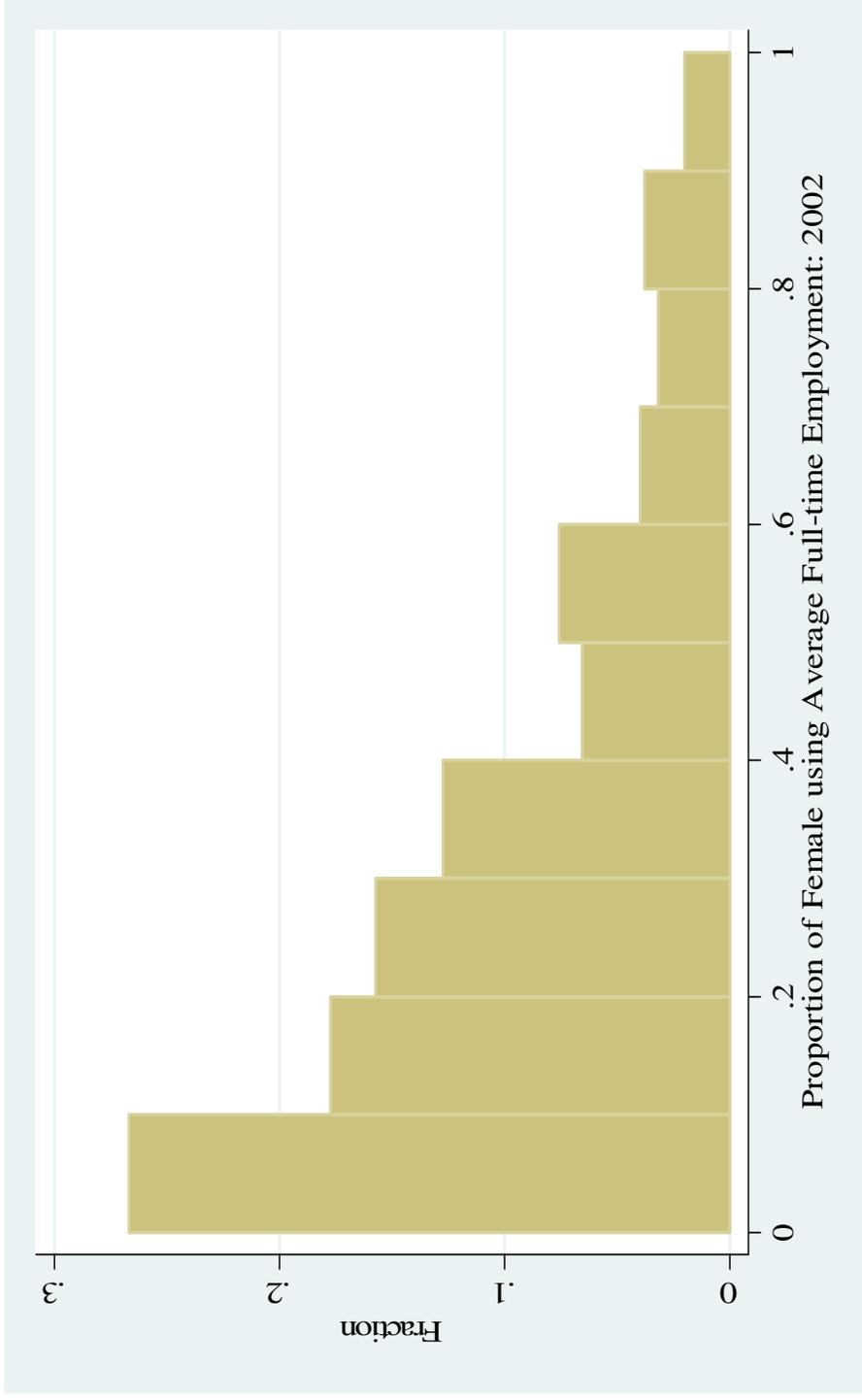
**Figure 2**
**Distribution of Establishment Female