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Segregation of female and male workers in Spain: Occupations and industries*

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Abstract

This paper studies female and male segregation in the Spanish labor market paying special attention to differences among industries. For this purpose, it studies segregation when jointly considering differences in 66 occupations and 4 large sectors (agriculture-fishing, construction, industry, and services), and analyzes the evolution of segregation from 1994 to 2009. In addition, it quantifies the occupational segregation within each large sector. In order to delve deeper in the analysis, differences between public and private services in terms of occupational segregation are also offered. In doing so, this paper uses additively decomposable indices, together with local segregation curves, recently proposed in the literature, which allows us to go further in the empirical analysis.

Keywords: Industrial segregation, local segregation curves, gender.

JEL classification: J71, J16, D63

1. Introduction

Most segregation studies existing in the literature focus on the case of two population subgroups (blacks/whites, high/low social position, women/men), either proposing ad hoc measures that are used for empirical analysis (as the popular index of dissimilarity introduced by Duncan and Duncan, 1955; the modified version proposed by Karmel and Maclachlan, 1988; and the Gini index of segregation proposed by Silber, 1989), or axiomatically deriving segregation indexes (Hutchens, 1991, 2004; Chakravarty and Silber, 2007, among others).[1]

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In this binary context, segregation measures usually compare the distribution of one demographic group across categories (schools, occupations, sectors, etc.) with the distribution of the other group. Thus, when studying school segregation by race, the distribution of black students across schools is usually compared with that of whites, while when focusing on occupational segregation by gender the distribution of female workers is compared with that of males.[2] According to this literature, segregation exists so long as one distribution departs from the other, which should be better interpreted as overall or aggregate segregation since both demographic groups are jointly considered.

In recent years, the study of overall segregation in the case of multiple population subgroups has received increasing attention among scholars (Reardon and Firebaugh, 2002; Frankel and Volij, 2010). This permits the study of overall segregation in a more complex context where the number of groups is higher than two. Thus, for example, in segregation analyses by race/ethnicity in the US, overall segregation measures quantify to what extent the distributions of whites, Hispanics, African Americans, Asians, and Native Americans depart from each other.

However, one can be interested not only in measuring aggregate segregation, but also in exploring the segregation of a target group. Alonso-Villar and Del Río (2010a) deal with this matter in a multigroup context by proposing an axiomatic framework in which to study the segregation of any population subgroup (labeled as local segregation, as opposed to overall segregation). To undertake the segregation of a target group in the labor market, they propose to compare the distribution of that group among categories (industries or occupations) with the distribution of total employment. In other words, according to this notion, a group is segregated so long as its distribution departs from the job structure of the economy. This approach allows putting emphasis on how each demographic group fills the job positions that exist in the economy. This distinction can be useful even in a binary case. Unevenness not only exists when women have a low presence in certain occupations, but also when men do in others (as documented by Anker (1998), there are occupations everywhere that are strongly feminized, such as nursing, secretary/typist, housekeeper, bookkeeper/cashier, building caretaker/cleaner and tailor/sewer).

By using local measures one can determine whether women (and men) distribute across occupations according to their weight in the labor force and also the extent of the differences among both groups.[3] It is important to note that these local segregation measures are very naturally related to several overall segregation measures proposed in the literature. In fact, if we partition the whole population into several mutually exclusive population groups, the weighted sum of the local segregation of each group, adds to the whole segregation level according to standard measures. Consequently, these local measures allow not only determining the segregation of each population subgroup but also the contribution of each subgroup to overall segregation.

The measurement of the segregation of a target group in the labor market is not a new topic in the literature since in a binary context there is a previous proposal. In this regard,

three decades ago, Moir and Selby Smith (1979) offered a variation of the index of dissimilarity to measure the industrial segregation of female workers in the Australian labor market.[4] However, as far as we know, only Alonso-Villar and Del Río (2010a) have explored this issue axiomatically in a multigroup case, while proposing new indices that satisfy basic properties.

Most of the gender segregation studies undertaken in the Spanish labor market have focused on measuring occupational segregation (Sánchez, 1993; Otero and Gradín, 2001; Mora and Ruiz-Castillo, 2003, 2004; Cebrián and Moreno, 2008) while only a few have also explored industrial segregation (Cáceres *et al.,* 2004; Iglesias and Llorente, 2008). However, the interplay between occupation and sector should not be ignored since: a) the gender composition of occupations may differ across sectors; and b) occupational segregation by sex may be the consequence of the industrial composition of occupations. On the other hand, the analyses of gender segregation in Spain have dealt with the measurement of overall segregation by gender, while the segregation of female workers has received almost no attention (an exception is Del Río and Alonso-Villar, 2010a, who study occupational segregation for women and men).

To fill this gap, this paper studies female and male segregation in the Spanish labor market paying special attention to differences among industries. For this purpose, this paper uses local segregation indices, together with local segregation curves, recently proposed in the literature (Alonso-Villar and Del Río, 2010a; Del Río and Alonso-Villar, 2010a), which allows us to go further in the empirical analysis. As opposed to previous studies, this paper measures the segregation of each demographic group separately and studies their evolution from 1994 to 2009.[5] Moreover, differences across occupations and large sectors are jointly measured, so that an occupation is considered as a different job category depending on whether it belongs to agriculture-fishing, industry, construction, or services. The occupational segregation within each large sector is quantified as well. In order to delve deeper in the analysis, differences between public and private services in terms of occupational segregation are also offered.

The paper is structured as follows. Section 2 introduces several local segregation measures and their decompositions, whilst offering a reflection about this measurement. Section 3 presents the analysis of segregation for 2007. In doing so, firstly, a classification of sectors in four large groups (agriculture-fishing, industry, construction and services) and a two-digit classification of occupations are used, which gives rise to over two hundred categories of jobs. Secondly, a deeper analysis of the occupational segregation within each large sector is undertaken. Thirdly, differences among private and public services are shown. In Section 4, the evolution of segregation across occupations and large sectors is explored, including not only female and male segregation but also overall segregation by gender. Finally, Section 5 presents the main conclusions.

2. Measuring local segregation

When segregation in the labor market is analyzed, the indexes commonly used quantify overall segregation (Duncan and Duncan, 1955; Karmel and MacLachlan, 1988; Silber, 1989).

In the case of occupational segregation by gender, the distribution of female workers across occupations is usually compared with that of males. One should be aware of the fact, however, that these measures do not allow quantifying the segregation of female workers, as it is sometimes said, but overall segregation by gender, since both demographic groups are jointly contrasted. Yet, one can be interested in exploring the segregation of a target group (female workers, high-educated women, Latin American immigrants, or whatever group of citizens that concerns us). Alonso-Villar and Del Río (2010a) tackle this matter in a multigroup context by proposing an axiomatic framework in which to study the segregation of any population subgroup, labeled as local segregation (as opposed to overall segregation). In this regard, a local segregation curve is put forward and new indexes consistent with it are proposed. In particular, a class of decomposable local segregation indexes (related to the generalized entropy family) consistent with non-crossing local segregation curves is characterized in terms of basic axioms. In addition, Del Río and Alonso-Villar (2010a) offer decompositions of the local segregation curves.

To measure the segregation of a target group, these authors propose to compare its distribution across job categories with that of total employment. In other words, to quantify female segregation the distribution of female workers across categories is contrasted with the employment structure of the economy (including both male and female workers) rather than with that of males. In what follows, we present the notation and introduce these tools.

Consider an economy with $O \geq 1$ occupations, $P \geq 1$ sectors and $T > 1$ jobs so that vector $(t_{11}, t_{12}, \ldots, t_{op})$ represents the distribution of jobs among occupations-sectors (i.e., a common occupation is considered a different category depending on the sector it belongs to) and $T = \sum_{o,p} t_{op}$. 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-sectors $(c_{11}, c_{12}, \ldots, c_{OP})$, 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: $t \equiv (t_1, t_2, \ldots, t_J)$ and $c \equiv (c_1, c_2, \ldots, c_J)$, where $J = O \cdot P$.

