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# Estimates of Worldwide Demand for Care (2010-2050)

An Econometric Approach

# **Estimates of Worldwide Demand for Care (2010-2050)**

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### ■ **Abstract**

This working paper examines the consequences of the role played by the female population in the labor market with respect to the demand for care within the framework of a new demographic order. Female labor participation not only has clear economic implications but also, from a demographic point of view, is an aspect warranting individual analysis. In general terms, care is considered to be a female activity, usually unpaid, and with limited social recognition. Thus, having defined care as an economic good, statistical information from 176 countries is analyzed with the aim of modeling external care demand econometrically.

### ■ **Key words**

Unpaid work, global economy, econometrics, care demand.

### ■ **Resumen**

Este documento de trabajo se centra en el análisis de las consecuencias que, en términos de demanda de cuidado y en el marco de un nuevo orden demográfico, se desprenden del papel que representa el colectivo femenino en el mercado laboral. La participación laboral femenina, además de presentar claras implicaciones de carácter económico, representa demográficamente un aspecto que analizar de forma individualizada. En términos generales, el cuidado se perfila como una actividad femenina, generalmente no remunerada, con reconocimiento social escaso. Por ello, una vez definido el cuidado como bien de carácter económico, se analiza la información estadística proveniente de 176 países con objeto de modelizar económicamente la demanda de cuidado externo.

### ■ **Palabras clave**

Trabajo no remunerado, economía global, econometría, demanda de cuidado.

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## 1. Introduction

THIS paper forms part of a wider research project on unpaid work in the global economy, carried out in 2009 and 2010 under the direction of María Ángeles Durán and with the support of the BBVA Foundation. The great breadth of the work, which encompasses contributions from seven researchers, calls for multiple publications: a monograph (Durán 2012) and five working papers, including this one and those by Rogero (2012), García Díez (2012), Domínguez (2012) and Durán and Milosavljevic (2012).

The papers range over different types of unpaid work (childcare, care of elderly people), different research methods (demographic and econometric techniques) and different regions (Latin America, Africa); though each monographic contribution can stand alone as an independently produced piece of research, the various perspectives complement one another. All six publications are concerned to identify the differences between work and employment, seek an international perspective, use dependency scales (in particular, the Madrid II scale), introduce time horizons and, as far as possible, estimate the time demand involved in meeting unpaid care needs.

Within the framework of the transformations that have taken place in our society, those affecting demographic change have acquired an important role. The most significant changes have given rise to a gradual decline in mortality with a consequent increase in life expectancy, accompanied by an even greater reduction in fertility indicators and an increase in migratory flows. Over the medium and long term, the new demographic order will produce a different scenario in which the adoption of new measures will be unavoidable. If full employment continues to be one of the principal aims of economic policy, the possible reduction in the workforce and the concomitant new labor demand will be issues requiring attention.

The progressive incorporation of women into the labor market, in the current demographic situation, is a structural change that takes place in most developed societies. This incorporation is normally adduced as a factor that explains declining fertility rates. Therefore, it is not surprising that, at the academic level, research focusing on the analysis of the relationships between the female labor supply and demographic aspects related to marital status and fertility have stimulated an unusual amount of interest.

Our aim centers on the analysis of the consequences that, in terms of demand for care, stem from the role played by women in the labor market in a new demographic order.

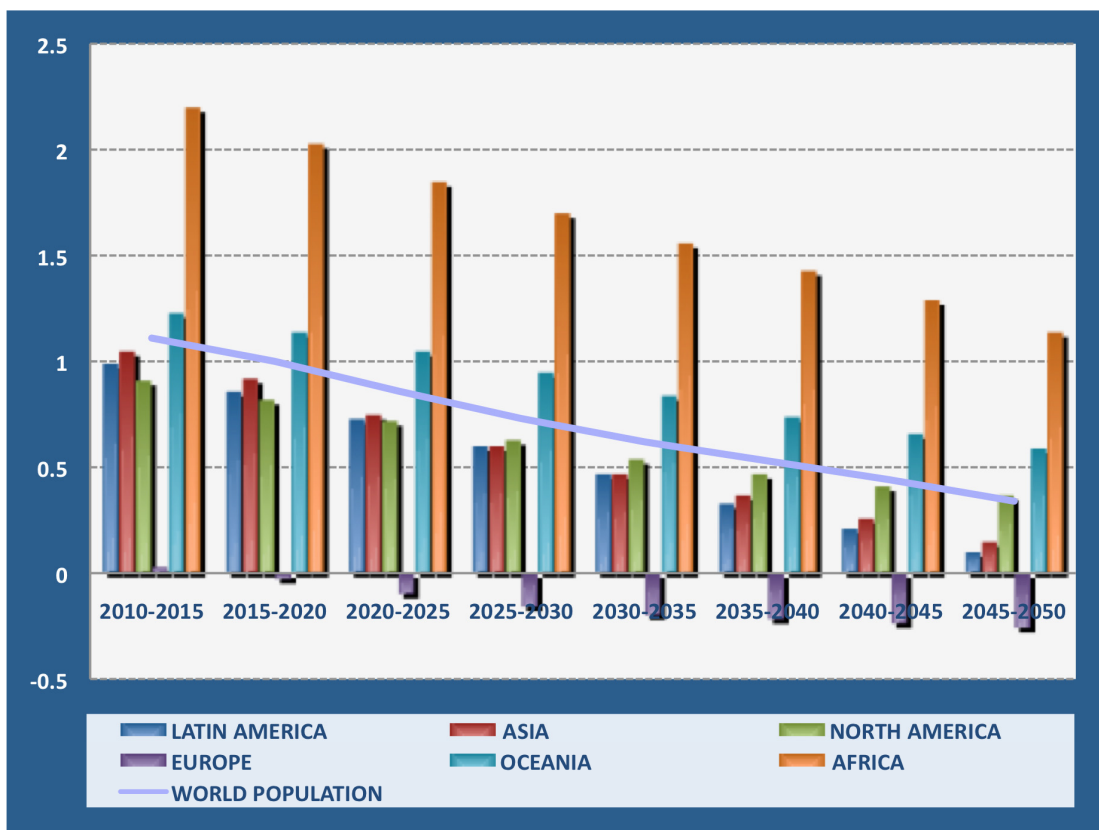
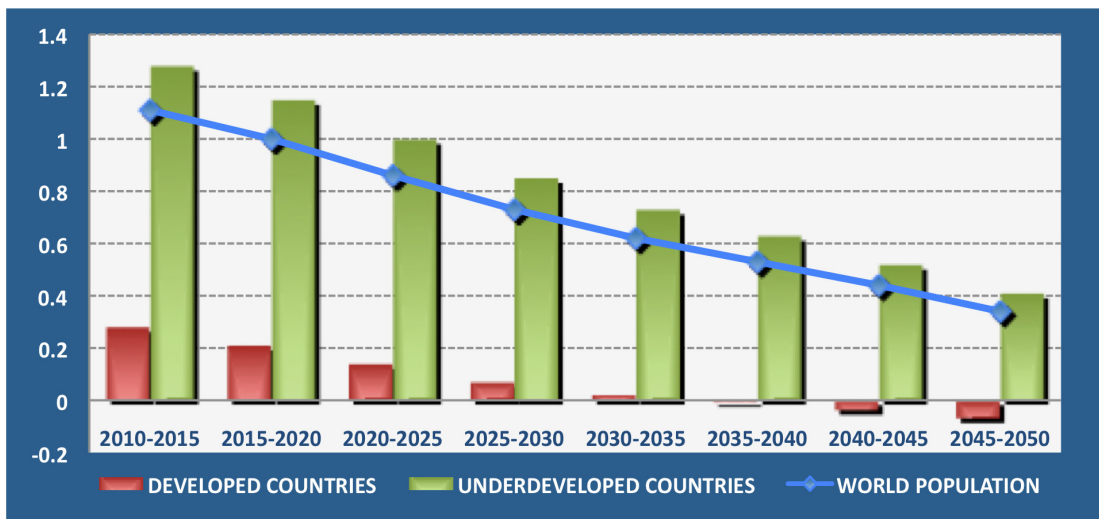
We are faced with novel demographic circumstances that are set to shape the contours of our society and involve various other elements that will influence economic activity in the near future.

## 2. Demographic Behavior: A Global Analysis

THERE are frequent debates and discussions about the effects of the new demographic order. All countries in the world are confronted by a new process of demographic transition characterized by a significant drop in mortality and fertility rates and a substantial increase in life expectancy that will lead, in the long term, to a reduction in population size and to the aging of populations. In themselves, these consequences should not present a problem as long as society is reorganized in such a way as to enable adaptation to the new scenario.

In general terms, the evolution of the world's population derived from the United Nations' projections reflects a pattern of growth that is clearly slower than that noted in the recent past. Between 2010 and 2050, predicted five-year growth rates exceed one percent only for 2010-2015, progressively decreasing until they reach the level of 0.34 percent in the five-year period from 2045 to 2050. During this period the discrepancies in the growth rates between the North and the South will be consolidated. While developed countries will register negative population growth rates from 2035 to 2040, developing countries will have positive rates throughout this period, making the gap between the two socioeconomic models obvious. Oceania and Africa are clearly situated above the average, Latin America, the United States, Canada and Asia are around the average, and Europe is at the lower end of the ranking, with consistently negative rates throughout the reference period of the projection (Figure 1).

FIGURE 1: Demographic behavior of the world population. Percentage rate of increase



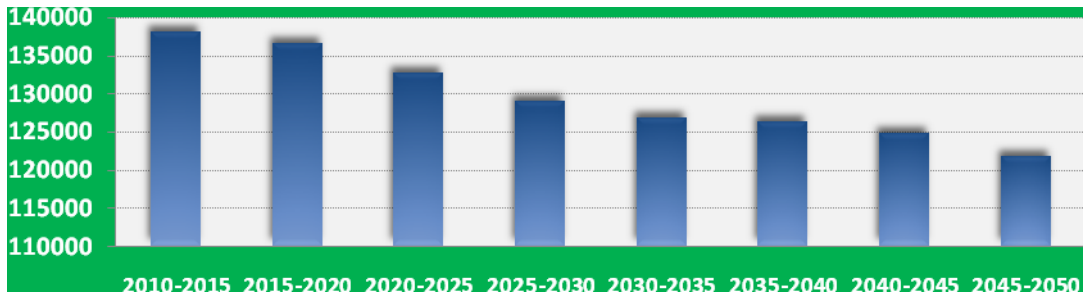
Source: Authors, based on United Nations data (2009a).

In the analysis of the future demographic evolution of the world's population, the derived profile of its age structure will be a key element. Analysis by broad age groups shows an accentuation of the trend towards a gradual aging of the population.

