Occupational and industrial segregation of female and male workers in Spain: An alternative approach[*]

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Abstract

This paper aims to analyze occupational and industrial segregation in the Spanish labor market by using the alternative tools proposed by Alonso-Villar and Del Río (2007), along with some new extensions put forward here. In particular, two decompositions of their segregation curves are proposed. The approach followed in this article allows measuring segregation of women and men separately, since the distribution of each group of workers across occupations and industries is compared with the distribution of total employment. To analyze industrial segregation, an aggregated classification of industries in four large groups (agriculture-fishing, industry, construction and services) and another by branches of activity are considered while to study occupational segregation, several partitions of individuals and of occupations are included.

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1. Introduction

All over the world, women receive lower salaries than men, whether computed on a daily, weekly or monthly basis (Anker, 1998). According to the Structure of Earnings Survey for 2002, provided by EUROSTAT, the average earnings per hour of women in the European Union (EU) are about 75% of men's. Hungary, Sweden, Slovenia and Poland are the countries with the lowest gender wage gaps -- female earnings representing between 85% and 89% of males' earnings. The gap is larger in countries such as United Kingdom, Slovakia, Cyprus, Estonia, Germany, Austria, Ireland, Greece and Spain, where the ratio is between 70% and 75%.

Male-female pay differentials can emerge, among other sources, from differences in education and experience, from differences in preferences for jobs, and from labor market discrimination.[1] Gender differences in skills may exist if women who expect to spend an important part of their lives in childcare have lower investments in human capital, and also if those who expect to face barriers against entering certain occupations invest in skills oriented mainly towards traditionally female jobs. As pointed out by Anker (1998, p. 7) "Decisions by parents, youngsters and schools regarding how much education to provide girls and boys, as well as which fields of study they should pursue, are based to a significant extent on labour market opportunities. This means that women's restricted labour market opportunities and lower pay for 'female' occupations help perpetuate women's inferior position in society." Gender differences in skills may arise not only from pre-market human capital, but also from social roles affecting female decisions within the labor market.[2] Those individuals who work fewer hours and/or fewer years in the course of their careers are expected to have a lower accumulation of and return to experience, which brings another explanation for gender wage differentials.

Alternatively, other theories emphasize the role of discrimination against women in order to explain gender disparities. In this regard, in his classical work, Becker (1957) argues that some employers may have what he termed a taste for discrimination (a prejudice), so that they hire women only if they receive lower salaries than men. Phelps (1972) and Aigner and Glen (1977) suggest, however, that the cause of discrimination is not due to such preferences, but to statistical discrimination. Employers do not have perfect information about individuals, so their decisions are based on their perception about average characteristics of the group in terms of productivity, absenteeism, turnover, etc.[3]

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[1] Petrongolo (2004) shows evidence of female over-representation in part-time and temporary jobs in most countries of the EU and suggests the existence of discrimination in Southern Europe since this segregation is not well explained by differences in preferences or productivity.

[2] According to latest data from the Spanish Institute of Statistics (INE), one out of two male workers with children leaves his parental responsibility to his wife, which has important consequences in terms of employment patterns.

[3] See also Arrow (1973). Certainly, employer beliefs can be the consequence of social stereotypes rather than statistical discrimination, as surveyed by Preston (1999).

Apart from the aforementioned factors, gender wage differentials may be affected by the earnings structure, in particular by overall wage inequality and by wage-setting institutions. Women are usually confined to occupations and firms at the bottom of the wage distribution, so when overall salary dispersion decreases, so does the gender gap. In this regard, Blau and Khan (2003) show that this effect is quantitatively important, since a large part of the gender differential between countries can be explained by differences in the overall wage structure. The literature also attributes an important role to occupational segregation by sex when explaining the wage gap. Thus, based on previous studies, Anker (1998) concludes that approximately one-third of the gap is due to this factor. Even if women and men had equal characteristics in terms of skills and preferences, wage differentials can arise from differences in pay for work of similar value (the most feminized jobs are usually those with lower pay) and also from differences in job availability, since both women and men can be excluded from occupations mainly-dominated by the other sex (or perhaps, men are not interested in working in feminized occupations). To the extent that occupational segregation has a remarkable effect on the gender pay gap, reducing segregation appears to be an important objective in order to achieve earnings equity.

The aim of this paper is to study occupational and industrial segregation in Spain, a country where occupational segregation explains a large part of the gender wage gap. In this regard, by using the European Structure of Earnings Survey for 1995 Plasman and Sissoko (2004) estimated that this contribution represents about 29.6% in Spain, while it decreases to 13% in Belgium and to 5.3% in Italy. Simon (2006) also suggested that in Spain female workers are confined to low-paying establishments to a larger extent than in other European countries, which opens the possibility that industrial disparities play a role in explaining the gender wage gap.[4]

When analyzing segregation in the labor market, most measures compare the distribution of female workers across occupations with that of males, so that segregation exists so long as the former differs from the latter.[5] Thus, most indexes are function of the female and male ratios in each occupation (calculated with respect to their respective population size) and are consistent with traditional segregation curves introduced by Duncan and Duncan (1955) (see Hutchens, 1991, 2004; Chakravarty and Silber, 2007).

Some papers, however, follow a different approach. In this regard, Moir and Selby Smith (1979) modified the popular dissimilarity index introduced by Duncan and Duncan (1955) to analyze industrial segregation in the Australian labor market. This modified index calculates the differences

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[4] However, Amuedo-Dorantes and De la Rica (2006) found that the gender wage gap in Spain is large even after controlling for the level of human capital, pay structure characteristics and female segregation in low-paying industries, occupations, and establishments. Other articles that study the contribution of occupational segregation to the wage gap in Spain are Hernández (1996) and Aláez and Ullibarri (2000).

[5] In measuring social segregation in secondary schools, Jenkins et al. (2006) follow a similar approach by comparing students with a high social position with those having a low position. Also, Duncan and Duncan (1955) and James and Taeuber (1985), among others, follow this line to study racial segregation of students -- considering only two types, blacks and whites -- across schools.

across industries between the proportion of female workers and the proportion of total workforce, rather than the differences between the former and the proportion of male workers. As a consequence, the ideal or benchmark distribution is that of total employment instead of male employment.

Other indexes have also been used to measure occupational segregation in such a way that the distribution of reference is somehow that of total employment. This is particularly the case with the index initially proposed by Theil and Finizza (1971) to analyze racial segregation across schools and recently developed by Mora and Ruiz-Castillo (2003, 2004) to analyze occupational segregation by sex in Spain. According to this index, the female and non-female (i.e. male) ratios are calculated with respect to this total employment value. However, this approach allows measuring gender segregation, in line with the traditional approach, but not exactly the segregation of female workers, since this index takes into account the distributions of women and men all together, and not separately.

In a recent paper Alonso-Villar and Del Río (2007) propose a general framework in which to study the occupational segregation of any target group. Thus, when there are two or more categories of individuals, the occupational segregation level of each group can be independently determined by comparing its distribution with respect to that of total employment. According to this view of segregation, an axiomatic framework to measure occupational segregation is presented, and alternative segregation curves are proposed. Also, additively decomposable indexes consistent with the above curves are defined.

This paper aims to measure both female and male segregation in the Spanish labor market by using the tools proposed by Alonso-Villar and Del Río (2007) (AV-DR, hereafter), and some new extensions put forward here. For this purpose, the framework proposed by AV-DR is first extended to measure the segregation level of any target group across occupations and industries so that each occupation-sector represents a different category. Next, two decompositions of their segregation curves are proposed. In this regard, the study uses a decomposition of the curve by classes of categories, which is in line with the decomposition of the Lorenz curve by population subgroups proposed by Bishop *et al*. (2003). An alternative decomposition of the segregation curve according to a classification of the individuals of the target group is also offered.

The paper is structured as follows. Section 2 extends the segregation measurement previously proposed by AV-DR and offers two decompositions of its segregation curves. In Section 3, several segregation measures and their decompositions are used in order to analyze overall segregation (occupational and industrial) of males and females in Spain in 2007. In this section a classification of sectors in four large groups is considered (agriculture-fishing, industry, construction and services). In Section 4, a deeper analysis of both occupational and industrial segregation is undertaken. In this regard, a classification of industries by branches of activity is considered, and several partitions of individuals and of occupations are included. The evolution of occupational and industrial segregation indexes in the last decade is also shown. Finally, Section 5 presents the main conclusions.

2. An alternative measurement of segregation

Consider an economy with $O \geq 1$ occupations, $P \geq 1$ sectors and $T > 1$ jobs so that vector $(t_{11}, t_{12}, ..., t_{OP})$ represents the distribution of jobs among occupations-sectors and $T = \sum_{o,p} t_{op}$.[6] In other words, t_{op} is the number of jobs in the economy corresponding to occupation *o* and sector *p*. Assume that we are interested in analyzing the segregation of a target group that has the following distribution among occupations and sectors $(c_{11}, c_{12}, ..., c_{OP})$, and denote by *C* the total number of individuals belonging to this group. Then $C = \sum_{o,p} c_{op}$ and $c_{op} \leq t_{op}$, since this group represents a subset of total workers. Distribution *c* could represent, for example, the number of women (or men) employed in each occupation-sector but also the number of individuals of an ethnic or social group or whatever group of citizens that interests us. For the sake of simplicity we rename the above vectors as follows: $t \equiv (t_1, t_2, ..., t_J)$ and $c \equiv (c_1, c_2, ..., c_J)$, where $J = O \times P$.

