DEMOGRAPHIC RESEARCH

Research Article

Regional child care availability and fertility decisions in Spain

Pau Baizán

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Abstract

In this paper I explore two hypotheses: (1) Formal childcare availability for children under 3 has a positive effect on fertility; and (2) Formal childcare availability has different effects across contexts, according to the degree of adaptation of social institutions to changes in gender roles. Event history models with regional fixed effects are applied to data from the European Community Household Panel (1994-2001). The results show a significant and positive effect of regional day care availability on both first and higher order births, while results are consistent with the second hypothesis only for second or higher order births.

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1. Introduction

A growing body of research points to the crucial role of the social context, and in particular certain institutions such as parental leave policies, labor market arrangements, and access to affordable childcare, in allowing the combination of childrearing and employment. The Spanish context is characterized not only by low day care availability overall, but also by important regional differentials in fertility and female labor force participation. Furthermore, during the last few decades, labor force participation of women and the proportion of children under 3 in childcare have increased substantially, while fertility has shown only small increases at the aggregate level since the mid-1990s.

The specification of relationships between these variables form the core of the existing theoretical arguments that support the hypothesis that childcare availability has a positive effect on fertility, since day care is presumed to influence principally through reducing the conflict between labor force participation and childrearing (e.g. Ermisch 1989; Bernhardt 1993). In spite of well-founded theoretical arguments, previous empirical studies focusing on the association between availability of childcare services and fertility have provided inconsistent findings (e.g. Kravdal 1996; Hank and Kreyenfeld 2003; Andersson, Duvander, and Hank, 2004; Del Boca 2002; Rindfuss et al. 2007). According to Rindfuss et al. (2007), these mixed findings may be due to the false assumption that childcare is an exogenous variable with respect to fertility. Yet the coverage rate of day care may to a certain degree be endogenous to fertility and other (unobserved) characteristics of a given place, such as particular values, income, or labor force participation. This may be particularly the case in countries, such as Spain, with large regional variations in fertility, female employment rate, and day care coverage for children under 3 (in Spain, some regions have provisions of less than 5%, while others have currently reached nearly 45%). This study's focus is on the years 1993-2000, a period in which enrolment between ages 3 and 5 were essentially universal, while the coverage rate for children under 3 was (and still is) very heterogeneous at the regional level, and where enrolment for the latter age group increased rapidly in some regions, in connection with particular regional policies.

The results obtained show a significant and positive effect of regional day care availability on fertility. This result is robust to several specifications of the model with respect to individual as well as regional variables.

2. Fertility and childcare

Different theoretical perspectives, including those of welfare regimes perspectives, neoclassic economics, and theories of cultural norms and individual values, offer insight into the link between childcare and fertility. A brief discussion of some key arguments of these approaches may be useful to evaluate how childcare availability can be related to fertility, and particularly in which situations it may matter most. As will be explained, all these theoretical perspectives basically lead to the hypothesis that an increased level of regional availability of childcare should lead to higher fertility at the individual level.

Research on the impact of welfare regimes on individual life courses state that institutional variation provides an explanation for cross-country variations in the relationship between women labor force attachment and fertility (Esping-Andersen 1999; Mayer, 2001). They point to the important mediating effects of the availability of childcare, among other variables, in explaining such cross-national variation. This institutional feature is part of a larger "regime" of welfare, in which different elements do not vary randomly, but form part of qualitatively different systems of welfare. Individual countries cluster in each of the regimes. Thus, a characteristic of the "conservative" welfare states, in particular the Southern European version of this type of welfare state[2], is their "familialism", consisting in the internalization of welfare responsibilities by families (Orloff 1996; Saraceno 1996). Apart from the important exceptions of the health care and educational systems, the welfare state is largely an income-transfer system, and is only marginally dedicated to provide services to families. This kind of welfare state basically assumes that married women are housewives who can care for their children, and thus provide little support in the form of public funding for childcare. In fact, the existing public childcare services are mainly considered to serve educational purposes and only to provide childcare as a secondary goal (Eurostat 2002). These Southern European welfare regimes also have a strongly regulated labor market that focuses its support in a "family wage" and creates several impediments to part-time jobs.

However, several of these prototypical characteristics of the Southern European welfare state have eroded considerably in Spain in the last few decades. Several reforms have taken place, including a partial de-regulation of the labor market, an increase in social services, changes in family policy (e.g. an increase in family benefits, extension of parental leave), and an important expansion of the childcare system (see below) (de Polavieja 2003; Arriba and Moreno 2005; Azmat and González 2008).

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[2] One could argue that these welfare regimes are partially the outcome of long standing cultural patterns and path dependency (Mayer 2001), and therefore endogenous to the choices of individuals in the population.

Nevertheless, there is substantial variation among different regions regarding some of these changes, partly related with the political decentralization of the country.

Parallel to the above, an important increase in labor force participation of women has taken place, in particular of those with small children (Figures 1 and 2). Current proportions are close to those prevalent throughout west European countries, with the particularity that the large majority of jobs are full time, including the jobs of mothers (Rubery, Smith, and Fagan 1999). Cross-country comparisons have found that an institutional adaptation to the higher labor force participation of mothers is the expansion of (formal) non-parental childcare. There are signs of a similar evolution in Spain, as larger increases in childcare coverage have taken place in regions with high participation rates for women. Furthermore, the highest increases in total fertility rate have taken place in regions with a relatively high female participation rate (Figure 3)[3]. As is known, Spanish TFR reached its lowest level in 1998 (1.16) and eventually this indicator recovered up to 1.39 in 2007 (Figure 6). The largest increases during the 1990s and early 2000s took place in areas that previously had the lowest fertility rates, already late age fertility patterns, and better economic performance.

Figure 1: **Women's labor force rate (age 25-49) by number of children and age of the youngest child in Spain and the EU-12 (1987-2005)**
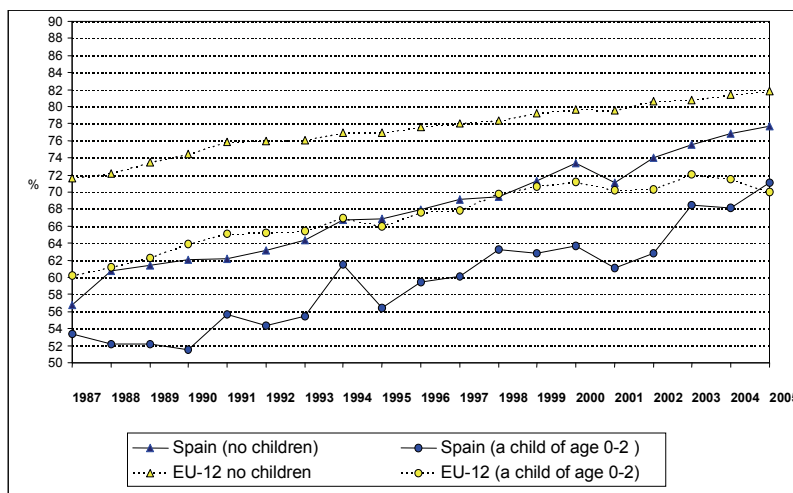
Source: Data from Labor Force Surveys, Eurostat, second trimesters (http://epp.eurostat.ec.europa.eu/; at 18/10/2006). EU-12 includes Belgium, Denmark, Germany, Greece, Spain, France, Ireland, Italy, Luxembourg, the Netherlands, Portugal and the United Kingdom.

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[3] Rosina and Del Boca (2007) made similar graphs for Italy and found even more striking results.

Figure 2: **Women's labor force participation (age 16-64), in 2000**

Spanish regions (Comunidades Autónomas)

	33.75 - 36.19
	36.19 - 38.03
	38.03 - 41.15
	41.15 - 42.12
	42.12 - 46.32
	46.32 - 48.24
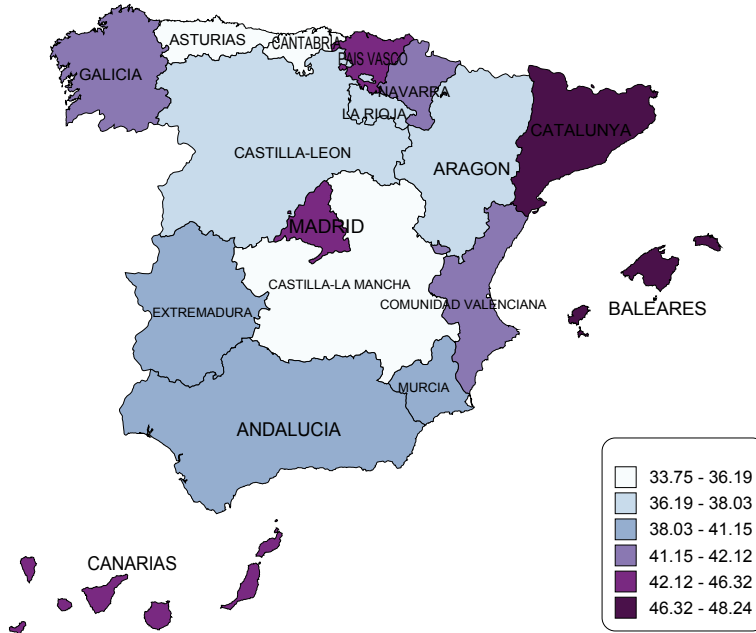
Source: Instituto Nacional de Estadística, 2009

So far, however, the increase in fertility rate above age 30 has slowed but not reversed cohort fertility decline. At the same time, some regions that had previously the highest fertility rates, continued to decline in TFR or only showed smaller increases.