The base of the population pyramid will narrow as a result of fertility rates and sizes of population of child-bearing age. The incorporation of members of the population to the demographic framework through fertility reflects a situation of continuous deterioration. In absolute terms, the drop in the number of births stands at 16 million fewer births, which represents a fall of 11.79 percent between 2045 and 2050 relative to the rate for 2010-2015 and a reduction in the Crude Birth Rate of 30.92 percent. Similarly, the mean number of children per woman will diminish, but nevertheless attain values close to the replacement level of 2.1 children per woman. During the period under consideration the Total Fertility Rate will change from 2.49 children per woman in 2010 to 2.02 in 2050 (Figure 2).

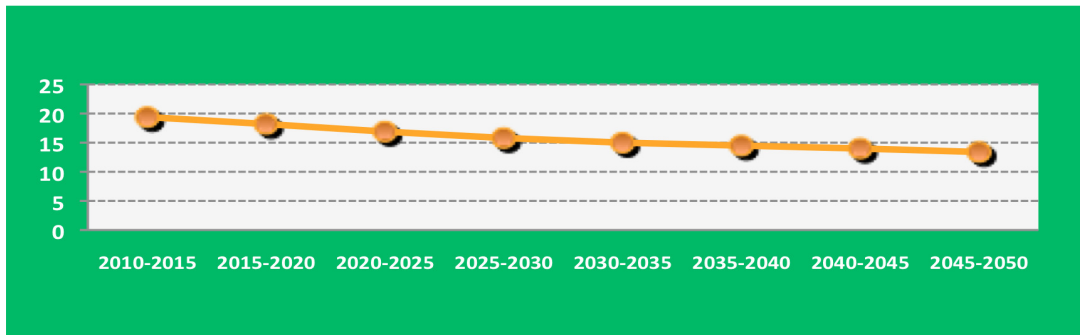
The homogeneous picture of the behavior of the different indicators is dispelled when the analysis is disaggregated regionally, with different behaviors with respect to fertility that help intensify the consequences of the new demographic order. The reduction in fertility is a general phenomenon in different cultural, political and economic circumstances. The difficulties involved in achieving a work-life balance, the postponement of child-bearing and the shift of values associated with matters connected with marriage, family and maternity help partly to explain this behavior. In absolute terms, the base of the pyramid, the population aged under 15 years, will shrink in size by 62 million people, and their proportion in the population will drop by 7.3 percentage points.

**FIGURE 2: Demographic behavior of the world population. Births**



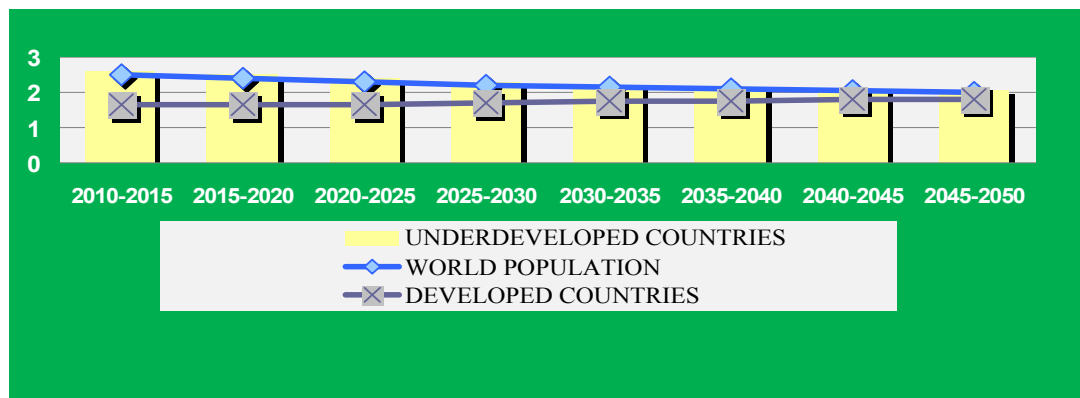
Source: Authors, based on United Nations data (2009a).

**FIGURE 3: Demographic behavior of the world population. Crude Birth Rate**



Source: Authors, based on United Nations data (2009a).

**FIGURE 4: Demographic behavior of the world population. Total fertility date**



Source: Authors, based on United Nations data (2009a).

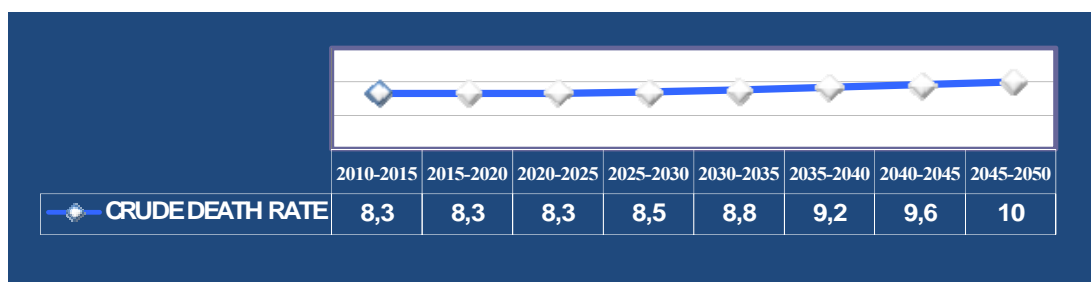


The increase in life expectancy is one of the main trends in the new demographic order and, without doubt, the most striking of phenomena for being one of humanity's greatest achievements. The world population ages in a continuous manner, in both absolute and relative terms. The study of aging is especially important because of its economic and social consequences: it could lead to serious problems if the required changes are not managed with reasonable speed and efficacy. The effects of this trajectory are clearly visualized at the apex of the population pyramid. The evolution of mortality is characterized by a reduction in its indicators, rates and probabilities of death at each age. The Crude Death Rate traces an upward trajectory, with gains of approximately two percentage points as a consequence of the greater proportion of people of advanced age (Figure 5).

The gap between men and women is maintained for life expectancy at birth, increasing by more than six years in both groups over the period under consideration (Figure 6). Any improvement in these figures will depend on what may be achieved for older people, especially those in the cohort comprised of members of the population aged over 80 years. As a consequence, the population aged 65 years or more will treble in the coming decades, from 525 million people in 2010 to 1,482 million in 2050. The proportion of this cohort in the total population will double, from 7.6 percent in 2010 to 16.2 percent in 2050. The population of those aged more than 80 years will increase by 250 million people and will gain 2.8 percentage points in the population pyramid.

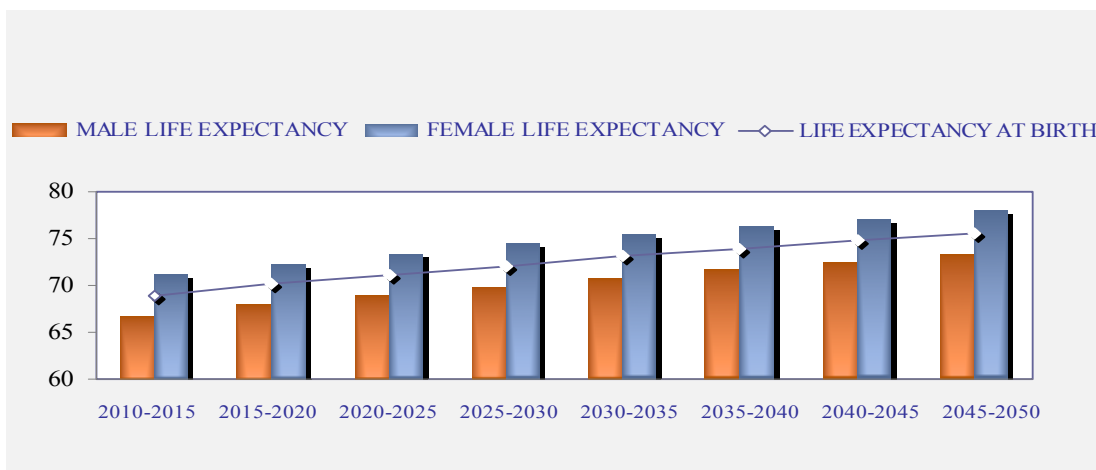
Over the period considered in the projection, the cohorts of those aged between 15 and 64 years are stable. In absolute terms, the potentially active population will increase by more than 1,300 million individuals over the next 40 years, a figure very different from that recorded in recent decades, and will lose only 1.4 percentage points in the population pyramid. Compared with 2010, there will be absolute and relative reductions in young adults, comprised of the cohorts of people aged 15-24 years, while the group of older adults will increase. The proportion of young adults will decrease by approximately 4 percentage points with respect to the total population, and by almost 6 percentage points with respect to the adult population.

FIGURE 5: Demographic behavior of the world population. Crude death rate



Source: Authors, based on United Nations data (2009a).

FIGURE 6: Demographic behavior of the world population. Life expectancy at birth



Source: Authors, based on United Nations data (2009a).

The basic coordinates of the new demographic order point to population stagnation, a reduction of fertility and a process of aging, and could lead to problems of sustainability from demographic, economic and social perspectives. The evolution described will produce an increased burden of the inactive population as a consequence of the aging population and will reduce the capacity to deal with this burden, putting the brakes on job creation.

### 3. The Labor Market: Female Participation in the Labor Force

THE influence of demographic dynamics on the functioning of the labor market could be decisive in determining the dimension of the population of active age, as well as interacting

with social and economic structures. The most immediate result of the new demographic order will directly affect the relationship between individuals of working age and all other cohorts.

The forecast reduction in the working age population will create problems for the supply of labor in the medium term. The maintenance and growth of productive capacity will require an increased participation of the active population in the form of a greater volume of female employment. This will foreseeably give rise to problems stemming from combining family and work and the lengthening of the period of activity, amongst other matters.

The incorporation of women into the labor market is an economic necessity, although in analyzing it we note different patterns of behavior from those of men. Currently, the number of women participating in the labor market is the highest it has ever been, and yet differences in the activity and unemployment rates of men and women are common traits in the labor market throughout the world (Table 1). Between 1998 and 2008 women's participation in work increased by 0.2 percentage points and that of men decreased by 1.7 percentage points. At the same time, the levels of female unemployment increased notably from 69.3 million in 1998 to 81.6 million ten years later. Of a total of 192.7 million people unemployed in 2008, 111.7 million (57.96%) were men and 81.0 million (42.94%) were women. In 2008 the worldwide unemployment rate was 6 percent, moderating the differences between men and women (5.9% and 6.3%, respectively). Between 2007 and 2008 the unemployment rate for men and women increased, narrowing the gap, which, from 2004, began a gradual downward trend (Figure 7).