AV-DR recently proposed a general framework in which to study the segregation of any population subgroup by comparing its distribution with respect to the employment structure of the economy, rather than doing it with respect to the distribution of a particular group considered as the standard or ideal. Within this new setup, the basic axioms for a segregation measure have been redefined. Also, alternative segregation curves have been proposed and new indexes consistent with them have been characterized. Their segregation curve, denoted by S^*, can be written as

$$S^*_{(c;t)}(\tau_j) = \frac{\sum_{i \leq j} c_i}{C},$$

where $\tau_j \equiv \sum_{i \leq j} \frac{t_i}{T}$ is the proportion of cumulative employment represented by the first *j* categories (occupations-sectors) lined up in ascending order of the ratio $\frac{c_j}{t_j}$ ($j = 1, ..., J$). Thus, to calculate this segregation curve, first, the categories have to be ranked and, second, the cumulative proportion of employment, $\sum_{i \leq j} \frac{t_i}{T}$, is plotted on the horizontal axis and the cumulative proportion of individuals of

[6] If interested in the economy as a whole, rather than in different industries, then $P = 1$, and we would focus on occupational segregation. Alternatively, if $O = 1$, we would measure industrial segregation. In order to make interesting analysis, we assume that either *O* or *P* is higher than one.

the target group (either women or men in our empirical implementation), $\sum_{i \le j} \frac{c_i}{C}$, is plotted on the vertical axis.[7]

They also proposed several segregation measures consistent with non-intersecting S^* curves so that when comparing two different distributions of the target group, if the segregation curve of one of them dominates that of the other (i.e., if the segregation curve of the former lies at no point below the latter and at some point above), then any segregation index satisfying some axiomatic properties (*scale invariance, symmetry in groups, movement between groups, and insensitivity to proportional divisions*) would take a higher value when it is evaluated at the dominated distribution. In particular, the following measures were proposed:

$$G^* = \frac{\sum_{i,j} \frac{t_i}{T}\frac{t_j}{T}\left|\frac{c_i}{t_i} - \frac{c_j}{t_j}\right|}{2\frac{C}{T}},$$

$$\Phi_a(c;t) = \begin{cases} \frac{1}{a(a-1)}\sum_j \frac{t_j}{T}\left[\left(\frac{c_j/C}{t_j/T}\right)^a - 1\right] & \text{if } a \neq 0,1 \\ \frac{1}{\mathrm{T}}\sum_j t_j\left[\frac{c_j/C}{t_j/T}\ln\left(\frac{c_j/C}{t_j/T}\right)\right] & \text{if } a = 1 \end{cases},$$

where the first measure is a variant of the classic Gini index and the second represents a family of indexes related to the generalized entropy family (a can be interpreted as a segregation aversion parameter). These indexes, together with a variation of the index of dissimilarity,[8] as proposed by Moir and Selby Smith (1979), will be used later in the paper to analyze female and male segregation in Spain.[9]

Two decompositions of the indexes Φ_a were also proposed in the aforementioned article:

i) *Decomposition by subgroups of categories* (occupations, for example). Given a partition of occupations in *K* classes, $(c;t) = (c^1,...,c^K;t^1,...,t^K)$, the indexes can be decomposed as follows:

$$\Phi_a(c^1,...,c^K;t^1,...,t^K) = \sum_k \left(\frac{C^k}{C}\right)^a \left(\frac{T^k}{T}\right)^{1-a} \Phi_a(c^k;t^k) + \Phi_a(C^1,...,C^K;T^1,...,T^K) \text{ if } a \neq 0$$

[7] Traditional occupational segregation curves represent, instead, the cumulative proportion of female workers corresponding to the cumulative share of male workers, once the occupations have been ranked by increasing gender ratios (the number of women divided by the number of men in each occupation).

[8] The expression of this index is the following: $D^* = \frac{1}{2}\sum_j \left|\frac{c_j}{C} - \frac{t_j}{T}\right|$.

[9] Both D^* and G^* take values within the interval $[0,1)$, while Φ_a can be easily transformed in order to take values within that interval (see AV-DR).

where the first addend of the above formula represents the *within* component, i.e. the weighted sum of segregation inside each class, while the second addend reflects the *between* component.

ii) *Decomposition by subgroups of individuals.* In order to analyze segregation differences between individuals of the target group, let us classify them into several mutually-exclusive subgroups. Without loss of generality, consider that there are only two subgroups *A* and *B* so that $(c;t)=(c^A+c^B;t)$. Then the contribution of subgroup *A* to the segregation level of the whole target group according to index Φ_2 is

$$IC_A=\rho_A\left(\frac{C^A}{C}\right)\sqrt{\frac{\Phi_2(c^A;t)}{\Phi_2(c;t)}},$$

where ρ_A is the correlation between $(\underbrace{\frac{c_1}{t_1},...,\frac{c_1}{t_1}}_{t_1},...,\underbrace{\frac{c_J}{t_J},...,\frac{c_J}{t_J}}_{t_J})$ and $(\underbrace{\frac{c_1^A}{t_1},...,\frac{c_1^A}{t_1}}_{t_1},...,\underbrace{\frac{c_J^A}{t_J},...,\frac{c_J^A}{t_J}}_{t_J})$.

These decompositions will be used later on in our empirical analysis. Among others, the former will be employed to measure the contribution of the four large sectors of the economy (agriculture-fishing, industry, construction and services) to overall segregation, while the later will be used to measure the contribution of young, middle-aged, and elderly workers to segregation.

Decomposing segregation curves

While additive decompositions of indexes have been proposed in the literature of segregation, as far as we know, no decompositions of segregation curves have been yet suggested. In what follows, we offer two forms of decomposing segregation curves S^*.[10] First, we present a decomposition of the curve according to a partition of categories into several classes, and, second, we propose a decomposition of the curve according to a classification of individuals into several groups.[11]

First, let occupations-sectors be classified into several mutually exclusive classes. For example, if we assume that $P=1$, we could classify occupations into three groups according to their average salary (low-, intermediate- and high-paid occupations), while if $O=1$, we could group the branches of activity into four large industries. Without loss of generality, let occupations-sectors be classified into two mutually exclusive classes, so that $(c;t)=(c^1,c^2;t^1,t^2)$. Denote by C^1 (respectively C^2) the number of individuals of the target group who work in the occupations-sectors classified in class 1 (respectively, 2). Define indicator G_1^j so that $G_1^j=1$ if occupation-sector *j*

[10] The decompositions proposed here could also be applied to the traditional segregation curve.
[11] The first decomposition is similar to the one proposed by Bishop *et al.* (2003) to decompose the Lorenz curve by population subgroups. However, the second decomposition has not parallel in that paper.

belongs to class 1 and $G_1^j = 0$ otherwise. Indicator G_2^j can be defined analogously. By using vector c^1, we can build $\tilde{c}^1$ as the J-dimensional vector resulting from enlarging vector c^1 with zero-values for those occupations-sectors that are not included in class 1, i.e. $\tilde{c}^1 = (c_1 G_1^1, ..., c_J G_1^J)$. In other words, $\tilde{c}^1$ is a fictitious distribution having the same dimension as the original distribution *c* so that it can be compared to the distribution of total employment *t.* Analogously, we can build distribution $\tilde{c}^2$.

Proposition 1. Given a partition of occupations-sectors into two mutually exclusive classes so that the distributions *c* and *t* can be expressed as $(c;t) = (c^1, c^2; t^1, t^2)$, then the segregation curve $S^*_{(c;t)}$ can be decomposed as follows:

$$S^*_{(c;t)}(\tau_j) = \frac{\mu(\tilde{c}^1)}{\mu(c)} \tilde{S}^*_{(\tilde{c}^1;t)}(\tau_j) + \frac{\mu(\tilde{c}^2)}{\mu(c)} \tilde{S}^*_{(\tilde{c}^2;t)}(\tau_j),$$

where $\tilde{S}^*_{(\tilde{c}^h;t)}(\tau_j) = \frac{\sum_{i \le j} c_i G_h^i}{C^h}$ $(h = 1, 2)$ represents the pseudo-segregation curve for fictitious distribution $(\tilde{c}^h; t)$ once occupations-sectors have been ranked according to ratios $\frac{c_j}{t_j}$, while $\mu(.)$ denotes the average of the corresponding distribution.[12]

Proof:

The segregation curve of $(c;t)$ can be decomposed as $S^*_{(c;t)}(\tau_j) = \frac{\mu(\tilde{c}^1)}{\mu(c)} \frac{\sum_{i \le j} c_i G_1^i}{C^1} + \frac{\mu(\tilde{c}^2)}{\mu(c)} \frac{\sum_{i \le j} c_i G_2^i}{C^2}$, since $\mu(\tilde{c}^i) = \frac{C^i}{J}$, $i = 1, 2$, and $\mu(c) = \frac{C}{J}$. Note that $\frac{\sum_{i \le j} c_i G_1^i}{C^1}$ is the value of the pseudo-segregation curve corresponding to the distribution $(\tilde{c}^1; t)$. Analogously, $\frac{\sum_{i \le j} c_i G_2^i}{C^2}$ is the value of the pseudo-segregation curve corresponding to $(\tilde{c}^2; t)$. This completes the proof. □

This decomposition can be easily generalized to *K* classes. In this vein, the expression:

$$SC_k = \frac{\mu(\tilde{c}^k)}{\mu(c)} \frac{\tilde{S}^*_{(\tilde{c}^k;t)}(\tau_j)}{S^*_{(c;t)}(\tau_j)} \qquad (1)$$

[12] Note that $\tilde{S}^*_{(\tilde{c}^1;t)}$ does not represent the segregation curve of the distribution $(c^1; t^1)$, nor that of fictitious distribution $(\tilde{c}^1; t)$, since the ranking of occupations-sectors is that of the original distribution $(c;t)$. We call pseudo-segregation curve $\tilde{S}^*$ to the segregation curve obtained when the ranking is that of curve S^*.

measures the contribution of class *k* to the value of the segregation curve in the corresponding percentile. For instance, assume that we focus now on the occupational-industrial segregation of female workers, and consider that the occupations-sectors are classified into four large categories: agriculture-fishing, industry, construction and services. The first decile of the distribution represents the 10% of the less- feminized jobs of the economy (that is, those belonging to occupations-sectors with the lowest $\frac{c_j}{t_j}$ ratios). The second cumulative decile represents the 20% of the less-feminized jobs, and so on. The above decomposition allows us to calculate the contribution of each class to each cumulative decile. In other words, we can determine the proportion of jobs in the first decile belonging to agriculture, industry, construction and services; the proportion of jobs in the second cumulative decile that corresponds to each large sector, and so on.

