Structural change and female participation in recent economic growth: A multisectoral analysis for the Spanish economy

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Abstract: Economic growth has different impacts on gender gaps. Despite that the incorporation of women into the labour market drove towards a convergence with male participation in recent decades, a notable gender pay gap still persists standing at around 15% on average in the European Union. In this context, this paper evaluates the impact of economic growth patterns on the evolution of female employment and gender pay gaps. As a case study, we examine Spanish economic growth from 1980 to 2007 and the influences on the size, composition (by skill), and distribution (by sector) of female and male employment, as well as the consequences for gender gaps. First, sectorial feminization, direct discrimination, and structural change factors are identified and evaluated as sources of change in gender pay gap. Second, we explore the influence of demand, technology, and intensity factors on the evolution of employment in Spain, combining gender, skill, sectorial, and temporal perspectives.

JEL Codes: A30, B54, C67, E24.

Keywords: Female participation, Gender pay gap, Structural change, Structural decomposition analysis, Input-output analysis.

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1. Introduction

Long-term economic growth is the result of a complex interplay of technological factors, structural change, consumption patterns, and gains in productivity and competitiveness. European economies, in their recent paths to economic growth, have experienced significant structural changes, mainly linked to trade expansion, greater economic integration, and the development of high-technology industries and services (European Commission, 2010). Traditionally, the intensification of the export-orientation of economies, the shift towards service-sector specialization, and the progressive introduction of more flexible modes of work, have been factors encouraging the relative increase of female participation in labour markets. Moreover, societal and political changes observed in developed economies in the second half of the 1990s and the first decades of the 21st century have contributed to the increased incorporation of women in overall economic activity.

In Europe, the broad data show for the whole European Union (EU) a generalized growth in the labour force since the 1990s, combined with a notable increase of women engaged in economic activity through their participation in the labour market. As an example, according to OECD (2014), during the period 1997-2013 female employment grew at a faster rate than male employment during the expansion period (1.58% against 0.75% from 1997 to 2008), and showed an improving pattern during the crisis (-0.70% against -0.88% from 2008 to 2013). Consequently, female employment and female participation increased during the whole period, with the participation rate ranging from 42.51% in 1997 to 45.72% in 2013.

Despite this general trend, the evolution of the participation of women in labour markets notably differs by country, and greater female participation rates have not always resulted in significant advances in gender equity in recent decades. Thus, economic and social indicators tell us about the persistence of gender employment gap (GEG) —which accounts for differences in participation in the labour market between women and men— and

gender pay gap (GPG) —which accounts for differences in salaries— in Europe. More specifically, EUROSTAT (2017) situates the GPG in the EU above 16% for the whole economy in many EU countries (being above 20% for private sector).

In this context, several inter-related factors have been cited in the literature to explain the GPG. First, direct discrimination —i.e. less salary for women doing the same job as men— has been an important explanatory factor in the past, although following national and international legislations only part of the GPG appears to still be directly explained by this (Watson, 2010; Kenedy et al., 2017). A closely related factor is the undervaluation of women's work whereby jobs requiring similar skills, qualifications, or experience are undervalued, and in consequence underpaid, when carried out by women (Grimshaw and Rubery, 2007).

The GPG is also enhanced by the fact that women tend to be concentrated in certain economic activities —such as health, education, etc—, where their work is lower-valued than in other sectors with greater rates of male participation. This feminization or horizontal segregation of sectors and occupations has received attention in the literature, finding abundant evidence of significant variability in wages depending on the gender composition (Macpherson and Hirsch, 1995; World Bank, 2011). Finally, other factors, such as the persistence of gender roles and stereotypes, cultural factors and national policies and social structures also contribute to labour market inequalities (Rubio-Bañón and Esteban-Lloret, 2016; and Pollmann-Schult, 2017, among others).

Regarding the effects of the patterns of economic growth, sectoral composition, structural and technological change and trade expansion on gender inequality, they seem to be inconclusive in the literature. Some economists suggest that international trade contributes to reducing gender inequality, as far as trade liberalization leads to an increase in relative returns to low-skilled labour, where women are mainly concentrated (Aydiner-Avşar and Onaran,

2010). However, other authors argue that the segregation of women in less capital-intensive sectors with low productivity is one of the most important factors in the persistence of the GPG (Seguino, 1997). Finally, some authors also focus on the effect of skill-based technological change and the increasing share of services on the GPG in advanced economies (Olivetti and Petrongolo, 2014; Petrongolo and Olivetti, 2016).

In this general context, the aim of this paper is to explore the impact that the patterns of economic growth observed in an advanced economy may have on the evolution of both GEG and GPG. More specifically, we are interested in studying how structural change, the variety of sectoral specialization, and the trade structure over more than 25 years, have all resulted in a particular composition and distribution of female employment, as well as the implications for the GPG. We also relate these structures to the process of the expansion and internationalization of demand from a multisectorial perspective.

The analysis of the extent to which the evolution of the gender gaps is explained by these structural factors is important in the European economies, where the participation of women in the labour market and the relationship to patterns of growth and specialization have changed in the last years. In particular, Spain is a relevant case study in this context. From the beginning of the democratic period in the late 1970s until the recent and severe economic crisis started in 2008, Spain was regarded as one of the most dynamic EU countries. During this period, the Spanish economy experienced an economic growth and a social transformation without precedent. During the 1990s, sustained growth rates higher than the EU average allowed the Spanish economy to narrow the significant gap in per capita income with the rest of the EU. In that same period, Spain was also one of the EU countries with a higher rate of female participation in the labour market. Particularly, our research focuses on the period 1980-2007, the most expansive period before the onset of the international

economic crisis, with the aim of evaluating the impact that patterns of economic growth in Spain have had on the evolution of gender gaps.

This work contributes to the literature on gender using the analytical and theoretical tools of input-output analysis. More specifically, within a multisectoral framework, our paper combines two approaches to analyse gender gap contributors and gender gap drivers in the evolution of the Spanish economy in the 27 years analysed. First, from a production perspective, we analyse sectoral and total gender gaps by skill categories, as well as their evolution over time. Based on Seguino (2000), we apply a decomposition approach to study the role played by horizontal segregation, direct discrimination and structural change in Spain in terms of the GPG. Second, we move to a demand perspective to analyse, within an input-output framework, how structural and technological change, demand expansion, and trade in Spain have resulted in sectoral allocations of women's employment and GEG also differentiating by skill categories. To the best of our knowledge, this is the first paper in the literature to combine these two perspectives.

The rest of the paper is organized as follows. Section 2 introduces the methodology. In Section 3, the main results of the analysis for Spain are presented and discussed. Finally, Section 4 closes the paper with a review of the main conclusions.