**TABLE 1: World unemployment. Millions of workers**

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Total	165.1	172.1	170.7	173.4	175.5	183.9	189.1	188.3	184.4	178.9	192.7
Men	95.7	99.5	100.0	100.7	101.7	107.2	108.7	108.0	105.9	103.4	111.7
Women	69.3	72.5	70.7	72.7	73.8	76.7	80.3	80.3	78.5	75.5	81.0

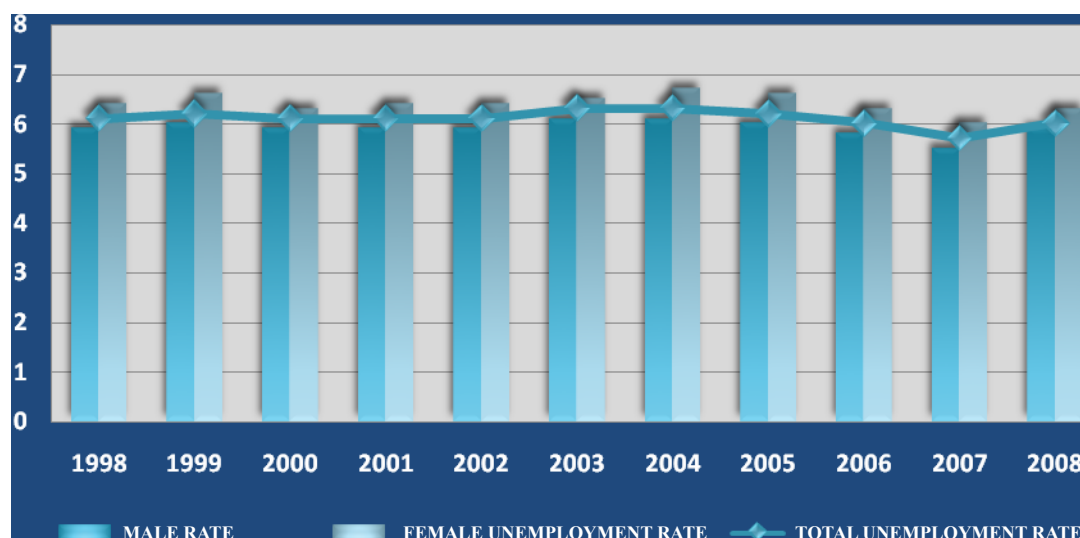
*Source:* Authors, based on International Labour Organization data (2009).

**TABLE 2: World employment. Percentage labor force participation rate**

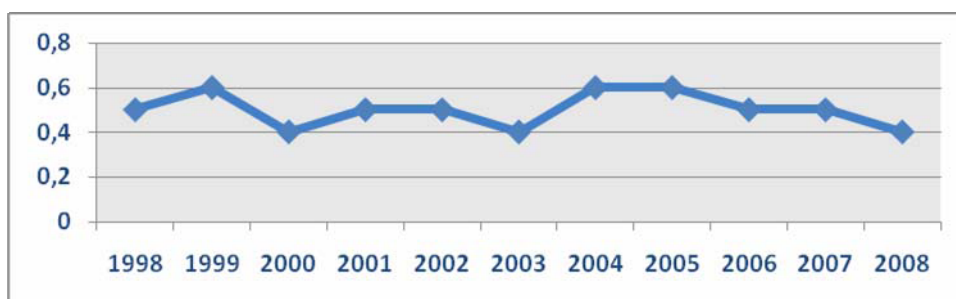
	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Total	65.8	65.7	65.6	65.5	65.4	65.2	65.2	65.2	65.1	65.1	65.1
Men	79.2	79.1	78.9	78.7	78.4	78.2	78.0	77.9	77.7	77.6	77.5
Women	52.4	52.3	52.3	52.3	52.3	52.3	52.3	51.3	52.6	52.6	52.6

Source: Authors, based on International Labour Organization data (2009).

The appreciation of differences in access to the labor market enables us to examine its structure in greater depth and to address, amongst other things, the economic independence of men and women. The activity rates of the two groups at the aggregate level tend to converge, albeit gradually. In 1998 the male and female participation rates differed by 26.8 percentage points. Ten years later the gap had narrowed by only 1.9 percentage points (Figure 7).

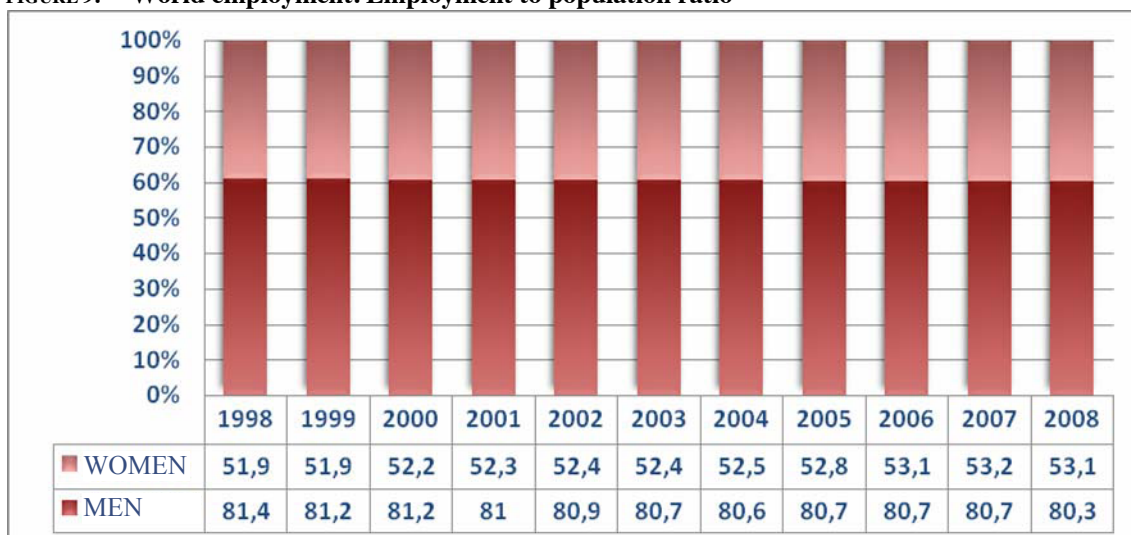
**FIGURE 7: World unemployment. Unemployment rate**

Source: Authors, based on International Labour Organization data (2009).

**FIGURE 8: World unemployment. Difference between male and female unemployment rate**

Source: Authors, based on International Labour Organization data (2009).

The exploitation of the potential of the working age population by economies is addressed by analyzing the employment to population ratio. On a worldwide level, the utilization of the workforce is basically centered on the male population. While in 1998 the female employment to population ratio was 51.9 percent, in 2008 it increased by only 1.2 percentage points. In the same period, the indicator for the male population decreased by almost the same magnitude, from 81.4 percent in 1998 to 80.3 percent ten years later. This figure means that the labor market involves approximately eight out of ten men who make up the male workforce, but only five out of ten women (Figure 8).

**FIGURE 9: World employment. Employment to population ratio**

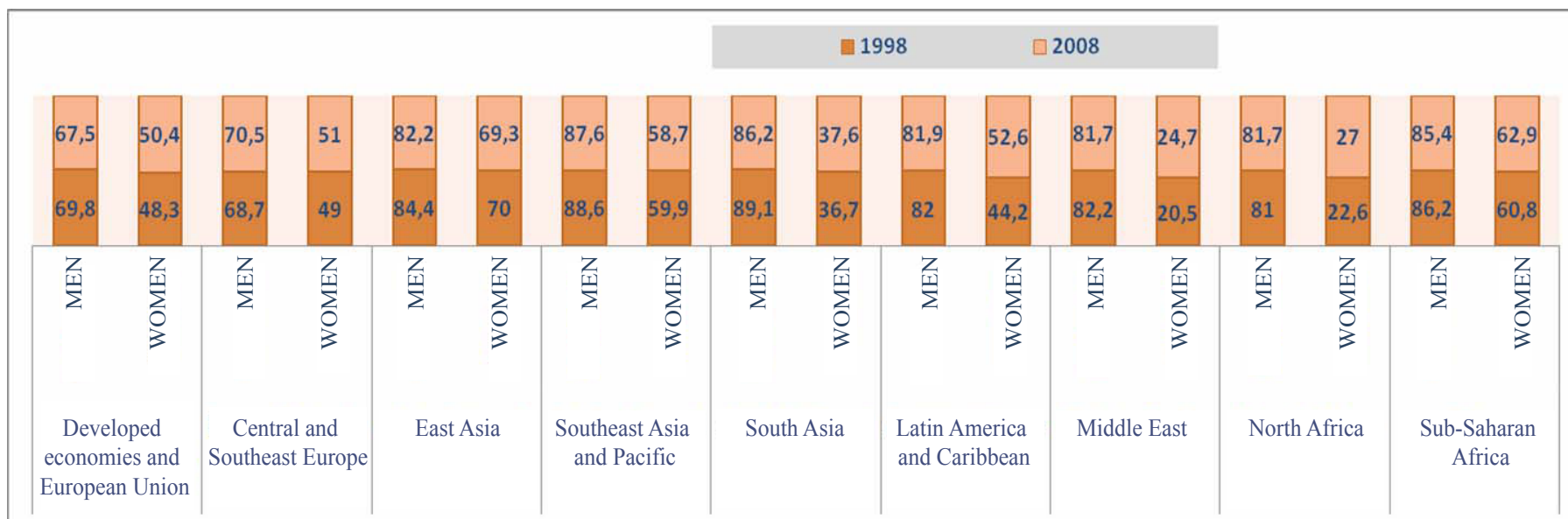
Source: Authors, based on International Labour Organization data (2009).

The regional analysis reveals patterns that are not very homogeneous. The female employment to population ratio increased between 1998 and 2008 in seven of the nine regions analyzed, the most significant increases being those attained in Latin America and the Caribbean (8.4 percentage points), the Middle East (4.2 percentage points) and North Africa (4.4 percentage points). Nevertheless, the scope for further convergence continues to be potentially significant, given that the ratio for the Middle East (24.7 percent) and for North Africa (27.0 percent) does not reach the level of 30 percent. At the opposite extreme, East Asia shows a different pattern, whereby seven out of ten women in the workforce participate in the labor market. In this region, the deviation noted with respect to the male population is the smallest of those found in this analysis, at 14.4 percentage points in 1998 and 12.9 percent in 2008. Among the developed economies, the gender differential was around 21.5 percentage points in 1998 and 4.4 percentage points lower in 2008 (Figure 9).

Despite these achievements, women's labor input continues to be an underused resource. The decision to participate or not is a response to different motives, which vary from region to region. Among the developed societies the existing gap between the level of use of the female and male workforce is generally the consequence of personal decisions. Nevertheless, in particular societies, the decision to remain within or outside the labor market is imposed by criteria that lie beyond people's free and individual decision. Not to be a member of the workforce does not mean that no activity is undertaken. Within the family sphere, unpaid domestic tasks are normally carried out by women who do not participate in the labor market.

