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Changing fertility rates in developed countries. The impact of labor market institutions

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Abstract. During the last two decades fertility rates have decreased and have become positively correlated with female participation rates across OECD countries. I use a panel of 23 OECD nations to study how different labor market arrangements shaped these trends. High unemployment and unstable contracts, common in Southern Europe, depress fertility, particularly of younger women. To increase lifetime income though early skill-acquisition and minimize unemployment risk, young women postpone (or abandon) childbearing. Further, both a large share of public employment, by providing employment stability, and generous maternity benefits linked to previous employment, such as those in Scandinavia, boost fertility of the 25–29 and 30–34 year old women.

JEL classification: J1, J22, H5

Key words: Fertility, unemployment, labor market institutions

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1. Introduction

During the last two decades two main developments have taken place in OECD countries that should capture the attention of demographers, economists, policy-makers and the public alike. On the one hand, the fertility rate has sharply decreased in most developed countries – in correspondence with an increase in female labor participation rates – and is now below the replacement rate. The average total fertility rate went down from 2.9 in 1960 to 2.04 in 1975 and then plummeted to 1.6 in the late 1990s. Female labor force participation rates had climbed to almost 48% in 1975 up from 41% in 1960 and dramatically increased to 64% by the late 1990s (Table 1). On the other hand, and reversing standard trends, fertility rates and both female participation and female employment rates have become positively correlated across countries since the 1980s. In countries with high female participation, such as the United States, New Zealand or Norway, fertility rates have stabilized close to replacement rates. By contrast, in countries with lower levels of participation, such as Spain or Italy, fertility rates are approaching the unity level.

Since the inception of the microanalysis of fertility choices in the 1960s (Becker 1960, Mincer 1963, Willis 1973), the standard expectation has been that, as women participate in the labor force at increasing numbers, they trade-off children in favor of less time-demanding alternatives (Butz and Ward 1979). The problem is that although these models may account for the general reduction in fertility rates as female participation increased, they cannot explain the reversal of the traditionally negative correlation between fertility and participation rates.

To account for the recent historical experience across OECD nations this paper emphasizes, instead, the role of institutional variation in labor markets and the corresponding level of employment uncertainty. Any exit from the market at childbirth implies an intertemporal loss of income that varies with the age of the mother and that stems from three factors: forgone earnings during the time spent with the child; a lower wage growth due to forgone experience; and, finally, a potential increase in unemployment risk. In turn, labor market institutions shape the level and variability of both wages and employment. Thus, women choose to bear children conditional on how labor market institutions affect their expected income and that of their spouses. In other words, the wide range of labor market arrangements we find across OECD countries molds childbearing and participation decisions of women.

Table 1. Total fertility rates and female activity rates 1960–1997

	Total fertility rate				Female activity rate			
	1960	1975	1986	1997	1960	1975	1986	1997
OECD	2.90	2.04	1.67	1.62	41	47.5	56	64
Europe	2.76	2.05	1.64	1.58	41	47	55	63
South Europe	2.64	2.48	1.54	1.27	32	38	43	51
Non Europe	3.40	2.01	1.80	1.76	40	48	61	67

Note: *OECD Labour Force Statistics*. Belgium female activity rate is 1996. Southern Europe includes Greece, Italy, Portugal and Spain. Non-European countries include Australia, Canada, Japan, New Zealand and USA.

The paper is organized as follows. In Sect. 2 I develop a theoretical framework to explain how the recent changes in demographic trends experienced across the advanced world during the last 35 years have been mediated by the vast institutional variation among OECD countries. In Sect. 3, I use a panel of OECD nations for that period to study the interaction between total and age-specific fertility rates and measures of the institutional structure of the labor market, public sector employment, part-time and fixed-term employment, and maternity leave benefits. The panel allows me to trace the points in time at which some of these variables became relevant in fertility decisions and how they affected in a distinct manner the behavior of women in different age brackets. Finally, Sect. 4 summarizes the main results.