2. Methodology

Despite the importance that the structure and specialization of economies has had for the generation and persistence of gender gaps —GEG and GPG— worldwide, few studies have analysed them from an integrated multisectoral perspective. Seguino (2000) focused on the effects of structural change and economic liberalisation on GPG in South Korea and Taiwan in the 1980s. Olivetti and Petrongolo (2014) proposed a multisector approach to identify between and within-industry forces affecting skill and gender intensities and finding evidence

of differences in hours and wages. Within the input-output framework, the pioneer studies of Schaffer and Stahmer (2006) and Schaffer (2007, 2008) estimated a gender-specific input-output table for Germany and identify women's and men's contributions to Gross Domestic Product. Gunluk-Senesen and Senesen (2011) studied sectoral composition of impacts on women and men employment in Turkey. More recently, female employment through supply chains has been incorporated to input-output analysis within a broader context of labour and social footprints (Alsamawi et al., 2014). Gómez-Paredes et al. (2015) calculated women's employment and gender gaps as part of labour footprints for India by 2011.

We build on this literature and combine two approaches, which we call "production perspective" and "demand perspective", to analyse contributing factors to temporal evolution of female employment and gender gaps.

Formally, we define GEG as $GEG = \left(1 - \frac{L^f}{L^m}\right)$ —i.e. one minus the ratio between women's and men's total participation in labour market—. Similarly, we calculate GPG as $GPG = \left(1 - \frac{\overline{w}^f}{\overline{w}^m}\right)$ where $\left(\frac{\overline{w}^f}{\overline{w}^m}\right)$ is the ratio between women's and men's average wage[1].

From the production perspective, we analyse sectoral and total gender gaps, as well as their evolution over time. This production perspective allows us to go deeper into the explanatory factors of the observed GPG through a decomposition analysis. Following Seguino (2000), we identify the role played by main discrimination factors on the evolution of the GPG.

The average wage differential between women and men (R) for the whole economy of a country (i.e. $1 - GPG$) can be explained as the sum of sectoral differences in terms of three

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[1] Matrices are indicated by bold, upright capital letters; vectors by bold, upright lower case letters; scalars by italicized lower case letters. Vectors are columns by definition, so that row vectors are obtained by transposition, indicated by a prime. A diagonal matrix with the elements of any vector on its main diagonal and all other entries equal to zero is indicated by a circumflex.

determinants: feminization of the sectors (f_i), direct discrimination (d_i), and economy specialization (s_i). Equation (1) expresses formally this idea:

$$R = (1 - GPG) = \frac{\overline{w}^f}{\overline{w}^m} = \frac{\frac{\sum_{i=1}^{n} w_i^f L_i^f}{L^f}}{\overline{w}^m} = \sum_{i=1}^{n} \frac{L_i^f}{L^f} \frac{w_i^f}{w_i^m} \frac{w_i^m}{\overline{w}^m} = \sum_{i=1}^{n} f_i d_i s_i \qquad (1)$$

where w_i^f and w_i^m are sectoral women's and men's salaries, respectively; and L_i^f represents the sectoral employment of women. In equation (1), f_i —which can be interpreted as a sort of feminization index of the economy— represents the distribution of female labour across sectors and provides information on the degree of horizontal segregation. Moreover, d_i measures the ratio between female and male wages in each sector as a proxy for direct discrimination. Finally, s_i aims at capturing structural change, with male salary used as a proxy for changes in salaries. Assuming this specification of GPG, we analyse changes over time on the basis of the changes observed in these three sectoral indices.

Our decomposition is also based on Structural Decomposition Analysis (SDA), a common technique in the field of multisectoral models aiming to disentangle the factors, driving force affecting changes in a variable over time. This technique aims to separate a time trend of an aggregated variable into a group of driving forces (Rose and Casler, 1996; Dietzenbacher and Los, 1998). Applying this type of decomposition analysis to changes in ratio of earnings R over time, we have:

$$\Delta R = R^1 - R^0 = \sum_{i=1}^{n} (f_i^1 d_i^1 s_i^1) - \sum_{i=1}^{n} (f_i^0 d_i^0 s_i^0) = \sum_{i=1}^{n} \Delta(f_i d_i s_i)$$

$$= \sum_{i=1}^{n} (\Delta f_i d_i s_i) + \sum_{i=1}^{n} (f_i \Delta d_i s_i) + \sum_{i=1}^{n} (f_i d_i \Delta s_i) = F + D + S \qquad (2)$$

Changes in R —and consequently in the GPG— can be explained on the basis of changes in the feminization index (F), the direct discrimination index (D), and the structural

change (S). In order to operationalize this expression in a discrete framework, since we have three explicative factors, there are 3! different ways to explain changes in R in an exact form —i.e. without residuals— only considering different combination of weights for the factors that are unchanged in each step. As is shown in Dietzenbacher and Los (1998), the simple average of the so-called polar solutions can be considered a good commitment solution to the average of the 3! different exact decomposition forms. So, R decomposition followed in this paper reads:

$$\Delta R = \sum_{i=1}^{n} \Delta(f_i\, d_i s_i)$$

$$= \sum_{i=1}^{n} \Delta f_i(\frac{d_i^0 s_i^0 + d_i^1 s_i^1}{2}) + \sum_{i=1}^{n} \Delta d_i(\frac{f_i^0 s_i^0 + f_i^1 s_i^1}{2}) \qquad (3)$$

$$+ \sum_{i=1}^{n} \Delta s_i(\frac{f_i^0 d_i^0 + f_i^1 d_i^1}{2}) = F + D + S$$

In addition to this production perspective, we also adopt a demand perspective in the analysis of the evolution observed in women's employment and gender gaps. Multisectoral input-output models allow us to relate to these two perspectives. The generation of employment, salary, and gender gaps in production activities is linked to the final destination of goods, establishing a clear relationship between the productive side and the demand side of the economy.

We depart from the equilibrium equation of an economy of n sectors $\mathbf{x} = \mathbf{Ax} + \mathbf{y}$, with $\mathbf{x} = [x_j]$ being the production vector, $\mathbf{y} = [y_i]$ the final demand vector —comprising households and government expenditures, investment, and net export—, and $\mathbf{A} = [a_{ij}]$ the matrix of technical coefficients, which is the formal representation of technology with $i, j = 1, \dots, n$. The solution is given by equation (4):

$$\mathbf{x} = (\mathbf{I} - \mathbf{A})^{-1}\mathbf{y} = \mathbf{By} \tag{4}$$

where $\mathbf{I}$ is the identity matrix. Matrix $\mathbf{B} = [\alpha_{ij}] = (\mathbf{I} - \mathbf{A})^{-1}$ is the well-known Leontief inverse, with generic element $[\alpha_{ij}]$ showing the inputs generated by sector i, directly and indirectly incorporated in the final demand of sector j.