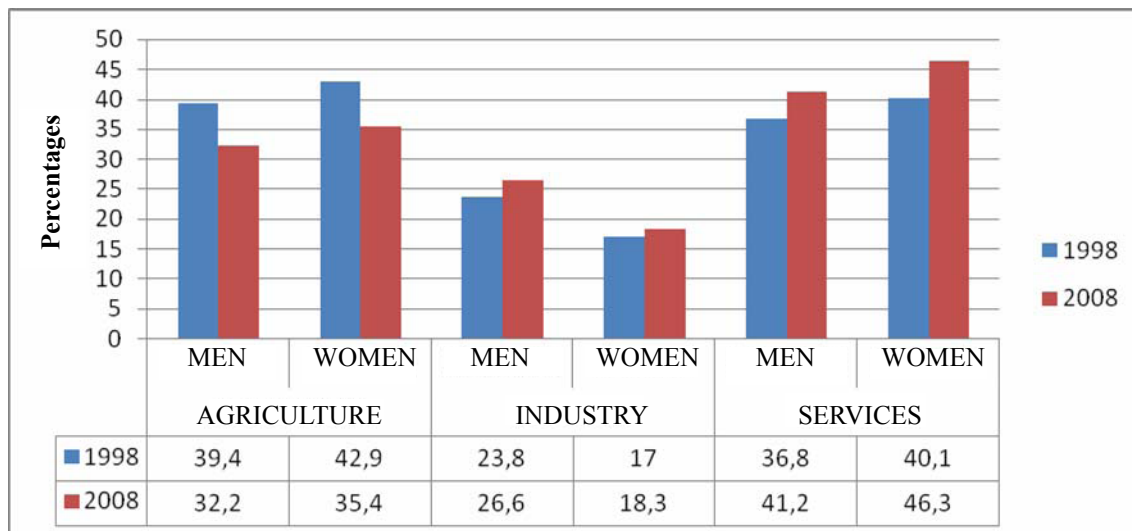
The sphere of work and the conditions under which men and women undertake their activity delineate a situation in which women's role is relegated from the outset. In 2008, employed women carried out their work activity fundamentally in the service sector (46.3%) and in agriculture (35.4%). Only 18.3 percent worked in the industrial sector, 8.3 percentage points less than the corresponding figure for the male group (Figure 10).

FIGURE 10: World employment. Employment to population ratio, 1998-2008



Source: Authors, based on International Labour Organization data (2009).

FIGURE 11: World employment. Distribution across sectors, by sex

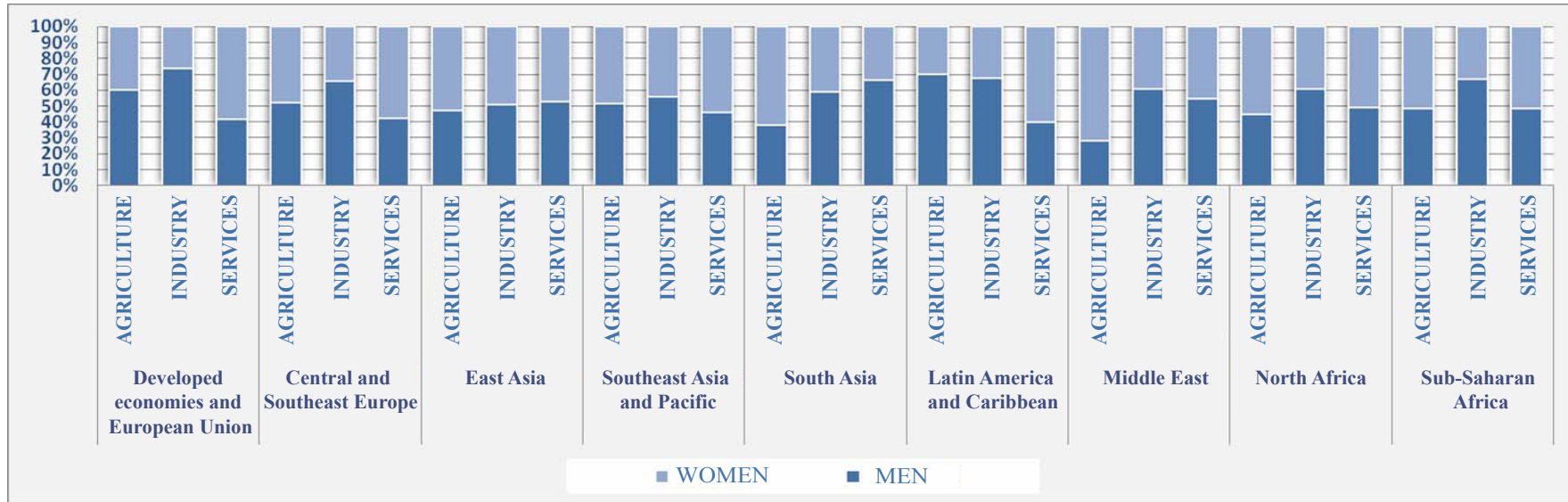


Source: Authors, based on International Labour Organization data (2009).

The distribution of employment by economic sector reflects a situation of generalized imbalance. The difference between the proportion of male and female employment in industry ranges from 0.6 percentage points (East Asia) to 22.5 percentage points (developed economies and the European Union). In the agricultural sector the greatest deviations are found in South Asia (64.5 percent female employment and 39.9 percent male employment) and the Middle East (32.0 percent female employment and 12.4 percent male employment). The activity carried out in the service sector is female labor-intensive, at least at the aggregated level, and increases over the period under consideration. Nevertheless, the differences turn out to be very significant in regions such as those of the developed economies and the European Union (84.4 percent female employment and 60.5 percent male employment) and Latin America and the Caribbean (76.7 percent female employment and 50.0 percent male employment). A different pattern is found in the regions of Asia and the Middle East, where it is noted that the activity is predominantly carried out by men (Figure 11).



FIGURE 12: World employment. Distribution by economic sector



Source: Authors, based on International Labour Organization data (2009).

Working conditions are an essential concern in the analysis of employment. The transition from what is known as vulnerable employment<sup>1</sup> to waged employment may be a decisive step in the attempt to gain economic independence. In aggregated terms, in 2007, the proportion of vulnerable employment with respect to total employment stood at 50.6 percent, although the female group registered 52.7 percent, 3.6 points higher than male employment. Between 1997 and 2007 the differential between men and women diminished, with vulnerable employment declining by 2.3 points as a proportion of male employment and by four points as a proportion of female employment (Table 3).

**TABLE 3: World employment. Percentage vulnerable employment**

	1997	2007
Total	53.5	50.6
Men	51.4	49.1
Women	56.7	52.7

*Source:* Authors, based on International Labour Organization data (2009).

The rate of female incorporation into the labor market is growing, but continues to show clear differences with respect to the male group in its sectorial distribution, proportion of vulnerable employment and employment-population ratio.

The changes arising from the new demographic order will directly affect the relationship between the members of the population of the working age cohorts and the rest of the population (Table 4). From an economic perspective, the concept of dependence relates the group of individuals without income who must be maintained by those who, over the period under consideration, are working. As a consequence of the intensification of the process of aging of the population and, to a lesser extent, of the recovery of demographic indicators, the overall dependency rate has a stable trajectory of around 50 percent worldwide for the period 2010-2050. However, different results emerge from analyses of individual areas of socio-economic development.

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<sup>1</sup> According to the International Labour Organization, this consists of the sum of workers with individual employment and unpaid family workers.

In developed countries, the 2010 dependency rate stands at one dependent person for each two potentially active persons. From 2015 there will be continuous increases, giving figures of 1.16 (2025) and 1.42 (2050) dependent persons for each two potentially active persons. In the less developed countries, starting from higher levels in 2010, 1.08 dependent persons for each two potentially active persons, the indicator will drop progressively until 2035, and in parallel, the global indicator will reach a turning-point that will place the global dependency rate at the same level in 2050 as in 2010.

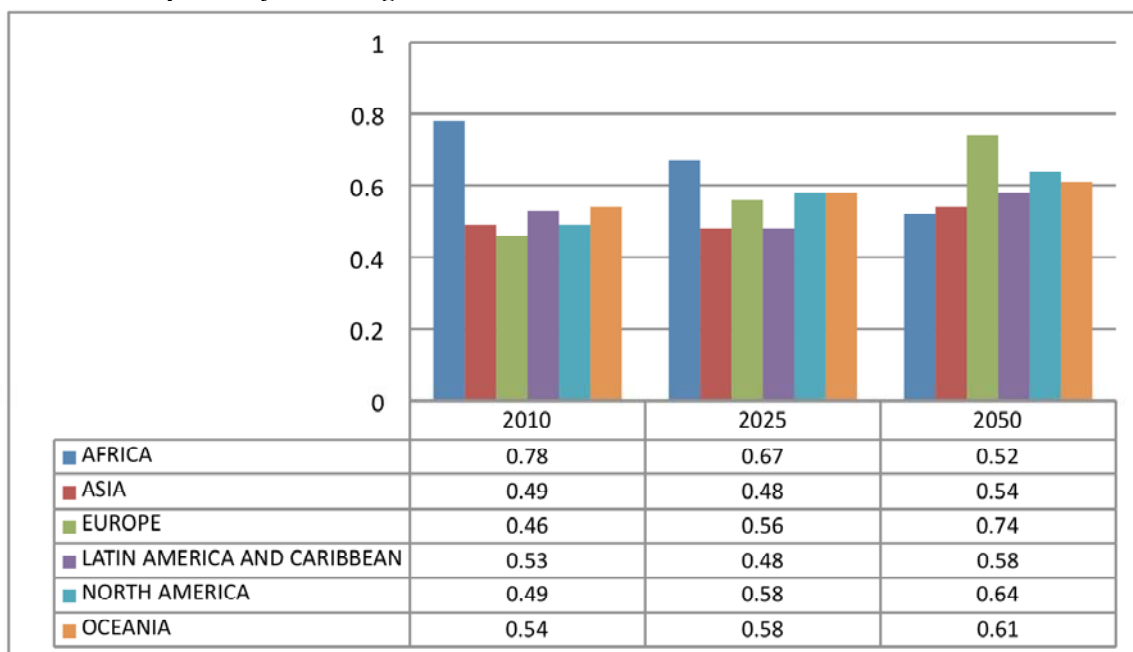
TABLE 4: **Dependency rates. Distribution by age group**

	World			Developed countries			Developing countries		
	Total	Young population	Old aged	Total	Young population	Old aged	Total	Young population	Old aged
<b>2010</b>	0.53	0.41	0.12	0.48	0.24	0.24	0.54	0.45	0.09
<b>2015</b>	0.52	0.39	0.13	0.51	0.25	0.26	0.52	0.43	0.10
<b>2020</b>	0.52	0.38	0.14	0.55	0.25	0.29	0.52	0.41	0.11
<b>2025</b>	0.52	0.36	0.16	0.58	0.25	0.33	0.51	0.39	0.13
<b>2030</b>	0.52	0.35	0.18	0.61	0.25	0.36	0.51	0.36	0.15
<b>2035</b>	0.53	0.33	0.20	0.64	0.25	0.39	0.51	0.34	0.17
<b>2040</b>	0.54	0.32	0.22	0.66	0.25	0.41	0.52	0.33	0.19
<b>2045</b>	0.55	0.31	0.22	0.69	0.26	0.43	0.53	0.32	0.21
<b>2050</b>	0.56	0.31	0.25	0.71	0.26	0.45	0.54	0.31	0.21

Source: Authors, based on International Labour Organization data (2009).