Proportion, Part-time Employees in 2002**
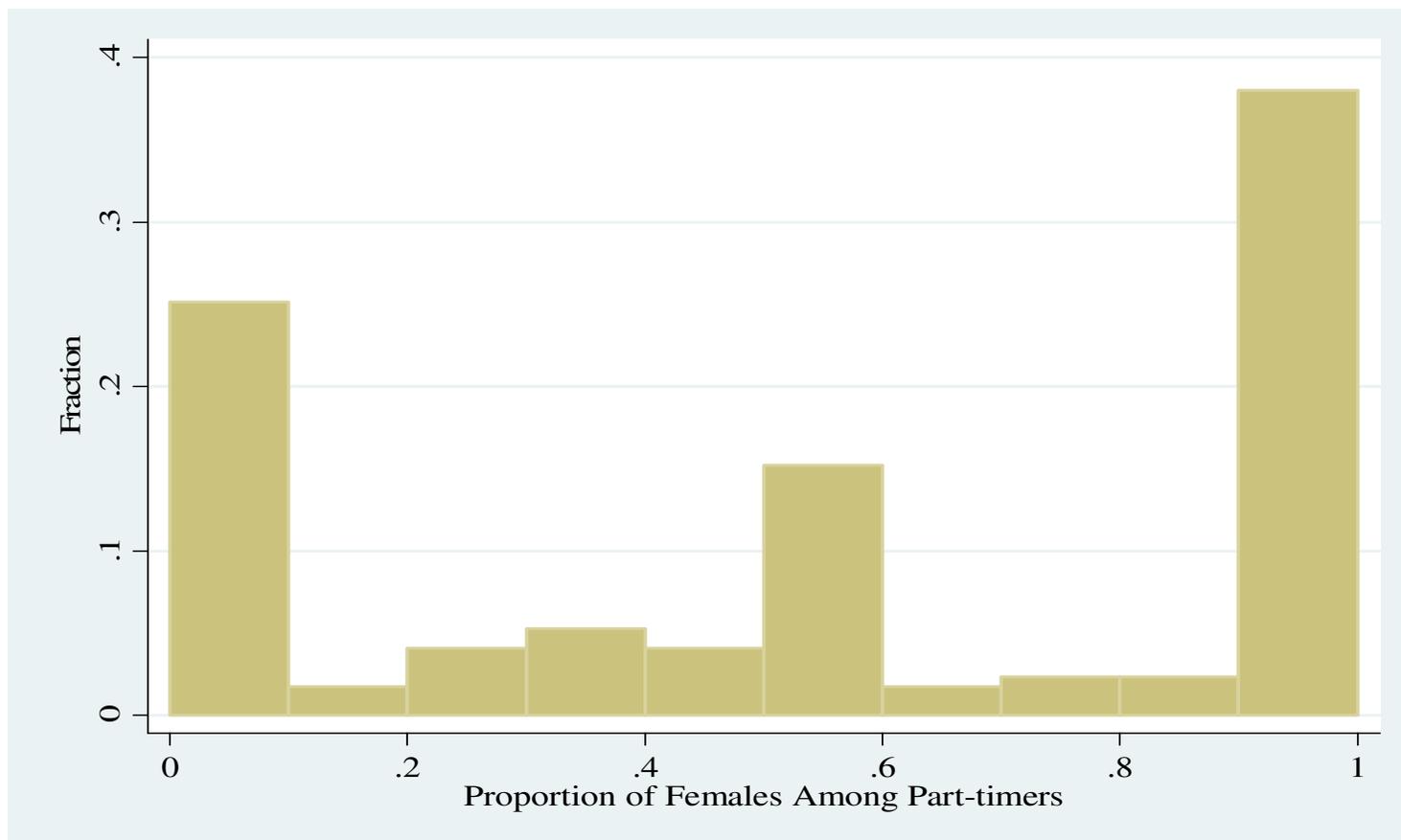
**Appendices To**