Moreover, function $S^*_{(\tilde{c}^k;t)}$ also enables us to determine how individuals of the target group working in occupations-sectors included in class *K* are distributed among non-cumulative deciles. In this regard, expression

$$\tilde{S}^*_{(\tilde{c}^k;t)}(\tau_j + 0.1) - \tilde{S}^*_{(\tilde{c}^k;t)}(\tau_j) \qquad (2)$$

indicates the proportion of the target individuals working in class *K* in each (non-cumulative) decile. In the above example, this analysis will permit us to find out whether the distribution of service employment across non-cumulative deciles of total employment, ranked from low- to high-feminization rates, differs from that of the industry.

Second, without loss of generality, let individuals of the target group be classified into two mutually-exclusive subgroups, *A* and *B*, so that $(c_1,...,c_J) = (c_1^A + c_1^B,...,c_J^A + c_J^B)$. Denote by C^A (respectively C^B) the number of individuals of the target subgroup A (respectively B).

Proposition 2. If the target group can be divided into two mutually-exclusive subgroups *A* and *B* so that $(c;t) = (c^A + c^B;t)$, then the segregation curve $S^*_{(c;t)}$ can be decomposed as follows:

$$S^*_{(c;t)}(\tau_j) = \frac{\mu(c^A)}{\mu(c)}\tilde{S}^*_{(c^A;t)}(\tau_j) + \frac{\mu(c^B)}{\mu(c)}\tilde{S}^*_{(c^B;t)}(\tau_j),$$

where $\tilde{S}^*_{(c^A;t)}(\tau_j) = \frac{\sum_{i\le j} c_i^A}{C^A}$ represents the pseudo-segregation curve corresponding to $(c^A;t)$, and $\tilde{S}^*_{(c^B;t)}(\tau_j) = \frac{\sum_{i\le j} c_i^B}{C^B}$ is the pseudo-segregation curve corresponding to $(c^B;t)$, once occupations-

sectors have been ranked according to ratios $\frac{c_j}{t_j} \forall j$, while $\mu(.)$ denotes again the average of the corresponding distribution.[13]

Proof:

Note that, on one hand, the segregation curve of $(c;t)$ can be decomposed as $S^*_{(c;t)}(\tau_j) = \frac{\mu(c^A)}{\mu(c)} \frac{\sum_{i \le j} c_i^A}{C^A} + \frac{\mu(c^B)}{\mu(c)} \frac{\sum_{i \le j} c_i^B}{C^B}$, since $\mu(c^A) = \frac{C^A}{J}$, $\mu(c^B) = \frac{C^B}{J}$ and $\mu(c) = \frac{C}{J}$. On the other hand, the second component of the first and second addend is, respectively, the pseudo-segregation curve of target subgroups *A* and *B*, since occupations-sectors are ranked from low to high $\frac{c_j}{t_j}$ ratios with $j = 1, ..., J$ and not according to the corresponding ratios of each subgroup. This completes the proof. □

This decomposition can also be easily generalized to more than two subgroups so that

$$SC_A = \frac{\mu(c^A)}{\mu(c)} \frac{\tilde{S}^*_{(c^A;t)}(\tau_j)}{S^*_{(c;t)}(\tau_j)} \quad (3)$$

measures the contribution of the target subgroup *A* to the segregation curve of the whole target group. For instance, in analyzing female occupational segregation, we can be interested in distinguishing between the contribution of high-educated women and that of low-educated. The above decomposition permits us to find out whether in the first decile of the distribution of occupations-sectors there are mainly low or high-educated female workers. Furthermore, if *A* represents the subgroup of high-educated female workers, expression

$$\tilde{S}^*_{(c^A;t)}(\tau_j + 0.1) - \tilde{S}^*_{(c^A;t)}(\tau_j) \quad (4)$$

enables us to determine how these women are distributed among the deciles of the whole distribution, i.e., whether they work in feminized jobs or not.

3. The joint effect of occupational and industrial segregation in Spain

The data used in this paper comes from the *Encuesta de Población Activa* (EPA) conducted by the Spanish Institute of Statistics (INE) by following EUROSTAT's guidelines. This survey offers labor market information of a representative sample of Spanish households and is commonly used for

[13] Notice that $\tilde{S}^*_{(c^A;t)}$ does not represent the segregation curve of distribution $(c^A;t)$ since the ranking of occupations-sectors is that of the original distribution $(c;t)$.

international comparisons. Our data corresponds to the second quarter of the years 1999-2007. Occupations and industries are considered at a two-digit level of the CNO-1994 (*National Classification of Occupations*) and CNAE-1993 (*National Classification of Economic Activities*), respectively. The list includes 66 occupations and 60 branches of activity, which can be aggregated into four large sectors: agriculture-fishing, industry, construction and services.[14]

In this section we analyze whether the distribution of female workers in 2007 differs from that of males when taking into account, simultaneously, differences in the 66 occupations and in the four aggregate sectors.[15] In this respect, a common occupation is considered a different category depending on whether it belongs to agriculture, industry, construction or services. Even though the cross between occupations and branches would lead to a larger number of categories (66 occupations multiplied by 4 sectors makes 264), we analyze only the 221 categories in which there is employment.

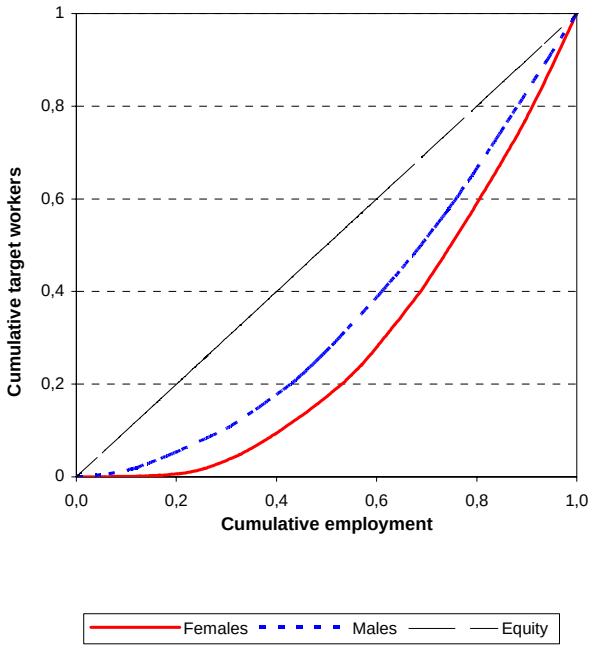


Figure 1. Occupational and industrial segregation curves (221 categories).

	$\Phi_{0.1}$	$\Phi_{0.5}$	Φ_1	Φ_2	D^*	G^*	**Distribution of female and male workers between groups of age**
FEMALE WORKERS	0.73	0.46	0.34	0.28	0.33	0.43	100%
<30 years old	1.02	0.55	0.43	0.39	0.37	0.49	25.28%
30 to 44 years old	0.76	0.45	0.34	0.28	0.32	0.43	44.69%
>45 years old	1.21	0.60	0.45	0.41	0.37	0.50	30.03%
MALE WORKERS	0.21	0.18	0.16	0.14	0.23	0.30	100%
<30 years old	0.40	0.33	0.30	0.32	0.32	0.43	22.98%
30 to 44 years old	0.24	0.20	0.18	0.16	0.24	0.32	43.24%
>45 years old	0.26	0.21	0.18	0.17	0.25	0.33	33.79%

Table 1. Occupational and industrial segregation indexes (221 categories) and distribution of female and male workers.

[14] Two out of sixty branches have been eliminated for 2007 since one of them had not employees (*extraction of uranium and thorium ores*), and the other had odd figures (*extraterritorial institutions*).

[15] In 2007, women represented 41% of workers, while men represented 59%.

Our segregation curves show that the distribution of male workers dominates that of females, since the curve corresponding to the former is above that of the latter (see Figure 1). In fact, as shown in Table 1, all indexes have remarkable increases when comparing the male and female distributions. One of them even triples their value ($\Phi_{0.1}$), while others double it (Φ_a with $a = 0.5,\ 1,\ 2$). On the other hand, we also see unevenness in the distribution of men workers across occupations and sectors so that men also have a non negligible segregation level, even though the causes of this phenomenon may substantially differ from that of female segregation.

3.1 Partition by age

This subsection discusses the partitioning of workers into three groups: young individuals (16 to 29 years old), middle-aged individuals (30 to 44 years old) and elderly individuals (over 45 years old). The distribution of the labor force among the three groups, shown in the last column of Table 1, indicates that the middle-age group is the largest for both women and men.