Local segregation curves

In the context of segregation by sex, traditional segregation curves represent the cumulative proportion of female workers corresponding to the cumulative share of male workers, once the categories have been ranked by increasing gender ratios (the number of women divided by the number of men in each category). Therefore, these curves actually measure overall segregation, rather than female segregation, since both demographic groups are contrasted. To analyze the segregation of any demographic group, Alonso-Villar and Del Río (2010a) propose to use what they call a local segregation curve and analyze its basic

properties. To calculate this local segregation curve, first, the categories have to be ranked in ascending order of the ratio $(c_j / t_j)(j = 1,...,J)$ and, second, the cumulative proportion of employment, $_{i \le j}\ t_i / T$, is plotted on the horizontal axis and the cumulative proportion of individuals of the target group (female workers, for example), $_{i \le j}\ c_i / C$, is plotted on the vertical axis. Therefore, this curve can be written as

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

where $\tau_j \quad _{i \le j}\ t_i / T$ is the proportion of cumulative employment represented by the first j categories. Therefore, if the target group is that of female workers, the first decile of the distribution represents 10% of the less-feminized jobs of the economy (that is, those belonging to categories with the lowest c_j / t_j ratios). The second cumulative decile represents 20% of the less-feminized jobs, and so on. If the segregation curve of a population subgroup dominates that of another (i.e., if the segregation curve of the former lies at no point below the latter and at some point above), we may say that it has lower segregation.

In what follows, we show several examples in order to compare local segregation with overall segregation. In the first example, we consider an economy with 100 female workers and 300 jobs distributed among categories according to vector $(c;t) = (10, 40, 50; 90, 60, 150)$. In Figure 1, we plot the local segregation curve for female workers, $S^*_{(c;t)}$, obtained from comparing the female distribution c with the employment distribution t. If we compare the female distribution with the distribution of male workers (which can be obtained from vector $(c;t)$), we can calculate the traditional segregation curve S, that measures actually overall segregation by gender rather than female segregation. This curve is also plotted in Figure 1, even though in this case the horizontal axis represents the cumulative proportion of male workers instead of total employment. We observe that S^* is closer to the equity line, which is

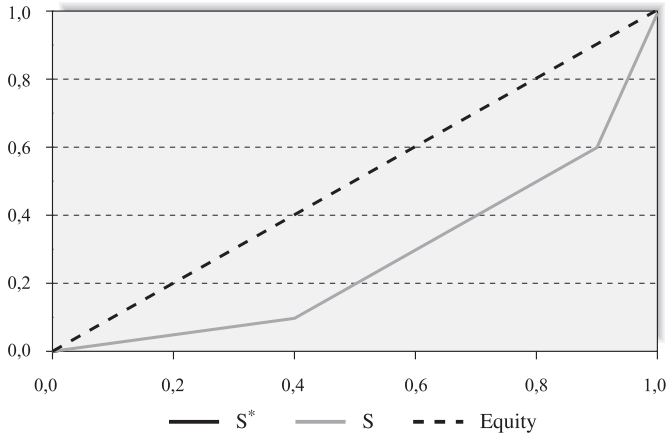

Figure 1. Segregation curves S^* and S in example 1

reasonable since it compares the female distribution with the employment distribution, which includes female workers, while S compares the former with the male distribution. Therefore, the local segregation curve of a given target group gives rise to lower segregation than the overall segregation curve of the economy.[6]

To understand better the differences between these curves, example 2 posits that the number and distribution of jobs, in addition to the distribution of female workers, are the same as in example 1, but now there are 120 women. Thus, $(c';t') = (12, 48, 60; 90, 60, 150)$. In this scenario the distribution of total employment among categories and that of female workers have not changed; therefore, S^* does not vary (see Figure 2). In other words, female segregation remains the same because there have been changes neither in their distribution nor in the employment structure. However, s has varied, since there has been a change in the distribution of male workers among categories, which moved from representing 40% in the first category, 10% in the second and 50% in the third, to 43%, 7% and 50%, respectively. We cannot deny that the economy has experienced a change when moving from example 1 to 2, but we find it interesting to distinguish between changes that affect the target group from those that do not. Female segregation should not vary so long as the employment and female labor force structures remain unaltered. If we are interested in other target groups (for example that of male workers), it is possible to measure their segregation by using the corresponding segregation curve.

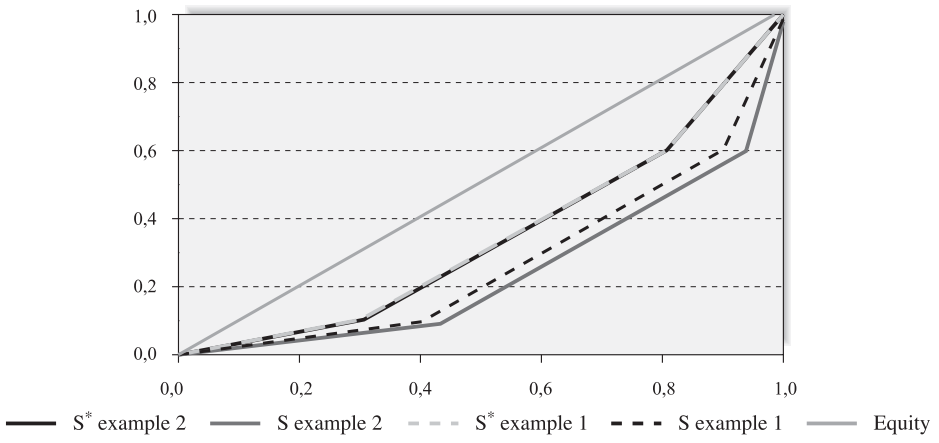

Figure 2. Segregation curves S^* and S in examples 1 and 2

In what follows we show another scenario in which changes in the distributions lead to changes in the segregation level when using S^*, but not when using S. Consider now that the number of jobs in the economy remains constant, but that category one loses 6 jobs in favor of category two. This means that the employment share decreases in category one, which represented 30% of jobs in example 1 and 28% now, and increases in category two (20% against 22%). Assume also that there are 120 female workers, like in example 2, with a distribution

among categories that keeps the same female shares as before, so that the first category still represents 10% of female jobs, the second represents 40%, and the third, 50%. Thus, $(c'';t'') = (12, 48, 60; 84, 66, 150)$. We find that overall segregation by gender does not change since the gender ratio in each category remains constant. However, if we calculate S^* curve for examples 1 and 3, we observe that they are different (see Figure 3). In particular, $S^*_{(c'';t'')}$ dominates $S^*_{(c;t)}$, which implies that female segregation is higher in the first example. How can we explain this fact? When comparing $(c;t)$ with $(c'';t'')$, we note that there has been a job reduction in category 1 –where female workers had a low presence– and a growth in category 2 –where women had a higher presence. Thus, the female segregation level decreases, since distribution c'' is closer to distribution t'' than c to t. It follows, then, that this segregation measurement does not care about situations where a category has a high female employment share while another has a low female share so long as they are consistent with the overall job distribution.

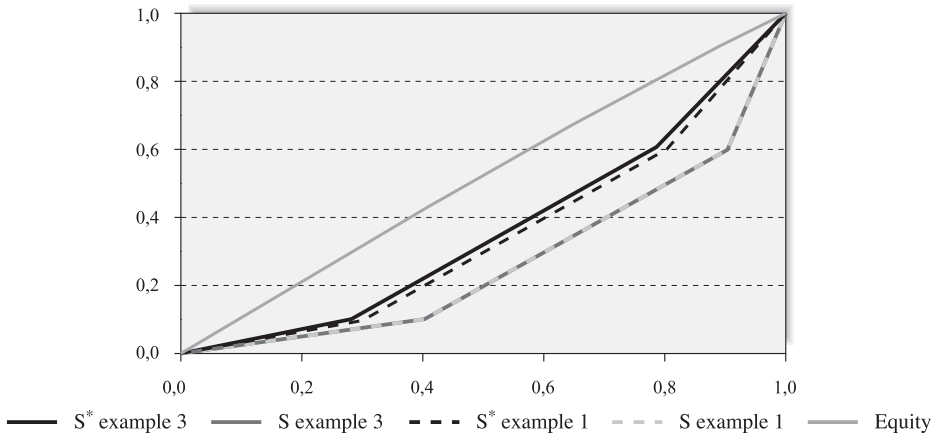

Figure 3. Segregation curves S^* and S in examples 1 and 3

Del Río and Alonso-Villar (2010a) offer a form of decomposing local segregation curves according to a partition of categories into several classes, which parallels that proposed by Bishop *et al.,* (2003) to decompose the Lorenz curve by population subgroups. This decomposition is presented in what follows.