**The Why of More or Less:**
**Evidence from Spain on Gender Segregation at the Establishment Level of the Firm**

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# Appendix A
## ISOS Data Appendix

We use the May 3, 2003 release of the 2002 Wage Discrimination and Job Characteristics Survey (ISOS) matched worker-establishment data set for Spain. In the main data set we have 600 establishments sampled from three of Spain's autonomous regions: Andalusia, Catalonia and Madrid. The individual worker data set that matches with the establishment data includes 2,382 workers in it. For this paper we will not use this portion of the data set.

We require the number of women employed full-time in the establishment and for 48 observations this information is missing. We lose another 18 observations because the number of full-time employees for 2002 is missing. Another four observations are eliminated because the implied establishment female proportion is greater than one. We eliminate another 32 observations because of missing values associated with other variables we use. After imposing these restrictions we are left with a sample of 502 establishments. At this point we eliminate 42 establishments which while having valid data for all the variables are classified as being establishments in the public sector {education establishment etc.}. This has been done since the economic arguments which motivate some of the variables used imply that the establishment faces an underlying profit constraint that is lacking in this sector.

In the Table A.1 we outline in detail the source in the ISOS data for each of the variables discussed in the paper:

**Table A.1**
**Variable Definitions and ISOS Source Code**

| Variable | ISOS Source Question(s) |
|---|---|
| **Establishment Female Proportion** | To calculate full-time employees in the establishments we average the answers to questions A.1.1-A.1.3, which are quarterly number of employees for the first three quarters of 2002. The number of females is obtained from question A.5.1 of Caracteristicas de la Empresa questionnaire of the ISOS. |
| **Industry** | Industry classification is based on answer to the first answer (or most important) activity of the establishment (using CNAE codes) in Caracteristicas de la Empresa questionnaire. In the data we have the three-digit CNAE code and have aggregated them into one-digit level industry dummy variables. This was done using the letter codes with three exceptions. The first is the one energy industry establishment is merged into the manufacturing industry. Second, the Retail and Hotel-Restaurant categories are joined together to create one category. Finally, public administration and education are merged to create a single public-sector. The private sector dummy is coded as one if establishment is not a public sector service establishment and zero otherwise. |
| **Location** | Using CCCA Variable to create a location dummy variable. CCCA coded as 1 if establishment in Andalusia; CCCA coded as 2 if establishment in Catalonia; and CCCA coded as 3 if establishment in Madrid. |
| **Full-time Employees (FTE)** | To calculate full-time employees in the establishments we average the answers to questions A.1.1-A.1.3, which are quarterly number of employees for the first three quarters of 2002. |
| **Establishment's FTE Does Vary During the Year** | A dummy variable coded as one if the three-quarters variance associated with FTE is greater than zero and coded zero if it is positive. |
| **Establishment's Capital Stock Greatly Changed in last 10 Years** | This variable is a dummy variable coded as one if answer equals 1 to Question A.9 of Caracteristicas de la Empresa questionnaire is obtained and zero otherwise. |

*Table A1 Continued on Next Page.*

**Table A.1**
**Variable Definitions and ISOS Source Code**

| Variable | ISOS Source Question(s) |
|---|---|
| **76% of Establishment's Workers have Tenure 5 Years or More** | This variable is a dummy variable coded as one if answer is 5 or more to Question A.8 of Caracteristicas de la Empresa questionnaire is obtained and zero if answer is no. |
| **Establishment's Employees Require On-the-Job Experience** | This variable is a dummy variable coded as one if answer yes to Question A.7 of Caracteristicas de la Empresa questionnaire is obtained and zero if answer is no. |
| **Weeks of Experience Employees Require On-the-Job** | This variable is the straight average of the answers to Questions A.7.1 {Office and Other Workers} of Caracteristicas de la Empresa questionnaire. When only Office or Other Workers was available this is the number used. |
| **Establishment Hires Part-time Employees** | This variable is a dummy variable coded as one if answer to Question A.5 of Caracteristicas de la Empresa questionnaire is greater than zero. |
| **Missing Value Control Establishment Hires Part-time Employees** | This is a dummy variable coded to one if answer to Question A.5 of Caracteristicas de la Empresa questionnaire is missing. |