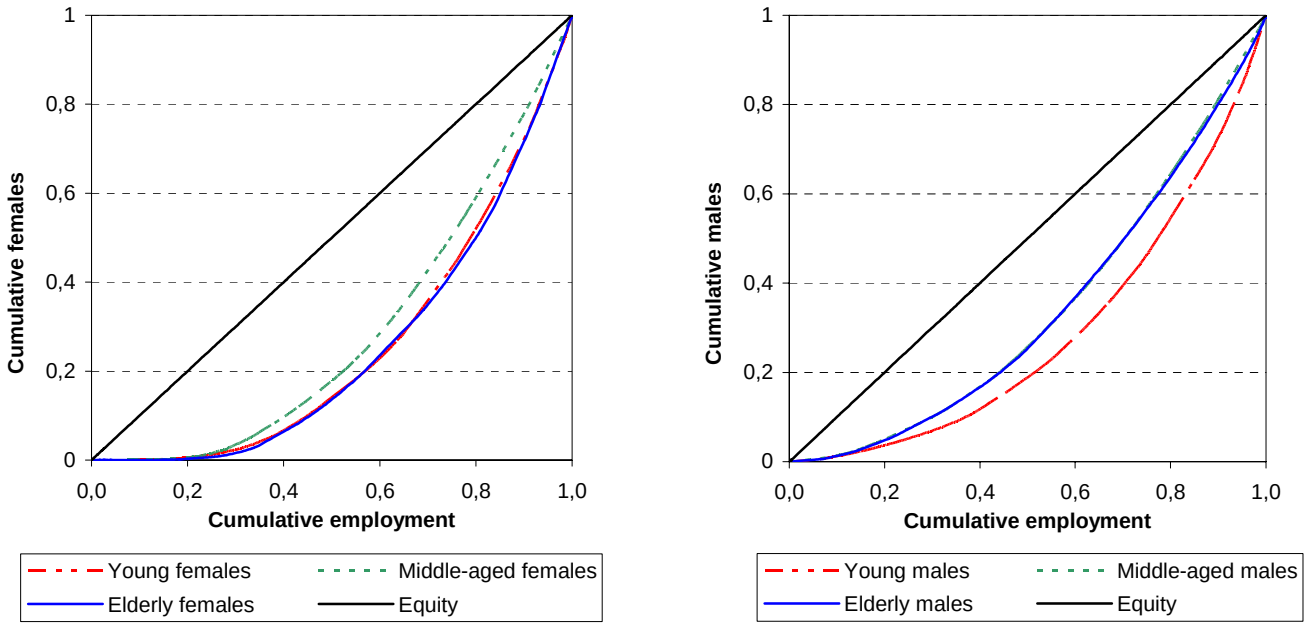


Figure 2. Occupational and industrial segregation curves (221 categories) by age.

When analyzing occupational and industrial segregation in each of the three groups, we observe the following patterns. First, in any age group, female workers suffer more segregation than males (Table 1). Therefore, even when comparing young cohorts, segregation is higher for women. Second, the middle-aged group has the lowest female segregation (regarding both curves and indexes), while the elderly group has a segregation level that is equal to, or slightly higher than, that of the young group (see Figure 2 and Table 1). Third, regarding males, the young-aged group suffers the

highest segregation, while the other two groups show similar levels. (The middle-aged group is again the one with the lowest segregation, according to most indexes).[16]

Following the decomposition of the segregation curve by individuals presented in Section 2 (expression (4)), Figure 3 shows how the three age groups are distributed across non-cumulative ventiles:[17]

a) We can see that the group of elderly women is the one more concentrated in the most feminized jobs. In this regard, 44.9% of them work in the fifth ventile, while the share slightly decreases in the other groups (see Table A1 in the Appendix).

b) The decomposition of the segregation curve of males suggests that the group of young workers is the one showing the highest concentration in male-dominated jobs. (While only 29% of elderly men are in the fifth ventile, this percentage rises to 39.4% in the group of young males).

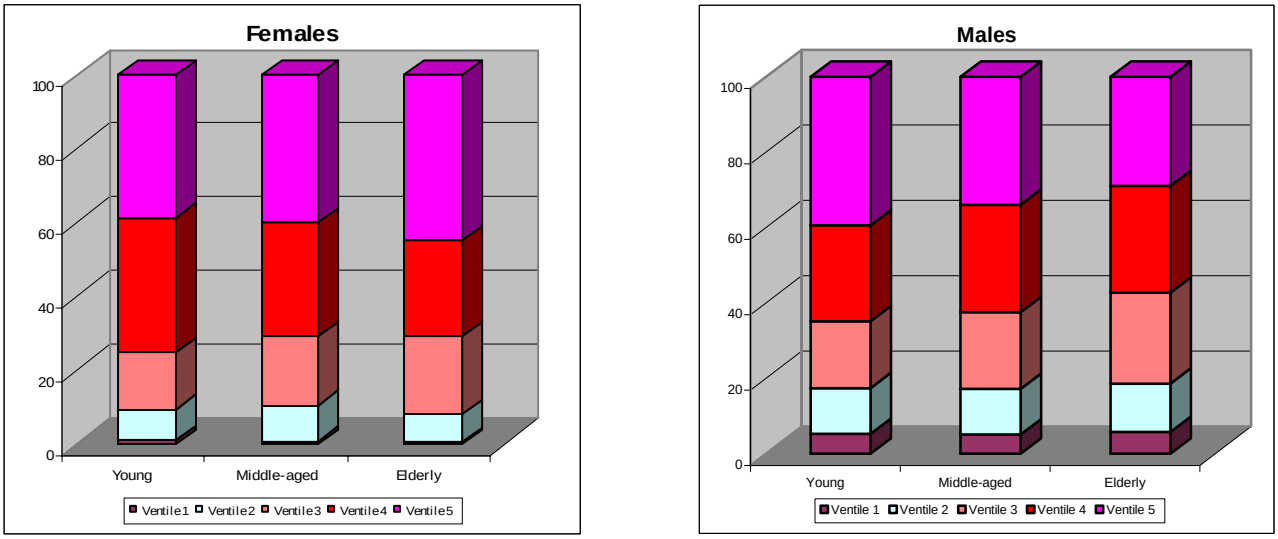


Figure 3. Distribution of each group age across non-cumulative ventiles (221 categories)

3.2 Occupational segregation within each large sector

By using the decomposition of index Φ_1 in the within-group and between-group components, shown in Section 2, we find that partitioning the 221 categories into large sectors (agriculture-fishing, industry, construction and services) appears to be relevant in explaining segregation in Spain, since the between-group component represents 35.7% in the case of females and 26.6% in males. In other words, differences between the four large sectors explain about 36% and 26% of female and male segregation, respectively.

[16] The results shown here remain basically unaltered when analyzing occupational segregation (66 categories) separately.

[17] The 221 categories of occupations-sectors have been ranked from low to high female (respectively, male) employment ratios in such a way that the first (non-cumulative) ventile represents the less-feminized (masculinized) jobs in the economy, while the fifth ventile represents the most-feminized (masculinized) jobs, with each ventile representing 20% of total employment.

For the above reason, in what follows, the occupational segregation of each large sector is analyzed separately, i.e., the benchmark distribution for each sector is the employment distribution of that sector.[18] Therefore, in each sector, a maximum of 66 categories is considered. Figure 4 shows that occupational segregation of women is higher in construction, while male segregation is higher in the service sector (i.e., the corresponding segregation curve is dominated by the other curves). Most indices also suggest that the agriculture-fishing sector has the lowest occupational segregation level for both women and men, especially for the latter (see Table 2). Note that when comparing female and male occupational segregation, most indexes show that segregation in the service sector is slightly higher for men, while in the remaining sectors, including industry, segregation is much higher for women.

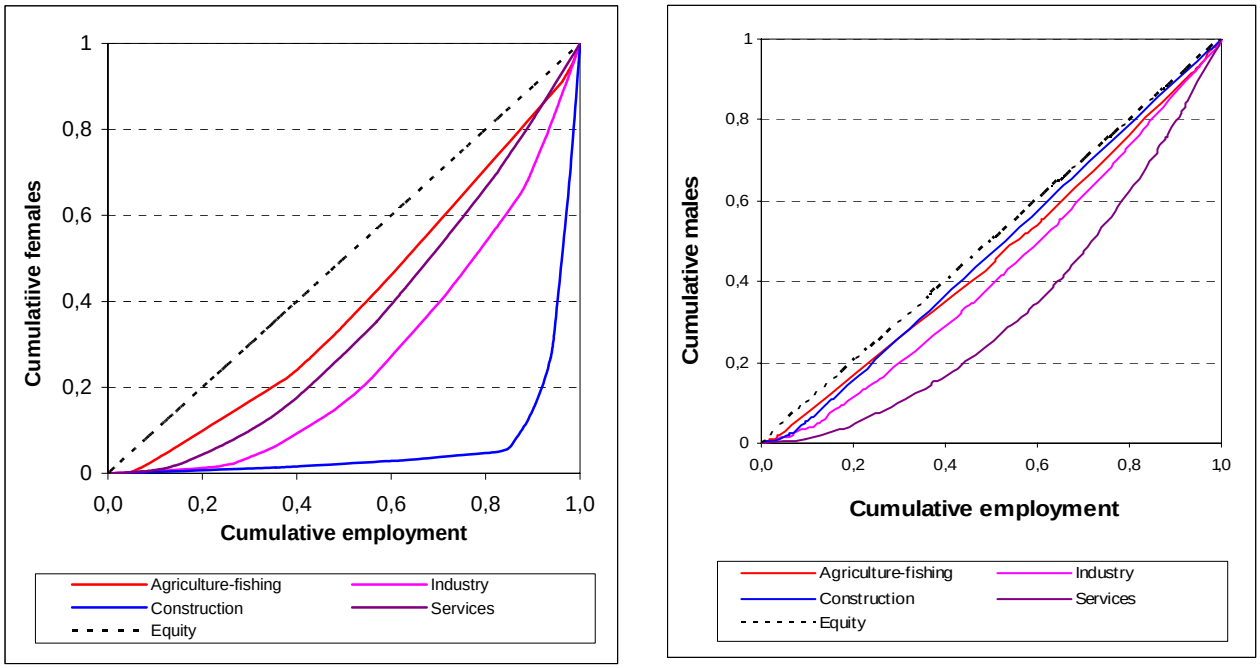


Figure 4. Occupational segregation within each sector and sex (66 categories).