From a more regionally disaggregated perspective we can see that Europe will experience a marked aging process, with the overall dependency rate changing from 0.46 in 2010 to 0.74 in 2050. In a similar way, but to a lesser extent, Oceania, Latin America and the Caribbean, North America and Asia will experience gains in the indicator. Conversely, Africa will head a process of population rejuvenation, dropping from 0.78 dependent persons for each potentially active person in 2010 to 0.67 in 2025 and 0.52 in 2050 (Figure 13).

FIGURE 13: Dependency rates. Regional distribution



Source: Authors, based on International Labour Organization data (2009).

The composition of the dependency rate will change over the period. While in 2010 77.36 percent of the indicator is accounted for by the contribution of the young population, in 2050 this will decrease to 55.35 percent. The socio-economic division between developed and less developed countries shows different patterns of behavior. Developed countries in 2010 have equally distributed proportions of their young and adult populations, whereas in the latter the population aged between 0 and 14 years makes up 83.33 percent of the figure. By 2050 the internal composition of the indicator will have changed markedly. The young population will grow to 36.62 percent in developed countries and will decrease to 57.41 percent in developing countries. The population aged 65 years and more will account for 63.38 percent of the indicator in 2050 in developed countries and 38.88 percent in the less developed countries. The weight of the population aged 65 years and over in both cases will be 1.65 dependent persons for each potentially active person in developed countries in 2050, although the increase registered in the less developed countries will be 25 percent with respect to 2010, 15 percentage points higher than the former.

The analysis of dependency reflects, in short, a situation of change between investment in the creation of human capital and social expenditure on care and attention. Achieving full employment is very important for men and women since it contributes to the generation of

wealth and the consolidation of levels of social stability. Nevertheless, access to the labor market is not the same for everyone, although heterogeneous patterns are gradually and progressively disappearing.

## 4. Care: An Economic Good

IN general terms, care is characterized as a female activity, generally unpaid and with little social recognition. Attending to children and dependents raises many questions about the position of women in various areas of society, fundamentally in the family and work spheres.

Care is taken to mean the action of helping a child or dependent person in the conduct and welfare of their daily life. This function can be exercised either in a remunerated fashion or within the family sphere. The conception of the activity is not the same for the two cases.

Care represents an economic good that satisfies a broad set of characteristics, in common with other goods of this nature but which, in the case of care, are present to different degrees. To speak of care means talking about a necessary good that satisfies a basic need in the life cycle of each member of the population, although this function is not always independent throughout it. Leaving aside the uncertainties to which any individual life cycle is exposed, particular cohorts of the population —the dependent population— require external attention to satisfy this function. Speaking of care also means talking about an important good, given that its enjoyment, when it involves external attention, means a greater economic cost that not all families can afford. In relation to this characteristic we must nevertheless take into account that external attention, at least theoretically, can be taken on by any member of the population who is part of any economically active cohort, although the reality reveals a range of characteristic practices. The care function falls fundamentally to women who undertake economically remunerated private domestic functions. Moreover, care is a durable good, heterogeneous and complex in nature, with important asymmetries in the channels of information. All these characteristics that are common to other economic goods exhibit certain peculiarities in the context of care that enable them to be considered as having their own status.

Care is exchanged in a market that is segmented into paid and unpaid sectors; it is clearly imperfect although its economic modeling on the basis of its size assumes a perfectly

competitive market. Care is exchanged in a market where the function of demand is centered on the attention given to the inactive cohorts of the population, the base and apex of the population, and the supply is situated in the sphere of the paid domestic market. As with any market, the balance is reached at the intersection of the functions of supply and demand. In this market, the problem really arises with determining the supply, where different considerations give rise to substantially different equilibrium conditions.

The time devoted to carrying out activities in the labor market represents a serious limitation on carrying out the function of care, its opportunity cost being very high.

The public sector, not-for-profit organizations, the market and the family are the basic pillars in the system of care of young and old dependent persons. The degree of participation of each of them in the care system will depend, amongst other aspects, on the degree of socio-economic development, although the role of the family in carrying out this function is a common trait in any type of society or territorial region.

Time is a scarce and limited resource that is divided up amongst alternative activities. Basically, its distribution is delimited by the time devoted to the paid market and to the family realm. Unpaid activity and the women in the population are the basic determinants of the time given over to the care of dependent members of the population. Unpaid work generated in the home and beyond the relations of the market is an essential resource for achieving levels of social welfare. Men and women use time asymmetrically, and the time that women devote to the family determines that available for paid work. In this context, the participation of women in the labor market limits and influences the time spent on caring and tending for dependent persons.

Considering distinct hypotheses in relation to members of the population fulfilling the care function gives rise to different scenarios. Currently we have recourse to an economic scenario in which the dynamization of the active population and, therefore, of the female population, is required. The demographic scenario, with its plummeting fertility indicators and markedly aging population, needs an intensification of the care function for the higher cohorts of the population pyramid. Within this framework, the decisions that women take in one sense or another will be decisive. Women engage in a broad panoply of situations: some abandon the option of participating in the labor market to focus exclusively on the family and to undertake domestic tasks; others involve themselves exclusively in the labor market and do not include any decisions about fertility in their structure of preferences; finally, another group make both

decisions simultaneously. There is no doubt that female participation in work is a reality and, furthermore, is necessary from an economic point of view, its achievements having repercussions on the care function. However, we should not lose sight of the fact that it is also women, fundamentally, who carry out the function of care.

## 5. An Econometric Approach to the Demand for Care

### 5.1. Econometric modeling

The analysis undertaken attempts to model the effect of women's participation in the labor market on one segment of care demand: childcare. This choice is an important aspect because of the socio-economic connotations generated over the medium and long terms.

We establish the following functional relationship in which to consider the factors that hypothetically determine the demand for care,

$$\text{Demand for care} = f(\text{Female employment}),$$

in which the demand for care is the response (or dependent) variable, and female employment is the explanatory variable, the two being linked by the functional relationship  $f$ .

The specification of a simple linear regression model enables us to address the question that concerns us. The dependent variable, demand for care, is approximated as the *ratio of care demand for people under 15 years of age to the active population* (Ratio2010). Taking into account that the potential effects that may be produced among the variables included in the analysis will not be instantaneous in any case, female employment, the explanatory variable, is estimated as the variable *female participation in the labor market in 1995*.

From the condition of equilibrium of the care market the econometric model under consideration is specified as

$$\text{Ratio } 2010_i = \alpha_0 + \alpha_1 \text{Female employment}_{1995i} + u_i$$

where we assume that the random perturbation term,  $u_i$ , satisfies the basic assumptions of the regression model;  $\alpha_0$ , denotes the independent demand for care;  $\alpha_1$ , is the mean change in care demand per unit increase in female employment, and  $n$ , the sample size.

## 5.2. Statistical information

Using the data from the projections of the world population for the period 2010-2050 made by the United Nations' Department of Economic and Social Affairs (2009a and b) we obtain the statistical information used in the analysis.

Any attempt to evaluate empirically the effect of female labor market participation on the demand for care requires, first of all, to determine the necessary units of demand for care by broad age and regional groups.

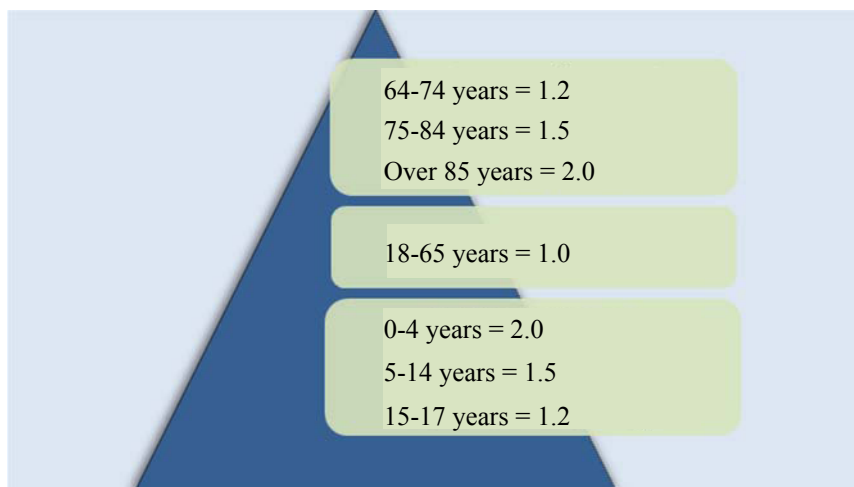
Applying the so-called *Madrid scale* (Durán 2005) to the population projection enables demand for care to be homogenized and compared. Systems of care vary by region and socio-economic level. Matters related to patterns of coexistence, customs and tradition feature in this demand. The scale weights the population cohorts differently and considers that the number of units of care required by each individual is related to the age cohort to which they belong (Figure 4.2.1). Adolescents, children and old people have greater care needs than the adult population in the 18-65 year age cohort.

The units of external care<sup>2</sup> needed to attend to the cohorts situated at the base and apex of the population pyramid are calculated by applying the aforementioned scale to the population aged under 18 years and older than 65 years. The resulting demand for care shows an increasing trend with unequal trajectories for the distinct cohorts of the population pyramid. In 2010, 86 percent of the units of care are concentrated at the base of the pyramid, its weighting decreasing by 24 percentage points, to 61.7 percent in 2050. The people in the upper age groups of the pyramid will substantially increase the requirements for care. While this is 17 percent in 2010, under the hypotheses considered, the figure would increase to 38.3 percent by 2050 (Figure 14).

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<sup>2</sup> A unit of external care is considered to be that corresponding to a distinct member of the population from the one who generates the need.