In the paper I find that whenever unemployment is low and institutions easily accommodate the entry-exit of the labor market, fertility rates are around replacement rate. This matches the case of either highly flexible labor markets, such as the US, where women leave the market, to rear children, with a high certainty of employment when they reenter or, alternatively, countries with a large government sector, such as those in Northern Europe, whose liberal leave programs and job security partially reduce the opportunity costs of childbearing.

By contrast, whenever the costs of childbearing in terms of loss of present or future income are intensified by high unemployment and rigid labor markets, fertility rates are very low. Southern Europe fits this pattern. Since the mid 1980s unemployment has run high, especially among the young. Mature workers hold permanent and highly protected jobs while the young cohorts experience high turnover rates across precarious jobs in the lower end of a dual market. As a result, young women either become unemployed, and eventually may drop out of the labor force, or stick to their unstable job trading off childbearing for the hope of employment security. The lack of employment stability among young men reinforces the depressing effect on fertility of this institutional framework. As argued in the last part of the paper, the sharp reduction of fertility in Southern Europe since the mid 1980s, when unemployment went up sharply, accounts for the sudden reversal in the participation-fertility relation within the OECD.

2. The analytical framework

In the last decade, academics have paid considerable attention to the ways different labor market arrangements responded to the patterns of rapid technological change and increased international competition that have taken place since the early 1980s. Whereas unemployment has remained low at a cost of higher levels of wage dispersion in countries with flexible labor markets, such as the US or the UK, nations with more rigid labor markets, such as continental Europe, have preserved their equality only to see much higher unemployment rates[1].

In a similar way, the structure of labor markets has shaped fertility trends by affecting the size of the opportunity cost of childbearing and therefore women's intertemporal income. Different types of labor market institutions across OECD nations accommodate to different degrees women's exit and entry decisions[2]. As the penalty they impose on truncated careers, through

forgone experience, delayed wage growth and higher levels of unemployment risk, goes up, fertility declines.

To capture these effects I employ a simple dynamic fertility model that includes unemployment risk. This variable, which has become increasingly relevant during the last two decades, is often ignored in this literature[3].

In the model, whose mathematical structure is developed in Appendix 1, I assume that women (or families) live two periods and decide whether to have a child in the first period, to postpone childbearing to the second period or to give up motherhood. For tractability, I consider, following Becker et al. (1990) and Ranjan (1999), that the utilities from consumption and children are additively separable, that is, the total welfare of the woman (or family) in each period is the sum of the utility derived from consumption, $U(c_t)$, and from each child ψ.

In each period an individual faces a probability of unemployment $\rho_t(h^w_{t-1}, h_t)$ that depends on the hours worked in the previous period h^w_{t-1} as well as the hours currently offered to the market h_t. Hours worked equal the number of hours offered in the market $h^w_t = h_t$ if employed, and $h^w_t = 0$ otherwise.[4] Unemployment risk is lower for individuals with more hours of experience $\rho_t(.)_{h^w_{t-1}} < 0$ and a stronger attachment to the market $\rho_t(.)_{h_t} < 0$.

Abstracting from leisure choices, assume each individual participates with T hours each period but, that, whenever a woman has a child, she allocates m of those hours to childcare that period. As a result, women participate in the market either T or $T - m$ hours. For simplicity, assume that if $h_t = T - m$, a woman's unemployment risk increases by α, where $0 \leq \alpha \leq 1$. The size of α is closely related to the readiness of employers to offer part-time employment. Each person has an initial probability of unemployment ρ_1 ($\rho_1 + \alpha$ if a woman has a child that period). If human capital also included acquired education, persons reaching adult life with different levels of education would face different risks of unemployment.