Without loss of generality, let categories be classified into two mutually exclusive classes, so that $(c;t) = (c^1,c^2;t^1,t^2)$. Define indicator G_1^j so that $G_1^j = 1$ if category j belongs to class 1 and $G_1^j = 0$ otherwise. Indicator G_2^j can be defined analogously. By using vector c^1, vector $\tilde{c}^1$ can be built as the one resulting from enlarging c^1 with zero-values for those occupations-sectors that are not included in class 1, i.e. $\tilde{c}^1 = (c_1G_1^1,\ldots,c_JG_1^J)$. Analogously, we can build vector $\tilde{c}^2$. The expression:

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

measures the contribution of class k ($k = 1,2$) to the value of the segregation curve S^* in the corresponding percentile, where the first quotient represents the proportion of individuals of the target group who work in class k, and $\tilde{S}^*_{(\tilde{c}^k;t)}(\tau_j) = \sum_{i \le j} c_i G^i_k / C^k$ represents the pseudo-segregation curve for fictitious distribution $\tilde{c}^k;t)$ once categories have been ranked according to ratios c_j/t_j.[7] For instance, assume that we focus now on the occupational-industrial segregation of female workers, and consider that the categories are classified into four large classes: agriculture-fishing, industry, construction, and services. 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 (which includes, in this case, the least feminized jobs of the economy) 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 categories included in class are distributed among cumulative and non-cumulative deciles. In this regard, expression

$$S^*_{(c^k;t)}\left(\tau_j + 0.1\right) - S^*_{(c^k;t)}\left(\tau_j\right) \tag{2}$$

indicates the proportion of the target individuals working in class in each non-cumulative decile. This analysis will permit us, for example, to find out whether the distribution of women working in services across non-cumulative deciles of total employment, ranked from low- to high-feminization rates, differs from that of women working in industry.

Local segregation indexes

Alonso-Villar and Del Río (2010a) also propose several segregation measures consistent with non-intersecting S^* curves so that when comparing two different distributions, if the segregation curve of one of them dominates that of the other, then any segregation index of the target group satisfying certain 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.[8] This makes the use of these curves a quite robust procedure. However, if the curves cross or if one is interested in quantifying the extent of segregation, the use of indexes satisfying the above basic properties seems the most appropriate course to take. In particular, in the aforementioned paper the following measures, which are consistent with the local segregation curves, are proposed:

$$G^* = \frac{\sum_{i,j} \frac{t_i}{T}\frac{t_j}{T}\left|\frac{c_i}{t_i} - \frac{c_j}{t_j}\right|}{2\frac{C}{T}}, \tag{3}$$

$$\Phi_a(c;t) = \begin{cases} \dfrac{1}{a(a-1)} \sum_j \dfrac{t_j}{T} \left[\left(\dfrac{c_j / C}{t_j / T} \right)^a - 1 \right] & if\ a \quad 0,1 \\ \dfrac{1}{T} \sum_j t_j \left[\dfrac{c_j / C}{t_j / T} \ln \left(\dfrac{c_j / C}{t_j / T} \right) \right] & if\ a = 1 \end{cases} \tag{4}$$

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).

The above indexes, together with the index proposed by Moir and Selby Smith (1979)

$$D^* = \frac{1}{2} \sum_j \left| \frac{c_j}{C} - \frac{t_j}{T} \right| \tag{5}$$

will be used later in the paper to analyze female and male segregation in Spain.[9]

Note that these indexes compare the distribution of the target group across categories, $(c_1/C,...,c_J/C)$, with that of total employment, $(t_1/T,...,t_J/T)$, even though each of them quantifies these discrepancies in a different way. Thus, index G^* is equal to twice the area between the local segregation curve and the 45°-line, index D^* equals the maximum vertical distance between the curve and the 45°-line, and the $_a$ family pays more attention to what happens in those occupations in which the target group has the highest relative presence as a increases.

These indexes satisfy certain good properties (as shown by Alonso-Villar and Del Río, 2010a). First, they satisfy *scale invariance*, which means that in measuring local segregation it is only employment shares that matters, not employment levels. Consequently, the segregation level of a target group is unaffected by the number of individuals belonging to that group so long as the proportion of target individuals in each job category remains unaltered. Second, these indexes are *symmetric*, so that when the categories are given in a different order, the local segregation index does not change. Third, they are *insensible to proportional divisions* of categories, which implies that if an occupation is partitioned into two or more in such a way that the proportion of target individuals and total employment in each of them remain unaltered, local segregation does not change. Therefore, these indexes are unaffected by a subdivision of categories so long as this subdivision does not introduce new disparities. Four, index G^* and the family of indexes $_a$ also satisfy the property of *movement between groups*, which means that, ceteris paribus, when an individual of the target group moves from an occupation in which the group has a lower relative presence to another in which the group has a higher relative presence, local segregation increases.

An additional advantage of the family of indexes $_a$ is that its members are decomposable. In particular, they are decomposable by subgroups of categories. Given a partition of

categories in K classes, let us denote by C^k the number of individuals of the target group who work in class k ($k = 1,...,K$), and by c^k the distribution of the target group among the categories included in that class, so that $(c;t) = (c^1,...,c^K;t^1,...,t^K)$. Then, the generalized entropy family of indexes can be decomposed in two components:

$$\Phi_a(c;t) = \sum_k \left(\frac{C^k}{C}\right)^a \left(\frac{T^k}{T}\right)^{1-a} \Phi_a\left(c^k;t^k\right) + \Phi_a\left(C^1,...,C^K;T^1,...,T^K\right) \quad (6)$$

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 (i.e., segregation due to the distribution of the target group among classes).

3. Segregation in Spain: Occupations and Large Sectors

Disparities between women and men in the labor market can emerge from several reasons, mainly, differences in education and experience, differences in preferences for jobs, and labor market discrimination. Thus, 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. [10]

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. In fact, the lack of equity between women and men in sharing family and household responsibilities has important consequences in terms of employment patterns, inducing some women to choose part-time jobs.[11] It is important to note that 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 differentials. Alternatively, other theories emphasize the role of discrimination against women in order to explain gender disparities. In this vein, apart from the arguments posed by classical discrimination theories, recent literature emphasizes the role played by the interactions between women and men at work (Akerlof and Kranton, 2000). Thus, discrimination against women can arise as a form of protection of men s occupational status, since the latter may lose status when the former are hired for the same kind of jobs (Goldin, 2002). In the case of southern Europe, Petrongolo (2004) shows that, as opposed to what happens in other EU countries, female over-representation in some kind of jobs (like part-time and temporary jobs) is not well explained by differences in preferences or productivity, which suggests the existence of discrimination.[12]

Most of the literature concerned with gender disparities in the Spanish labor market has focused on wage discrimination (Hernández, 1996; Aláez and Ullibarri, 2000; Gardeazábal and Ugidos, 2005; Amuedo-Dorantes and De la Rica, 2006; Simón, 2006; Cueto and Sánchez-Sánchez, 2009; Gradín and Del Río, 2009; among many others). The investigation on segregation is scarce and has mainly dealt with the measurement of overall segregation by gender, rather than female segregation (Sánchez 1993; Otero and Gradín, 2001; Mora and Ruiz-Castillo, 2003; Cebrián and Moreno, 2008; Iglesias and Llorente, 2008; Iglesias *et al.,* 2009). An exception is Del Río and Alonso-Villar (2010a), who explore the segregation of female (and male) workers across occupations. Following the same approach, this section aims to quantify the extent of segregation of both demographic groups when considering differences in occupations and industries simultaneously. In addition, occupational segregation (and industrial segregation among branches of activity) within each large sector are explored as well. In particular, occupational discrepancies among public and private service sectors are analyzed.