More crucial for this analysis, the largest regional increases in TFR are taking place in regions with relatively high availability of formal childcare and where the increases in formal childcare have been more substantial. Nevertheless, the relationship between these two indicators is far from perfect (Figure 4 and 5). These changes seem to point to a regionally differentiated transition in the care regime, where care arrangements and other institutions in society gradually adapt to the ongoing reconfiguration of gender roles (Hochschild 1989; Gershuny 2000; McDonald 2000).

Figure 3: **Change in TFR and female labor force participation in Spanish regions**
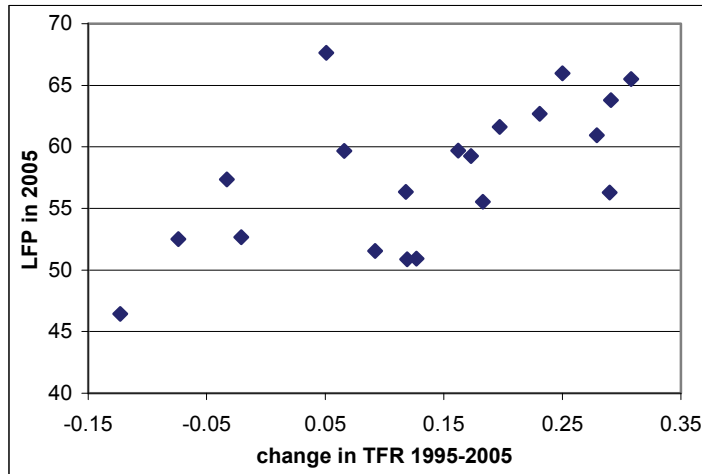
Source: Data from the Instituto Nacional de Estadística, 2008 (www.ine.es).

Figure 4: **Change in TFR and formal childcare coverage in Spanish regions**
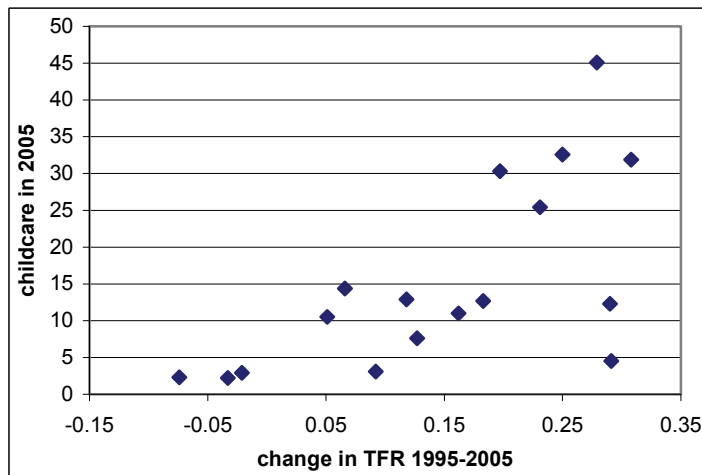
Source: Data from the Instituto Nacional de Estadística 2008 (www.ine.es).

Figure 5:   **Proportion of children 0-2 enrolled in formal childcare, 2000**

Spanish regions (Comunidades Autónomas)
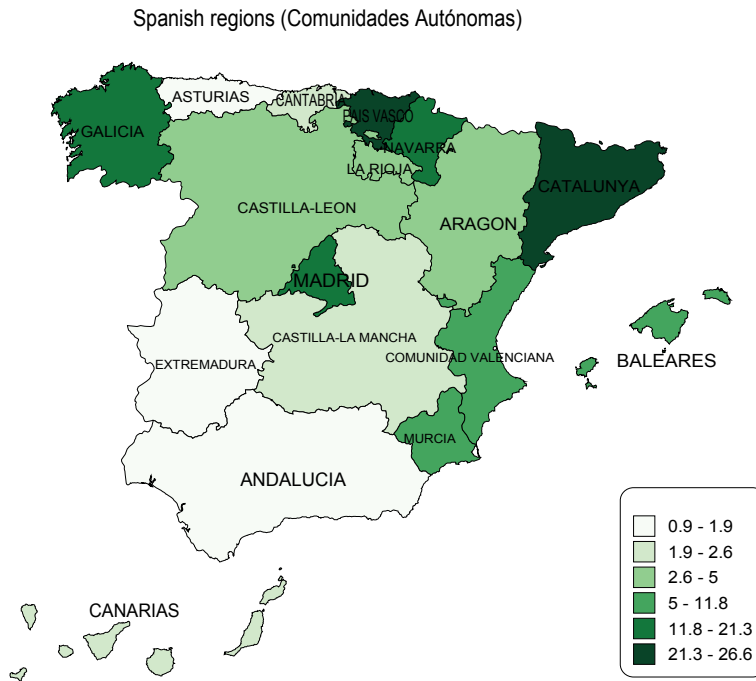
Source: Spanish Ministry of Education (2008)

The arguments stated so far have a counterpart at the individual level, where the increased availability of non-parental care should diminish the existing negative relationship between paid work and fertility. The standard microeconomic model of fertility assumes a joint household utility function in which decisions about participation, care, fertility, and child "quality" are closely interrelated, and are the result of a calculation of costs and benefits (Becker 1981; Cigno and Ermisch 1989; Hotz, Klerman, and Willis 1997). In this framework, the availability of affordable non–parental care would reduce the opportunity costs of childbearing and child rearing for women. It can then be expected that the availability of non-parental care is positively associated with fertility and its timing, and several authors have empirically found a connection between these variables (Del Boca 2002; Rindfuss et al. 2007).

Figure 6:   **Total fertility rate in 2000**

Spanish regions (Comunidades Autónomas)
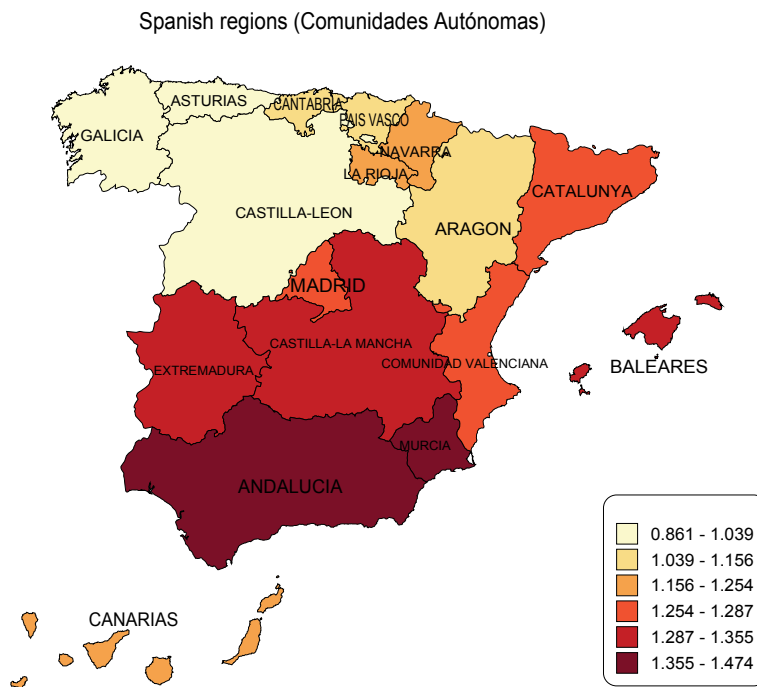
The effect of non-parental care or working time regulations are examples of how social institutions influence the options available to individuals, modifying the expected effects of the microeconomic model of fertility (Folbre 2004; Del Boca and Locatelli 2007). In particular, public policies help shape the context in which individual (or household) decision-making takes place, by providing incentives or disincentives to certain behaviors, and by influencing behavioral norms. Different combinations of policies in domains such as tax, labor market, gender, care, and family, can reduce (or increase) the cost of children (Gauthier and Hatzius 1997). Although some policies might reinforce the caring role of women, they can potentially be designed to support men who wish to do active fathering, for instance, through a reduction of standard working hours or alternative kinds of fathers' leave (Gornick and Meyers 2003). Other labor market arrangements have also been found to be crucial for fertility, such as policies dealing with temporary jobs and job security, working time regulations,

unemployment benefits, the ease with which women return to the labor market after an interruption, or the availability of protected public employment (Aaberge, Colombino, and Del Boca 2005; Baizán 2007). Therefore, the interactions between policies and between policies and particular structural contexts should be considered. The opportunity costs of childbearing will be greater where social institutions do not facilitate the combination of parental and worker roles. These differences may be an important part of the explanation of the fertility differentials between southern European countries and the Nordic countries (Kohler, Billari, and Ortega 2006). By the same token, differences in social institutions and policies may by relevant in explaining regional differences in Spain.

In particular, the availability of subsidized childcare should influence participation and fertility decisions, by reducing potential wage losses and earnings depreciation. At the same time, childcare availability may induce some women to enter (or remain) in the labor market; and being in the labor market could lead to a reduction of their fertility. But for a majority of young women already present in the labor market, as is the case in most European countries, affordable childcare should lead to an increase of their fertility. Other things being equal, the overall effect on fertility of the availability of non mother childcare will depend on the proportion of women in the labor market: if a majority of women participate, its aggregate effect should be to increase fertility. In addition, an increase in labor force participation of women will reduce the available pool of informal caregivers in a society, further exacerbating the childcare deficit. Therefore, when a majority of women in a society participate in the labor market, formal day care will enhance the compatibility between paid work and childrearing.