	$\Phi_{0.1}$	$\Phi_{0.5}$	Φ_{1}	Φ_{2}	D^{*}	G^{*}	**Distribution of female and male workers between sectors**
FEMALE WORKERS							100%
Agriculture-fishing	0.46	0.14	0.10	0.09	0.16	0.21	2.93%
Industry	0.56	0.44	0.37	0.36	0.34	0.46	9.69%
Construction	2.23	1.77	1.87	4.25	0.79	0.87	1.84%
Services	0.30	0.21	0.17	0.14	0.22	0.30	85.55%
MALE WORKERS							100%
Agriculture-fishing	0.02	0.02	0.01	0.01	0.06	0.08	5.63%
Industry	0.06	0.05	0.05	0.04	0.11	0.15	20.27%
Construction	0.03	0.03	0.02	0.02	0.05	0.05	21.32%
Services	0.24	0.21	0.19	0.18	0.25	0.34	52.77%

Table 2. Occupational segregation indexes (66 categories) and distribution of female and male workers between sectors.

[18] As can be seen in Table 2, 85.6% of females work in the service sector, while less than 10% works in industry. With respect to males, 52.8% of them work in services, while over 41.6% are evenly distributed between industry and construction.

The decomposition of the occupational segregation curve (Section 2, expression (2)) shows that the distribution of female workers across ventiles substantially differs among sectors (see Figure 5). In this regard, while agriculture-fishing and industry have important weights in the first three ventiles, which represent the less-feminized jobs of the economy, construction and services are mainly concentrated in the top ventiles, which represent the most-feminized jobs. In other words, women working in construction and services tend to concentrate in female-dominated occupations, while in industry and agriculture, the degree of concentration of women in female-dominated occupations is lower. In fact, 63.4% of the female labor force employed in agriculture-fishing is in the third ventile of the female distribution (see Table A2 in the Appendix). This percentage rises to 93.7% if one is jointly considering the second and third ventiles, which suggests that there are no feminized occupations within this sector. In industry, the third ventile also represents a high percentage of the female employment in this sector (45.2%), although the forth and fifth ventiles have, in this case, higher values than in agriculture. On the contrary, a large proportion of the females working in construction and services work in the most feminized occupations (36.9% and 44.8%, respectively).[19]

When studying the distribution of male workers, we find that most of the men who are in the first decile of the corresponding segregation curve, actually 93.9% of them, work in services (see Table A3 in the Appendix, which shows the decomposition of each cumulative decile by sector, as defined in expression (1)). In other words, most of the men working in the most feminized occupations of the economy are in the service sector.

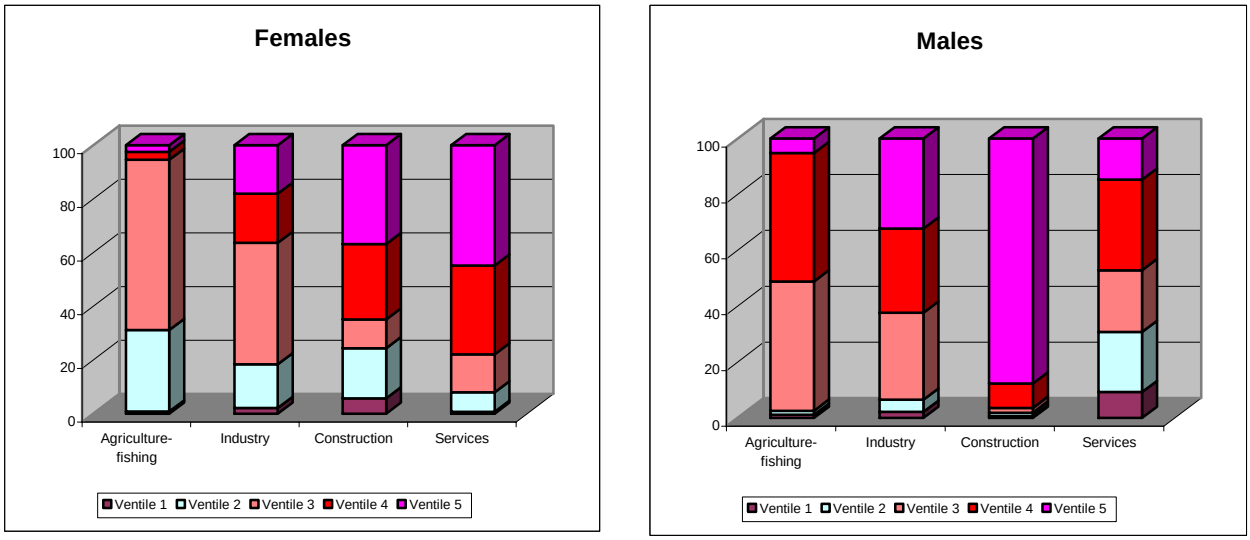


Figure 5. Distribution of each sector across non-cumulative ventiles (66 categories).

[19] In the case of construction, the occupations are: *Domestic employees and other indoor cleaning personnel; Assistant clerks;* and *Administrative management support professionals.* In the case of services, these occupations are: *Domestic employees and other indoor cleaning personnel; Personnel services workers; Professions associated with a 1st cycle university degree in natural and health sciences, except in optics, physiotherapy and related services; Professions associated with a 1st cycle university degree in teaching; and Assistant clerks (with customer service tasks not classified previously).*

On the other hand, the distribution of agriculture-fishing across non-cumulative ventiles shows that most of the male staff works in occupations with an intermediate-high level of masculinization (see Figure 5). In fact, the third and forth ventiles jointly represent 92% of the male employment in the sector (see Table A2 in the Appendix). Industry has a similar pattern, even though the fifth ventile represents now a higher value than in the case of agriculture. In construction, the situation is more extreme, since 87.7% of its male employment is concentrated in the most male-dominated occupations of the economy (in the fifth ventile). On the contrary, in the service sector, the distribution of male employment across ventiles is more equalitarian. This suggests that the degree of masculinization of this sector is lower.

4. Occupational versus industrial segregation in Spain

In this section, occupational and industrial segregation are analyzed separately. First, occupational segregation in 2007 is explored by using several partitions of individuals and occupations. Second, industrial segregation among 58 branches of activity, as opposed to the most aggregate classification used in the previous section, is studied. Finally, the evolution of both occupational and industrial segregation in the last decade is shown.

4.1 Occupational segregation

In this subsection we present a deeper analysis of occupational segregation, considering several partitions of individuals (by education level, type of contract, and type of job) and of occupations (by salary level). Since we analyze the distribution of employment across occupations, 66 categories of jobs are considered.[20]

Partition by education level

Individuals have been classified into three groups: low-educated (those who have not finished secondary school); intermediate-educated (those who have completed secondary school); and high-educated (those who have a college degree).[21] The distribution of workers among the three classes suggests that in the labor force the education level of women is higher than that of men (see Table 3, last column).

Table 3 also shows that the occupational segregation level of female workers is higher for the low-educated, while most indices show that intermediate-educated women suffer the lowest segregation. A similar pattern is shown by the male distribution, even though the segregation level for any educational group is always lower for men.

[20] The top 10 most feminized and masculinized occupations are shown in the Appendix (Table A5).
[21] It also includes those who have obtained a degree in "formación profesional superior" (vocational training, 2nd technical college).

	$\Phi_{0.1}$	$\Phi_{0.5}$	Φ_1	Φ_2	D^*	G^*	**Decomposition of Φ_2 by education**	**Distribution of female and male workers between educational groups**
FEMALE WORKERS	0.57	0.42	0.33	0.27	0.33	0.42	100%	100%
Low-educated	1.55	0.81	0.67	0.72	0.49	0.61	40.87%	37.05%
Intermediate-educated	1.20	0.67	0.54	0.53	0.44	0.55	27.26%	24.82%
High-educated	1.07	0.72	0.62	0.70	0.45	0.59	31.87%	38.13%
MALE WORKERS	0.20	0.18	0.15	0.13	0.23	0.29	100%	100%
Low-educated	1.22	0.56	0.44	0.40	0.40	0.50	66.43%	48.25%
Intermediate-educated	0.69	0.30	0.23	0.19	0.26	0.35	21.00%	22.84%
High-educated	0.48	0.43	0.41	0.49	0.37	0.50	12.57%	28.91%

Table 3. Occupational segregation indexes (66 categories), decomposition of Φ_2, and distribution of female and male workers by education level.

The decomposition of index Φ_2 by education level, as defined in Section 2, shows that (see Table 3, column 7):

a) Low-educated women contribute to explaining 40.9% of occupational segregation, intermediate-educated women explain 27.3%, while high-educated women explain the remaining 31.9%, percentages that slightly differ from the weight that each group has in terms of employment. In other words, high-educated women contribute less to occupational segregation than one would expect according to the demographic weight of this group.

b) In the male case, the decomposition of the index by educational groups substantially differs from the demographic weight that each group has. In this vein, the contribution of low-educated men to occupational segregation is much higher than expected, while the opposite happens when looking at the high-educated males.

Partition by type of contract: Temporary versus permanent

According to our data, 66.7% of female workers have permanent contracts, while this percentage rises to 69.2% in the case of male workers (see Table 4, last column).