The data used in this paper comes from the Spanish Labor Force Survey (EPA) conducted by the Spanish Institute of Statistics (INE), and corresponds to the second quarter of each year from 1994 to 2009.[13] Since we are interested in quantifying segregation in a year of high employment, our analysis mainly focuses on 2007,[14] even though past and recent evolution is also shown. Occupations are considered at a two-digit level of the CNO-1994 (*National Classification of Occupations*), which leads to 66 types of occupations. Four large sectors are considered agriculture-fishing, industry, construction and services.[15]

First, we analyze the distributions of female and male workers in 2007 when taking into account, simultaneously, differences in the 66 occupations and in the 4 aggregate sectors.[16] In this respect, a common occupation is considered a different job category depending on whether it belongs to agriculture, industry, construction or services. This brings the possibility of distinguishing between occupations, according to their female (male) presence, depending on whether a given occupation is undertaken in a sector or another.[17] Even though the cross between occupations and branches of activity 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 in 2007.[18]

Figure 4 shows the segregation curves for women and men when considering these 221 categories. We observe that there are about 20% of jobs in which women do not work, while the corresponding proportion for men is 5%. Moreover, the distribution of male workers dominates that of females, since the curve corresponding to the former is above that of the latter. Therefore, the occupational-industrial segregation of female workers is higher than that of males for any segregation index consistent with these curves (index G^* and the family of indexes $_a$). In fact, all indexes in Table 1 show remarkable increases when comparing the male and female distributions. One of them even triples their value ($_{0.1}$), while others double it ($_a$ with $a = 0.5, 1, 2$). In any case, the analysis also suggests a non-negligible inequality in the distribution of men workers across occupations-sectors (even though the causes of this phenomenon, which are beyond the scope of this paper, may substantially differ from that of female segregation).[19]

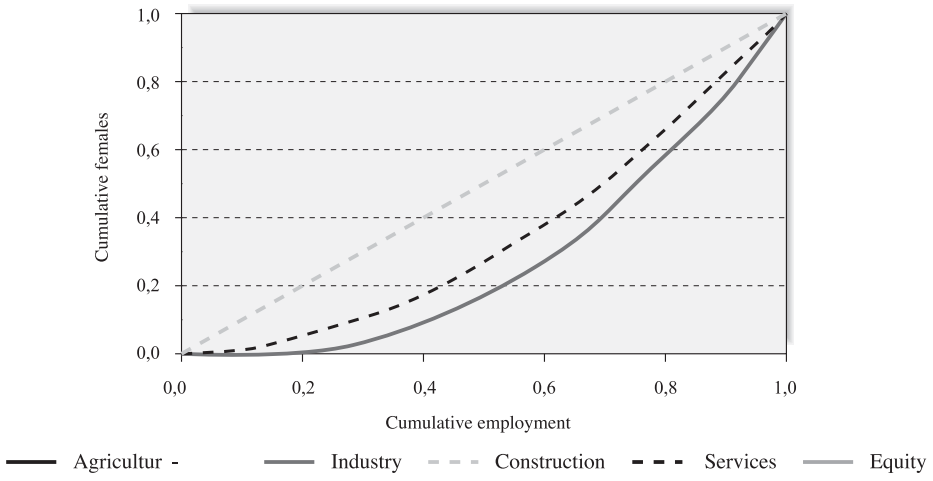

Figure 4. Occupational-industrial segregation curves in 2007 (221 categories)

Table 1
OCCUPATIONAL-INDUSTRIAL SEGREGATION INDEXES IN 2007
(221 categories)

	0.1	0.	1		D^*	G^*
Female Workers	0.73	0.46	0.34	0.28	0.33	0.43
Male Workers	0.21	0.18	0.16	0.14	0.23	0.30

3.1. Partition by large sectors

By using the decomposition of index $_1$ in the *within-group* and *between-group* components (see expression (6)), we find that partitioning the 221 categories into 4 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 (see Table 2). In other words, differences between the four large sectors explain about 36% and 27% of female and male segregation in the labor market, respectively.[20]

Taking into account this finding, we now decompose the female (respectively, male) segregation curve in four classes according to the above partition (obtained from expression (2)). Figure 5 shows the distribution of women (respectively, men) working in each large sector across non-cumulative quintiles of total employment. The first quintile represents 20% of total employment and includes those job categories of the economy in which women (men) have the lowest relative presence (c_j/t_j), while the fifth quintile, which also represents 20% of total employment, includes those categories in which women (men) have the highest presence. Therefore, in order to plot Figure 5, first, we have to rank the jobs of the economy from low

to high female (respectively, male) presence, and later, for each large sector, we determine the number of women (men) who work in the categories included in each quintile (i.e., the quintiles of employment are common to the four large sectors).

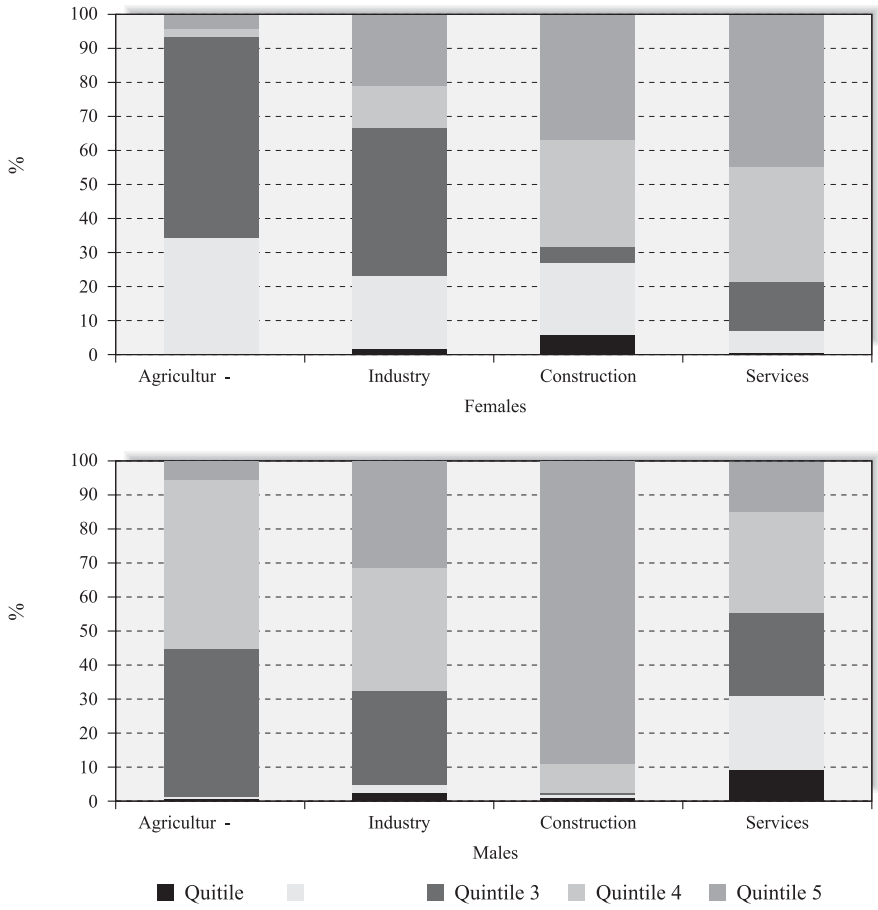

Figure 5. Distribution of each large sector across non-cumulative quintiles in 2007 (221 categories)

We see that the distribution of female workers across quintiles substantially differs among sectors. In this regard, while agriculture-fishing and industry have important weights in the first three quintiles, which represent the less-feminized jobs of the whole economy, construction and services are mainly concentrated in the top quintiles, which represent the most-feminized jobs. In other words, women working in construction and services tend to concentrate in female-dominated jobs, while in industry and agriculture-fishing, the degree of concentration of women in female-dominated jobs is lower. In fact, 59.27% of the female labor force employed in

agriculture-fishing is in the third quintile of the female distribution (see Table A3 in the Appendix). This percentage rises to 93.5% if one is jointly considering the second and third quintiles, which suggests that there are not many feminized jobs within this sector. In industry, the third quintile also represents a high percentage of the female employment in this sector (43.8%), although the fourth and fifth quintiles have, in this case, higher values than in agriculture. On the contrary, a large proportion of the females working in construction and services concentrate in the most feminized jobs (36.9% and 44.7%, respectively).[21]

When studying the distribution of male workers, we find that the distribution of agriculture-fishing across non-cumulative quintiles shows that a high proportion of the male staff works in jobs with an intermediate-high level of masculinization (see Figure 5). In fact, the third and forth quintiles jointly represent 93.6% of the male employment in the sector (see Table A3 in the Appendix). Industry has a similar pattern, even though the fifth quintile represents now a higher value than in the case of agriculture. In construction, the situation is more extreme, since 89.3% of its male employment is concentrated in the most male-dominated jobs of the economy (in the fifth quintile). On the contrary, in the service sector, the distribution of male employment across quintiles is more egalitarian. This suggests that the degree of masculinization of this sector is lower.

3.2. Occupational segregation within each large sector

In what follows, the occupational segregation of each large sector is analyzed separately, i.e., the benchmark distribution for each sector is now the employment distribution of that sector across 66 categories.[22] This means that segregation due to disparities among sectors is left aside and we now exclusively focus on the occupational segregation within each large sector. Therefore, as opposed to the analysis shown in Figure 5, the job categories included in each quintile are not common across sectors. Thus, for example, the first quintile in the case of agriculture includes only those jobs of the sector in which women (men) have the lowest presence. For the sake of clarity, in Figure 6 female segregation curves are shown in the top, while male segregation curves are shown in the bottom.