Second period wages w_2 depend on the time worked on the previous period and on the initial given wage w_1:

$$w_2(h^w_1) = (1 - \delta)w_1 + \gamma h^w_1 \tag{1}$$

where δ is a depreciation factor (as in Rosenzweig and Wolpin 1980) and γ indicates the appreciation rate by new experience. Accordingly, during either childcare time or unemployment spells the potential growth of wages slows down. Women may be entitled to either maternity benefits $M_t(h^w_{t-1})$ or unemployment benefits $\theta_t(h^w_{t-1})$, a given percentage of their previous wages. For simplicity, I normalize them to zero in the absence of work experience, although, in some countries, maternity benefits are either means-tested, such as the welfare system in the US, or consist of a fixed allowance per birth independent of the woman's labor market attachment. I consider that there is a guaranteed minimum income y, in terms of direct transfers or subsidized consumption, in the absence of adequate income. Beyond the mother's time, a child requires P_k units of expenditure when he is born. With lack of capital markets, income in each period, the larger between y and that obtained from work or benefits, is divided between current consumption and child expenditures.

At the beginning of her adult life, a woman decides whether to have a child during the first period or to postpone the decision to the second period. She

compares the expected welfare from having a child in the first period V^{k1} with the expected welfare of postponing childbirth to the second period V^{k2} or giving up maternity V^{nk}. The spouse's income and unemployment risk can be easily added to the model. Results of the core model are only strengthened by this extension.

The probability that women (or families) will choose one of these three alternatives will vary with individual preferences, the pattern of wage growth, maternity and unemployment benefits, the size of the public sector, the level of guaranteed income and unemployment risk. Let me turn now to discuss the effects of each of these factors in detail.

Preferences. The relative reward of an early childbearing strategy increases with ψ because of the extra benefit of enjoying the child on both periods instead of having him in either one or none.

Wage growth. The reduction of wages from career interruption is a well established empirical regularity and may translate into permanent wage gaps between different timing strategies.[5] Its relevance in childbearing choices depends on how fast skills depreciate when a woman withdraws from the market and on how recent experience affects earnings.[6] As a result, the relative attractiveness of early childbearing V^{k1} decreases with the length of withdrawal m, the appreciation rate of new experience γ, and the depreciation factor δ. Moreover, it decreases with child expenditures P_k since the absence of perfect capital markets encourages late births to put off children expenditures to periods of more prosperity.[7]

Benefits. Both maternity and unemployment benefits encourage fertility and affect its timing. If benefits consist of a fixed allowance, higher benefits boost women's income in any period but have a stronger marginal effect on the utility in the first period since wages are lower in that period. By contrast, if they are defined by a replacement rate over previous wages, women have an incentive to delay childbirth and actively participate in the market in the first period to become eligible for higher benefits later.

Public sector. Public employment affects fertility rates in two ways. On the one hand, parental leave as well as maternity benefits and work schedules tend to be more liberal and accommodating in the public sector than elsewhere, further facilitating the entrance of women in the labor force without having to give up childbearing.[8] On the other hand, contracts within the public sector tend to be permanent and, as a result, are a guarantee of employment after childbirth. Since women are over-represented within the public sector, larger government sectors grant job stability to a large proportion of women.

Guaranteed income. Increases in y, which boost overall welfare, encourage early fertility, specially among women with higher unemployment risk. This probably explains why young uneducated women in countries with means-tested systems, such as the US, exhibit high fertility rates.

Unemployment. In general, unemployment reduces the expected welfare of the population independently of their fertility decisions not only through a lower expected income but also, with risk aversion, through the increase in employment uncertainty. The effect of unemployment on fertility depends on whether the former is temporary or persistent, whether it affects both spouses and, as a result, substantially trims down family income, and whether it is particularly intense for young workers.