Several sociological perspectives also emphasize the importance of role compatibility on fertility decisions in contemporary advanced countries, within contexts marked by the increased prevalence of values of individual autonomy and gender equality (Lesthaeghe 1995). In these societies, most women are socialized to expect that they will have a role as an individual beyond any family role they may have (Alwin 1996; Alberdi 1999). At the same time, children continue to be valued for their emotional and social benefits, since they are "economically worthless, but emotionally priceless" (Zelizer 1985); although it is acknowledged that they are an economic drain (Caldwell 1982). As a result, a majority of women in Western societies place a high value in both labor force participation and parenthood, while only relatively small minorities of women attach a strong priority to either maternity or labor force achievement (Hakim 2000; Pfau-Effinger 2004). It is precisely because most women value both labor force participation and parental roles, that they face a dilemma if they perceive them as mutually incompatible. In such a situation, childcare availability can reduce the role of incompatibility and raise fertility levels.

Furthermore, if men and women's family values and attitudes about gender roles shape fertility behavior (Bernhardt and Goldscheider 2006), then these are themselves closely linked to the prevalent care regime and gender arrangements (Pfau-Effinger 2004; Bettio and Plantenga 2004; Lewis 1998). This suggests that the percentage of children in day care may be correlated to other contextual variables, such as labor force participation, norms on the acceptability of childcare by non relatives and family obligations (e.g. a grandmother's obligations towards her grandchildren), gender equality norms, or the degree of flexibility in working time arrangements. In a context of difficult compatibility between labor force participation and childrearing, like that which has been prevalent in Spain in the last few decades, increases in labor force participation may lead to postponement and reduction of childbearing. But the continued expansion of the availability of formal childcare (stimulated by the demand created by the increase in participation) reduce this incompatibility, allowing for increases in fertility. In addition, the effect of more women in the labor market may be more important than a simple compositional effect, as it may contribute to changing the norms about care. For instance, if the acceptability of formal childcare for children under 3 in a region is high, fewer women will withdraw from the labor market in connection with maternity and the effect of formal childcare availability will be stronger than in regions lacking this norm. It can be assumed that an extended provision of care facilities has a positive impact on the transition to a birth in regions where it is widely accepted that working mothers send their pre-school children to formal childcare. In regions where social acceptance for formal care arrangements is low, the formal care system is less relevant in individuals' childbearing decisions.

The theoretical models mentioned above suggest that the availability of childcare services enhances compatibility between paid work and parenthood and, at the same time, favors gender equity within couples through a de-familiazation of caring labor. Therefore, one expects that an increase in the availability of childcare services should have a positive effect on births. In addition, an increase in the availability of childcare could also have an "indirect" effect on fertility, by its influence on norms about the combination of childrearing and paid work. The arguments above also suggest that the effect of an increase in the availability of formal childcare will be more important in contexts (regions) where other social institutions and arrangements have more consistently adapted to changes in gender roles, and in particular where a majority of women participate in the labor market. Furthermore, if the deployment of childcare services across regions is not random, but is in fact related to certain characteristics that simultaneously influence fertility (like a different organization of care and employment), then these two variables will be endogenous, and the modeling strategy must take this into account.

3. Childcare system

Consistently with the predictions derived from the "welfare regime" perspective, in Spain the coverage of formal childcare services for infants aged less than 3 years is low: only 16.9 % of children aged 0 to 2 years had access to childcare services in 2005, while the corresponding figure for 1993 was 5.2 % (Ministry of Education 2008). In contrast, educational enrolment is close to universal for the 4-5 age group (99.0 % in 1993), while the enrolment ratios for age 3 were 53.0% in 1993 and 98.8% in 2005. The percentage was close to universal by the mid-1990s in several regions. Here these enrolment ratios refer to formal childcare during the official timetables; after school care and non-registered day care centers are not included in the figures. In fact, since 1983, when the Law of Education was issued, day care centers have been progressively included, through established curricula and quality requirements, in the general education system (González López 2003).

Childcare services in pre-primary schools are provided by both public and private sectors. The private sector accounts for 57 % of enrolment for children under 3, while the public sector is largely dominant for the 3-5 age group (69 %). Note, however, that public subsidies contributed to the financing of the private sector to some extent[4]. While the quality of publicly provided childcare services is generally high in terms of staff qualifications and child to staff ratio, and parents pay a fraction of the real cost of the services, there are only a limited number of slots available. Furthermore, opening hours of childcare centers in the public sector are typically too limited to combine with a full time job[5]. It can be argued as well that long and inflexible work timetables in most jobs are responsible for the mismatch. Characteristics of the childcare provided are much more heterogeneous in the private sector, although opening hours are often longer and parents face higher costs. Parents who cannot access a public childcare slot, either because of long waiting lists or because it is located too far away, may find a private sector slot available of satisfactory quality. Nevertheless, private services might be too expensive for lower income groups and, as is the case for public childcare, its availability is very uneven. Increasing quality requirements may have hindered the expansion of the private sector to a certain extent (González López 2003).

As has been argued for several other European countries with heavily regulated childcare provision, where public provision and subsidizing are important, the availability of childcare should be of crucial importance in fertility decisions, while its

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[4] In addition, during the 1990s, parents had access to income tax deductions that covered part of the costs of formal childcare (Azmat and González 2008).

[5] Typically, public day care centers open on weekdays, from 9am to 5pm (sometimes from 8am to 6pm), while private day care centers often open from 7am to 8pm. Therefore, often care provided by these centers is complemented by the help of a private child-minder or a grandmother (Fernández Cordón and Tobío Soler 2005).

price may be less so (Hank and Kreyenfeld 2003; Del Boca 2002). Furthermore, some evidence exists that in the context of southern Europe, informal care arrangements predominate (Nicodemo and Waldman 2009). In particular, certain studies point to the crucial role of grandmothers, not only as main providers of non-parental care, but also to supplement formal arrangements during school holidays and to bridge the timetables of parents and children (Fernández Cordón and Tobío Soler 2005).

Table 1:   Percentage of children 0-2 enrolled in formal childcare

NUTS 1 region or Autonomous Community	1993	1994	1995	1996	1997	1998	1999	2000	2007
North West	3.41	4.1	4.8	5.5	6.2	6.8	7.6	8.31	16.2
Galicia	4.8	5.8	6.8	7.8	8.8	9.8	10.8	11.8	17.6
Asturias	0.7	0.8	0.7	1.2	1.1	1.1	1.9	1.8	10.5
Cantabria	1.1	1.3	1.5	1.5	1.5	1.5	1.5	1.9	19.2
North East	3.7	5.4	7.3	8.7	9.9	11.2	12.3	13.5	37.0
País Vasco	4.5	7.8	11.6	14.0	16.1	18.3	19.9	21.3	48.1
Navarra	4.7	5.9	7.1	8.3	9.5	10.7	11.9	13.1	27.3
Aragón	2.5	1.9	1.6	1.8	1.6	2.0	2.5	3.3	30.4
Rioja	0.8	2.3	2.3	2.5	2.2	2.1	2.2	2.6	6.4
Center	1.1	1.3	1.2	1.5	1.6	1.7	1.8	2.1	6.4
Castilla y León	1.5	1.7	1.6	1.7	1.7	1.9	2.4	2.9	12.3
Castilla-La M.	1.0	1.0	1.0	1.6	1.8	2.0	1.8	2.1	2.5
Extremadura	0.6	0.9	0.9	1.0	1.1	1.1	1.2	0.9	2.7
Madrid	4.7	5.8	6.3	6.7	7.7	9.6	12.4	13.8	35.8
East	13.8	14.4	14.5	14.9	15.2	15.4	16.0	16.9	24.5
Cataluña	19.9	21.8	23.8	24.5	24.6	25.0	25.5	26.6	33.1
Baleares	2.4	3.1	4.1	4.1	5.4	5.5	5.4	6.5	11.2
C. Valenciana	7.2	5.9	3.1	3.1	3.6	3.5	4.3	5.0	14.6
South	0.7	0.9	1.3	1.4	1.4	1.8	1.8	1.9	8.0
Andalucía	0.6	0.6	0.7	0.7	0.7	0.9	0.9	1.0	6.6
Murcia	1.5	1.5	3.0	5.1	6.0	6.2	7.1	7.7	16.1
Islas Canarias	1.3	1.3	1.5	1.5	1.7	2.4	2.2	2.2	*
Total	5.2	5.5	5.8	6.2	6.6	7.3	8.0	8.9	19.9

Source: Ministry of Education (2009; www.mec.es). Data on each Comunidad Autónoma was grouped, when necessary, into NUTS 1 regions, according to their population of children 0-2. NUTS 1 region refers to the standardized classification of the Statistical Office of European Communities. Since figures for each year were not available for Galicia and Navarra, several data has been interpolated. * not available.

Another important feature of the day care system in Spain is its strong regional variability, which in part derives from the fact that regions are responsible, together with municipalities, for social services and educational services. As can be observed in Table 1, the last two decades have witnessed an important expansion of the coverage rate of day care centers. The average proportion of children under 3 enrolled in

preschool education was 5.2 % in 1993-94, 8.9% in 2000-01 and 19.9% in 2007-08[6]. Yet, it should be noted that in the regions of the south and the center of Spain (excluding Madrid) the development of day care centers has been very slow (for instance, the coverage rate was 6.6% in Andalusia in 2007-08, while in the Basque Country it reached 48.1% in the same year).