On the one hand, the analysis 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).[23] Consequently, women working in construction tend to concentrate in a few occupations to a greater extent than those working in the remaining sectors, which is in line with the analysis shown in Figure 5. More surprising is perhaps the fact that men working in services concentrate to a greater extent than those working in other sectors, since, as shown in Figure 5, the distribution of male service jobs across quintiles of total employment is rather egalitarian. Note, however, that each analysis puts emphasis on a different aspect of the service distribution. Former analysis suggested that men working in services are employed in both the least and the most masculinized jobs of the economy as a whole, while the latest analysis implies that within the service sector, men tend to concentrate in a fewer number of occupations than men working in other sectors do.

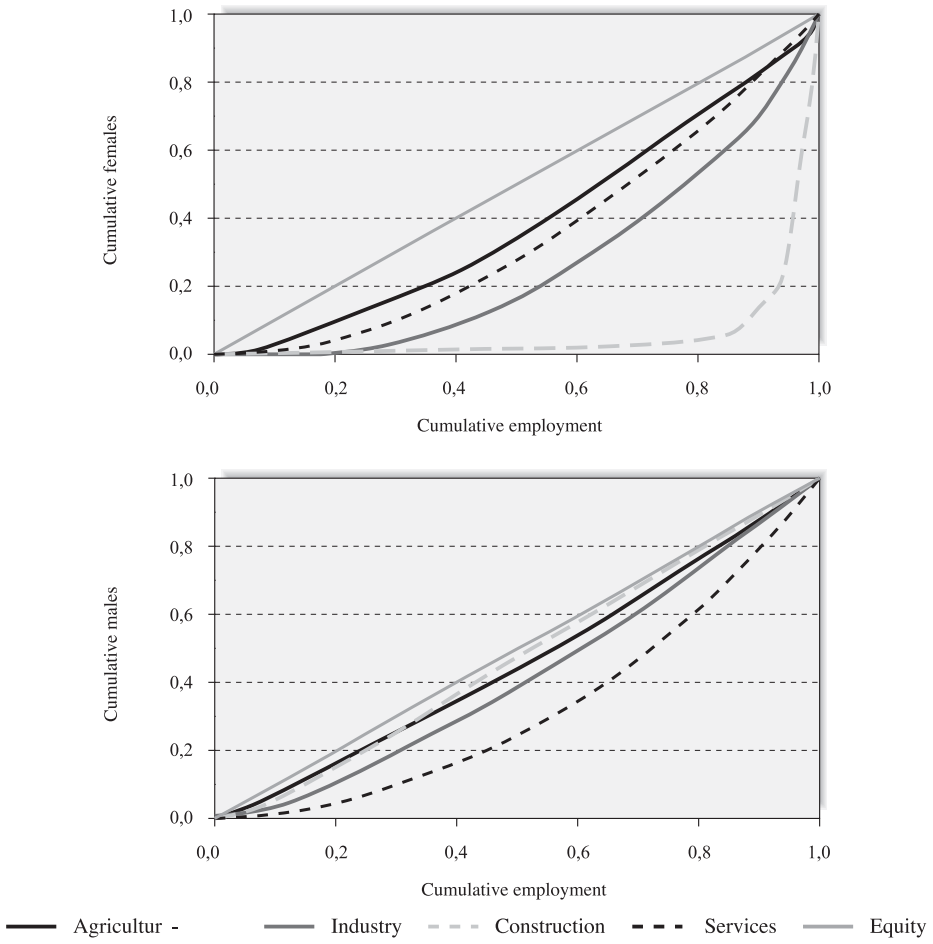

Figure 6. Occupational segregation within each large sector in 2007 (66 categories)

On the other hand, we see that the segregation curve for women working in agriculture-fishing crosses that of women working in services and, therefore, we cannot rank both sectors in a robust way. However, most indices suggest that the agriculture-fishing sector has the lowest occupational segregation level for women (see Table 2). This sector, together with construction, is the industry with lower male segregation, as well. 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. This suggests that in the service sector the distribution of women among jobs has more resemblance to the distribution of total employment in services than the distribution of men do, while in the remaining sectors the opposite holds. In other words, men do not work in some kind of services while women do not work in many types of jobs in industry, construction, and agriculture-fishing (and also in some kind of services, as $_{0.1}$ shows).

Table 2
OCCUPATIONAL SEGREGATION INDEXES IN 2007
(4 large sectors, 66 categories)

	0.1	0.	1		D^*	G^*	Within-Between decomposition of $_1$	Distribution of female and male workers between sectors
Female Workers							64.31%-35.69%	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							73.47%-26.53%	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%

3.3. Occupational segregation within services: Public versus private

In order to delve deeper in the analysis, we study whether in the service sector there are differences between the public and private sectors.[24] For this purpose, first, we calculate the local segregation curves of four target groups: Females and males working in the public and private service sectors (see Figure 7). In doing so, a common distribution of reference against which to compare the distribution of any target group is used (that of total service

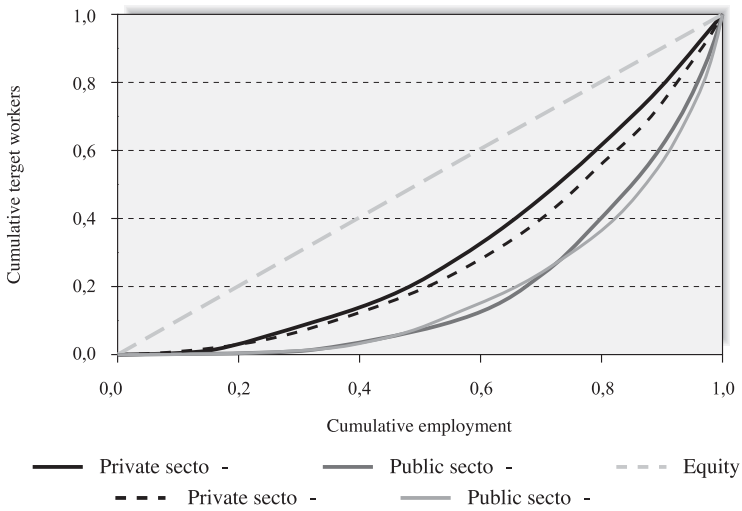

Figure 7. Occupational segregation within the service sector in 2007 (44 categories)

employment). One should keep in mind that some occupations are associated to the private sector, while others to the public. For this reason, the list of occupations is now reduced to 44, since only those occupationswhere there are public and private jobs are included in the analysis.[25]

The curves suggest that segregation in the public sector is higher than in the private sector for both women and men, which seems unintuitive. In addition, we also find that according to most indexes, segregation in the private sector is lower for women than for men, while in the public sector no clear conclusion can be reached (see Table 3).

Table 3
OCCUPATIONAL SEGREGATION INDEXES IN 2007
(service sector, 44 categories)

	0.1	0.	1		*D**	*G**	Distribution of female and male workers between sectors
Female Workers	0.31	0.22	0.17	0.14	0.22	0.30	100%
Public services	1.04	0.75	0.64	0.73	0.48	0.60	21.9%
Private services	0.38	0.28	0.23	0.20	0.28	0.37	78.1%
Male Workers	0.26	0.23	0.20	0.19	0.26	0.35	100%
Public services	0.94	0.74	0.67	0.85	0.46	0.61	21.7%
Private services	0.34	0.30	0.28	0.27	0.32	0.41	78.3%

In order to understand why female and male segregation are higher in the public sector, we compare the distribution of public service employment across occupations with that of the private sector. Figure 8 shows that the former is more unevenly distributed across

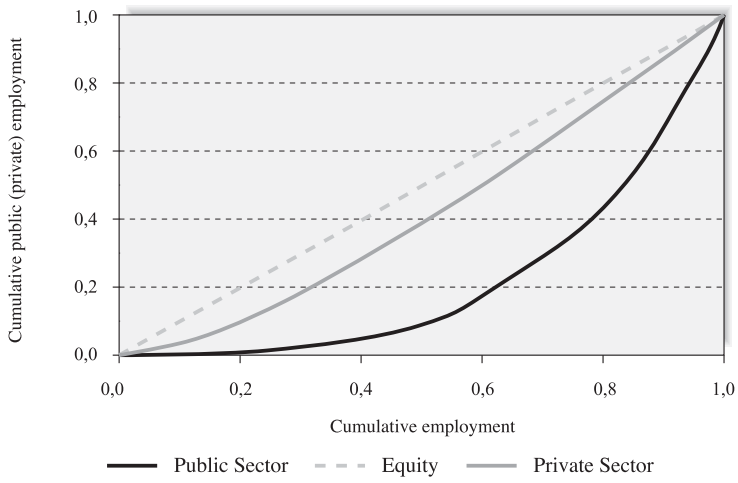

Figure 8. Employment Lorenz curve of the public and private service sectors in 2007 (44 categories)[27]

occupations than the latter. In other words, the distribution of public service employment across occupations clearly departs from that of the private sector,[26] which can explain the unintuitive finding mentioned above. For this reason, next, we calculate female and male segregation in each sector separately, i.e., the distribution of reference against which to compare that of the target group is either that of private or public employment. Figure 9a shows female and male segregation curves in the former case, while Figure 9b does it in the latter.