**Results Excluding Establishments with Missing Values on Independent Variables**

**Table B.1**
**Establishment Descriptive Statistics**

| Variable | Mean | Standard Deviation |
|---|---|---|
| **Establishment Female Proportion** | 0.256 | 0.237 |
| **(A) Location Characteristics** | | |
| **Madrid Establishments** | 0.244 | 0.430 |
| **Catalonia Establishments** | 0.496 | 0.501 |
| **Andalusia Establishments** | 0.260 | 0.439 |
| **(B) Industry Characteristics** | | |
| **Manufacturing and Energy Establishments** | 0.332 | 0.471 |
| **Construction Establishments** | 0.129 | 0.335 |
| **Retail and Hotel Establishments** | 0.347 | 0.476 |
| **Transport, Storage and Communication Establishments** | 0.039 | 0.193 |
| **Finance and Real Estate Service Establishments** | 0.105 | 0.307 |
| **(C) Establishment Characteristics** | | |
| **Full-time Employees (FTE)** | 47.536 | 179.393 |
| **Small Establishments: 10-19 FTE** | 0.673 | 0.470 |
| **Mid-Size Establishments: 20-99 FTE** | 0.234 | 0.424 |
| **Large Establishments: 100 or More FTE** | 0.093 | 0 .290 |
| **Full-time Female Employees (FTFE)** | 14.864 | 83.457 |
| **Establishment's FTE Does Vary During the Year** | 0.427 | 0.495 |
| **Establishment's Employees Require On-the-Job Experience** | 0.596 | 0.491 |
| **Weeks Employees Require On-the-Job Experience** | 4.200 | 8.907 |
| **Establishment's Capital Stock Greatly Changed in last 10 Years** | 0.267 | 0.443 |
| **76% of Establishment's Workers have Tenure 5 Years or More.** | 0.301 | 0.459 |
| **Establishment Hires Part-time Employees** | 0.509 | 0 .501 |
| **Number of Establishments** | **389** | |

**Table B.2**
**Establishment Female Proportion, Difference in Mean Tests[a]**

**(A): Location**

| Characteristic | Establishment Female Proportion | Standard Error on Difference | Probability Means Differ (Two-Sided) |
|---|---|---|---|
| **Madrid Establishments (N=101)** | 0.331 | | |
| **Catalonia Establishments (N=193)** | 0.197 | | |
| **Andalusia Establishments (N=95)** | 0.300 | | |
| **Difference Madrid-Catalonia Establishments** | **0.126** | **0.028** | **0.000** |
| **Difference Madrid-Andalusia Establishments** | **0.031** | **0.036** | **0.394** |
| **Difference Andalusia-Catalonia Establishments** | **0.103** | **0.027** | **0.000** |

**(B): Industry**

| Characteristic | Establishment Female Proportion | Standard Error on Difference | Probability Means Differ (Two-Sided) |
|---|---|---|---|
| **Manufacturing-Energy Establishments (N=129)** | 0.240 | | |
| **Construction Establishments (N=50)** | 0.103 | | |
| **Retail-Hotel Establishments (N=134)** | 0.260 | | |
| **Transport, Storage & Com. Establishments (N=15)** | 0.395 | | |
| **Finance and Real Estate Service Establishments (N=41)** | 0.392 | | |
| **Difference Manufacturing – Construction Establishments** | **0.137** | **0.034** | **0.000** |
| **Difference Manufacturing – Retail Establishments** | **-0.020** | **0.028** | **0.468** |
| **Difference Manufacturing – Finance Establishments** | **-0.152** | **0.042** | **0.000** |
| **Difference Manufacturing – Transport Establishments** | **-0.119** | **0.056** | **0.034** |