4. Data sources and methods

The individual level data used for the analyses are from the Spanish sample of the European Community Household Panel survey (ECHP). This data source has several features that make it suited for the purposes of the paper, as well as several limitations. The longitudinal design of ECHP makes it possible to follow up and interview the same set of private households and persons over several consecutive years. It thus supplies data on all household members in a dynamic way. The ECHP offers detailed data on fertility and partnership careers, and particularly on the labor market trajectories of each member of the household. For instance, it contains monthly data on labor force status, yearly income of each member of the household, the educational level attained, and health status. The first wave of the survey took place in 1994, and the panel was stopped after the 2001 wave. Although most of the data refers to the wave year or the previous year, the survey also offers a limited amount of retrospective information.

The levels of attrition are similar to those of other panel surveys (Watson 2002; Eurostat 2001). For the Spanish sample, out of an initial sample size of 17893 individuals, 44.7 % are attritors, i.e. individuals who, at a certain wave, left the sample forever, while 10.8 % are returnees (individuals who were missing in one or more intermediate waves and answered later on). However, this rate of attrition would only be problematic if it were correlated with the outcome studied. Several studies have analyzed in detail the nature of attrition in the ECHP with respect to a wide range of variables, including age, sex, income, marital status, number of children, activity status, among others (Watson 2002; Gallo, Mastrovita, and Siciliani 2004). These studies conclude that the impact of attrition on sample structure is small, including the Spanish sample, and that it is not likely to lead to significant bias in the analyses. Although none of these studies focus specifically on fertility, it appears that individuals with children have significantly lower probabilities of dropping out from the panel. These studies also show that married individuals have lower probabilities of attrition, and that individuals living in high income households show somewhat higher probabilities of attrition in Spain. The only characteristic that has a strong impact on attrition is previous

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[6] The rate of expansion of day care provision may be somewhat overestimated, because of deficiencies in the statistics, which have been gradually improved and standardized (González López 2003).

geographic mobility of the individual. Nevertheless, geographic mobility in Spain is very low and concerns only a small fraction of the sample[7]. Using data from the ECHP, Tatsiramos (2004) estimated that only 0.53 % of individuals in the Spanish sample migrated inter-regionally. Given that the regions studied are relatively large and the fact that an important fraction of inter-regional migration is work-related, it is very unlikely that parents-to-be would migrate to another region just to find a childcare service (if that were the goal of migration, migrating within a region would be much less costly). Therefore, the possible bias arising from the endogeneity of migration with respect to the main variables analyzed in this paper should not significantly affect the results presented here.

For this paper, I studied women born between 1957 and 1978 (i.e. they were between 16 and 42 years of age during the panel years), from January 1993 to December 2000, with at least one valid interview[8]. This resulted in a sample of 4303 women (11 cases were excluded because no information on the region of residence was available). The analyses were performed on 3080 first birth spells leading to 598 first births. In the case of second and higher order births, only women living in a partnership (marriage or cohabitation) were included, resulting in a sample of 2189 spells (of which 1077 for second births, 891 for third births, and 221 for higher order births), and 545 births. Censoring may occur if: the woman reaches the end of the year 2000; drops-out from the survey; or, for 2nd or higher order births, in case the woman divorces or separates from her partner, whatever comes first. Left censoring is avoided by including the age of the women (for first births) or the age of a previous child in the baseline (for 2nd + births); however, the period before the individual enters the panel is not included in the computations (Guo 1993).

The dependent variables of the analyses are the transition to a first birth or to a higher order birth. However, I backdate the date of birth by nine months, to approximate as much as possible the conditions of the woman when she decided to have a child, and to avoid reverse causation, i.e. the change in the values of the variables (for instance, labor force status) as a consequence of a pregnancy.

An important independent variable in this study is the woman's labor force status. I construct this variable using the monthly calendar of activities. These answers indicate the main activity performed by the women each month during the previous calendar year, i.e. student, working in the labor market, unemployed, not in the labor market. A key dimension of the Spanish labor market is the type of job contract, as individuals with a temporary contract suffer a high risk of unemployment. Therefore, a distinction

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[7] Several studies show that internal migration and residential mobility in Spain is among the lowest in Europe (Antolin, and Bover1997; OECD 2000; Recaño and Cabré 2003). These rates are particularly low for individuals in a union (married or cohabiting), parents, and homeowners; while they are much higher for the highly educated, and young individuals no longer living in the parental home (Baizán 2002).
[8] The minimum age to enter the panel is 16.

was made among the employed individuals according to the type of contract they held (permanent/temporary) or whether they were self-employed (thus, this dimension has to be interpreted together with the "activity status" variable, where the reference category are individuals with a permanent contract). I had also included an indicator for private or public sector, since public sector employees often enjoy work conditions that are more easily compatible with childrearing. However, this was dropped from the final models, as it did not result in significant differences.

The partner's income level may provide an indication of the capacity of the household to meet the expenses of a newborn, and can be considered as exogenous with respect to fertility (unlike women's income). The respondents to the ECHP were asked to provide their individual earnings during the calendar year preceding the interview. In order to make answers comparable through time, I deflated the earnings by using International Labor Organization price index information (base year: 1992). And in a second step, I classified the gross incomes into three groups: low (less than 33.3 of the men's earnings distribution), middle income (from 33.3 to 66.6), and high income (more than 66.6 of the distribution).

The ECHP provides very basic information concerning the level of education, classifying into only three levels: low, corresponding to less than second stage of secondary education (ISCED levels 0-2); higher secondary (ISCED level 3); and tertiary education (ISCED levels 5-7). Moreover, this information was only asked in the first wave the individual entered the panel, and was not updated until 1997. Finally, individual date of birth information allows the creation of the variables "age" and "age of the youngest child", updated each month.

Crucial to this analysis, the ECHP identifies the individual's region of residence in each wave. This feature makes it possible to link individual level information with other data sources at the regional level. Unfortunately, information is provided only at a relatively low level of desegregation, i.e. according to the European Union standardized classification of regions, NUTS, at level 1. Sometimes this level corresponds to administrative regions (Comunidad Autónoma), but is more often a grouping of neighboring Autonomous Communities. Seven regions have been studied. The large size of the regions suggests that the actual availability of childcare is heterogeneous across households belonging to the same region[9]. This also implies that the effects of childcare will be underestimated statistically (see below).

The regional level indicator of the availability of childcare utilized is the percentage of children 0-2 enrolled in formal day care out of the total children of that age. In most of the models presented below, this variable was measured as a continuous

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[9] Ideally, one would be able to know the availability of childcare for particular households in geographical areas within a daily commute. However, in that case, the possible endogeneity of migration behavior with respect to fertility would become much more relevant than in the present study.

variable; this specification was preferred since the number of regions studied is only seven, and thus a risk of collinearity exists with the values of the childcare levels. Nevertheless, in Model 5 and 6, a categorical specification was tested, with 4 categories: less than 4% of coverage, from 4% to 8%, from 8% to 12%, and 12% or higher. This data was obtained from the Ministry of Education[10]. This is not an indicator of availability of childcare strictly speaking, but rather use of childcare; however, as argued in the previous section, since childcare is severely rationed, it is safe to assume that it reflects available day care opportunities in each region. The regional level women's labor force participation rate was included in some of the analyses, available from the National Institute of Statistics.

The empirical approach uses an event history model with fixed regional effects. Regional dummy variables are included in order to capture time invariant unobserved characteristics at the regional level, such as norms concerning childcare and fertility, and particularly the placement of childcare centers. Furthermore, in a multi-level model with random effects, it would be assumed that the error term is uncorrelated with the percentage of children enrolled in preschools and the other independent variables included (Goldstein 1995; Allison 2005). However, as explained above, the placement of childcare centers may in fact be endogenous to other (unobserved) regional characteristics that also affect fertility, leading to biased estimates (Angeles, Guilkey and Mroz 2005). Therefore, a fixed-effects approach was implemented.

In order to statistically control for the possible effects of selection into a specific birth order, I have used a simultaneous equation approach, in which the equations for first births and second or higher order births have been estimated jointly. The formulation for this hazard model is:

$$
\begin{cases}
\ln h_i^{\,B1}(t) = \gamma'T(t)_i + \beta' X_i(t) + \varepsilon_i \\[2mm]
\ln h_{ji}^{\,B2}(t) = \gamma'T(t)_{ji} + \beta' X_{ji}(t) + \varepsilon_i
\end{cases}
$$

where $ln\ h_{ji}(t)$ is the log of the rate for spell j belonging to individual i at time t for the first births process (B1) and the second or higher order births process (B2) respectively. The effect of duration, denoted by $\gamma'T(t)_{ji}$, is measured in months on the hazard rate. Duration dependence is modeled with piecewise linear splines (also known as the Gompertz model or piecewise linear exponential model). Piecewise linear splines are used to approximate continuous functions (such as a baseline hazard or a non-proportional relative risk), by using functions that are linear within each (possibly open-

---

[10] Data on each Autonomous Community was grouped, when necessary, into NUTS 1 regions, according to their population of children aged 0-2. Since information on the provision of childcare was not available for every single year in Galicia and Navarra, information for missing years was interpolated.

ended) interval. Those linear functions are connected at points in time that are decided *a priori*: piecewise linear splines are then also continuous functions. Representing a vector of independent (time-varying or fixed) variables is $X_{ji}(t)$, and β denotes the value of the estimated coefficients of the model for every variable. Lastly, I include a random term ε_i, in order to capture unobserved heterogeneity at the individual level, which is assumed to follow a normal distribution.