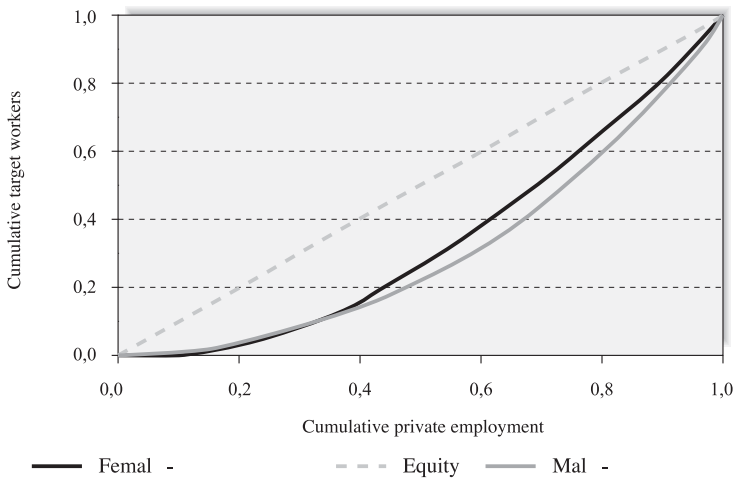

Figure 9a. Segregation curves within the private service sector in 2007 (44 categories)

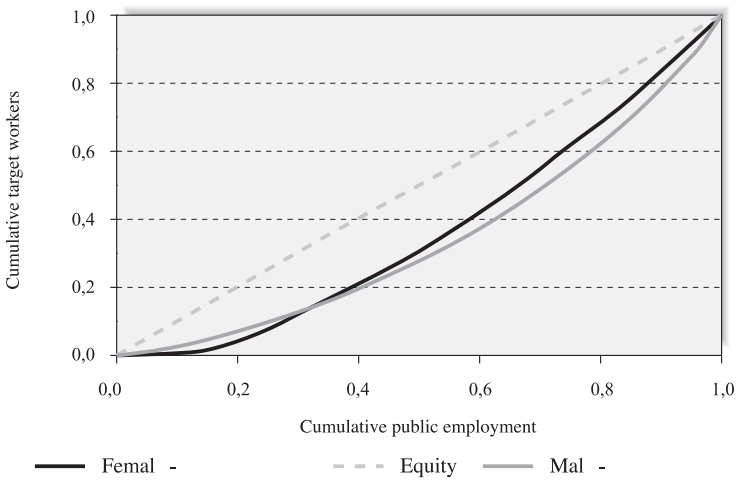

Figure 9b. Segregation curves within the public service sector in 2007 (44 categories)

According to these curves, female and male segregation seems to be higher in the private service sector, as the values of the indexes prove (see Table 4). This may help to explain why Mora and Ruiz-Castillo (2004) find that in 1994 overall segregation by gender was higher in the private sector than in the public. Note that in measuring overall segregation in a sector, they calculate an aggregate segregation index that can be decomposed as the summation of our local index (Table 4) for males and females weighted by the demographic weight of each group (see index *M* in Section 4). In fact, if we calculated this overall segregation index for 2007, we would also obtain that this index is higher for the private service sector (0.20 as compared to 0.14).[18]

Table 4
OCCUPATIONAL SEGREGATION INDEXES IN 2007
(private and public service sectors, 44 categories)

	$_{0.1}$	$_{0.}$	$_{1}$		D^*	G^*	Distribution of female and male workers between sectors
Public Services							100%
Female workers	0.22	0.17	0.14	0.11	0.19	0.25	54.4%
Male workers	0.16	0.15	0.15	0.15	0.22	0.30	45.6%
Private Services							100%
Female workers	0.35	0.24	0.19	0.15	0.24	0.31	54.1%
Male workers	0.29	0.25	0.22	0.21	0.28	0.37	45.9%

The crosses between female and male curves in the private and public service sectors do not allow one to reach a general conclusion. Most local segregation indexes show that segregation is lower for women than for men both in the public and private service sectors (Table 4). However, according to the indexes which give more importance to the most highly feminized/masculinized occupations, such as index $_{0.1}$, segregation is lower for males.

4. Evolution of segregation

Spain has witnessed a remarkable employment growth from 1994 up to 2007 (around 67% according to the EPA) and a job destruction process from 2007 onwards. The initial rise was accompanied by changes on both the industrial and gender employment structure. Thus, the employment share accounted for by industry and agriculture decreased five percentage points each during the expansion phase, while the share of services and construction increased six and four points, respectively. This change has been intensified even further during the current crisis, in which the weight of services in terms of employment rose (four percentage points in only two years) at the expense of industry and, especially, construction, which illustrates the important employment adjustments that have occurred along this period. On the other hand, the proportion of women within the whole group of workers increased from 33.7% in 1994 to 43.5% in 2009. The incorporation of women into the labor market has mainly affected the service sector, in which the female employment weight increased from 43.8% to 53.7%. As a consequence of all of the above, it seems timely to analyze the evolution of segregation of female and male workers along this period taking into account not only differences among occupations but also among large sectors.

The evolution of the occupational-industrial segregation of women (denoted by *w*) and men (*m*) from 1994 to 2009 shows a remarkable increase for the latter during the period and a slightly decreasing trend for the former until 2007, which becomes more intense during the current crisis (see Figure 10, where *a* is the parameter corresponding to the family of local segregation indexes $_a$). In addition, this analysis illustrates that an increase in male segregation is not necessarily accompanied by a decrease in female segregation. In fact, from 1994 to 1999 segregation remained rather stable for women while it clearly increased for men.

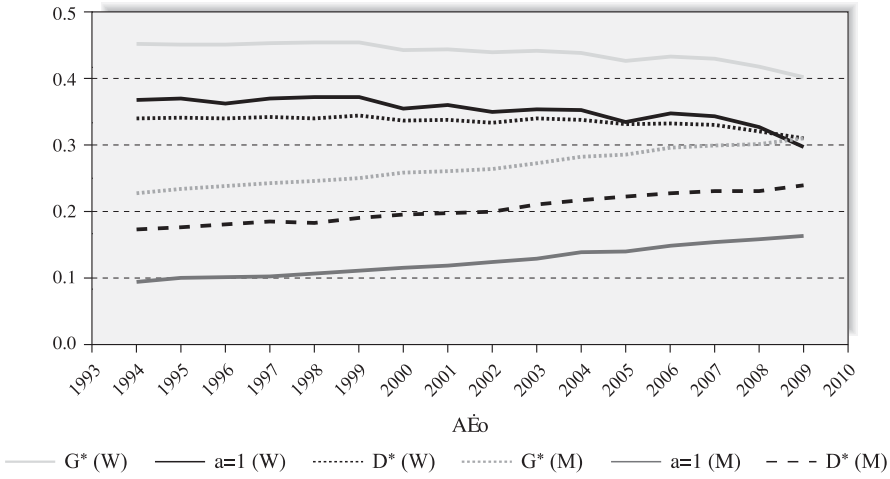

Figure 10. Local segregation indexes for women and men from 1994 to 2009

If we classify the job categories into the four large sectors, we find that the *between-group* component is more relevant to explain segregation of both women and men in 2007 than in earlier years. In fact, the *between-group* component clearly increased up to the beginning of the current economic crisis, rising from 27.7% in 1994 to 35.7% in 2007 for women and from 20.1% to 26.5% for men (afterwards, this component decreased to 31.2% in the case of female workers and to 24.2% in the case of males).[29] Therefore, the employment growth that occurred in the Spanish economy from 1994 to 2007 was accompanied by an increasing influence of industrial disparities between women and men.