When women do not work, the income effect that results from increases in the husband's wages during good times boosts fertility. By contrast, as more

women enter the labor force, families substitute against children and in favor of other items that do not require as much time from the woman. From this standpoint, the larger the proportion of women either employed or on the margin to become employed, the greater the likelihood that good times will be associated with low-fertility rates (Butz and Ward 1979; Galor and Weil 1996).[9]

Notice, however, that the literature has not focused on the most essential mechanism through which unemployment risk shapes childbearing decisions: its intertemporal effect. Although it is true that a temporary spell of unemployment is likely to be seen as a cheap time to have children, if unemployment is high and persistent, a weaker commitment to the market early in life can turn into an unemployment trap with substantial income effects. Even if an increase of ρ_1 can make an early childbearing strategy more attractive, the weaker attachment to the market entails an increase α in the risk of unemployment. A large α discourages maternity since it depresses both V^{k1} and V^{k2} without affecting V^{nk}. In addition, if unemployment is persistent, as in Europe since the 1980s, an increase of ρ_1 comes along with corresponding increases in all unemployment rates, thereby reducing expected family income and increasing uncertainty further.

Finally the timing of childbirth is affected by the slope of the unemployment function with respect to experience, that is $\rho(.)_{h^w}$. If the unemployment function is flat, the timing of withdrawal has less impact on the chances of employment and on lifetime earnings than otherwise. If unemployment risk decreases with respect to experience at an increasing rate, not only is unemployment risk higher at low levels of experience but also any skill depreciation due to a temporarily withdrawal from the market early in a career increases the likelihood of unemployment by more than if that same depreciation occurred when the individual had already accumulated a substantial level of experience. In this case, when unemployment particularly affects the young and inexperienced, it is better to postpone childbearing until a career is well established. Further, if we allow human capital to accumulate through education, individuals may not only postpone childbearing but also participation in the labor market. An extra year of education may pay-off more, in the long run, than an extra year of unsuccessful job search. As a result, low fertility could come hand in hand with low participation rates of young women.

Notice that at the beginning of the second period, if a woman chose to postpone childbirth, she has better information to decide whether to have a child now or give up maternity. If both unemployment and maternity benefits are generous, the risk of unemployment is relatively low for workers with experience and part-time positions are readily available, she is likely to have a child now.[10] A woman who was unemployed in the first period is more likely to give up maternity if guaranteed income y is very low, the penalty of the market for partial attachment α is high and U' is sufficiently steep for very low values of consumption.

Summing up, the labor market arrangements, that vary extraordinarily across the OECD, mediate women's fertility decisions. Generous maternity benefits, liberal legislation of part-time, and, most importantly, full employment, (either by the active participation of the public sector in the labor market or by a well-functioning market that tailors job opportunities to individual's needs) should encourage fertility. Increased income uncertainty from either unemployment or marginal employment arrangements make maternity a risky and costly choice.

3. The empirical analysis

3.1. Data

To test the theoretical argument I develop in the previous section, I have gathered data on fertility rates as well as on variables that reflect the institutional structure and composition of the labor market and the availability of maternity benefits for OECD countries. Table 2 presents descriptive statistics for the series used in the estimations. Most of the series are available for the period 1960–1997. A few, as their smaller sample size indicates, start at later dates.

Dependent variable. Comprehensive data on total fertility rate (TFR) and on age-specific fertility rates for all European countries from 1960–1997 was obtained from the Council of Europe (various years). That publication also included partial series for non-European countries that were subsequently completed with data from national statistical sources. Age-specific fertility rates are measured by births per 1,000 women in a particular age bracket and the total fertility rate is found by adding up all age-specific fertility rates over the different groups.

Independent variables. Most data on the structure of the labor market was obtained from the OECD *Labour Force Statistics* and completed, whenever available, using national official statistics. I gathered relatively complete series for 1960–1997 on total and gender-specific unemployment and activity rates, share of agricultural, government and self employment. Age-specific unemployment was available for some countries since the late 1960s and for the others starting in the early 1970s.[11] Data on part-time employment was complete for 1979-1997 though available for some countries since 1973.

To control for the level of development for 1960–1997 I use the log of GDP per capita in purchasing power parity terms ($1991) from the OECD *Economic Outlook* and the level of urbanization from the *World Bank Economic Indicators*.