	$\Phi_{0.1}$	$\Phi_{0.5}$	Φ_1	Φ_2	D^*	G^*	**Decomposition of Φ_2 by type of contract**	**Distribution of female and male workers between groups**
FEMALE WORKERS	0.59	0.43	0.33	0.27	0.33	0.42	100%	100%
Permanent	0.67	0.46	0.35	0.28	0.34	0.43	66.21%	66.74%
Temporary	0.61	0.46	0.38	0.35	0.36	0.47	33.79%	33.26%
MALE WORKERS	0.24	0.20	0.18	0.16	0.25	0.32	100%	100%
Permanent	0.24	0.21	0.18	0.17	0.25	0.33	59.36%	69.22%
Temporary	0.50	0.46	0.45	0.53	0.39	0.52	40.64%	30.78%

Table 4. Occupational segregation indexes (66 categories), decomposition of Φ_2, and distribution of female and male workers by type of contract. [22]

[22] The value of the indexes corresponding to females and males slightly differs from those of Table 3, since Table 4 includes only employees.

Segregation indexes show that the occupational segregation level of permanent workers is much higher for women than for men, while the opposite happens with respect to temporary jobs according to most indexes (see Table 4). Furthermore, there are remarkable differences between the segregation level of males having permanent jobs and those having temporary jobs. The decomposition of Φ_2 shows that the distinction between permanent and temporary contracts is more important to explain male segregation than female segregation, since in the former case the contribution of temporary jobs to occupational segregation is 10 points over what one would expect, while in the latter case there is almost no difference.

Partition by type of job: Part-time versus full-time

About 23% of female workers have part-time jobs, while this ratio decreases to 4.3% regarding males, which means that women tend to concentrate in part-time jobs to a higher extent (Table 5, last column). One should keep in mind that, on one hand, over 31% of workers (either women or men) who work part-time do not do it because they prefer this option but because they have not found a full-time position. On the other hand, the reasons why men and women choose this type of job differ substantially. In this vein, family responsibilities is the main reason for 5% of men working part-time, while this percentage rises to over 34% in the case of females (figures provided by the INE).

	$\Phi_{0.1}$	$\Phi_{0.5}$	Φ_1	Φ_2	D^*	G^*	**Decomposition of Φ_2 by type of job**	**Distribution of female and male workers between groups**
FEMALE WORKERS	0.57	0.42	0.33	0.27	0.33	0.42	100%	100%
Full-time	0.52	0.38	0.30	0.24	0.31	0.40	68.66%	76.97%
Part-time	1.12	0.72	0.62	0.75	0.45	0.59	31.34%	23.03%
MALE WORKERS	0.20	0.18	0.15	0.13	0.23	0.29	100%	100%
Full-time	0.22	0.19	0.17	0.14	0.24	0.31	99.68%	95.71%
Part-time	0.40	0.36	0.37	0.50	0.34	0.46	0.32%	4.29%

Table 5. Occupational segregation indexes (66 categories), decomposition of Φ_2**,** and distribution of female and male workers by type of job.

The analysis undertaken in this section suggests that the occupational segregation of women having part-time jobs is remarkable higher than that of women working full-time (and also higher than that of males either working part-time or not). In fact, the indexes strongly increase when comparing the former with the latter, duplicating in many cases its value (Table 5). Even though occupational segregation of females is higher than that of males in the two cases, we observe that the type of job affects both sexes in the same way.

The decomposition of index Φ_2 by type of job shows that the contribution of part-time employment to female segregation is about 31.3% (see Table 5, column 7), even though the demographic weight of this group is 23%, which implies that the effect of part-time jobs to the occupational segregation of women is higher than expected. However, the contribution of this type of job to male segregation is almost zero (value 4 points lower than its demographic weight).

The decomposition of the female segregation curve shows that part-time jobs of female workers tend to concentrate in the most feminized occupations (see Table A4 in the Appendix). In particular, while 55.2% of women doing part-time jobs work in the most feminized occupations (fifth ventile), this ratio falls to 35.5% when considering women working full-time. This pattern substantially differs from what happens in the male case since, for men, part-time jobs are more evenly distributed across ventiles than full-time jobs. Moreover, the weight of part-time employment in the fifth ventile is much lower than that of full-time (11% against 34.3%).

Partition by salary level

The 66 occupations have been partitioned into three classes of similar sizes according to their average wage. Since the EPA does not gather any salary data, this information comes from the Earning Survey (*Encuesta de Estructura Salarial*) conducted by the INE in 2002. As shown in Table 6, the distribution of female and male workers across the three classes is similar.

	$\Phi_{0.1}$	$\Phi_{0.5}$	Φ_1	Φ_2	D^*	G^*	**Within-Between decomposition of Φ_1**	**Distribution of female and male workers between classes**
FEMALE WORKERS	0.57	0.42	0.33	0.27	0.33	0.42	99.95% - 0.05%	100%
Low wage	0.74	0.54	0.42	0.35	0.38	0.47		40.84%
Intermediate wage	0.69	0.49	0.37	0.29	0.35	0.43		33.83%
High wage	0.13	0.12	0.12	0.12	0.21	0.27		25.33%
MALE WORKERS	0.20	0.18	0.15	0.13	0.23	0.29	99.95% - 0.05%	100%
Low wage	0.30	0.25	0.21	0.17	0.27	0.33		40.37%
Intermediate wage	0.19	0.17	0.16	0.15	0.25	0.31		33.00%
High wage	0.07	0.07	0.06	0.05	0.14	0.18		26.63%

Table 6. Occupational segregation indexes (66 categories), and distribution of female and male workers by salary level. [23]

The analysis shown in Table 6 suggests that either women or men who are in low-paid jobs have higher occupational segregation, while lower segregation is achieved in high-paid jobs. However, this partition does not seem helpful to explain occupational segregation, since the between-group component is near zero for both women and men. Perhaps a classification of occupations at a finer scale would permit one to find out more differences between the distributions of men and women across salary classes.

4.2 Industrial segregation by branches of activity

This section provides a deeper analysis of industrial segregation by focusing on the distribution of employment across 58 branches of activity.[24] As in the case of occupational

[23] For each class of occupations a different benchmark is considered. In particular, the distribution of high-paid jobs across occupations, rather than that of total employment, is the benchmark for the third class.
[24] The top 10 most feminized and masculinized branches are shown in the Appendix (Table A6).

segregation, industrial segregation is also higher for women and, in fact, some indexes duplicate when comparing them with that of males (see Table 7). The level of industrial segregation for both men and women is, however, lower than that of occupational segregation, (compare, for example, Tables 7 and 3). This result is in line with results obtained by Deutsch, Flückiger and Silber (1994) for Switzerland when using Oppenheimer's (1969) approach. Since occupational segregation in Spain is much more important than industrial segregation, Plasman and Sissoko (2004) find that the former contributes to a much larger extent to explain the Spanish gender wage gap. This is not, however, a general pattern, since these authors also show that in Italy, the industrial segregation is much more relevant to explain the gender pay gap than occupational segregation.

	$\Phi_{0.1}$	$\Phi_{0.5}$	Φ_1	Φ_2	D^*	G^*	**Within-Between decomposition of Φ_1**	**Distribution of female and male workers between sectors**
FEMALE WORKERS	0.27	0.23	0.20	0.18	0.25	0.34	39.12% - 60.88%	100%
Agriculture-fishing	0.01	0.01	0.01	0.01	0.04	0.04		2.93%
Industry	0.13	0.13	0.14	0.15	0.22	0.29		9.69%
Construction	-	-	-	-	-	-		1.84%
Services	0.09	0.08	0.08	0.07	0.14	0.20		85.55%
MALE WORKERS	0.12	0.10	0.09	0.09	0.18	0.24	55.96% - 44.04%	100%
Agriculture-fishing	0.00	0.00	0.00	0.00	0.01	0.01		5.63%
Industry	0.02	0.02	0.02	0.02	0.07	0.10		20.27%
Construction	-	-	-	-	-	-		21.32%
Services	0.11	0.10	0.09	0.09	0.16	0.23		52.77%

Table 7. Industrial segregation indexes (58 categories), decomposition of Φ_1, and distribution of female and male workers across sectors.[25]

The classification of branches of activity into the four large sectors appears as relevant, since the decomposition of index Φ_1 into the between-group and within-group components shows that the former explains approximately 60.9% of industrial segregation of female workers (Table 7, column 7). This partition is also relevant for explaining male segregation, since the between-group component is 44%.

When decomposing the segregation curves (as mentioned in expression (2)) by large sectors, we observe that (see Figure 6):

a) 100% of female workers of the construction sector are in the first ventile, i.e., these women work in the most masculinized branch of the economy. Something similar happens in agriculture-fishing, since 100% of its female employment is in the second ventile. Women working in the industry also work in branches highly masculinized (especially in second and third ventiles). On the contrary, in the service sector female workers concentrate in branches highly feminized (41.3% of them are in the fifth ventile).

[25] Table 7 does not show the values of the indexes for the construction sector because it has only one branch of activity. We should also note that the agricultural sector has only three branches.

b) Regarding males, the service sector is dispersed among branches, some more feminized and others less. In the industry, the pattern is less even, since male employment is mainly distributed between ventiles 3, 4 and 5.