Given the different evolution of segregation for men and women, one may wonder how overall segregation by gender has evolved during these years. For this purpose, we use the Gini index (Silber, 1989), the variation of the index of dissimilarity I_p, proposed by Silber (1992), and the mutual information index (Frankel and Volij, 2010), which are related to local index G^*, D^*, and $_1$, respectively (Alonso-Villar and Del Río, 2010a). In this regard, the aforementioned overall segregation indexes can be written as weighted averages of the corresponding local segregation indexes for women and men according to their demographic weights:

$$G = \frac{C^w}{T} G^w + \frac{C^m}{T} G^m,$$

$$I_p = \frac{C^w}{T} D^w + \frac{C^m}{T} D^m,$$

$$M = \frac{C^w}{T} \Phi_1\left(c^w; t\right) + \frac{C^m}{T} \Phi_1\left(c^m; t\right)$$

We see that overall segregation by gender across occupations-large sectors has increased along the period, even though this process seems to halt after 2006 (see Figure 11).[30] This result is in line with that obtained by Iglesias and Llorente (2008),[31] who also find an upward trend between 2002 and 2007 when considering occupational and industrial segregation, at a three-digit level, separately (124 and 151 job categories, respectively).[32]

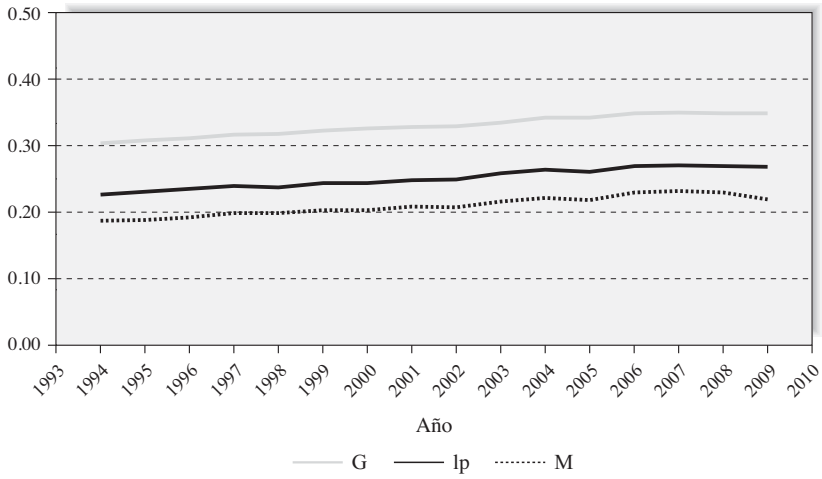

Figure 11. Overall segregation by gender from 1994 to 2009

Note, however, that our previous finding suggests that the rise of overall segregation is not the consequence of segregation increasing for women but for men. Moreover, even though overall segregation by gender (across occupations and large sectors) remained rather stable according to indexes and between 2007 and 2009, the employment structure of women and men do show important changes between these years. Thus, as Figure 10 shows, segregation kept increasing for men while it decreased for women.[33]

Given the numerous changes that have occurred in the Spanish labor market during the last two decades, it does not seem easy to explain the causes of this evolution. Alonso-Villar and Del Río (2010b) has recently shown that an important proportion of the employment growth along this period occurred in jobs in which immigrants have a high presence, some of

them strongly feminized (as in the case of domestic employees) and others strongly masculinized (like construction laborers). Regarding this, we find that the male segregation rise observed along this period may be not only the consequence of male immigrants filling male-dominated jobs in construction (such as *workers at structural construction sites*, *workers dedicated to finishing construction*, and *construction laborers*),[34] but also the result of a decreasing presence of men in traditional feminized jobs included in the service sector (such as *catering services*, *retail workers*, *assistant clerks, and cahiers*).[35]

On the contrary, the changes observed in the female employment structure seem more complex. On the one hand, the educational level of female workers has notably increased in this period. On the other hand, the female employment growth is not only due to the arrival of immigrant women but also to the incorporation of native women into the labor market. Perhaps these two demographic groups do not move in the same direction, which may help to explain why female segregation tends to decrease in the last years despite the remarkable employment growth in feminized occupations in which immigrants have a high presence (Del Río and Alonso-Villar, 2010b; Alonso-Villar and Del Río, 2010b). In fact, in the service sector, we find both more and more feminized occupations (as mentioned above) and masculinized occupations in which women have increased their presence more than expected according to the female participation rise (such as *management of companies with 10 or more employees; technicians in financial and commercial transactions; other technicians;* and *library, mail services and related employees*).[36] The role played for native and immigrant women in explaining the evolution of female segregation should be explored in more detail by further research, given that the latter are more segregated than the former (and also more than immigrant men), see Del Río and Alonso-Villar (2010b).

5. Final remarks

Traditional analyses on gender segregation in the labor market focus on measuring overall segregation. This paper has offered a different perspective by measuring the segregation of women and men separately. Following this approach, we found that even though male workers are far from being homogeneously distributed across occupations and industries, unevenness is much higher for women. We have also shown that, according to most local indexes, 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. In addition, the analysis suggests that women working in construction and services tend to concentrate in the most female-dominated occupations of the whole economy, while in industry and agriculture, the degree of concentration in those occupations is lower. Regarding males, the study reveals that in the construction sector, male employment is concentrated in the most male-dominated occupations of the economy, while in the service sector males are more evenly distributed across jobs.

When looking at the service sector in more detail, we found that the employment structure of the public sector clearly departs from that of the private, which suggests that the analysis of

segregation by gender should be explored separately in the public and private sectors since their occupational structures are rather different. This explains why when considering a common benchmark against which to compare both sectors (that of total service employment), female and male segregation are higher in the public sector; while when using a different benchmark for each of them (that of the employment distribution of the sector), segregation is then higher in the private sector. We also found that, in both the public and private service sector, local segregation curves for women and men cross so that no general agreement can be reached. Thus, segregation is higher for females only for those indexes that give more relevance to the most feminized (masculinized) occupations.

Our investigation of occupational-industrial segregation during the period 1994-2009 has shown that it remained rather stable for women up to 1999; afterwards it started to decrease slightly. Regarding males, segregation clearly increased for the whole period. As consequence of all of the above, overall segregation by gender increased up to 2006. The results obtained in this paper suggest that this segregation increase is closely related to the economic growth pattern followed in Spain during the last two decades. Consequently, segregation in the labor market should be another dimension to take into account when assessing the outcomes of the economic growth system and proposing alternative economic policies.

Our analysis has also demonstrated that between 2007 and 2009 overall segregation remained stable despite the fact that segregation increased for men and decreased for women. In other words, this paper has revealed that studying only overall segregation might lead one to the conclusion that no change has occurred along time even when female and male workers have had different performances, which allows us to illustrate the complementarity of our approach with respect to traditional analyses.

Notes

1. - For a revision of occupational segregation measures, see Flückiger and Silber (1999). James and Taueber (1985) also offer an interesting discussion of segregation indexes in the case of school segregation.
2. - Jenkins et al. (2008) also follow this approach to study social segregation in secondary schools.
3. - Note that segregation does not have to be higher for women. Thus, as shown by Alonso-Villar et al. (2010), occupational segregation of Hispanic men in the US is higher than that of Hispanic women, while for the remaining racial/ethnic groups, the opposite happens.
4. - By following the same reasoning, Lewis (1982) defined an analogous index to measure male segregation.
5. - This paper departs from that of Del Río and Alonso-Villar (2010a), since they do not take into account either the industrial dimension or the evolution of segregation.
6. - In the case of segregation by sex, total employment is the result of adding female and male workers, so that curve S can be obtained by calculating S^* for distribution $(c;t-c)$. However, if we were interested in other types of segregation involving more than 2 groups of individuals –for instance female segregation by age, or race segregation, etc.– both approaches would substantially differ.
7. - Note that $\tilde{S}^*(\tilde{c}^1;t)$ does not represent the local 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 $(c;t)$.
8. - Later on, a reflection on these properties is given.

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

10. - In the case of Spain, men are much more evenly distributed across occupations than women, as shown by Del Río and Alonso-Villar (2010a), despite the fact that employed women have a higher educational level than men. Moreover, these authors show that high-educated women are more segregated across occupations than high-educated men, which suggests that education alone does not explain gender disparities in Spain.

11. - According to data from the Spanish Institute of Statistics (INE, 2006), one out of two male workers with children leaves his full parental responsibility to his wife. One should keep in mind, although, that 31% of women working part-time state that they wish a full-time job (INE, 2008).

12. - By comparing several European countries, Dolado et al. (2004) also suggests that the concentration of women in part-time jobs is mainly due to discrimination attitudes.

13. - In 1994 the new classification of occupations was adopted. The period analyzed is 1994-2009 so that homogeneous date are available for the full period.