Moreover, let us denote by $\boldsymbol{l} = [L_j]$ the vector of employment by sector, which consists of $\boldsymbol{l}^f = [L_j^f]$ —female labour vector— and $\boldsymbol{l}^m = [L_j^m]$ —male labour vector—, being $\boldsymbol{l} = \boldsymbol{l}^f + \boldsymbol{l}^m$. On the basis of these vectors, we can also define $\mathbf{e}' = \boldsymbol{l}'\hat{\mathbf{x}}^{-1} = \left[\dfrac{L_j}{x_j}\right]$ the vector of employment coefficients, showing the intensity of employment per unit of output in each economic sector. This coefficient can also be defined separately for women and men, such as $\mathbf{e}^{f\prime} = \boldsymbol{l}^{f\prime}\hat{\mathbf{x}}^{-1} = [e_j^f] = \left[\dfrac{L_j^f}{x_j}\right]$ and $\mathbf{e}^{m\prime} = \boldsymbol{l}^{m\prime}\hat{\mathbf{x}}^{-1} = [e_j^m] = \left[\dfrac{L_j^m}{x_j}\right]$.

The Leontief inverse allows to allocate all the employment generated in the economy according to the final demand of the economy, that is to say, explicitly taking into account the employment in each sector in the generation of all inputs directly and indirectly used to obtain final goods. In this regard, the production and demand perspectives are linked within the input-output framework.

So, departing from (4) we obtain matrix $\mathbf{H} = \hat{\mathbf{e}}\mathbf{B}\hat{\mathbf{y}} =$ $\begin{pmatrix} e_1\alpha_{11}y_1 & \cdots & e_1\alpha_{1n}y_n \\ \cdots & e_i\alpha_{ij}y_j & \cdots \\ e_n\alpha_{n1}y_1 & \cdots & e_n\alpha_{nn}y_n \end{pmatrix}$, whose representative element $[h_{ij}] = [e_i\alpha_{ij}y_j]$ shows the labour incorporated in sector i directly and indirectly used by sector j to obtain its final demand. By rows, matrix $\mathbf{H}$ allocates employment used in each economic sector according to the final good that this employment produces; whereas by columns this matrix shows the employment generated across the different sectors that is embedded in each final good.

Similar matrices $\mathbf{H^f} = \left[h_{ij}^f\right]$ and $\mathbf{H^m} = \left[h_{ij}^m\right]$ are obtained from female and male employment vectors $\mathbf{e^f}$ and $\mathbf{e^m}$.

According to this demand-driven model, changes in final demand influence economic growth and, in consequence, the specific size and distribution of female and male employment involved in the economic sectors. This distribution is mediated by the sectoral structure of the economy and the employment intensity —i.e. employment per unit of production— in each sector. Therefore, changes in these three components —final demand (**C**), employment intensity (**M**) and sectoral structure (**T**)— over time are reflected in changes in the female and male distributions of labour in the economy. To study the contribution of these factors, we apply again an SDA as the average of the corresponding polar solutions as equations (5) to (6) show:

$$\Delta \mathbf{H} = \Delta \mathbf{H}^1 - \Delta \mathbf{H}^0 = \Delta(\hat{\mathbf{e}}\mathbf{B}\hat{\mathbf{y}}) = \Delta\hat{\mathbf{e}}\mathbf{B}\hat{\mathbf{y}} + \hat{\mathbf{e}}\Delta\mathbf{B}\hat{\mathbf{y}} + \hat{\mathbf{e}}\mathbf{B}\Delta\hat{\mathbf{y}} \tag{5}$$

$$\Delta \mathbf{H} = \left(\frac{\Delta\hat{\mathbf{e}}\mathbf{B}^0\hat{\mathbf{y}}^0 + \Delta\hat{\mathbf{e}}\mathbf{B}^1\hat{\mathbf{y}}^1}{2}\right) + \left(\frac{\hat{\mathbf{e}}^1\Delta\mathbf{B}\hat{\mathbf{y}}^0 + \hat{\mathbf{e}}^0\Delta\mathbf{B}\hat{\mathbf{y}}^1}{2}\right) + \left(\frac{\hat{\mathbf{e}}^1\mathbf{B}^0\Delta\hat{\mathbf{y}} + \hat{\mathbf{e}}^0\mathbf{B}^1\Delta\hat{\mathbf{y}}}{2}\right)$$
$$= \mathbf{M} + \mathbf{T} + \mathbf{C} \tag{6}$$

The first addend in (6) represents the "intensity effect" **M**, showing the contribution of changes in the employment per unit of output to the evolution of total employment. The second addend **T** is the "technological effect" and shows the contribution to employment of changes in the sectoral structure of production over time. The third component **C** is the "final demand effect", showing the contribution of changes in final demand, which can also be divided between the roles of final consumption, investment, and trade balance as drivers of work changes. In our empirical analysis, this type of breakdown is conducted for both women and men, identifying the variety of patterns associated with the evolution of final demands. Equations (7) and (8) show the corresponding decomposition for female and male

employment:

$$\Delta \mathbf{H^f} = \left(\frac{\Delta \hat{\mathbf{e}}^{\mathbf{f}} \mathbf{B}^0 \hat{\mathbf{y}}^0 + \Delta \hat{\mathbf{e}}^{\mathbf{f}} \mathbf{B}^1 \hat{\mathbf{y}}^1}{2}\right) + \left(\frac{\hat{\mathbf{e}}^{\mathbf{f}1} \Delta \mathbf{B} \hat{\mathbf{y}}^0 + \hat{\mathbf{e}}^{\mathbf{f}0} \Delta \mathbf{B} \hat{\mathbf{y}}^1}{2}\right) + \left(\frac{\hat{\mathbf{e}}^{\mathbf{f}1} \mathbf{B}^0 \Delta \hat{\mathbf{y}} + \hat{\mathbf{e}}^{\mathbf{f}0} \mathbf{B}^1 \Delta \hat{\mathbf{y}}}{2}\right)$$

$$= \mathbf{M^f} + \mathbf{T^f} + \mathbf{C^f}$$

(7)

$$\Delta \mathbf{H^m} = \left(\frac{\Delta \hat{\mathbf{e}}^{\mathbf{m}} \mathbf{B}^0 \hat{\mathbf{y}}^0 + \Delta \hat{\mathbf{e}}^{\mathbf{m}} \mathbf{B}^1 \hat{\mathbf{y}}^1}{2}\right) + \left(\frac{\hat{\mathbf{e}}^{\mathbf{m}1} \Delta \mathbf{B} \hat{\mathbf{y}}^0 + \hat{\mathbf{e}}^{\mathbf{m}0} \Delta \mathbf{B} \hat{\mathbf{y}}^1}{2}\right)$$

$$+ \left(\frac{\hat{\mathbf{e}}^{\mathbf{m}1} \mathbf{B}^0 \Delta \hat{\mathbf{y}} + \hat{\mathbf{e}}^{\mathbf{m}0} \mathbf{B}^1 \Delta \hat{\mathbf{y}}}{2}\right) = \mathbf{M^m} + \mathbf{T^m} + \mathbf{C^m}$$

(8)

Note that the reading by rows and by columns also holds form matrices $\mathbf{M}$ ($\mathbf{M^f}$ and $\mathbf{M^m}$), $\mathbf{T}$ ($\mathbf{T^f}$ and $\mathbf{T^m}$), and $\mathbf{C}$ ($\mathbf{C^f}$ and $\mathbf{C^m}$). Reading by rows, we see how the evolution of the sectoral employment intensity, the production structure, and the demand for all products in the economy, contribute to the evolution of sectoral employment (total and by gender). Reading by columns, we observe how the changes in the components for all sectors contribute to the evolution of the employment embedded in the final goods of each sector. Both sets of results provide interesting information on the factors contributing to changes in the female-male ratios over time. However, due to space restrictions, in this study we focus on the decomposition of sectoral employment (i.e. reading by rows).