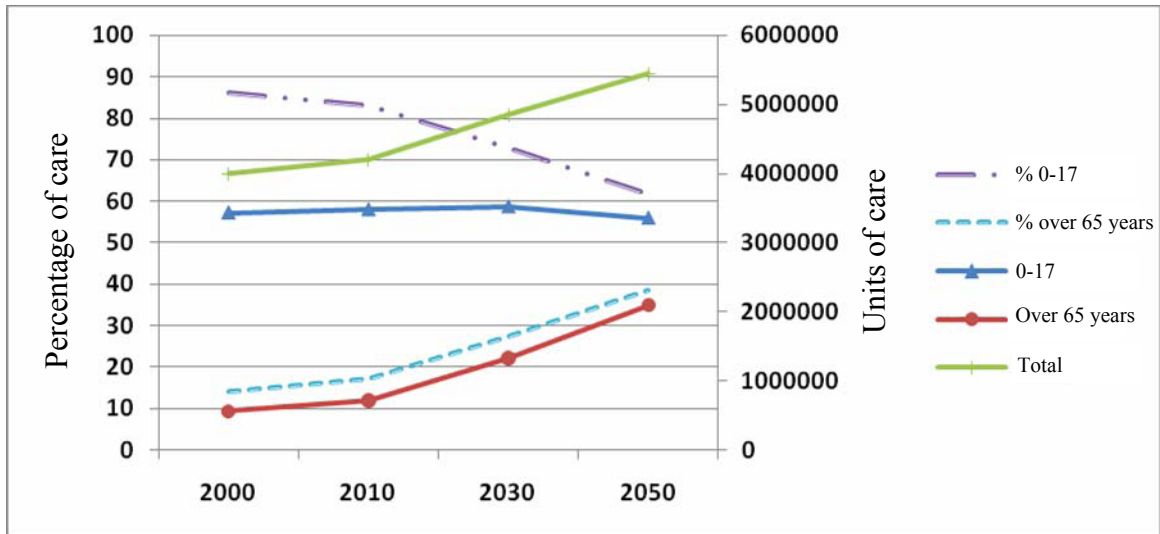


**FIGURE 14: Demand for units of care. Weighting factor by population cohort. Madrid scale**

Source: Durán (2005).

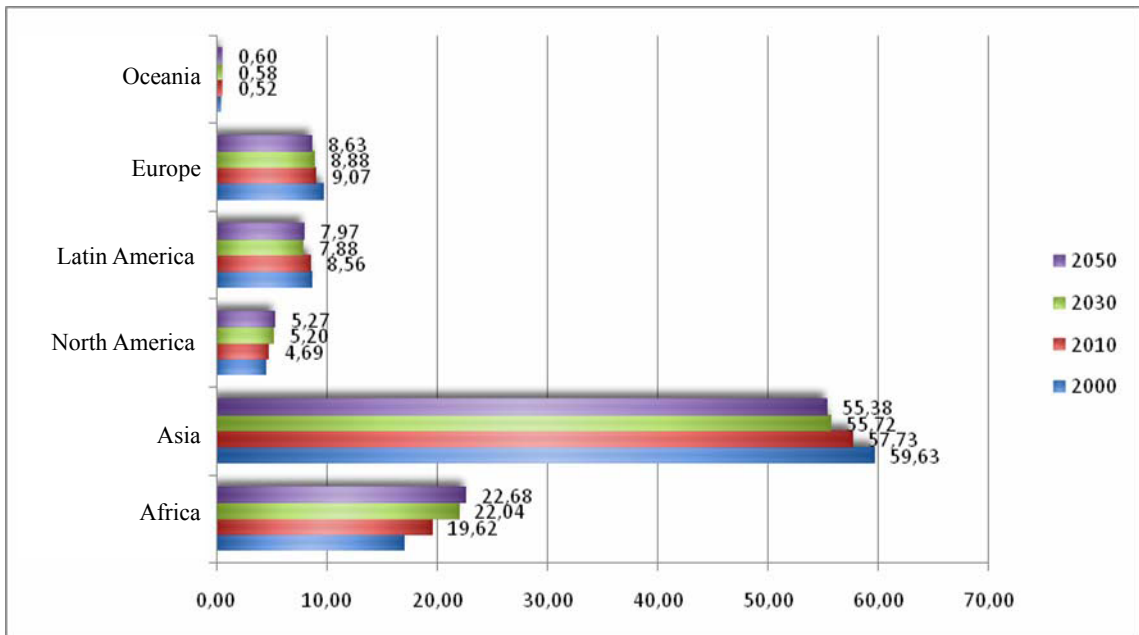
At the regional level the distribution is variable (Figure 15). The highest demand for external care during the period under consideration is found in Asia. In 2010, this demand is concentrated in the lower cohorts (88.33 percent), although it loses its predominance in 2050, falling to 58.12 percent. Africa, currently the youngest region, exerts a demand for care that represents 19 percent of worldwide demand. Over the period analyzed, in 2010 only 6.6 percent of the demand for care corresponds to the apex of the pyramid, increasing to 17.5 percent in 2050. Europe is, without doubt, the oldest region, its needs for care in 2010 accounting for 9 percent of the worldwide total with a substantially different distribution and requirements. Only 56.3 percent of the demand for care in Europe corresponds to the base of the pyramid in 2010. It has a downward trajectory over time, resulting in a value of 41.2 percent in 2050. A similar, though notably younger, picture of the distribution of care to that of Europe is seen for North America, with 66.9 percent in 2010 and 49.5 percent in 2050.

FIGURE 15: Worldwide demand for external care. Evolution 2000-2050



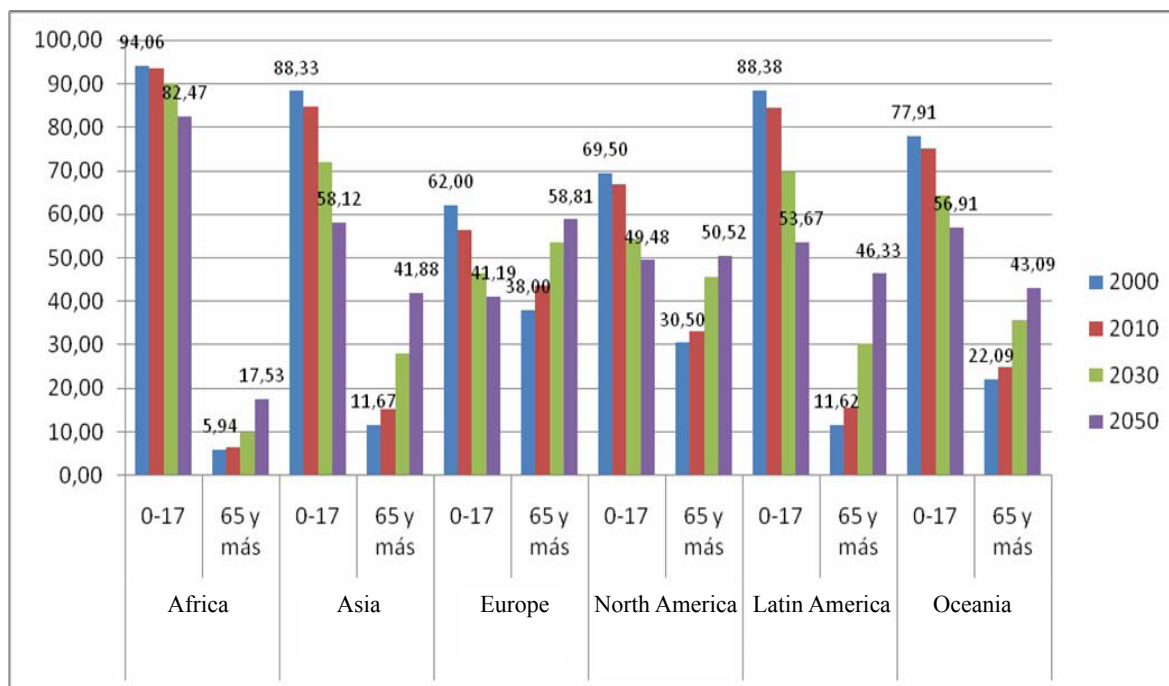
Source: Authors, based on United Nations data (2009a).

FIGURE 16: Worldwide demand for external care. Percentage distribution by continent



Source: Authors, based on United Nations data (2009a).

FIGURE 17: Worldwide demand for external care. Percentage distribution by continent and age cohort



Source: Authors, based on United Nations data (2009a).

The inclusion of hypotheses of behavior relating to the population who carry out the care function enables different scenarios to be derived (Table 5). Below, we set out three hypotheses of care behaviors: a uniform distribution among the female and male population, female care and care by non-active women.

A uniform distribution of care among the population included in the 18-64 year old cohort assumes a one-to-one relationship between demand for care and the size of the active population. In 2050 the ratio would diminish to 0.98. Considering that only the female population of active age would perform that function, the ratio would double over the period under consideration. Under such a hypothesis, each active woman would have to look after herself and two dependents, on average, over the period 2010-2050.

**TABLE 5: Worldwide demand for external care. Distribution of demand for external care units among the population aged 18 to 64 years by continent and year**

	Ratio total population 18-64			Ratio female population 18-64		
	2010	2030	2050	2010	2030	2050
World population	1.00	0.94	0.98	2.01	1.92	2.00
Africa	1.56	1.32	1.01	3.10	2.64	2.02
Asia	0.93	0.86	0.93	1.90	1.77	1.93
North America	0.88	1.04	1.10	1.76	2.12	2.25
Latin America	1.00	0.87	0.98	1.97	1.72	1.96
Europe	0.79	0.99	1.23	1.57	1.98	2.50
Oceania	0.99	1.06	1.07	1.99	2.15	2.19

*Source:* Authors, based on United Nations data (2009a).

Regionally, the scenarios show deviations independently of the hypothesis under consideration, whereby Africa is the continent with the greatest volume of demand for care. In 2010 the figure stands at 1.56 dependent persons requiring to be attended by each person in the active population and 3.10 for each active female population unit. Both ratios are practically double the figures for Europe. Over time, Africa's ratio will decrease to 1.01 by 2050 under the first hypothesis and to 2.02 under the second, whilst that of Europe will increase to 1.23 units of care per active member of the population and 2.50 units of care per potentially active woman. Latin America, with figures close to the average, shows a more stable trend over the period considered.

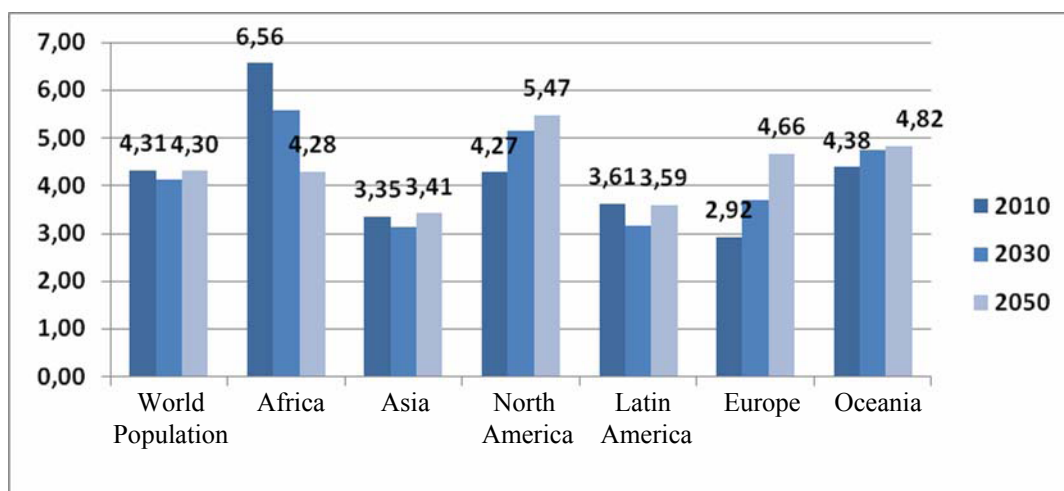
The so-called new division of labor consists of the incorporation of women into employment without men having taken on their part in carrying out domestic work and care functions. The time given over to paid work seriously limits the care supply. In traditional societies this fact produces a polarized situation with two extremes. One part of the female population takes on the domestic and care work almost alone, withdrawing from employment to undertake care, and the other group renounces motherhood, contributing to the crash in fertility indicators.