A different specification was also performed in order to address the issue of the possible endogeneity of the processes of labor market participation and fertility. Labor market participation decisions may be jointly determined by fertility intentions, for instance as a result of the existence of norms and values concerning labor force participation and family building, and may be related to the extent to which the roles of mother and worker are compatible. In this respect, the strength of the correlation between fertility and participation process could be connected to the incompatibility between them. In contexts where incompatibility is highest, women determine their behavior in the two domains jointly, whereas in contexts with higher compatibility, decisions concerning labor market and fertility may be more independent from one other. Thus, in order to deal with the possible endogeneity of labor force participation and fertility, it is included in a third equation. The additional equation is specified as a logistic regression in which the dependent variable reflects whether the woman is participating or not in the labor market in each of the survey waves. Periods in which the woman is enrolled in education are excluded from the analysis (this exclusion only applies to the last equation that deals with labor force participation).

$$
\begin{cases}
\ln h_i^{\,B1}(t) = \gamma' T(t)_i + \beta' X_i(t) + \varepsilon_i \\[2mm]
\ln h_{ji}^{\,B2}(t) = \gamma' T(t)_{ji} + \beta' X_{ji}(t) + \varepsilon_i \\[2mm]
\ln[P_{ij} / (1-P_{ij})] = \alpha + \beta' X_{ij} + u_{ij} + \delta_i
\end{cases}
$$

In the last equation, P is the probability of individual i participating in the labor market by observation (year) j, α is a constant term, X_{ij} is a vector of explicative variables and β denotes the value of the estimated coefficients of the model for every variable. A residual specific to each observation is u_{ij}, assumed to follow the logistic distribution with mean 0 on j for each individual i. Lastly, δ_i is a random (normally distributed) term specific to every individual, which has been included in order to account for the existence of heterogeneity among individuals related to variables not included in the model, as well as to account for the correlation of multiple observations belonging to the same individual. The random variables ε and δ capture unobserved heterogeneity, and are assumed to follow a joint bivariate normal distribution:

$$\begin{pmatrix} \varepsilon \\ \delta \end{pmatrix} \sim N\left(\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} \sigma_\varepsilon^2 & \rho_{\varepsilon\delta} \\ \rho_{\varepsilon\delta} & \sigma_\delta^2 \end{pmatrix} \right)$$

in which $\rho_{\varepsilon\delta}$ is the correlation between the unobserved heterogeneity terms of the two processes. The model estimation was performed using full information maximum likelihood, as implemented in the package aML (Lillard and Panis 2003).

As can be seen in the results (Table 4, in Annex), the correlations between the heterogeneity terms obtained are significant. This means that there are indeed selection effects not picked up by the variables included in the models. However, the coefficients obtained are substantively identical to the models that do not include an equation for labor force participation[11] for most variables, particularly those concerning the proportion of regional childcare coverage. The main exception is, logically, the labor force status of the women, for which being a housewife loses part of its effect and significance (with respect to being employed). Furthermore, the effect of childcare coverage on labor force participation is positive and significant in all the models computed, with a coefficient of 0.03 (Table 4c in Annex). This result is consistent with the theoretical arguments presented above and with previous empirical evidence for Spain (Baizán and González, 2007)[12]. For the sake of simplicity, the presentation of results that follows will only concern the simpler specification that does not include an equation for labor force status.

Table 2a: Multi-level estimation of the transition to a first birth

Individual level	Model 1		Model 2		Model 3		Model 4	
	Estimate	S.E.	Estimate	S.E.	Estimate	S.E	Estimate	S.E
Age (spline)								
16-23	0.222	0.047***	0.108	0.048**	0.102	0.048**	0.099	0.049**
23-28	0.256	0.034***	0.168	0.035**	0.166	0.035***	0.166	0.035***
28-32	0.040	0.042	-0.004	0.043	-0.003	0.043	-0.006	0.044
32-36	-0.150	0.072 **	-0.149	0.07**	-0.143	0.074*	-0.144	0.074*
36+	-0.578	0.223***	-0.592	0.225***	-0.614	0.226***	-0.612	0.227***
Educational level								
High	-0.043	0.116	0.038	0.119	0.026	0.121	0.023	0.122
Middle (ref.)								
Low	0.539	0.109***	0.261	0.113**	0.257	0.115**	0.265	0.116**

---

[11] The models presented in Table 2 have an identical specification as the models presented in Annex (Table 4), except that these last models include an equation for labor force participation. In this last equation the number of (person/year) observations is 19683 (5687 non active women and 13996 active women).
[12] A specification using whether the woman is working or not (instead of labor market activity) as a dependent variable, yielded similar results.

Table 2a: (Continued)

Individual level	Model 1 Estimate	Model 1 S.E.	Model 2 Estimate	Model 2 S.E.	Model 3 Estimate	Model 3 S.E	Model 4 Estimate	Model 4 S.E
Activity status								
Employed (ref.)								
Other inactive			0.340	0.132***	0.407	0.135***	0.416	0.137***
Student			-1.484	0.147***	-1.526	0.149***	-1.539	0.151***
Unemployed			-0.433	0.120***	-0.447	0.122***	-0.447	0.123***
Type of contract								
Permanent (ref.)								
Temporary			-0.419	0.154***	-0.428	0.157***	-0.425	0.159***
Self-employed			-0.011	0.232	-0.012	0.236	-0.021	0.239
Health status								
Good (ref)								
Bad			-0.786	0.213***	-0.792	0.215***	-0.786	0.217***
Missing			-0.344	0.10***	-0.290	0.106***	-0.249	0.112**
Regional level								
Childcare(percent)	0.055	0.027 **	0.073	0.030**	0.029	0.037	0.040	0.039
Women's labor force (percent)					0.083	0.039**		
Region NE (ref.)								
NW	0.329	0.180*	0.347	0.185*	0.228	0.196	-0.502	0.588
Madrid	0.017	0.192	-0.058	0.19	-0.262	0.216	-0.460	0.622
Center	0.622	0.253**	0.720	0.277***	0.836	0.285***	-0.038	0.685
East	-0.052	0.230	-0.246	0.238	-0.302	0.243	-3.337	1.681**
South	0.588	0.250**	0.682	0.275**	0.541	0.284	-0.198	0.510
Canary Islands	0.921	0.267***	1.069	0.287***	0.566	0.380	0.352	0.732
Childcare*NW							0.129	0.087
Childcare* Madrid							0.044	0.066
Childcare*Center							0.333	0.379
Childcare*East							0.217	0.113*
Childcare*South							0.441	0.264*
Childcare*Canary Is.							0.282	0.374
Constant	-6.273	0.410***	-4.562	0.449***	-7.314	1.382***	-4.2340	0.501***

Significance: '*'=10%; '**'=5%; '***'=1%.

Table 2b: Multi-level estimation of the transition to a second or higher order birth

Individual level	Model 1 Estimate	Model 1 S.E.	Model 2 Estimate	Model 2 S.E.	Model 3 Estimate	Model 3 S.E.	Model 4 Estimate	Model 4 S.E.
Age of youngest child								
0-1 years	1.603	0.424***	1.623	0.428***	1.611	0.429**	1.619	0.432***
1-4 years	0.150	0.065**	0.164	0.066**	0.181	0.067***	0.183	0.068***
4-6 years	-0.036	0.082	-0.025	0.083	-0.008	0.083	-0.004	0.084
6+ years	-0.126	0.033***	-0.124	0.033***	-0.126	0.033***	-0.125	0.034***
Age 16-33	-0.020	0.015	-0.030	0.015*	-0.028	0.016*	-0.029	0.016*
Age 33+	-0.156	0.037***	-0.166	0.038***	-0.161	0.038***	-0.161	0.038***
Second birth (ref.)								
Third birth	-1.577	0.125***	-1.602	0.127***	-1.633	0.130***	-1.631	0.132***
Fourth or higher birth	-1.433	0.198***	-1.430	0.202***	-1.473	0.206***	-1.465	0.210***
Educational level								
High	0.279	0.137**	0.238	0.145	0.251	0.148*	0.262	0.150*
Middle (ref.)								
Low	0.056	0.121	0.089	0.125	0.079	0.128	0.080	0.129
Activity status								
Employed (ref.)								
Other inactive			-0.026	0.129	-0.004	0.133	0.001	0.136
Student			-0.763	0.500	-0.779	0.516	-0.792	0.522
Unemployed			-0.176	0.154	-0.141	0.159	-0.142	0.162
Type of contract								
Permanent (ref.)								
Temporary			-0.339	0.225	-0.317	0.232	-0.312	0.236
Self-employed			-0.104	0.260	-0.107	0.266	-0.100	0.270
Partner's income								
Low or Middle (ref)								
High income			0.299	0.104***	0.299	0.107***	0.298	0.109***
Income missing			-0.179	0.551	-0.202	0.553	-0.199	0.572

Table 2b: (Continued)

	Model 1		Model 2		Model 3		Model 4	
Regional level	**Estimate**	**S.E.**	**Estimate**	**S.E.**	**Estimate**	**S.E.**	**Estimate**	**S.E.**
Childcare(percent)	0.060	0.028**	0.061	0.028**	0.125	0.037***	0.079	0.038**
Women's labor force (percent)					-0.099	0.037***		
Region NE (ref.)								
NW	-0.040	0.186	0.025	0.190	0.205	0.204	-0.234	0.580
Madrid	-0.026	0.196	-0.089	0.201	0.124	0.223	0.285	0.607
Center	0.475	0.260*	0.530	0.263**	0.456	0.272*	1.481	0.619**
East	-0.569	0.234**	-0.539	0.236**	-0.571	0.239*	0.641	1.845
South	0.491	0.256*	0.557	0.259	0.784	0.277**	1.313	0.457***
Canary Islands	0.146	0.279	0.261	0.285	0.944	0.385*	0.630	0.770
Childcare*NW							0.056	0.086
Childcare* Madrid							-0.044	0.068
Childcare*Center							-0.547	0.337
Childcare*East							-0.086	0.127
Childcare*South							-0.463	0.213**
Childcare*Canary Is.							-0.138	0.379
Constant	-3.555	0.604***	-3.428	0.624***	0.380	1.346	-3.717	0.686***
σ_{ε}	0.249	0.232	0.288	0.203	0.399	0.157**	0.419	0.154***
Log Likelihood	-6900.02		-6811.78		-6805.57		-6039.57	

Significance: '*'=10%; '**'=5%; '***'=1%.