3. Empirical results

Our empirical analysis on female participation and gender gaps is focused on Spain as a case study. The analysis is based on available series of annual input-output tables for the period 1980-2007 for Spain (Cazcarro et al., 2013). Regarding labour data obtained from EUKLEMS (O'Mahony and Timmer, 2009), we used total number of hours engaged. The ratio between

labour compensation and hours was used to proxy salary for each group (by gender and skill-categories). Due to the lack of information on skills and gender shares for 2006 and 2007, these have been projected using the aggregated data for these years and the shares corresponding to 2005. A final aggregation level of 25 sectors has been considered after matching labour, salaries, and economic information. Although information is obtained at sectoral level (available upon request), results are displayed in 8 sectoral blocks according to their technological characteristics to present the relevant information[2].

Results from the "production approach" are presented in sections (3.1) —stylized facts on impacts of economic growth on gender gaps— and (3.2) —decomposition of GPG— whereas section (3.3) is devoted to the analysis from the so-called "demand approach" and the decomposition of the GEG.

3.1. Recent economic growth in Spain and its impact on female-male employment

The massive incorporation of women to the labour market at the beginning of the democratic period makes Spain an interesting case study regarding the participation of women in economic growth and employment (Merino, 2015). From the 1980s, Spain entered a process of economic expansion and significant structural and social change that was maintained until the onset of the economic crisis in 2008, although with different nature and intensity over the years (Figure 1).

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[2] Sectors are clustered according to their technological character following the OECD Analytical Business Enterprise Research and Development classifications (OECD, 2003). Additional aggregation, however, has been needed due to lack of sectoral details. Finally the eight sectoral blocks resulting from 25 sectors are: Primary sector (agriculture, hunting, forestry and fishing); Energy sector (mining and quarrying); High- and medium-high technology industry (electricity, gas and water supply; electrical and optical equipment; chemical and chemical products; machinery n.e.c; transport equipment); Medium-low technology industry (coke, refined petroleum and nuclear fuels; rubber and plastics; other non-metallic mineral; basic metals and fabricated metal); Low technology industry (food, beverage and tobacco; textiles, textile leather and footwear; wood and of wood and cork; pulp, paper, paper printing and publishing; manufacturing n.e.c., recycling); Construction (construction); Knowledge intensive services (post and telecommunications; business activities); Rest of services (wholesale and retail trade; hotels and restaurants; transport and storage; financial intermediation; real estate activities; other services).

Figure 1: Spanish Gross Domestic Product, 1980-2007 (annual growth rate %)
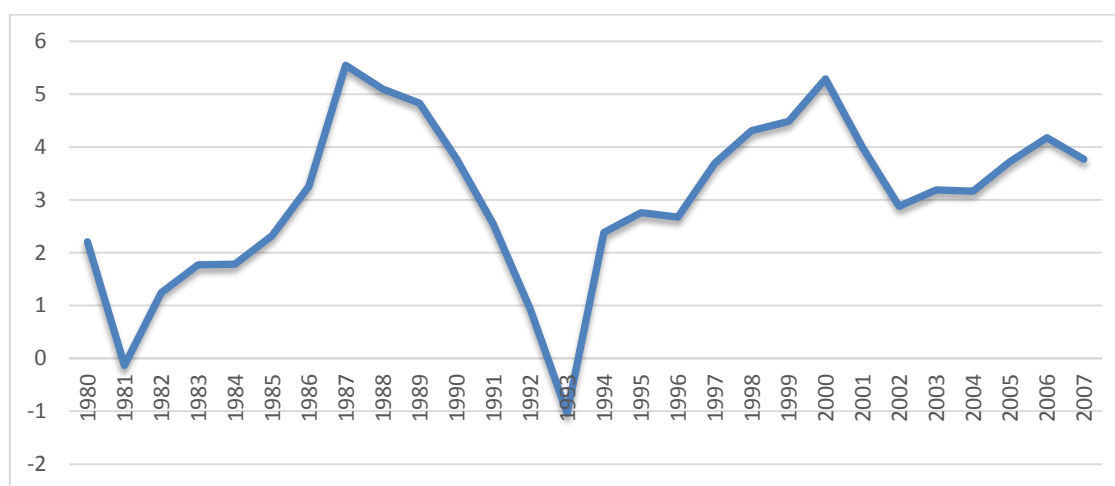
Source: World Data Bank, 2017

The last years of the dictatorship in the 1970s and the beginning of the democratic era in the early 1980s marked a process of growth in Spain accompanied by significant social and legislative changes. For instance, the Development Plans of the 1960s and 1970s began a process of transformation in Spanish industry, highly dependent on primary inputs, technology, and investments from abroad. As Merino (2015) states, this industrial development marked a displacement of Spanish population from rural to urban areas, who experienced a notable increase in their labour opportunities. Similarly, the democratic period led to a large increase in tourism. The touristic sector and associated service sectors acted as significant attractors of female employment during those decades.

Moreover, integration into the EU in 1986 launched a process of economic openness and expansion of trade, providing an opportunity for a progressive adoption of technologies and modes of production common in neighbouring advanced countries. The accompanying increase of per capita income of Spanish citizens together with the coming societal changes and the adoption of new lifestyles by populations in cities meant a significant expansion of

consumption and changes in consumption patterns. The progressive adoption of international labour standards also encouraged the incorporation of women into the Spanish labour market.

The crisis of the early 1990's —especially since 1993— also marked a change in the structure of growth in Spain. It was the starting point for an economic period characterized by an increasing liberalization of markets, a significant strength in the process of privatization of Spanish state-owned enterprises —starting in 1985 and intensifying from 1996 onwards—, and an increasing economic openness that attracted foreign investment. Funding from the EU significantly contributed to economic empowerment. Moreover, funds from the EU common agricultural policy along with structural and cohesion funds drastically transformed the rural and urban landscapes. The 1990s were also a period of significant population and economic growth, expanding consumption and imports. The dynamism of the economy and the labour market attracted a significant local and foreign population. However, the specific structure of the Spanish economy and labour market during the expansion period made it more vulnerable to the severe international crisis of 2008, which had a clear impact on the Spanish economy highly dependent on labour-intensive sectors such as construction and services. From the beginning of 2008, Spain experienced a rapid decrease in major economic magnitudes (consumption, production, public and private investment), a significant reduction in per capita income, and large increases in unemployment rates[3] and social inequality.