Table 2. Descriptive statistics (1960–1997)

Variable	N. Obs	Mean	St.Dev	MIN	MAX
Total fertility rate	874	2.11	0.61	1.15	4.17
Log age-specific fertility 20–24 y.	856	4.65	0.40	2.53	5.58
Log age-specific fertility 25–29 y.	856	4.92	0.22	4.33	5.56
Log age-specific fertility 30–34 y.	856	4.44	0.28	3.74	5.39
% Female unemployed	787	5.97	5.34	0	31.4
% Male unemployed	787	4.76	3.91	0.09	19.6
% Female 20–24 y. unemployed	528	12.18	10.23	0.3	47.4
% Female 25–34 y. unemployed	530	7.93	5.87	0.4	34.8
% Male 25–34 y. unemployed	531	6.00	4.36	0.2	22.2
% Urban population	874	72.01	15.31	22.06	97.11
Log % government employment	808	2.69	0.38	1.52	3.51
Sq. log % government employment	808	7.36	2.01	2.30	12.31
% Agriculture employment	874	12.15	9.50	1.86	57.15
% Self-employed	828	20.06	11.13	6.69	67.9
Weeks maternity leave	874	15.45	11.00	0	52
Replacement rate × weeks maternity	774	5.35	9.73	0	46.8
Log GDP per capita (PPP 91)	874	9.42	0.39	7.94	10.29
Log % employed part time	491	2.53	0.57	1.03	3.64

The US Department of Health and Human Services regularly publishes *Social Security Programs Throughout the World,* a compendium of social legislation for most world countries. I combined that information with data from the OECD *Jobs Study* (1991) and from I.L.O. (1985) to generate two annual series on maternity benefits since 1960, one with the number of weeks of maternity leave and another with information on replacement rates during maternity leave. In most of the OECD countries maternity benefits are specified as replacement rates, a percentage of previous earnings. Only in the 1960s and early 1970s some countries such as Denmark, Iceland, Ireland and Norway had fixed allowances. Replacement rates were not available for Switzerland.

Estimation. Subsect. 3.2 and 3.3 present random-effects estimates of the effect of labor market institutions on total fertility rate and age-specific fertility rates on the panel of OECD countries (or European countries). Lagrange multiplier tests (Breusch-Pagan) to assess whether OLS estimates based on pooled data are consistent or whether country-specific components should be taken into account indicate, in all cases, that the latter is appropriate. Equations were also estimated using fixed effects with country and year dummies and results are available from the author. Haussman tests on the consistency of the random-effects estimates, included in the tables, indicate stability of coefficients across fixed and random-effects except in some estimates including all OECD countries. Relevant parameters, however, are always robust across both estimation methods as I indicate below.

Unit root test for panel data with country specific intercepts by Levin-Lin (1993, 2002) indicate that TFR is both level and log-stationary and age-specific fertility rates for 25–29 years old and 30–34 years old are log-stationary. I could not reject the presence of a unit root for the series of age-specific fertility for 20–24 years old (specially in the European subsample since the early 1970s). Among independent variables, urbanization, total and age-specific unemployment rates and the share of agricultural and self employment are level-stationary. The share of government employment is log-stationary for all subsamples and level-stationary for 1960–1997. Income per capita and the share of part-time employment were included in logs. To analyze the stationarity of the residuals of the level estimations in Tables 3 to 5, I present t-statistics for the panel unit root test of the errors with country specific intercepts. [12] Problems of nonstationarity arise in the level estimates of the fertility of 20–24 years old and in some specifications of the 30–34 year old group. In those cases, the same specification is estimated on the first differences of the series instead of on the levels so that inferences can be made from the results.