5. Results

The results obtained from the analyses are presented in Table 2a and 3a for the process
of first births and Table 2b and 3b for second or higher order births. In these tables I
report the results for eight models, which include different sets of individual and
regional level variables. The first model includes several individual variables,
considered to be exogenous with respect to fertility, such as the level of education and
the birth order, as well as a set of dummy variables for the region of residence and the
proportion in childcare (Model 1). This last variable provides positive and significant
results, with a coefficient of 0.06 (or a relative increase of 6%) for each percentage
increase in the proportion of children in childcare, both in the case of first and higher
order births. This effect is substantively large, taking into account that the percentage of
increase in childcare coverage in certain regions has reached nearly 10% between 1993
and 2001, and by more that 20% between 2001 and 2007. This exceptionally large
effect of childcare is unlikely to apply to all possible increases in the values of

childcare, since it would lead to implausibly large increases in fertility rates[13]. More likely, this (linear) change in fertility rates with childcare increases is circumscribed to the range of childcare values actually existing in Spain during the period studied (1993-2000), but nothing guarantees that after a certain (unspecified) threshold this would continue to hold true. An alternative specification of the childcare variable, as a dummy variable indicating different levels of coverage, also provides significant and strongly positive results, that only slightly decline with higher values of childcare (Model 5 and 6). Thus, for instance, in the case of first births and Model 6, an increase in childcare coverage from very low levels (0-4 percent) to somewhat higher levels (4-8 percent) imply a significant coefficient of 0.68; for a coverage between 8 and 12 percent, the coefficient is 0.77; and for coverage proportions above 12 percent the result is 0.96. For second and higher order births the coefficients are 0.69, 1.06, and 0.57, respectively.

The results obtained for the other variables included in Model 1 are as expected. Thus, age follows a bell-shaped effect for first births, peaking at the ages 28-32, while it continuously declines for higher order births. In the equation for second and higher order births the "age of the youngest child" also follows a bell-shaped form, with the highest level around age 4. Women with a low educational level (less than higher secondary), have significantly higher rates of first birth, with a coefficient of 0.54; and in the case of higher parities, the highly educated show positive coefficients. This last result is in line with results obtained in several other countries (e.g. Kravdal 2001; Kreyenfeld 2002), and could be related to better possibilities for highly educated women to combine paid work and motherhood, and to the higher opportunity costs of prolonging interruptions in their work trajectories for these women[14]. The results for the regions fixed effects are consistent with the fertility levels and age at first birth for each region, as calculated from register data (Instituto Nacional de Estadística 2008). They show a higher fertility and younger age at first birth in the South, Canary Islands and the Center.

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[13] I thank an anonymous referee for this insight.

[14] This result refers to Model 1, in which the variable for labor force status is not included. Yet, when this last variable is included in Model 2, the effect of education is considerably reduced (first birth) or becomes insignificant (higher order births). These results reflect the fact that education is positively correlated with participation (see also the results for labor force participation, in Table 4c in Annex). In addition, education is related to job quality in Spain, in particular with job stability and with flexibility in working time (see e.g. Gallie 2007).

Table 3a: Multi-level estimation of the transition to a first birth

	Model 5		Model 6		Model 7		Model 8	
Individual level	Estimate	S.E.	Estimate	S.E.	Estimate	S.E.	Estimate	S.E.
Age (spline)								
16-23	0.241 ***	.047	0.128 ***	.048	0.220 ***	.047	0.102 **	.048
23-28	0.248 ***	.034	0.165***	.034	0.255 ***	.034	0.166 ***	.035
28-32	0.039	.042	-0.002	.042	0.044	.043	-0.003	.043
32-36	-0.142 **	.072	-0.140 *	.226	-0.148 **	.073	-0.145 **	.074
36+	-0.569 **	.223	0.067	.118	-0.590 ***	.223	-0.612 ***	.226
Educational level								
High	-0.009	.115	0.067	.118	-0.053	.117	0.030	.120
Middle (ref.)								
Low	0.531 ***	.108	0.280 **	.113	0.548 ***	.110	0.263 **	.114
Activity status								
Employed (ref.)								
Other inactive			0.402 ***	.130			0.414 ***	.134
Student			-1.395 ***	.143			-1.522 ***	.149
Unemployed			-0.397 ***	.118			-0.443 ***	.122
Type of contract								
Permanent (ref.)								
Temporary			-0.385 **	.152			-0.425***	.156
Self-employed			0.009	.231			-0.023	.235
Health status								
Good (ref)								
Bad			-0.795 ***	.212			-0.791 ***	.215
Missing			-0.416***	.097			-0.308 ***	.105
Regional level								
Childcare (percent)					0.032	.034	0.037	.035
0 to <4 (ref.)								
4 to < 8	0.803 ***	.169	0.676 ***	.166				
8 to < 12	1.079 ***	.319	0.766 **	.319				
>=12	0.926 *	.485	0.957 *	.545				
Period (Ref.=1993-96)								
1997-2000					0.132	.109	0.235 **	.114
Region NE (ref.)								
NW	0.156	.170	0.107	.166	0.259	.192	0.234	.195
Madrid	-0.575 **	.229	-0.560 **	.224	0.002	.195	-0.091	.195
Center	0.415 **	.166	0.354 **	.165	0.451	.293	0.448	.307
East	-0.397	.499	-0.543	.555	0.091	.263	-0.027	.265
South	0.404 **	.159	0.330 **	.157	0.412	.293	0.405	.307
Canary Islands	0.741 ***	.189	0.725 ***	.186	0.765 **	.303	0.822 ***	.313
Constant	-6.126 ***	.343	-4.252***	.375	-6.135 ***	.433	-4.314 ***	.466

Significance: '*'=10%; '**'=5%; '***'=1%.

Table 3b: **Multi-level estimation of the transition to a second or higher order birth**

	Model 5		Model 6		Model 7		Model 8	
Individual level	Estimate	S.E.	Estimate	S.E.	Estimate	S.E	Estimate	S.E
Age of youngest child								
0-1 years	1.637 ***	.425	1.635 ***	.433	1.631 ***	.425	1.615 ***	.429
1-4 years	0.164***	.061	0.176***	.061	0.155 **	.066	0.173 ***	.066
4-6 years	-0.025	.079	-0.015	.080	-0.020	.082	-0.008	.083
6+ years	-0.116***	.033	-0.113***	.033	-0.127 ***	.033	-0.124 ***	.033
Age 16-33	-0.021	.014	-0.030 **	.015	-0.020	.015	-0.029 *	.016
Age 33+	-0.153 ***	.037	-0.163 ***	.037	-0.153***	.038	-0.163 ***	.038
Second birth (ref.)								
Third birth	-1.569***	.120	-1.590***	.122	-1.596***	.127	-1.625***	.130
Fourth or higher birth	-1.414***	.181	-1.407***	.185	-1.446***	.200	-1.462 ***	.206
Educational level								
High	0.285 **	.135	0.249 *	.142	0.284 **	.139	0.246 *	.147
Middle (ref.)								
Low	0.045	.118	0.079	.121	0.051	.123	0.083	.127
Activity status								
Employed (ref.)								
Other inactive			-0.012	.125			-0.015	.132
Student			-0.805	.507			-0.768	.510
Unemployed			-0.158	.150			-0.164	.158
Type of contract								
Permanent (ref.)								
Temporary			-0.323	.221			-0.327	.231
Self-employed			-0.108	.254			-0.104	.264
Partner's income								
Low or Middle (ref)								
High income			0.305 ***	.103			0.300 ***	.106
Income missing			-0.313	.570			-0.203	.558
Regional level								
Childcare (percent)					0.092 **	.036	0.090 **	.036
0 to <4 (ref.)								
4 to <8	0.648 ***	.193	0.686 ***	.193				
8 to <12	1.027 ***	.273	1.057 ***	.277				
>=12	0.578	.513	0.570	.509				
Period (Ref.=1993-96)								
1997-2000					-0.181	.118	-0.172	.119

Table 3b: (Continued)

Regional level	Model 5		Model 6		Model 7		Model 8	
	Estimate	S.E.	Estimate	S.E.	Estimate	S.E	Estimate	S.E
Region NE (ref.)								
NW	-0.137	.181	-0.074	.184	0.057	.202	0.117	.206
Madrid	-0.423 *	.227	-0.512 **	.229	-0.009	.200	-0.067	.205
Center	0.378 **	.184	0.434 **	.188	0.704 **	.305	0.744 **	.307
East	-0.436	.517	-0.383	.512	-0.772***	.278	-0.727 **	.283
South	0.378 **	.175	0.449 **	.178	0.723 **	.303	0.778 **	.305
Canary Islands	0.062	.216	0.186	.224	0.374	.323	0.478	.327
Constant	-3.387 ***	.537	-3.232 ***	.564	-3.826 ***	.641	-3.687 ***	.666
σ_ε	0.000		0.000		0.339 *	.180	0.381 **	.163
Log Likelihood	-6881.641		-6798.241		-6898.089		-6808.504	

Significance: '*'=10%; '**'=5%; '***'=1%.