Based on these different evolutions, in what follows we will refer the analysis to the whole period 1980-2007 in which we identify four sub-periods: 1980-1986, 1986-1993, 1993-2000 and 2000-2007. Two of them —1980-1986 and 1993-2000— had a clearly expansionary character, while the other two correspond to stages of economic deceleration.

The stylized economic facts described above are reflected in the size and conditions of women's engagement in the labour markets. Figure 2 shows the evolution of two index

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[3] In 2013 the unemployment rate was 27.2% (56% of Spaniards aged 15 to 30).

measures of the gender gap over the period studied: the GEG that accounts for differences in participation in the labour market between women and men, and the GPG that accounts for differences in salaries[4].

Figure 2: Evolution of gender employment gap and gender pay gap, Spain 1980-2007

2a   2b
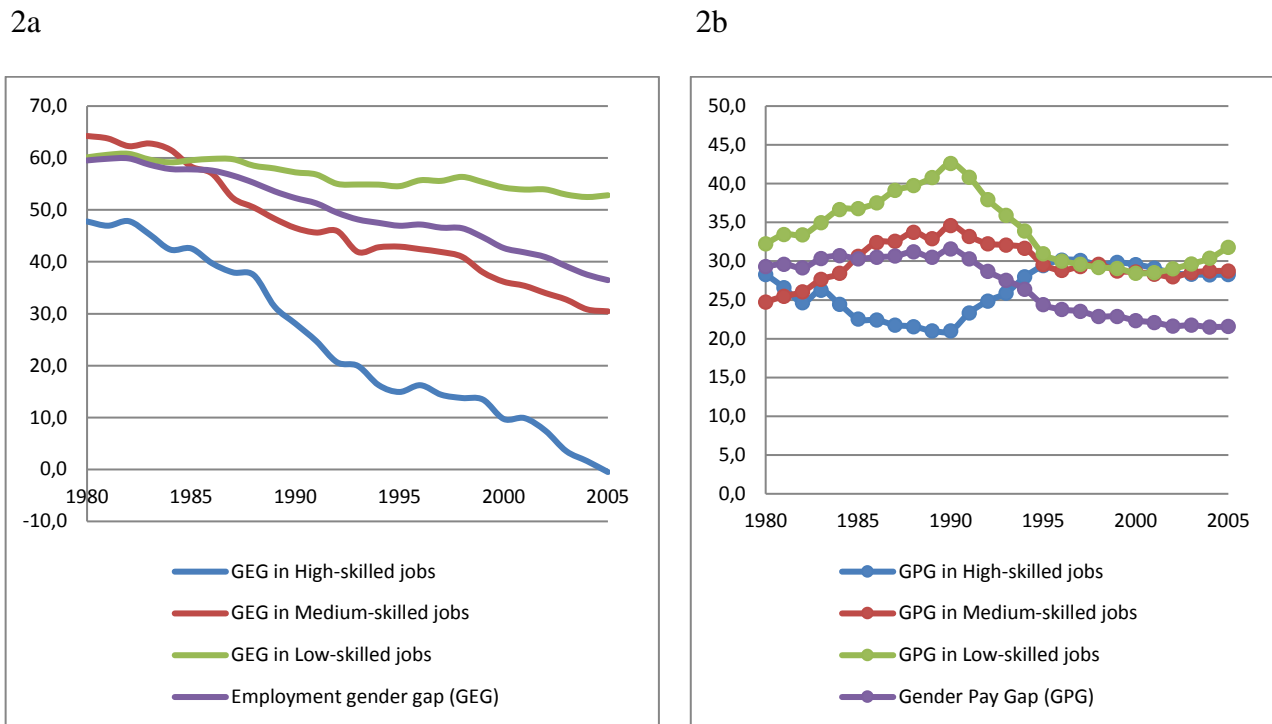
Source: Own elaboration.

According to this data, during the period 1980-2007 an important convergence in participation in the labour market took place, reflecting a global reduction of the GEG of 38%, mainly due to a sharp decline in the GEG observed in the high- and medium-skilled categories (Figure 2a). In contrast, data reveal an irregular and smooth convergence trend in wages —i.e. increasing GPG in the 1980s, some reduction in the early 1990s and practical stagnation since the mid-1990s (Figure 2b). To go deeper into this analysis, Table 1

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[4] Average salaries have been calculated from EUKLEMS, dividing labour compensation by employment (all the employment magnitudes in hours).

summarizes the main changes observed over the period in the composition of employment and the sectoral contribution to these changes.

Table 1. Sectoral contribution to employment change by gender and skill categories, Spain 1980-2007

	Total change (thousand hours)	Relative change (%)	PS	ES	HTI-MHTI	MLTI	LTI	C	KIS	RS	Total
High-skilled women	3007	468	0.23	0.14	0.52	0.75	0.80	0.76	4.61	21.74	29.56
High-skilled men	2408	197	0.38	0.22	1.24	0.74	0.89	2.37	5.70	12.13	23.67
Medium-skilled women	3963	878	0.74	0.10	0.88	0.80	1.69	0.99	4.70	29.05	38.95
Medium-skilled men	5083	406	1.82	0.42	3.60	2.75	3.30	9.93	4.53	23.61	49.96
Low-skilled women	-742	-13	-7.07	-0.01	-0.18	-0.46	-3.66	0.32	3.16	0.60	-7.29
Low-skilled men	-3546	-25	-18.74	-1.63	-5.91	-3.42	-5.67	12.10	0.54	-12.14	-34.86
Women labour	6228	93	-6.09	0.24	1.23	1.10	-1.17	2.07	12.47	51.39	61.22
Men labour	3945	24	-16.54	-0.99	-1.08	0.07	-1.47	24.41	10.77	23.61	38.78
Total changes	**10173**	**44**	**-22.63**	**-0.75**	**0.15**	**1.16**	**-2.64**	**26.48**	**23.24**	**75.00**	**100.00**

Source: Own elaboration.

Note: PS: Primary sector; ES: Energy sector; HTI-MHTI: High- and medium-high technology industry; MLTI: Medium-low technology industry; LTI: Low-technology industry; C: Construction; KIS: Knowledge intensive services; RS: Rest of services.

From the beginning to the end of the period, the number of total hours worked grew by 44% (a total of 10,173 thousand of hours over 1980's levels). Women increased their work by 93%, while men increased their work by 24%. The incorporation of women into the labour market explains 61.22% of the total growth in employment over 1980-2007, with 38.78% of the total change being explained by the increase in men's labour.