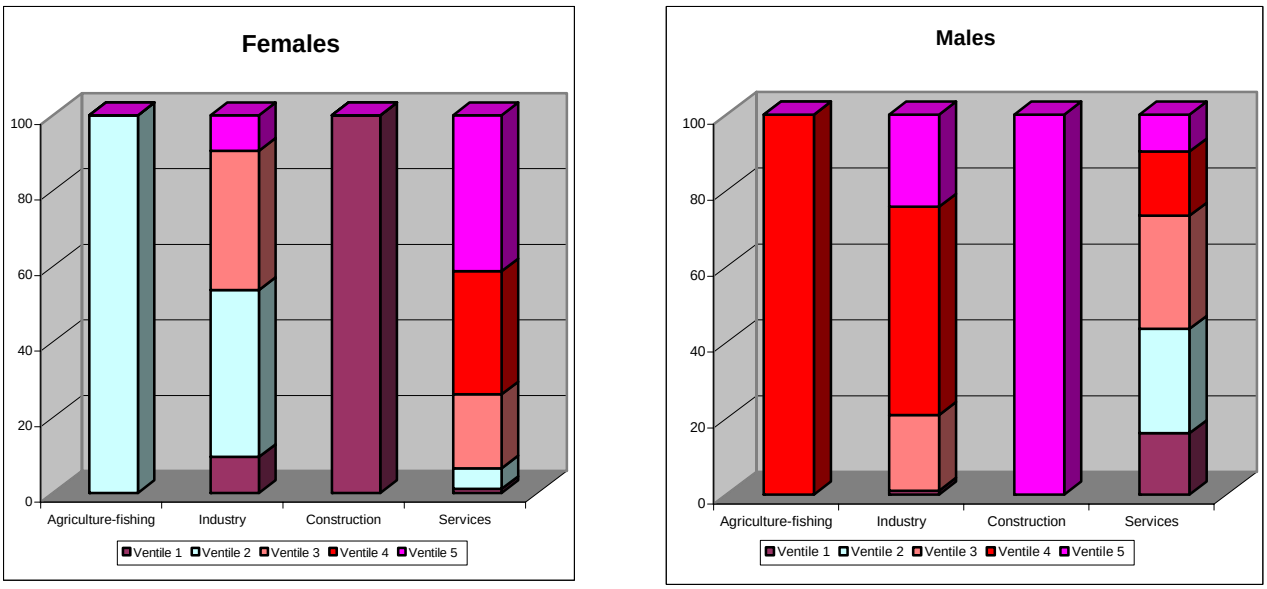


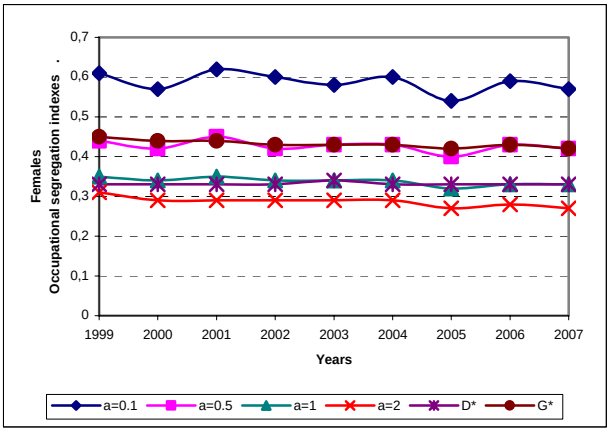
Figure 6. Distribution of each sector across non-cumulative ventiles (58 categories).

4.3 Recent evolution

When studying segregation in the last few years, no significant changes can be seen in the female distribution, since both the indexes of occupational and industrial segregation remain rather stable between 1999-2007 (see Figures 7 and 8). However, even though the segregation level of male workers is much lower than that of females, it seems that this group is experiencing a small increase in its segregation levels, both occupational and industrial, during the last decade.

By using the classical index of dissimilarity, so that the female distribution is compared with that of males, Otero and Gradín (2001) analyzed the evolution of gender occupational segregation in Spain between 1977 and 1998, and found that segregation remained rather stable during the first decade, while it increased along the 90s. By using the index proposed by Theil and Finizza (1971), Mora and Ruiz-Castillo (2004) also found that gender segregation increased slightly between 1977 and 1992 in the private sector, while Mora and Ruiz-Castillo (2003) found a small decrease in that period in the whole economy. Our approach allows us to distinguish between changes in the distribution of female workers from changes in the distribution of males. Our results suggest that in the last few years it is male segregation, rather than female segregation, that has increased.

When analyzing the occupational segregation level existing within each sector, we found that three large sectors (agriculture-fishing, industry and construction) remain almost unaltered in recent years. However, in services, a small decrease in the occupational segregation of the female distribution, together with a tiny increase in the male distribution is observed (Figure 9).



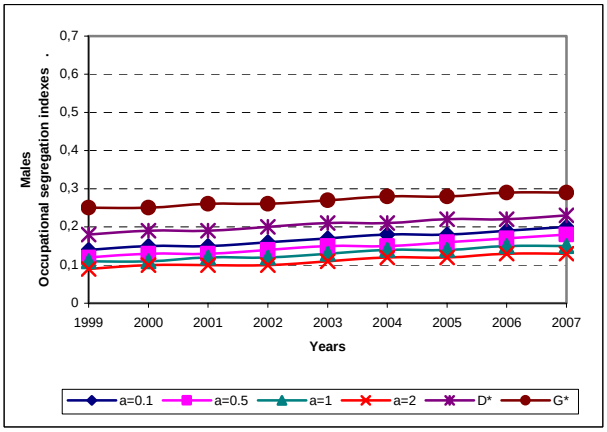
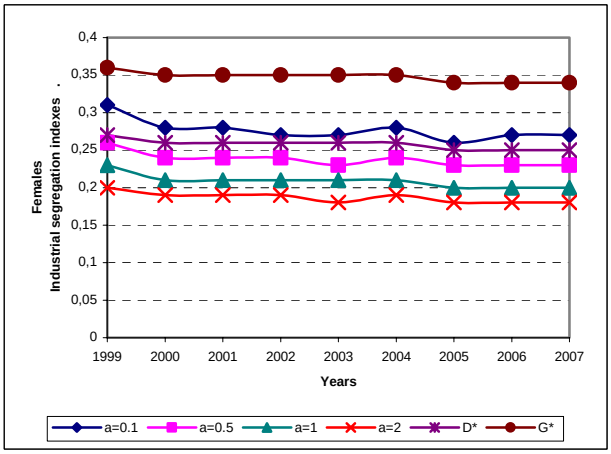


Figure 7. Occupational segregation (66 categories) between 1999 and 2007.



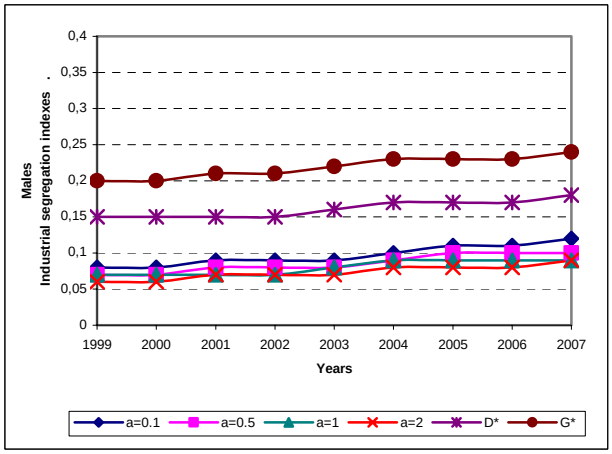
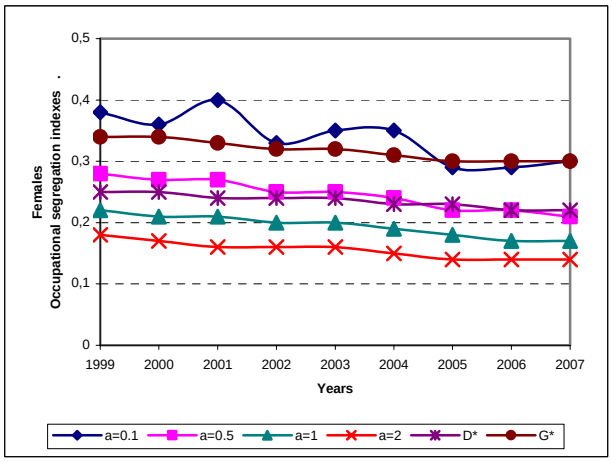


Figure 8. Industrial segregation (58 categories) between 1999 and 2007.



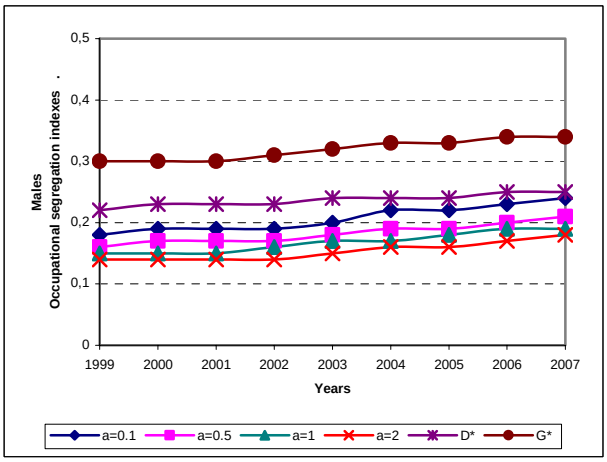


Figure 9. Occupational segregation (66 categories) in the service sector between 1999 and 2007.

5. Final remarks

When focusing on occupational segregation, the indexes commonly used quantify the differences between female and male ratios in each occupation. Some of these ratios are calculated with respect to the population size of the corresponding group, either women or men, while others are

obtained by dividing the number of men and women in each occupation by overall employment there. In any case, all these indexes measure gender segregation, rather than female segregation, because they jointly consider the distributions of men and women.

This paper has followed a different approach, so that to study the segregation of any population group across categories (occupations and industries), the distribution of that group is compared with the distribution of overall employment across categories. Thus, rather than considering the distribution of a particular group of individuals (usually men) as the standard or ideal, the overall employment structure of the economy is considered to be the benchmark. This allows measuring not only female segregation, but also the segregation of any social or demographic group in which we are interested, including men.