In Model 2, I added several variables concerning the activity status, workplace, and partner's income (this last variable for second and higher order births only). The inclusion of these variables implied an increase in the effect of the regional childcare indicator (with a coefficient of 0.07) in the case of first births, while for higher order births this coefficient was practically unchanged (0.06). This is consistent with the strong impact of the activity status for first births, that shows negative effects of unemployment and being a student, but positive effects of being in other situations (e.g. dedicated to household tasks), comparing to being employed. Furthermore, holding a temporary employment has a strong negative effect on first birth. In the case of second and higher order births, the activity status variables lose much of their importance and the coefficients are no longer significant. As predicted by the economics literature, the partner's income has a strong positive effect on fertility; nevertheless, in the Spanish context, this variable may also reflect the partner's job security (Baizán 2007).

These results reflect childcare coverage at the point in time individuals decide to have a child (i.e. at conception). However, it could be argued that a certain period of time is needed before individuals realize that some improvements in childcare coverage have been made. In a statistical model, this can be translated to a childcare variable lagged two years with respect to conception. The results for this lagged variable are substantively similar to those for the variable that measures childcare facilities at the time of child conception, although the effect of childcare is somewhat less strong. For instance, for a specification in all other respects equivalent to Model 1, the results for a lagged childcare variable are 0.046** for first birth and 0.047* for higher order births. For an equivalent specification to Model 2, the results are 0.058** and 0.048*,

respectively[15]. Given the similarity of results, I have presented in all tables the specification that measures childcare at conception.

I also tried several interactions of the day care variable, in particular with the activity status of the women, expecting that the effect of childcare would be higher for employed women. However, the results did not provide significant differences between the categories, suggesting that an increased availability of day care has a general effect on fertility (results not shown). It is possible that the interaction between women's labor force participation and formal childcare availability is not significant due to the interrelationship between childcare options, labor market situation and fertility. For instance, in the case of second and higher order births, those women who have a job may have already found some childcare arrangement, be it formal or informal, including father's participation in care or the adaptation of women's working hours, (otherwise working women would have previously quit their jobs), reducing fertility differentials between working and non-working women. Differences between working and non-working women will also be diluted if the fact of not working is due to difficulties in accessing a satisfactory childcare arrangement.

Previously, it was suggested that the placement of childcare centers may be endogenous to other (unobserved) regional characteristics that also affect fertility. I therefore explored the inclusion of several contextual variables to take this into account. In particular, the percentage of women's labor force participation at the regional level was included in Model 3. The results of this last variable show significant coefficients, with a positive sign for first births and a negative sign for second births. The inclusion of the labor force participation of women leads to nonsignificant results for the proportion of children in childcare for the first birth process (0.03); by contrast, it leads to a strengthening of the effect and significance of the coefficient for higher births (0.13). One should keep in mind however that the time-varying rate of women's labor force may also be correlated with childcare provision, which possibly leads to biased results. The effects of the regional unemployment rate for women and the proportions of part-time jobs were also tested (results not shown), providing negative but not significant coefficients, that did not substantially change the coefficients of the childcare indicator. These results suggest ambiguous effects of unemployment, and are consistent with the idea that part-time jobs indicate a precarious situation in the Spanish labor market, rather than a voluntary reduction of working hours to accommodate care needs. In Model 7 and 8, dummy variables for time period were included (these models replicate Model 1 and 2 for the other variables), to allow for the possibility that the unobservable regional-level variables vary over time[16]. Thus, the years 1993-96 were distinguished from the years 1997-2000. In these two periods, economic conditions

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[15] I thank an anonymous referee for suggesting to apply this variable.
[16] I thank an anonymous referee for suggesting the inclusion of this variable.

were quite different, with stagnant or negative economic growth in the first period, and a rapidly expanding economy during the second. However, the results obtained do not show significant results for this variable, with the exception of first births in Model 8 (0.235 **). Furthermore, the inclusion of a time dummy substantially attenuates the positive impact of the childcare variable, which becomes insignificant for first births, but not for higher order births. It should be kept in mind that the childcare variable reflects the variation over time in the levels of coverage; therefore, the inclusion of a time dummy necessarily accounts for part of the observed variation of the childcare coverage (if year dummies were included, they would fully account for all the variation in childcare).

Finally, in Model 4, the effect of an interaction between the region and the availability of childcare was tested. The expectation was that the effect of childcare would be stronger in the East, North East and Madrid (regions with higher percentages of women's labor force participation and higher recent increases in TFR), and weaker in the South, Center, and the Canary Islands. The results obtained do not fit the expectations for first births, for which positive significant coefficients are obtained for the East and the South regions. On the contrary, the results for second or higher order births are consistent with these expectations, since they show negative interaction coefficients in the Canary Islands, Center and South, although this is only significant in the last region.

6. Conclusion

Three main hypotheses have been explored in this paper. The first one sustains that an increase in formal day care availability for children under 3 should have a positive effect on fertility at the individual level in Spain in the 1990s and early 2000s. The effect of day care is hypothesized to be based on the reduction of the conflict between labor force participation and childrearing through a defamiliazation of caring labor. A second argument suggests that the effect of an increase in the availability of formal childcare will be more important in contexts (regions) where other social institutions and arrangements have more consistently adapted to changes in gender roles, and in particular where a majority of women participate in the labor market. And finally, it has also been argued that the deployment of childcare services across regions is not random, but is related to several characteristics of the regions, such as a different organization of care and employment, that simultaneously influence fertility. As a result, the availability of childcare and fertility will be endogenous, and the modeling strategy adopted in this research (fixed effects) is designed to account for that situation.

The results obtained are consistent with the hypothesis, derived from the main existing theoretical perspectives on the issue, that an increase of childcare coverage has a positive effect on fertility. Across different specifications, a significant positive effect of the percentage of children aged 0-2 enrolled in childcare is found on first births as well as second and higher order births. This effect is substantively large, as it implies increases in the relative risk of fertility of at least 5% for each percent increase in the proportion of children in childcare. These analyses are based on the assumption, put forward above, that there are time-invariant regional characteristics that affect both childcare availability and fertility, during the period considered. Although I have not modeled explicitly the process of placement of day care centers (for which no data are available), this process could be related to the proportions of women present in the labor market, and the growing acceptability of formal childcare centers in several regions (presumably also related to the decreasing availability of relatives to care for children). The inclusion of the aggregate proportion of women in the labor market in one of the models provided mixed results, since the effect of the indicator for childcare availability lost its significance for first births, while its positive effect increased for second and higher order births. These results can also be interpreted taking into account that childcare availability has a positive effect on women's labor force participation, as shown by the results presented here. Moreover, these results are consistent with the theoretical arguments put forward above, concerning the strong interrelationships postulated between these variables. As a consequence, the fact that childcare's "direct" effect on fertility loses its significance while simultaneously increasing women's participation may indicate the existence of an indirect positive effect of childcare on fertility.

Several limitations in the available data, such as the short period of observation (nine years) and the large geographical units studied, should be emphasized, and therefore the results obtained here should be interpreted with some caution. However, in principle, a longer period of observation and smaller regions should provide sharper results.

The methods utilized also intended to analyze the complex interrelationships that affect fertility processes. These include the existence of selection effects (found to be significant) that influence different birth orders. In addition, testing whether fertility and the employment status are endogenous processes yielded significant results, but they were not found to affect the impact of childcare. However, the analyses performed may not fully capture that interrelationship, given the sample size and the limited number of years in observation. Furthermore, care processes, in addition to employment and fertility, may be interrelated, and this may partly explain lack of significant effects found in the interaction between women's employment and the regional childcare variable.

The results obtained partially supported the hypothesis that formal childcare availability has different effects according to the degree of adaptation of social institutions to changes in gender roles in each region. This argument was tested with an interaction between the women's region of residence and the availability of childcare indicator, providing results consistent with the hypothesis only for second and higher order births. On the one hand, these mixed results may be related to the importance of other providers of care, such as other family members, which may have the effect of reducing the impact of the interaction. On the other hand, it may also be the case that the differences between Spanish regions are less important than anticipated.

Overall, the results obtained suggest that the adaptation of institutions to changing gender roles that is taking place in Spain, and the concomitant changes in the care regime, particularly the increased availability of formal childcare, are involved in the explanation of the recent increases in TFR. If this interpretation is correct, these institutional changes may lead to still further fertility increases in the future.