By skill and gender categories, the increase in labour is mainly explained by three elements. First, the significant incorporation of medium-skilled females and males into the labour market. Second, an impressive change in the tendency observed in high-skill categories, in which females increased significantly their participation. Third, an important reduction of male employment in low-skilled categories; this behaviour was much more

moderated in the case of female labour since women remained linked to low-skilled work, which is also concentrated in the services sectors.

By sectoral blocks, the contribution to total employment has been unequal over time. Traditional services sectors (rest of services, RS) explain nearly 75% of this growth, together with the increase observed construction (C, 26.48%) and knowledge intensive services (KIS, 23.4%). Reductions of employment mainly concentrate on primary sectors (PS, 22.63%) and Low-technology industry (LTI, -2.64%). The reduction of employment mainly affected low-skilled women and men in almost all sectors, while high- and medium-high skilled workers —especially women— increased their participation mainly in services sectors.

These sectoral changes also determine the level of concentration of women and men in the different sectors, which can be analysed as horizontal segregation in the labour market. Figures 3 and 4 show the evolution of the concentration of female and male labour in economic sectors. We considered those sectors that accounted for 80% of the total employment (females and males) in 1980. All other sectors were grouped in the "Rest of economic sectors".

Figure 3: Female labour concentration (horizontal segregation), Spain 1980-2007
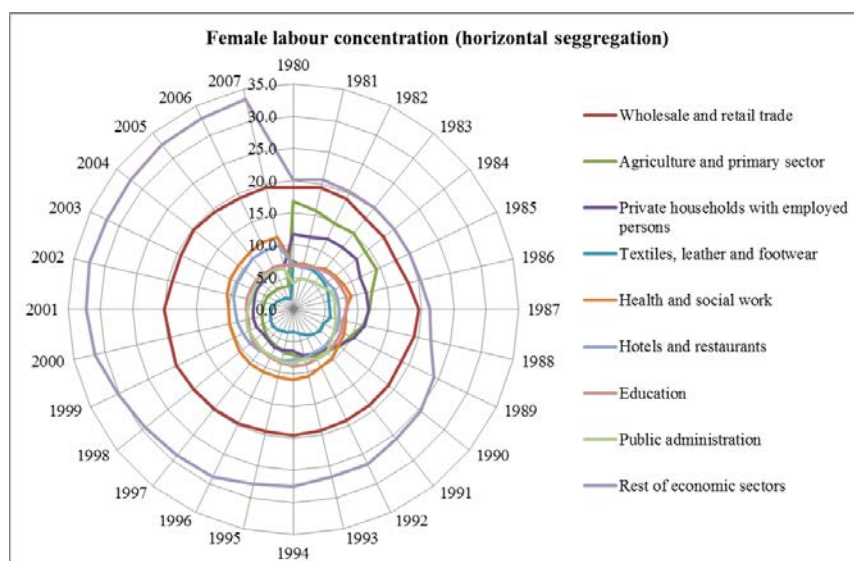
Source: Own elaboration.

Figure 4: Male labour concentration (horizontal segregation), Spain 1980-2007
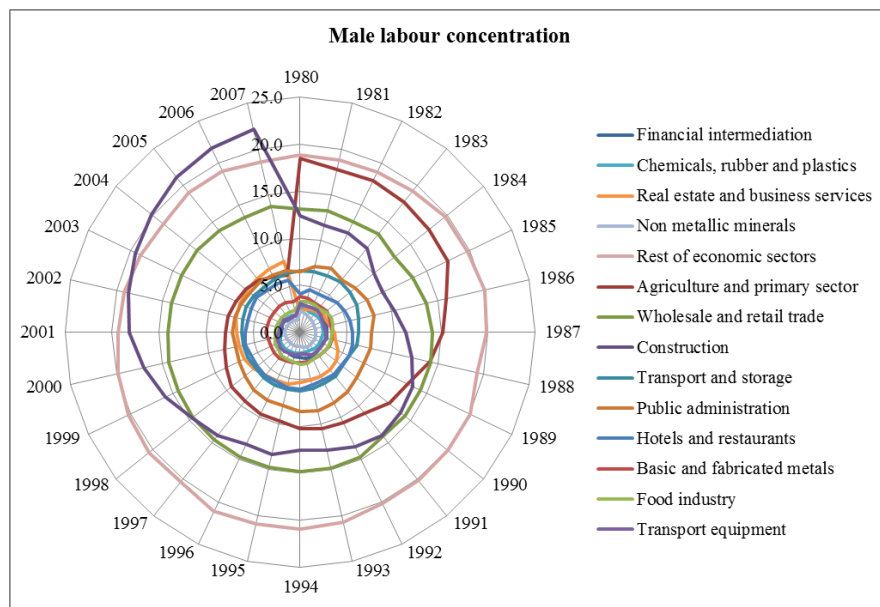
Source: Own elaboration.

Results confirm that female labour is much more concentrated than male labour, although a tendency to spread in the first case and certain invariance in the second can be observed. For women, 8 sectors out of 25 explained more than 80% of the employment in 1980, all corresponding to services, the primary sector and the textile sector. The most important features were the progressive tendency to expand the number of sectors in which women significantly participate (these 8 sectors accounted for 66.5% of the total in 2007); the invariant shares in the wholesale and retail trade sector (around 20%); the sharp decline in the share of agriculture and primary sector (from 17% to 4%), private households sector (12% to 7%), and textile sector (8% to 2%); and the sharp increase in the share of more skilled services as real estate and business services (from 2% to 12%), health and social work (7 to 11%), public administration (4% to 7%), and hotels and restaurants (7% to 10%).

Regarding employment distribution among men, around 80% of employment in 1980 was explained for 13 sectors —aggregating the rest of economic sectors in another one—.

This result is a clear sign of lower concentration. We find a greater dispersion in the distribution of employment among sectors but a surprising stability over the 27 years studied. These sectors represent 81.1% of the employment in 1980 and 81.4% twenty-seven years later. The main changes followed the main evolution of the general economy; that is, agriculture and primary sector went from 18.5% to 6.2% of total employment, the construction share increased from 12.4% to 22.2%, real estate and business services also increased their participation from 2.2% to 7.7%, and remaining sectors maintained and/or slightly reduced their participation over the period.

Looking at the skill-content of the work and the changes in the four sub-periods, Table 2 synthetizes the general changes in female-male participation by skill categories.