*Table B.2 Continued on Next Page*

**Table B.2**
**Establishment Female Proportion, Difference in Mean Tests[a]**

**(C): Establishment Characteristics**

| Characteristic | Establishment Female Proportion | Standard Error on Difference | Probability Means Differ (Two-Sided) |
|---|---|---|---|
| **Small Establishments: 10-19 FTE (N=262)** | 0.262 | | |
| **Mid-Size Establishments: 20-99 FTE (N=91)** | 0.255 | | |
| **Large Establishments: 100 or More FTE (N=36)** | 0.219 | | |
| **Difference Small and Mid-Size Establishments** | **0.007** | **0.029** | **0.822** |
| **Difference Mid-Size and Large Establishments** | **0.036** | **0.047** | **0.446** |
| **Difference Small and Large Establishments** | **0.043** | **0.041** | **0.304** |
| **Establishment's FTE Does Not Vary During the Year (N=223)** | 0.265 | | |
| **Establishment's FTE Varies During the Year (N=166)** | 0.244 | | |
| **Difference Establishments Do Not and Do Vary FTE During the Year** | **-0.020** | **0.024** | **0.412** |
| **Establishment Does Not Hire Part-time Employees (N=191)** | 0.210 | | |
| **Establishment Hires Part-time Employees (N=198)** | 0.301 | | |
| **Difference Establishments that Do Not and Do Hire Part-time Employees** | **-0.091** | **0.024** | **0.000** |
| **Establishment's Capital Stock Greatly Changed in last 10 Years (N=104)** | 0.348 | | |
| **Establishment's Capital Stock Not Greatly Changed in last 10 Years (N=285)** | 0.223 | | |
| **Difference Establishments Capital Stock Changes in Last 10 Years** | **0.125** | **0.026** | **0.000** |

*Table B.2 Continued on Next Page*

**Table B.2**
**Establishment Female Proportion, Difference in Mean Tests[a]**

| Characteristic | Establishment Female Proportion | Standard Error on Difference | Probability Means Differ (Two-Sided) |
|---|---|---|---|
| **Establishment's Employees Do Not Require On-the-Job Experience (N=157)** | 0.219 | | |
| **Establishment's Employees Do Require On-the-Job Experience (N=232)** | 0.281 | | |
| **Difference Establishment's Do Not or Do Require On-the-Job Experience** | **-0.062** | **0.024** | **0.011** |
| **76% of Establishment's Workers have Tenure Less than 5 Years (N=272)** | 0.273 | | |
| **76% of Establishment's Workers have Tenure 5 Years or More (N=117)** | 0.216 | | |
| **Difference Establishments Tenure Stock Less Than- Greater Than 5 Years** | **0.058** | **0.026** | **0.026** |

*Note: {a} The (N=) is number of establishments with the characteristic.*

**Table B.3**
**Two-Limit Tobit Determinants of Establishment Female Proportion**

| Industry Dummy Specification | Dependent Variable: Establishment Female Proportion[a] | | | |
|---|---|---|---|---|
| | One-Digit Dummies | | Two-Digit Dummies[b] | |
| Independent Variables | (1) | (2) | (3) | (4) |
| Full-time Employees (FTE)*(1/1000) | 0.043 (0.073) [0.557] | 0.052 (0.072) [0.465] | -0.008 (0.069) [0.912] | 0.003 (0.068) [0.967] |
| Establishment's FTE Does Vary During the Year | -0.068 (0.028) [0.017] | -0.068 (0.024) [0.016] | -0.062 (0.027) [0.020] | -0.062 (0.026) [0.020] |
| Establishment Hires Part-time Employees | 0.053 (0.029) [0.067] | 0.054 (0.028) [0.059] | 0.046 (0.027) [0.092] | 0.046 (0.027) [0.086] |
| Establishment's Capital Stock Greatly Changed in last 10 Years | 0.074 (0.035) [0.037] | 0.073 (0.035) [0.038] | 0.064 (0.033) [0.054] | 0.062 (0.033) [0.058] |
| 76% of Establishment's Workers have Tenure 5 Years or More | -0.037 (0.030) [0.223] | -0.037 (0.030) [0.219] | -0.048 (0.029) [0.094] | -0.047 (0.028) [0.094] |