The analysis carried out here considers exclusively as the care supply the group of women who do not participate in the labor market, on the assumption that the employment to

population ratio for women in the figure corresponding to 2007<sup>3</sup> is stable over time. For such a scenario, care needs are seen to increase. On average in 2010, each carer would have to look after herself and 4.31 dependent members of the population (Figure 18).

Considering the distributions by region, Africa occupies the upper end, having the greatest number of care units per non-active woman (6.56 in 2010), while Europe, at the lower end, registers 2.92 units of care in 2010. At the end of the period considered, 2050, the situation of the two regions differs greatly with respect to both the number of units of care and their characterization. Africa would register a fall of 2.30 units of care, the indicator standing at 4.28 units of care per non-active woman, concentrated at the base of the pyramid. In Europe the units of care would increase by 1.7 to give a ratio of 4.66 units of care per non-active female member of the population and would be located fundamentally at the apex of the population pyramid.

**FIGURE 18: Worldwide demand for external care. Non-active female population aged 18-64 years**



Source: Authors, based on United Nations data (2009a and 2009b).

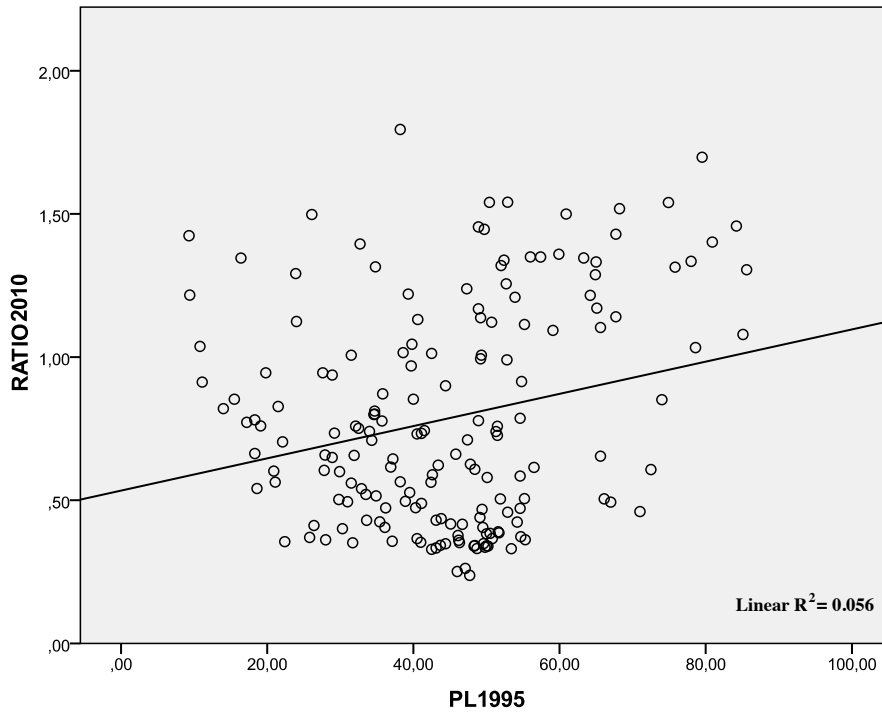
<sup>3</sup> The average value for each continent is calculated from all the countries for which data are available.

The dispersion analysis of 176 countries for the variables considered reveals a combined picture of certain statistical independence with a clearly heterogeneous pattern with respect to different regions.

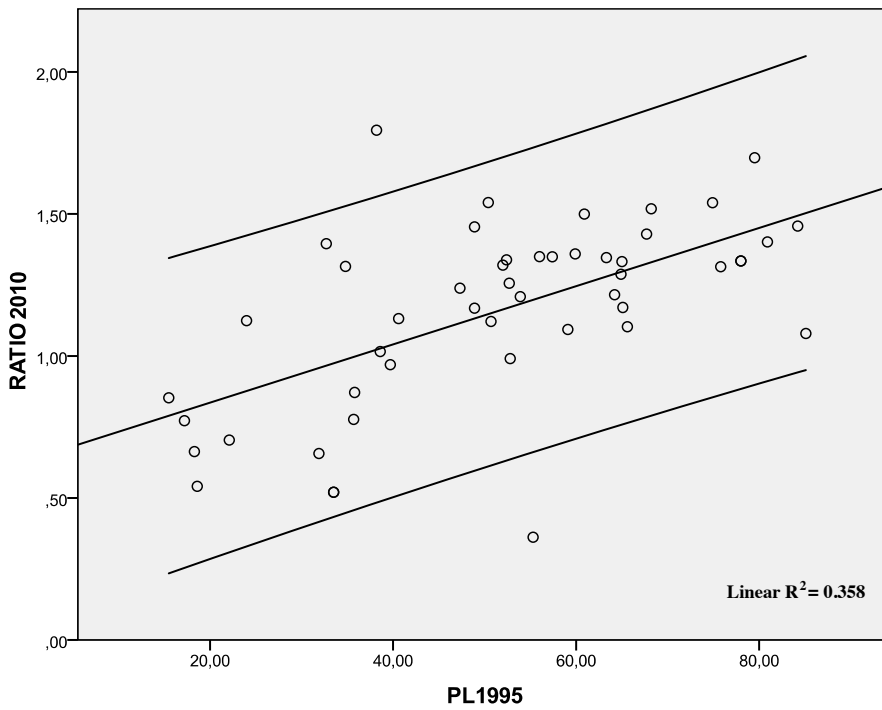
Scenarios of high figures for the demand for care coexist with a disparate employment to population ratio in some countries. While Uganda's demand for care is 1.70 units per active female member of the population and its employment to population ratio reaches 79.50 percent, in Equatorial Guinea the coordinates correspond to a demand for care of 1.30 and an employment to population ratio of 78.00 percent. With a lower demand, 0.80 units of care per active female in the population, India registers a lower employment to population ratio for women of 34.60 percent. Other territories that are very distant, both geographically and socio-economically, for example, Niger and Luxembourg, have quite similar ratios of employment to population (38.20 and 33.60 percent, respectively) and are significantly distinct with respect to demand for care, at 1.79 units of demand per female member of the population in Niger and 0.43 in Luxembourg (Figure 19).

Combined over large geographical areas, the pattern of care and employment traces a downward trajectory in Asia, is directly proportional in Africa, and shows signs of randomness in Europe and of stability in America.

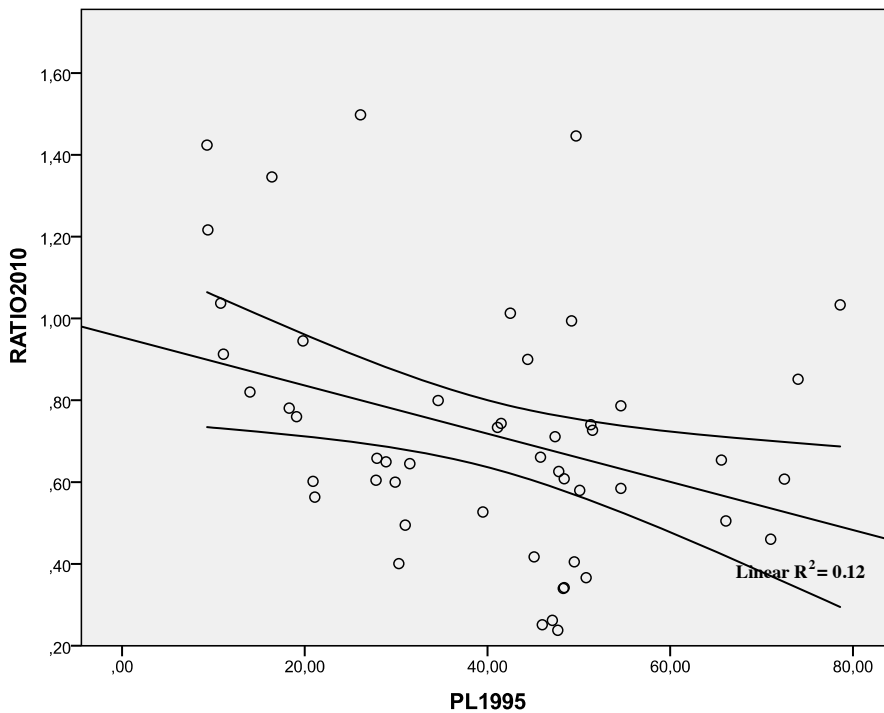
**FIGURE 19: Demand for care. Female participation in work, 1995. Ratio of demand for care of people under 15 years of age to active population. Scatter-plot**