We found that segregation, by occupations and industries, is much higher for women than for men, even though the latter experienced a slight increase in the last few years. On the other hand, occupational segregation in Spain is much higher than industrial segregation, for both women and men, which explains why Plasman and Sissoko (2004) found that the contribution of the former to explain the Spanish gender wage gap is much larger (29.6% against 3.6%). We have also shown that in the service sector, the occupational segregation of male workers is slightly higher than that of females, while in the remaining large sectors (industry, agriculture-fishing and construction) segregation is much higher for women.

Building upon Theil and Finizza's (1971) approach, Mora and Ruiz-Castillo (2003) found that gender occupational segregation in Spain decreases with age.[26] When analyzing the segregation of women and men separately, we concluded that female and male patterns are rather different. Within the female group, those who are 30 to 44 years old clearly suffer the lowest occupational and industrial segregation, while the other two age groups have similar and higher levels, even though elderly women are more concentrated in female-dominated jobs. Regarding males, segregation is higher for young workers, who clearly depart from the other two age groups, since they tend to concentrate in male-dominated jobs to a larger extent.

Our study about the effect of human capital on occupational segregation indicates that individuals having intermediate-education levels suffer lower segregation than those with higher education, both for women and men, which suggests that an increase in human capital does not necessarily reduce segregation. Therefore, even though the female labor force in Spain has experienced an important increase in its educational level in recent years, policy intervention seems to be essential in order to reduce the gender gap.

When classifying individuals by type of contract (permanent versus temporary), we found that this partition is more important to explain male segregation than female segregation. In this vein, the contribution of temporary jobs to the occupational segregation of male workers is much higher than

[26] More precisely, they showed that occupational segregation decreases with age in all educational levels considered in their analysis (low, primary, secondary and college education).

expected, while for females there are almost no differences between their contribution and their demographic weight. On the contrary, part-time jobs have more power to explain the occupational segregation of female workers than that of males, since the former tend to concentrate in the most feminized occupations of the economy, while for men part-time jobs are more evenly distributed across occupations independently of the degree of masculinization. This finding is in line with that recently obtained by Bardasi and Gornick (2008) for a sample of OECD countries. In particular, they concluded that occupational differences between part- and full-time jobs explain a large portion of the wage gap between both types of female workers. All of the above suggests that part-time jobs of women and men should be studied in more detail by further research given its implications in terms of occupational segregation and wage differentials.

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Appendix

	Ventile 1	Ventile 2	Ventile 3	Ventile 4	Ventile 5	Total
FEMALE WORKERS						
<30 years old	0.86%	8.46%	15.54%	36.56%	38.58%	100%
30 to 44 years old	0.60%	9.86%	18.54%	31.13%	39.87%	100%
>45 years old	0.39%	7.67%	21.03%	26.06%	44.85%	100%
MALE WORKERS						
<30 years old	5.27%	12.14%	17.71%	25.48%	39.40%	100%
30 to 44 years old	5.08%	12.10%	20.38%	28.52%	33.92%	100%
>45 years old	5.76%	12.82%	24.11%	28.35%	28.96%	100%

Table A1. Distribution of each group of age across non-cumulative ventiles (221 categories).

	Ventile 1	Ventile 2	Ventile 3	Ventile 4	Ventile 5	Total
FEMALE WORKERS						
Agriculture-fishing	0.84%	30.31%	63.37%	3.08%	2.40%	100%
Industry	2.10%	16.30%	45.20%	18.34%	18.06%	100%
Construction	5.63%	18.75%	10.67%	28.05%	36.90%	100%
Services	0.66%	7.22%	14.22%	33.10%	44.80%	100%
MALE WORKERS						
Agriculture-fishing	1.13%	1.42%	46.32%	45.94%	5.19%	100%
Industry	2.12%	4.40%	31.15%	30.11%	32.22%	100%
Construction	0.69%	1.16%	1.72%	8.74%	87.69%	100%
Services	9.22%	21.48%	22.14%	32.42%	14.74%	100%

Table A2. Distribution of each sector across non-cumulative ventiles (66 categories).

FEMALE WORKERS	**Decile 1**	**Decile 2**	**Decile 3**	**Decile 4**	**Decile 5**	**Decile 6**	**Decile 7**	**Decile 8**	**Decile 9**	**Decile 10**
Agriculture-fishing	3.70%	2.27%	16.41%	9.21%	15.20%	9.73%	6.62%	4.83%	3.76%	2.93%
Industry	37.04%	22.73%	21.21%	18.02%	26.66%	21.63%	15.86%	13.42%	12.12%	9.69%
Construction	14.81%	11.36%	6.06%	4.55%	3.12%	2.25%	1.61%	1.96%	2.26%	1.84%
Services	44.44%	63.64%	56.31%	68.22%	55.02%	66.40%	75.92%	79.79%	81.86%	85.54%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
MALE WORKERS	**Decile 1**	**Decile 2**	**Decile 3**	**Decile 4**	**Decile 5**	**Decile 6**	**Decile 7**	**Decile 8**	**Decile 9**	**Decile 10**
Agriculture-fishing	0.68%	1.09%	0.93%	0.78%	0.73%	7.05%	6.30%	8.01%	6.72%	5.63%
Industry	4.76%	7.82%	8.02%	7.31%	10.96%	19.57%	20.04%	20.60%	18.78%	20.27%
Construction	0.68%	2.73%	3.36%	2.16%	1.71%	1.95%	3.33%	3.93%	14.68%	21.32%
Services	93.88%	88.36%	87.69%	89.75%	86.60%	71.43%	70.32%	67.46%	59.82%	52.78%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Table A3. Distribution of workers, in each cumulative decile, across sectors (66 categories).

	Ventile 1	Ventile 2	Ventile 3	Ventile 4	Ventile 5	Total
FEMALE WORKERS						
Full-time	1.0	10	20.7	31.8	35.5	100%
Part-time	0.5	5.6	11.7	27.0	55.2	100%
MALE WORKERS						
Full-time	5.3	12.0	20.7	27.8	34.3	100%
Part-time	10.5	25.4	27.6	25.5	11.0	100%

Table A4. Distribution of each group of job (full-time versus part-time) across non-cumulative ventiles (221 categories).

	Employment ratio (%)	Female employment ratio (%)
The 10 most-feminized occupations		
91. Domestic employees and other indoor cleaning personnel	6.59	93.73
51. Personnel services workers	3.97	86.67
27. Professions associated with a 1st cycle university degree in natural and health sciences, except in optics, physiotherapy and related services	1.08	84.21
28. Professions associated with a 1st cycle university degree in teaching	1.92	75.92
44. Assistant clerks (with custumer service tasks not classified previously)	2.76	74.88
45. Employees in direct contact with the public in travel agencies, receptionists, telephone operators	1.05	74.30
43. Assistant clerks (without custumer service tasks not classified previously)	2.07	73.33
46. Cashiers, tellers and other similar personnel in direct contact with the public	1.23	72.48
53. Retail workers and the like	5.00	70.70
32. Technicians in child education, flight instructors, vehicle navigation and driving	0.22	67.12
The 10 most-masculinized occupations		
70. Work site managers and foremen	0.58	0.63
71. Workers at structural construction works and the like	5.13	0.97
75. Welders, auto body workers, metal structure fitters, blacksmiths, tool manufacturers	1.69	1.16
73. Metallurgy and mechanical workshop foremen	0.24	1.22
76. Mechanics and adjusters for electric and electronic machinery and equipment	2.57	1.44
85. Locomotive machinist, operators of agricultural machinery and mobile heavy equipment, and seamen	1.32	1.71
72. Workers dedicated to finishing constructions and the like (painters and related workers)	3.76	1.98
96. Construction laborers	2.41	3.07
74. Extractive industry workers	0.14	3.61
86. Drivers of vehicles for urban or road transport	3.81	3.61

Table A5. The most- and least-feminized occupations: Employment share in each occupation, and proportion of female workers, with respect to total employment, in each occupation.

	Employment ratio (%)	Female employment ratio (%)
The 10 most-feminized branches		
95. Households that employ domestic personnel	3.77	92.10
93. Various personal services activities	1.42	78.66
85. Health and veterinary activities; social services	5.95	76.68
18. Clothing and fur industry	0.49	75.49
80. Education: primary, secondary and higher education	5.64	64.90
52. Retail trade except trade of motor vehicles, motorcycles and mopeds; repair of personal effects and household equipment	9.42	61.99
67. Activities auxiliary to financial intermediation; activities auxiliary to insurance and pension funds	0.24	58.29
55. Catering: includes hotels, motels, hostels, campsites, restaurants, bars, canteens	7.24	55.35
74. Other business activities: legal, accounting, bookkeeping and auditing activities, fiscal consultancy, market research and public opinion surveys, etc.	7.45	54.01
66. Insurance and pension plans, except compulsory social security	0.63	52.70
The 10 most-masculinized occupations		
45.Construction	13.33	5.66
14. Extraction of non-metallic and non-energetic ores	0.23	7.46
27. Metallurgy	0.58	8.24
10. Extraction and agglomeration of coal, lignite and peat	0.04	10.10
60. Land transport; transport of pipes	2.99	10.89
20. Wood and cork industry, except furniture, basket making and wickerwork	0.47	11.98
28. Manufacture of metal products, except machinery and equipment	1.82	12.79
90. Public health activities	0.41	12.99
29. Machinery and mechanical equipment construction industry	1.31	14.39
41. Collection, purification and distribution of water	0.21	14.69

Table A6. The most- and least-feminized branches of activity: Employment share of each branch and proportion of female workers, with respect to total employment, in each branch.