*Table B.3 Continues on Next Page*

**Table B.3**
**Two-Limit Tobit Determinants of Establishment Female Proportion**

| Industry Dummy Specification | Dependent Variable: Establishment Female Proportion[a] | | | |
| --- | --- | --- | --- | --- |
| | One-Digit Dummies | | Two-Digit Dummies[b] | |
| Independent Variables | (1) | (2) | (3) | (4) |
| Establishment's Employees Require On-the-Job Experience | 0.055 (0.028) [0.048] | | 0.047 (0.026) [0.075] | |
| Weeks of Experience Employees Require On-the-Job | | 0.011 (0.004) [0.004] | | 0.010 (0.004) [0.008] |
| Square of Weeks of Experience Employees Require On-the-Job *(1/100) | | -0.016 (0.008) [0.041] | | -0.014 (0.008) [0.069] |
| Construction Establishments[c] | -0.193 (0.043) [0.000] | -0.184 (0.042) [0.000] | | |
| Retail-Hotel Establishments[c] | -0.023 (0.031) [0.460] | -0.017 (0.031) [0.573] | | |
| Transport, Storage and Communication Establishments[c] | 0.138 (0.069) [0.049] | 0.120 (0.069) [0.080] | | |

**Table B.3**
**Two-Limit Tobit Determinants of Establishment Female Proportion**

| Industry Dummy Specification | Dependent Variable: Establishment Female Proportion[a] | | | |
|---|---|---|---|---|
| | One-Digit Dummies | | Two-Digit Dummies[b] | |
| **Independent Variables** | **(1)** | **(2)** | **(3)** | **(4)** |
| **Finance and Real Estate Service Establishments[c]** | 0.079 (0.048) [0.096] | 0.076 (0.047) [0.111] | | |
| **Catalonia Establishments[d]** | -0.026 (0.038) [0.489] | 0.003 (0.038) [0.945] | -0.017 (0.038) [0.642] | 0.012 (0.038) [0.753] |
| **Madrid Establishments[d]** | 0.041 (0.038) [0.283] | 0.034 (0.038) [0.382] | 0.022 (0.037) [0.561] | 0.018 (0.037) [0.639] |
| **Constant** | 0.218 (0.048) [0.000] | 0.203 (0.047) [0.000] | 0.197 (0.049) [0.000] | 0.183 (0.047) [0.000] |

**Table B.3**
**Two-Limit Tobit Determinants of Establishment Female Proportion**

| Industry Dummy Specification | Dependent Variable: Establishment Female Proportion[a] | | | |
|---|---|---|---|---|
| | One-Digit Dummies | | Two-Digit Dummies[b] | |
| **Independent Variables** | **(1)** | **(2)** | **(3)** | **(4)** |
| **Tests** | | | | |
| **Joint Significance of Industry Dummies** | 8.160 {4, 377} [0.000] | 7.470 {4, 376} [0.000] | 4.980 {17, 364} [0.000] | 4.800 {17, 363} [0.000] |
| **Joint Significance of Geographic Dummies** | 1.390 {2, 377} [0.251] | 0.430 {2, 376} [0.652] | 0.530 {2, 364} [0.591] | 0.120 {2, 363} [0.889] |
| **Joint Significance of Weeks of Experience Variables** | | 4.320 {2, 487} [0.014] | | 4.960 {2, 363} [0.008] |
| **Pseudo $R^2$** | 0.341 | 0.369 | 0.534 | 0.563 |
| **Likelihood Ratio Test** | 79.580 {12} [0.000] | 86.170 {13} [0.000] | 124.600 {25} [0.000] | 131.220 {26} [0.000] |
| **Number of Establishments** | | | 389 | |

*Notes: {a} (): Standard Error of Coefficient, []: Two-Sided Probability Value and {}: Degrees of Freedom.*
*{b} Industry Coefficients are unreported in the two-digit industry dummy variables case.*
*{c} The exclude dummy variable is for manufacturing establishments.*
*{d} The excluded dummy variable is for establishments in Andalusia.*