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Annex

Table 4a: **Multi-level estimation of the transition to a first birth. Simultaneous estimation of fertility and labor force participation**

Individual level	Model 9		Model 10		Model 11		Model 12	
	Estimate	S.E.	Estimate	S.E.	Estimate	S.E.	Estimate	S.E.
Age (spline)								
16-23	0.218 ***	.047	0.103 **	.048	0.099 **	.049	0.096 *	.049
23-28	0.255 ***	.034	0.171 ***	.035	0.165 ***	.035	0.164 ***	.035
28-32	0.040	.042	-0.004	.043	-0.005	.043	-0.008	.043
32-36	-0.155 **	.072	-0.152 **	.073	-0.146 **	.073	-0.147 **	.074
36+	-0.581 ***	.223	-0.589 ***	.225	-0.612 ***	.226	-0.612***	.227
Educational level								
High	-0.034	.117	0.069	.117	0.026	.120	0.023	.121
Middle (ref.)								
Low	0.494 ***	.110	0.233 **	.113	0.239 **	.114	0.246 **	.115
Activity status								
Employed (ref.)								
Other inactive			0.245 *	.140	0.250 *	.1429	0.256 *	.145
Student			-1.542***	.146	-1.559 ***	.148	-1.570***	.150
Unemployed			-0.482 ***	.121	-0.485***	.1227	-0.482 ***	.123
Type of contract								
Permanent (ref.)								
Temporary			-0.413***	.155	-0.410 ***	.156	-0.405 ***	.157
Self-employed			-0.054	.228	-0.021	.232	-0.028	.234
Health status								
Good (ref)								
Bad			-0.845 ***	.215	-0.857 ***	.216	-0.851***	.217
Missing			-0.347 ***	.104	-0.288***	.107	-0.247 **	.112
Regional level								
Childcare (percent)	0.057 **	.027	0.074 **	.030	0.030	.037	0.041	.039
Women's labor force (percent)					0.083 **	.039		
Region NE (ref.)								
NW	0.348 *	.181	0.358 *	.185	0.237	.195	-0.491	.586
Madrid	0.026	.193	-0.044	.192	-0.247	.216	-0.450	.620
Center	0.653 ***	.251	0.742 ***	.278	0.851 ***	.285	-0.034	.686
East	-0.044	.232	-0.245	.238	-0.300	.243	-3.249 *	.678
South	0.560 **	.248	0.703 **	.275	0.553 *	.284	-0.188	.509
Canary Islands	0.933 ***	.264	1.085 ***	.287	0.567	.380	0.378	.733

Table 4a: **(Continued)**

Regional level	Model 9		Model 10		Model 11		Model 12	
	Estimate	S.E.	Estimate	S.E.	Estimate	S.E.	Estimate	S.E.
Childcare*NW							0.128	.086
Childcare* Madrid							0.045	.066
Childcare*Center							0.339	.378
Childcare*East							0.212 *	.113
Childcare*South							0.442 *	.262
Childcare*Canary Is.							0.266	.374
Constant	-6.274 ***	.402	-4.485***	.451	-7.231 ***	1.380	-4.172 ***	.501

Significance: '*'=10%; '**'=5%; '***'=1%.

Table 4b: **Multi-level estimation of the transition to a second or higher order birth. Simultaneous estimation of fertility and labor force participation**

Individual level	Model 9		Model 10		Model 11		Model 12	
	Estimate	S.E.	Estimate	S.E.	Estimate	S.E.	Estimate	S.E.
Age of youngest child								
0-1 years	1.627 ***	.425	1.625***	.429	1.619 ***	.430	1.623 ***	.433
1-4 years	0.159 **	.063	0.163 **	.066	0.176 ***	.067	0.178 ***	.067
4-6 years	-0.019	.081	-0.022	.083	-0.006	.084	-0.003	.084
6+ years	-0.123 ***	.033	-0.123 ***	.033	-0.124***	.033	-0.123 ***	.034
Age 16-33	-0.021	.015	-0.031 **	.015	-0.031 *	.016	-0.032 **	.016
Age 33+	-0.154 ***	.037	-0.166 ***	.038	-0.163 ***	.038	-0.164 ***	.038
Second birth (ref.)								
Third birth	-1.59***	.122	-1.582 ***	.127	-1.60 ***	.130	-1.600 ***	.131
Fourth or higher birth	-1.42 ***	.192	-1.386 ***	.202	-1.41 ***	.205	-1.402 ***	.208
Education Middle (ref.)								
High	0.315 **	.137	0.251 *	.143	0.233	.148	0.243	.149
Low	0.040	.121	0.083	.124	0.077	.127	0.077	.128
Activity status								
Employed (ref.)								
Other inactive			-0.210	.134	-0.172	.142	-0.172	.143
Student			-0.888 *	.505	-0.868 *	.522	-0.884 *	.527
Unemployed			-0.275 *	.152	-0.213	.159	-0.217	.161
Type of contract								
Permanent (ref.)								
Temporary			-0.330	.224	-0.288	.233	-0.287	.236
Self-employed			-0.116	.254	-0.066	.263	-0.059	.266

Table 4b: (Continued)

	Model 9		Model 10		Model 11		Model 12	
Individual level	**Estimate**	**S.E.**	**Estimate**	**S.E.**	**Estimate**	**S.E.**	**Estimate**	**S.E.**
Partner's income								
Low or Middle (ref)								
High income			0.284***	.105	0.282 ***	.107	0.282 ***	.108
Income missing			-0.189	.576	-0.203	.578	-0.196	.584
Regional level								
Childcare (percent)	0.053 *	.028	0.061 **	.028	0.125 ***	.037	0.079 **	.038
Women's labor force (percent)					-0.097 ***	.038		
Region NE (ref.)								
NW	-0.062	.187	0.027	.191	0.202	.204	-0.208	.579
Madrid	-0.032	.199	-0.097	.203	0.108	.223	0.244	.610
Center	0.426	.262	0.538 **	.265	0.466 *	.272	1.463 **	.619
East	-0.522 **	.235	-0.562 **	.237	-0.60 **	.240	0.405	.833
South	0.450 *	.256	0.565 **	.259	0.795 ***	.277	1.322 ***	.457
Canary Islands	0.088	.256	0.260	.285	0.938 **	.386	0.670	.781
Childcare*NW							0.051	.086
Childcare* Madrid							0.040	.068
Childcare*Center							0.534	.337
Childcare*East							0.072	.126
Childcare*South							0.464 **	.213
Childcare*Canary Is.							0.163	.385
Constant	-3.560 ***	.597	-3.260 ***	.623	-0.222	1.352	3.513 ***	.679

Significance: '*'=10%; '**'=5%; '***'=1%.

Table 4c: **Probability of women's labor force participation.**
Simultaneous estimation of fertility and labor force participation

Individual level	Model 9 Estimate	S.E.	Model 10 Estimate	S.E.	Model 11 Estimate	S.E.	Model 12 Estimate	S.E.
Age	-0.040***	.009	0.010	.010	0.008	.011	0.008	.010
Education								
Middle (ref.)								
High	1.270 ***	.109	1.264 ***	.111	1.264 ***	.111	1.265 ***	.111
Low	-0.801 ***	.091	-0.846 ***	.093	-0.849***	.093	-0.849 ***	.093
Health status								
Good (ref.)								
Bad health			-0.517 ***	.100	-0.518 ***	.100	-0.518 ***	.100
Missing			0.201 **	.084	0.198 **	.086	0.199 **	.085
Unemployed in the last 5 years			0.738 ***	.105	0.740 ***	.105	0.740***	.105
Partnership status								
In partnership (ref)								
No partner			1.863***	.1190	1.855 ***	.119	1.855 ***	.119
Children								
No (ref.)								
Yes	-2.561***	.104	-1.920 ***	.112	-1.902***	.112	-1.902 ***	.112
Partner's income								
Low			0.255 ***	.079	0.253 ***	.079	0.254***	.079
Middle (ref)								
High income			-0.224 ***	.083	-0.224 ***	.083	-0.224***	.083
Income missing			0.908 *	.504	0.899 *	.504	0.901 *	.505
Regional level								
Childcare(percent)	0.033 **	.016	0.030 *	.017	0.031 *	.017	0.031 *	.017
Region NE (ref.)								
NW	-0.257	.214	-0.272	.220	-0.270	.220	-0.268	.220
Madrid	0.027	.230	0.195	.231	0.196	.230	0.197	.232
Center	-0.572**	.238	-0.587 **	.243	-0.582 **	.243	-0.584 **	.243
East	0.019	.214	0.084	.219	0.079	.219	0.083	.219
South	-0.332	.228	-0.422 *	.232	-0.415 *	.232	-0.415 *	.232
Canary Islands	-0.096	.282	-0.197	.286	-0.190	.287	-0.190	.290
Constant	4.841 ***	.292	2.002 ***	.342	2.026 ***	.546	2.025 ***	.342
Log Likelihood	-14408.03		-14151.47		-14143.84		-14141.85	
σ_ε fertility	0.318 ***	.106	0.277	.204	0.368 **	.162	0.384 **	.157
σ_δ participation	2.692 ***	.073	2.596***	.072	2.596 ***	.072	2.595 ***	.072
Correlation	-0.594***	.170	-0.468	.361	-0.416 **	.202	-0.403 **	.184

Significance: '*'=10%; '**'=5%; '***'=1%.