Table 2: General changes in female-male participation, Spain 1980-2007

	Average annual growth rate (%)				Labour composition (% share in total hours worked)				
	1980-1986	1986-1993	1993-2000	2000-2007	1980	1986	1993	2000	2007
High-skilled women	4.9	8.4	7.3	5.7	2.78	4.02	6.37	8.75	10.95
High-skilled men	2.6	4.0	5.5	4.1	5.29	6.71	7.95	9.69	10.90
Medium-skilled women	8.3	13.3	8.4	5.3	1.95	3.43	7.38	10.86	13.25
Medium-skilled men	5.2	8.5	6.9	4.0	5.41	7.98	12.71	17.00	19.01
Low-skilled women	-2.8	0.2	-0.2	0.4	24.29	22.26	20.36	16.84	14.65
Low-skilled men	-2.7	-1.4	-0.4	0.0	60.29	55.59	45.23	36.86	31.24
Total women	-1.0	3.6	3.5	3.3	29.02	29.72	34.11	36.45	38.85
Total men	-1.6	0.6	2.0	1.8	70.98	70.28	65.89	63.55	61.15
Total employment (hours)	-1.4	1.5	2.6	2.4	100.00	100.00	100.00	100.00	100.00

Source: Own elaboration.

Except for the period 1980-1986, the employment growth rate in Spain was positive —and higher than 2% from the mid-1990s until the recent economic crisis—. The female employment growth rate was particularly vigorous, being six times the male annual average rate for the period 1986-1993, and nearly doubling the corresponding male employment rates in the latest two periods (1993-2000 and 2000-2007). More specifically, the highest rates of

employment growth were for the high- and medium-skilled categories and particularly for women, for whom the average annual growth rate reached 8.4% and 13.3% in 1986-1993, respectively. These general data also offer first insights of a significant structural change in the economy, characterized by two facts: first, a significant shift towards the incorporation of high- and medium-skilled workers; and second, towards a greater participation of women in the economy, mainly through incorporation into high- and medium-skilled categories, which is in line with the sectoral data. During these 27 years, there was a progressive process of engagement of women in the economy, mainly in the sectors requiring high- and medium-skilled workers. High- and medium-skilled women together went from 4.73% in 1980 to 24.2% in 2007. However, total women hours worked (38.85%) are still much less than total men hours worked (61.15%) in 2007.

3.2. Decomposition of changes in the Spanish GPG

The evolution of female and male employment described in section 3.1 had consequences for the evolution of the GPG in the period 1980-2007. As shown in equation 2, the evolution of the ratio between women's and men's earning —and consequently of the GPG— can be explained on the basis of changes in feminization or horizontal segregation, direct discrimination, and structural change of the economy. Table 3 shows the results of this decomposition for the 1980-2007 period and the four sub-periods considered in the analysis of the Spanish economy (sectoral results available upon request).

Table 3: Decomposition of changes in gender pay gap (GPG), Spain 1980-2007 (%)

	1980-2007	1980-1986	1986-1993	1993-2000	2000-2007
GPG	(29.55 to 22.23)	(29.55 to 30.81)	(30.81 to 27.73)	(27.73 to 22.50)	(22.50 to 22.23)
Changes in the ratio of salaries	**7.32**	**-1.26**	**3.08**	**5.23**	**0.27**
Feminization	12.88	4.61	4.61	0.69	1.48
Direct discrimination	2.16	-3.66	2.15	2.16	0.95
Structural change	-7..73	-2.22	-3.68	2.38	-2.16

Source: Own elaboration

Regarding GPG, two different temporal behaviours can be identified. From 1980 to 1986 the GPG increased, and from 1993 to 2007 it decreased, corresponding the higher reduction to the period 1986-2000. In Spain, feminization contributed actively to the reduction of GPG in the 1980s, being much more moderate in its influence from 1993 to 2000. Direct discrimination —i.e. salary differences between women and men within sectors— also had a different effect on the GPG over time. From 1980 to 1986, the evolution in this component contributed to an increase in the GPG; however, convergence in salaries was a positive contributing factor to its reduction from the mid-1980s —even more important than feminization from 1993 to 2000— and with a much more moderate share in the last period. Finally, changes in the structure of the economy was also important in explaining the evolution of the GPG. In fact, results suggest that the evolution of average salaries —driven by specialization in the economy— pushed in the direction of increasing the GPG over the period, except for the sub-period 1993-2000s.

In sum, from results we can infer that the Spanish GPG followed a sort of inverted U-shape. During the first 1980s, although feminization actively played in the direction of increasing the ratio between women's and men's salaries, direct discrimination and structural change played in the opposite direction, particularly driven by the increasing salary differences and the still important shares of sectors such as textiles, wholesale and retail trade, hotels and restaurants and private households with employed persons. Sectoral convergence in wages (reduction of discrimination indices) has contributed to the reduction in GPGs from 1986 to 2007, although with a much more reduced effect in the last sub-period. Over the whole period, the convergence salaries, notably important in the services sectors (Business activities, Public Administration, Education, Health, Other community services) and much more moderated in the industry (Chemicals, Metals,… and with a weak contribution in the last periods) contributed to reduce the GPG. Changes in the economic structure contributed

notably to women participation the labour market, as well as to the evolution of the GPG. Reduction in relative average salaries in sectors such as hotels and restaurants, public administration, health and other services, with a significant share of women, *ceteris paribus*, pushed-up the GPG from 2000 to 2007. On the contrary, the positive evolution of the services sectors from the mid-1990s went hand-in-hand with the reduction in the GPG mainly due to the development of knowledge-intensive services.

3.3. Decomposition of changes in the Spanish GEG: a demand approach

In order to further study the specific role that changes in the economy contributed to GEG, the following section addresses the evolution of female and male employment in terms of the contribution of different factors. Following the SDA proposed in equations 5 to 8, we distinguish three factors: the so-called intensity effect that shows the contribution of changes in employment per unit of output; the technology effect that reflect changes in sectorial composition of production over time; and the final demand effect showing changes in final demand components (private and public consumption, investment and net exports). Table 4 presents the results of this decomposition for the period 1980-2007, the four sub-periods, different categories of skills and gender (sectoral results available upon request).

Table 4: Decomposition of changes in gender employment gap (GEG), Spain 1980-2007 (%)