14. - The second quarter of 2007 has the lowest unemployment rate of the whole democratic period, 7.95% (6.1% for men and 10.49% for women).

15. - The top 10 most feminized and masculinized occupations and branches of activity (according to the CNAE-1993 classification of economic activities) in 2007 are shown in the Appendix (Tables A1 and A2).

16. - In 2007, women represented 41% of workers, while men represented 59%.

17. - Note that a given occupation can be more or less feminized/masculinized depending on the sector in which it is analyzed. Thus, for example, 30% of the workers included in the category given by the cross between the service sector and occupation labeled *management of other companies with less than 10 employees* are women, while this percentage reduces to 9% when this occupation is combined with construction. The same happens in the case of occupation labeled accounting, finance services employees, and production and transport support services employees, where 56% of its workers are women when this occupation is combined with construction, while it decreases to 28% when combined with industry.

18. - Note that this analysis departs from that of Del Río and Alonso-Villar (2010a) since these authors do not consider differences among occupations and sectors. In fact, they only consider 66 categories of jobs while here we consider 221 categories. If the 221 categories were partitioned into 66 classes (i.e., by occupations) and we decomposed local segregation in the within-between components, the between component would be the analysis undertaken in the aforementioned paper. Our analysis includes not only the between component but also the within component (i.e. the segregation due to the distribution of the target group among sectors for each occupation).

19. - By using a multinomial logit model, Iglesias and Llorente (2008) find that education appears as the most relevant variable to explain the allocation of women and men to integrated occupations and branches of activity in Spain, where a category is considered as integrated if the proportion of women there ranges between 36.9% and 45.1%. They also suggest that working full time increases men's probability of working in male occupations, while it reduces women's probability of working in female occupations. In addition, they find that age and experience only affect the allocation of men, even though at a low extent.

20. - 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.

21. - 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).*

22. - Industrial segregation in Spain across branches of activity has a much lower extent than occupational segregation, for both women and men (see Table A4 in the Appendix). The analysis also suggests that industrial segregation within each large sector, except services, is higher for women than for men.

23. - It is important to note that the local measures used in this paper are scale invariant (i.e., they do not depend on the total number of target individuals). Therefore, a group with a large presence in the economy does not necessarily have lower segregation.

24. - A job is considered to be public if the interviewed worker states that he/she works in the public sector.

25. - In particular, we only consider those occupations with public and private employment rates over 0.05%.

26. - Thus, for example, the data show that *retail workers and the like*; *financial and commercial transactions support professionals*; *catering service workers*; and *unskilled retail workers* are occupations with much more private employment than public.

27. - This graph has been built in the same way that a local segregation curve (occupations are now ranked form low to high public (private) employment rates). However, we do not keep that label because it has no meaning in this case. We prefer to call it employment Lorenz curve .

28. - This does not contradict, however, the fact that female and male segregation is higher in the public service sector than in the private (Table 3) when considering a common benchmark against which to compare the distribution of any target group (i.e., if the distribution of reference is that of total service employment). This is due to the especial employment distribution of occupations in the public sector, as discussed above.

29. - The *within-between* components for 2007 are given in Table 2.

30. - Other studies show that, according to the index of dissimilarity, occupational segregation in Spain experienced ups and downs in earlier decades (Sánchez, 1993; Otero and Gradín, 2001), even though this index seemed to increase from 1987 to 1998. For other studies of the period 1977-1992, see Mora and Ruiz-Castillo (2003, 2004) who use alternative overall segregation indexes.

31. - In addition, Iglesias et al. (2008) explore the different evolution of segregation in each Spanish region.

32. - Maté *et al.* (2002) also give evidence of an increasing trend in occupational segregation between 1994 and 1999 by using the index proposed by Karmel and MacLachlan.

33. - One might think that the decreasing segregation trend for women is the consequence of their higher participation in the labor force. However, it is important to note that a demographic group may have an increasing participation in the labor force along time together with an increasing segregation level. In fact, as shown by Alonso-Villar and Del Río (2010b), this is the case of immigrants in Spain.

34. - These occupations, which represent an important employment share in 2007, experienced a remarkable growth in previous years (between 1994 and 2007, the total employment share in these occupations rose from 6.6% to 9.4%). In addition, the proportion of males in each of them remained rather stable and extraordinary high along the period (over 99%).

35. - In 1994, the proportion of men in these occupations was notably below the proportion of men in the whole economy (between 10 and 30 percentage points below), and in 2007, male presence in these occupations decreased much further than in the economy.

36. - In addition, other jobs in which there were almost no women in 1994 have seen an increase in their female ratios. This is the case of *professions linked to 2nd and 3rd university cycle degrees in physical, chemical, mathematic sciences and in engineering* within industry; *professions linked to 1st university cycle degree in physical, chemical, mathematic sciences and in engineering* within construction; *skilled fishermen and skilled fish farm workers*; and *transport labourers and freight handlers* within the service sector.

37. - Table A3 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.

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Resumen

En este trabajo se estudia la segregación de mujeres y hombres en el mercado de trabajo español prestando especial atención a las diferencias entre sectores económicos. Con este objetivo, se analiza la segregación considerando conjuntamente diferencias en 66 ocupaciones y 4 grandes sectores (agricultura-pesca, construcción, industria y servicios) y se muestra su evolución entre 1994 y 2009. Además, se cuantifica la segregación ocupacional dentro de cada gran sector. Para ahondar en el análisis, se muestran también las diferencias en los niveles de segregación ocupacional existentes dentro de los servicios públicos y privados. Para realizar estos análisis, se utilizan índices aditivamente descomponibles, así como curvas, que se han propuesto recientemente en la literatura y que permiten profundizar en el análisis empírico.

Palabras clave: Segregación industrial, curvas de segregación local, género.

Clasificación JEL: J71, J16, D63

Appendix

Table A1
THE MOST –AND LEAST– FEMINIZED OCCUPATIONS IN 2007: EMPLOYMENT SHARE IN EACH OCCUPATION, AND PROPORTION OF FEMALE WORKER, WITH RESPECT TO TOTAL EMPLOYMENT, IN EACH OCCUPATION

	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 customer 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 customer 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 A2
THE MOST –AND LEAST– FEMINIZED BRANCHES OF ACTIVITY IN 2007: EMPLOYMENT SHARE OF EACH BRANCH AND PROPORTION OF FEMALE WORKER, WITH RESPECT TO TOTAL EMPLOYMENT, IN EACH BRANCH

	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: washing, dry cleaning and dying of leather and cloth garments; hairdressing and other beauty treatments; physical fitness activities; funeral parlors and related activities	1.42	78.66
85. Health and veterinary activities; social services: includes medical, hospital, dentistry, and veterinarian activities and social work with or without accommodation	5.95	76.68
18. Clothing and fur industry: tailoring of leather clothes, work clothes and other outer and underwear and accessories; preparation and dying of furs for furriers and manufacture of furriery articles	0.49	75.49
80. Education: primary, secondary and higher education: also including driving schools, adult education, and other types of education	5.64	64.90
52. Retail trade except trade of motor vehicles, motorcycles and mopeds; repair of personal effects and household equipment: also includes the repair of footwear, electrical appliances, watches and clocks and jewellery and other small repairs	9.42	61.99
67. Activities auxiliary to financial intermediation: administration of financial markets and stock market activities; 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 branches		
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 A3
DISTRIBUTION OF EACH SECTOR ACROSS NON-CUMULATIVE QUINTILES IN PERCENTAGES IN 2007 (221 categories)

	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Total
Female Workers						
Agriculture-fishing	0	34.24	59.27	2.57	3.92	100
Indutry	1.69	21.29	43.76	12.43	20.83	100
Construction	5.66	21.14	4.82	31.51	36.87	100
Services	0.39	6.31	14.57	34.04	44.69	100
Male Workers						
Agriculture-fishing	0.34	0.7	43.58	50	5.38	100
Indutry	2.21	2.34	27.74	36.25	31.46	100
Construction	0.6	1.2	0.39	8.5	89.31	100
Services	9.02	21.95	24.38	29.91	14.74	100

Table A4
INDUSTRIAL SEGREGATION INDEXES IN 2007 (58 categories)[37 -]

	0.1	0.	1		D^*	G^*	Distribution of female and male workers between sectors
Female Workers							100%
Agriculture-fishing	0.01	0.01	0.01	0.01	0.04	0.04	2.93%
Indutry	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							100%
Agriculture-fishing	0.00	0.00	0.00	0.00	0.01	0.01	5.63%
Indutry	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%