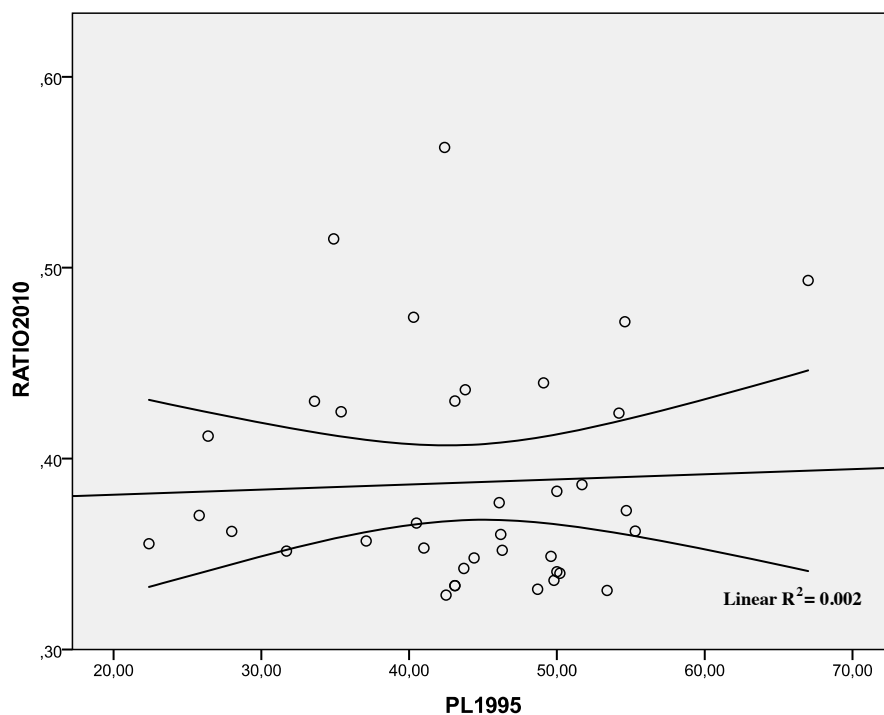
**AFRICA**



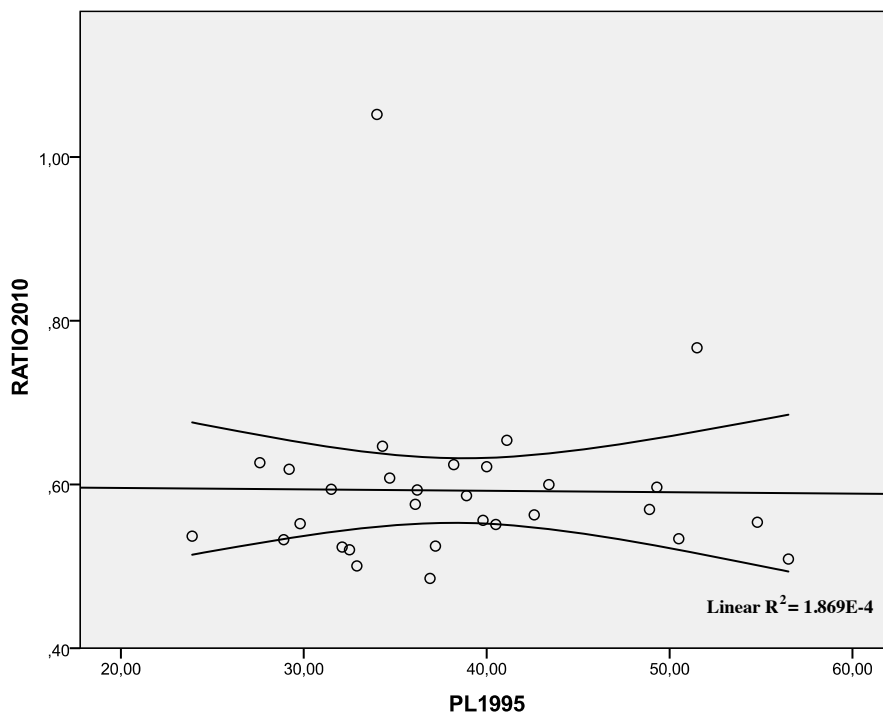
**ASIA**



**EUROPE**





**AMERICA**

Source: Authors, based on United Nations data (2009b).

### 5.3. Estimation and results

An econometric approach to the question enables us to analyze in depth and test the existence or otherwise of a cause and effect relationship between the variables considered. We want to know whether female participation has repercussions on the demand for care. In terms of the structures of preferences and their satisfaction in matters of fertility:

- How is the opportunity cost of having, or not having, children in relation to work activity measured?
- Does the decision to have a child influence female employment?
- Does the decision to participate in the labor market have a substitution effect on matters of fertility? Is the effect complementary? Does it affect income?

Without doubt it will be difficult to obtain a single answer, since matters related to aspects of culture, socio-economic development, territorial location and characteristics of care as an economic good will influence the result.

Tables 6 and 7 illustrate the estimates of the Ordinary Least Squares (OLS) model at the worldwide level (n=176 countries) and by continent for the period under consideration. From the analysis of the results it is concluded that, at the combined level, the degree of linear association between female employment and care needs is 23.6 percent with directly proportional trajectories. Employment and demand for care develop in the same direction.

Econometric modeling shows a statistically significant relationship between the demand for care and female employment. The overall model is statistically significant at the 99 percent confidence level. Individually, the explanatory variable is significant in the specification of the model (98 percent level of confidence), although it shows signs of weakness in certain regions.

**TABLE 6: Demand for care. Female participation in work, 1995. Ratio of demand for care of people under 15 years of age to active population. Statistical analysis**

Worldwide										
Model	Unstandardized coefficients		Standardized coefficients	t	Sig.	95% confidence interval for B		Correlations		
	B	Standard error	Beta			Lower	Upper	Zero-order	Partial	Semi-partial
(Constant)	0.534	0.083		6.442	0.000	0.370	0.698			
1 PL1995	0.006	0.002	0.236	3.203	0.002	0.002	0.009	0.236	0.236	0.236

a. Dependent variable: Ratio2010

Source: Authors, based on United Nations data (2009b).

**TABLE 7: Demand for care. Female participation in work, 1995. Ratio of demand for care of people under 15 years of age to active population. Territorial distribution. Statistical analysis**

		Coefficients <sup>a</sup>										
Model		Unstandardized coefficients		Standardized coefficients	t	Sig.	95% confidence interval for B		Correlations			
		B	Standard error	Beta			Lower	Upper	Zero-order	Partial	Semi-partial	
Africa	1	(Constant)	0.631	0.110		5.733	0.000	0.409	0.852			
		PL1995	0.010	0.002	0.598	5.119	0.000	0.006	0.014	0.598	0.598	0.598
Asia	1	(Constant)	0.954	0.101		9.422	0.000	0.750	1.158			
		PL1995	-0.006	0.002	-0.346	-2.550	0.014	-0.011	-0.001	-0.346	-0.346	-0.346
Europe	1	(Constant)	0.376	0.046		8.116	0.000	0.282	0.470			
		PL1995	0.000	0.001	0.044	0.258	0.798	-0.002	0.002	0.044	0.044	0.044
America	1	(Constant)	0.674	0.092		7.342	0.000	0.487				
		PL1995	-0.002	0.002	-0.189	-1.050	0.301	-0.007	0.862	-0.189	-0.189	-0.189

a. Dependent variable: Ratio2010

Source: Authors, based on United Nations data (2009b).

The regression analysis demonstrates the statistical significance of the independent demand for care<sup>4</sup> in the cohort considered of people younger than 15 years of age, and likewise the small mean increase that accrues (0.006 units) per unit increase in female employment. Although at the combined level the determining component explains only 5.56 percent of the change in demand for care, it can be claimed that two components should be considered: independent demand, and derived, albeit weak, effects of female employment.

The regional analysis shows a varied array of situations and in some cases displays significant differences from the previous effect. In Asia and America there is a negative linear association between the variables considered, which signifies that increases in employment coexist with reductions in the demand for care of the cohort described here. It must be borne in

<sup>4</sup> Not dependent on any variable.

mind that in East Asia the female employment to population ratio stands at seven employed women out of ten in the workforce. On the other hand, in Africa and Europe the result obtained is different, the association between demand and employment being directly proportional.

The results disaggregated by region provide a different picture. While in Africa and Asia the relationship of cause and effect between demand for care and female employment is statistically significant, in Europe and America the results obtained do not allow definite conclusions to be drawn.

The demand for care in Asia and Africa may be explained from the point of view of the pattern of female employment. Both regressions are significant overall, although the effects they produce are opposite. Likewise, the explanatory variable, demand for care, emerges individually as being important in the specification of the model. The burden of independent demand in both cases produces statistically satisfactory results.

#### **5.4. Discussion of results**

1. The empirical exercise enables us to verify that figures for the demand for care may be substantially different if, from a methodological perspective, distinct hypotheses are assumed. Determining the demand for care is relatively simple to do, although the market's equilibrium may be altered in a more or less subjective fashion, depending on the concept established in relation to the corresponding supply.
2. Different levels of investment in care and supply of care might therefore coexist within the same period and in response to the same level of demand, depending on the definition of the care supply variable.
3. To consider that the entire active population provides the supply of care distances us from the practical reality and clearly underestimates the role of women in the sphere of care.
4. By including assumptions in the empirical analysis that approximate to reality — specifically, that care is carried out fundamentally by women who do not participate in the labor market— we arrive at a more accurate analysis of the phenomenon and are accordingly able to understand and quantify the contribution of unpaid workers to collective, individual and family welfare.

5. The degree of linear association between employment and demand for care is weakly positive at the worldwide level, the effect of the determining component of this econometric focus being statistically significant. Independent demand and female employment help to explain the pattern of demand for care.

## 6. Conclusions

- The new demographic order will generate an increased burden of the non-active population as a consequence of population aging and will reduce the capacity to tackle that burden by putting the brakes on job creation. In the medium term, the negative effects on productive capacity will become perceptible.
- The attainment of full employment is very important for men and women since it contributes to wealth generation and the consolidation of levels of social stability. Nevertheless, access to the labor market differs from person to person, although these heterogeneous patterns are gradually and progressively tending to disappear.
- The incorporation of women into the labor market has taken place without men having accepted their participation in the domestic and care sphere.
- Maintenance of productive capacity will require an increase in the participation of the active population, and in particular, of the female population.
- The time that women devote to the domestic sphere influences and determines the supply of time that may be spent in the paid labor market. The distribution of this resource will affect the demand for care. Greater participation in the labor market will have negative effects on fertility indicators, contributing to the reduction in demand for care by the lower cohorts of the pyramid. The process of population aging will contribute to the increased demand for care centered on the older aged cohorts. The reduction in supply given over to care as a consequence of the dynamization of the labor market will be an element that generates uncertainty in performing the function of care.
- Care will be intensified and centralized in the higher groups of the pyramid, coexisting with a situation of decrease and stabilization of the care supply.

To counteract the effects of population aging the organization of measures that manage to arrest the fall in fertility rates will be unavoidable, and this will depend on women deciding to have children. The incorporation of women into work without men contributing to domestic work explains the fertility rates that, in the long term, will determine dependency rates.

## 7. References

- DOMÍNGUEZ SERRANO, M. *Unpaid care work in Africa*, Bilbao: Fundación: BBVA (2012).
- DURÁN HERAS, M.<sup>a</sup> Á. *Los costes invisibles de la enfermedad*. 2nd edition. Bilbao: Fundación BBVA (2002).
- \_\_\_\_\_. “El trabajo no remunerado y las familias”. *Revista Jurídica de Igualdad de Oportunidades entre Hombres y Mujeres*, 17 (2005):. 47-59.
- \_\_\_\_\_. *Unpaid work in the global economy*, Bilbao: Fundación BBVA (2012).
- DURÁN HERAS, M.<sup>a</sup> Á. and V. MILOSAVLJEVIC. *Unpaid work, time use surveys, and care demand forecasting in Latin America*, Bilbao: Fundación BBVA (2012).
- GARCÍA DÍEZ, S. *Childcare in Europe: A reflection on the present economic approach* , Bilbao: Fundación BBVA (2012).
- UNITED NATIONS. *World Population Prospects: The 2008 Revision*. New York: Department of Social and Economic Affairs, 2009a. <http://esa.un.org/unpp>.
- \_\_\_\_\_. *Millennium Development Goals Indicators*. New York: Department of Social and Economic Affairs, 2009b. <http://unstats.un.org/unsd>
- INTERNATIONAL LABOUR ORGANIZATION. *Global employment trends for women: March 2009*. Geneva: ILO, 2009. <http://www.ilo.org/publns>:
- ROGERO GARCÍA, J. *Regions overburdened with care: Continental differences in attention for dependent adults*, Bilbao: Fundación BBVA (2012).

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