		Women					Men				
		1980-2007	1980-1986	1986-1993	1993-2000	2000-2007	1980-2007	1980-1986	1986-1993	1993-2000	2000-2007
High-skilled	**Total change**	**17.3**	**5.5**	**10.9**	**9.1**	**6.8**	**7.3**	**2.8**	**4.5**	**6.5**	**4.7**
	Intensity	7.6	3	5.7	5.5	0	0.4	0.5	-0.3	2.4	-1.3
	Technology	1.3	0.2	0.3	-0.1	2	1.4	0.5	0.9	0.1	1.9
	Demand	8.5	2.3	4.8	3.8	4.8	5.5	1.8	4	4	4.1
	Consumption	7.6	2.5	5	2.7	4.1	4.4	2.2	4	2.4	3.2
	Investment	1.6	-0.2	0.1	1.6	1.2	1.8	-0.3	0.3	2.4	1.7
	Trade	-0.7	-0.1	-0.3	-0.5	-0.5	-0.7	-0.1	-0.3	-0.8	-0.8
Medium-skilled	**Total change**	**32.5**	**10.2**	**19.9**	**10.8**	**6.3**	**15**	**5.9**	**11**	**8.5**	**4.6**
	Intensity	18.6	7.8	13.3	6.5	0.6	6.5	3.7	5.7	3.8	-0.3
	Technology	1.9	0.5	1.1	0.1	1.7	1.3	0.5	0.7	0.4	1.5
	Demand	12	2	5.5	4.2	3.9	7.2	1.7	4.6	4.3	3.4
	Consumption	10.1	2.6	5.7	2.3	3.2	5.1	2.2	4.4	2	2.1
	Investment	3.2	-0.5	0.2	2.5	1.4	3.3	-0.5	0.5	3	2.2
	Trade	-1.3	0	-0.4	-0.6	-0.6	-1.1	0	-0.3	-0.8	-0.9
Low-skilled	**Total change**	**-0.5**	**-2.6**	**0.2**	**-0.2**	**0.4**	**-0.9**	**-2.6**	**-1.4**	**-0.4**	**0**
	Intensity	-3.6	-4.4	-3.6	-2.9	-3.4	-4.1	-4.1	-5.1	-3.7	-3.8
	Technology	0.4	0.2	0.4	0	1	0.6	0.2	0.2	0.5	1.1
	Demand	2.7	1.6	3.4	2.7	2.8	2.6	1.3	3.5	2.8	2.7
	Consumption	2.3	1.9	3.8	1.3	2.3	1.7	1.7	3.1	1.1	1.4
	Investment	0.6	-0.6	-0.2	1.7	1	1.2	-0.7	0.5	2.1	2.1
	Trade	-0.2	0.3	-0.2	-0.3	-0.5	-0.3	0.3	-0.1	-0.4	-0.7
Total	**Total change**	**3.4**	**-1**	**4**	**4**	**3.7**	**0.9**	**-1.5**	**0.6**	**2.2**	**1.9**
	Intensity	-1.1	-2.9	-0.4	0.7	-1.4	-3	-3.2	-3.4	-1.5	-2.5
	Technology	0.6	0.2	0.4	0	1.5	0.7	0.3	0.3	0.4	1.3
	Demand	3.9	1.7	3.9	3.3	3.6	3.2	1.4	3.7	3.2	3.1
	Consumption	3.3	2	4.2	1.8	3	2.2	1.8	3.3	1.4	1.8
	Investment	0.9	-0.5	-0.1	1.8	1.1	1.4	-0.6	0.5	2.3	2.1
	Trade	-0.3	0.2	-0.2	-0.4	-0.5	-0.4	0.2	-0.1	-0.5	-0.8

Source: Own elaboration

For the whole economy, the intensity effect was negative in all periods, meaning a progressive reduction in the use of employment per unit of production. The evolution of the intensity effect shows a larger reduction for men than for women, which implies a change in the labour composition of production *ceteris paribus,* rising the share of women and, hence, originating an increase of feminization in production. Moreover, looking at employment

categories, the negative intensity effect is mainly due to strong reductions in low-skilled employment for both women and men. Whereas the intensity effect is positive for high- and medium-skilled categories, and interestingly, greater for women than for men in most of the sub-periods.

The technology effect drove employment increases, especially from 2000 to 2007. However, the contribution of these changes by gender varied over time. Thus, in the expansive period (1993-2000), technical and structural changes pushed sectors in the direction of increasing male participation in a higher proportion than female. However, in periods of contraction (1986-1993 and the most recent period 2000-2007) technological change favoured female engagement.

Regarding the demand effect, demand expansion was highly significant in all periods. Changes in private and public consumption led to new demand for goods traditionally produced in sectors dominated by female labour in all the periods and with a rising trend. Growth induced by investment was more focused in the construction and supply sectors, however, had a greater impact on male work. Finally, trade expansion (net exports), with a growing negative balance, had a negative effect on employment *ceteris paribus*. This trade expansion mainly involved the substitution of domestic production of traditional sectors and the restructuring and reduction of certain sectors, such as energy and textiles. This had an impact on employment that, in general terms, was stronger for men than for women, except during the 1980s when the delocalization of the textile industry mainly occurred.

The sectoral analysis confirms these general facts: a generalized productivity growth (reduction in labour intensity), a rising incorporation of high-technology services per unit of demand, as well as a demand expansion in construction and services and a damping effect of industrial demand.

4. Conclusions

The objective of this paper is to approximate the effects economic growth and specialization patterns have on the size and composition of female employment, and on the gender gaps. Taking Spain as a case study, two complementary approaches have been followed both focused on the consideration of the multisectoral character of the economy. First, we decomposed changes in the GPG, attending to three different factors capturing the feminization of sectors, direct discrimination within sectors, and the evolution of the economy. Second, we made use of a structural decomposition analysis to study the roles of labour intensity, structural and technological change, and the evolution of demand (and its components) on employment outcomes by gender and skill characteristics of employment.

Our results confirm the suitability of the multisectoral input-output framework to analyse structural and technological changes and their impact on the GPG. Moreover, this work illustrates the potentialities of introducing gender issues in macroeconomic analysis given the strong relationship of input-output information to national and labour accounts, and also due to the possibility of obtaining meaningful indicators regarding distribution of employment, horizontal segregation, direct discrimination, structural changes, and the evolution of economic size and composition.

Although our paper is a first approximation, the vertical integration of production — i.e. the study of the different steps of the production chain, from final demand to primary resources— also allows us to identify the main intersectoral linkages (connecting production and demand perspectives) and to obtain detailed impacts on male and female labour from a global demand perspective.

From the study of the Spanish economy, we conclude that from 1980 to 2007 there was a continuous positive employment growth rate (more than 2.5% per year, on average). Labour productivity increased (which in total meant less labour per unit of production), but

employment creation benefited from a technological effect with positive impacts in medium and high-skilled categories meant higher demand for work per unit of final demand —mainly of finalist and services orientation—. The increase of demand (scale effect) was also an important driver of employment growth.

From a gender perspective, structural change meant greater shares of women in labour participation. More specifically, we observed a structural change driving towards more female employment per unit of final demand, particularly important in high and medium-skilled categories (KIS), greater demand (scale effects of Rest of services), and a shift to a more service-oriented economy. Sectoral feminization and the reduction of direct discrimination helped to reduce the GPG in Spain on last decades.

Given the long-term approach followed in this paper and the lack of detailed data on the origin and destination of imports and exports, our analysis has focused on Spanish domestic production and its impact on employment, avoiding an analytical discussion of the associated internationally-induced effects of changes in production and employment worldwide. However, the most recent decades have been characterized by an intense process of globalization and production fragmentation. Without doubt, the extension of the analysis to a multiregional framework is a clear next step in our work that will provide us with a more complete picture of the global nature of gender issues in a highly globalized economy.

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