3.2. The decrease in total fertility rates

Table 3 presents random-effects estimates for the level of total fertility rate (TFR). All models contain the basic independent variables, a time trend and either female, male, or age-specific female or male unemployment jointly with their interactive with self-employment. In Models 6 and 7 I restrict the sample period from 1975 to show the recent increased importance of government employment on fertility. In Model 7, I introduce both the replacement rate of

Table 3. Total fertility rate

	(1)	(2)	(3)	(4)	(5)
Constant	14.30	14.12	18.182	16.34	15.16
	(9.61)	(9.15)	(9.76)	(8.86)	(8.43)
Log GDP per capita (PPP 91)	−0.834	−0.783	−1.085	−1.006	−1.189
	(−6.01)	(−5.40)	(−6.63)	(−6.49)	(−7.62)
% Urban population	−0.0004	0.0008	0.0192	0.0174	0.0161
	(−0.01)	(0.20)	(4.42)	(4.17)	(3.28)
Log % Government employment	−2.427	−2.683	−4.815	−4.017	−2.537
	(−5.32)	(−6.06)	(−8.54)	(−6.81)	(−4.38)
Sq. log % Government	0.3626	0.411	0.764	0.636	0.4047
employment.	(4.53)	(5.28)	(7.74)	(6.21)	(4.09)
% Agriculture employment	−0.0036	0.0012	0.0178	0.0201	0.0407
	(−0.62)	(0.21)	(2.73)	(3.102)	(6.27)
Weeks maternity leave	0.0038	0.0037	0.00615	0.0059	0.0106
	(2.22)	(2.13)	(3.44)	(3.33)	(6.07)
% Self-employed	−0.0091	−0.0143	−0.0167	−0.015	−0.0096
	(−1.96)	(−3.39)	(−2.96)	(−2.71)	(−1.52)
Trend (1960 = 1)	−0.0107	−0.0111	0.004	0.0038	0.0163
	(−3.46)	(−3.32)	(1.13)	(1.18)	(4.6)
% Female unemployed	−0.00265	−0.0196			
	(−0.42)	(−3.85)			
% Male unemployed		0.0048			
		(0.72)			
% Male 25–34 y. unemployed			−0.006		
			(−0.89)		
% Female 25–34 y. unemployed				−0.0065	−0.0025
				(−1.14)	(−0.45)
% Female unemployed x %	−0.0007				
self-emp.	(−2.74)				
% Male 25–34 y. unemployed			−0.00024		
x % self-emp.			(−0.73)		
% Female 25–34 y. unemployed				−0.00033	−0.0008
x % self-emp.				(−1.27)	(−3.12)
Joint chi2 (3)[a]	44.24	N/A	23.84	38.02	59.53
Haussman	15.74	35.40	70.25	88.2	5.57
Prob > chi2	0.1074	0.001	0.000	0.000	0.8496
Levin-Lin[b]	13.11	13.78	14.23	13.82	9.25
N. Observations	743	746	527	526	383
N. Countries	23	23	23	23	18
	OECD	OECD	OECD	OECD	Europe
	1960−-97	1960–97	1964–97	1964–97	1964–97

Note: Unbalanced panel random-effects estimates. T-statistics calculated from robust errors.
[a] Joint test of % Female Unemployed, % Self Employed and their interactive.
[b] Unit root test for errors with country-specific intercepts.

maternity benefits and the proportion of part-time employees as additional controls to show the robustness of the results. Models 5 and 7 restrict the sample to Europe to show the larger relevance of some explanatory variables for those countries.

One of the key findings of the paper is a strong negative effect of unemployment on fertility, especially since the 1980s, and most importantly, the intense depressing effect of high unemployment when combined with a large

Table 3. (contd.)

	(6)	(7)
Constant	6.48	10.11
	(5.25)	(4.28)
Log GDP per capita (PPP 91)	−0.732	−0.714
	(−6.21)	(−5.02)
% Urban population	0.0177	0.0232
	(4.80)	(4.58)
% Agriculture employment	0.075	0.0586
	(15.58)	(8.63)
% Self-employed	−0.0125	−0.0087
	(−3.42)	(−1.56)
% Female-unemployed	−0.0094	0.0003
	(−2.17)	(0.05)
% Female-unemployed x % self-emp.	−0.0011	−0.0009
	(−6.87)	(−3.81)
Trend (1975 = 1)	0.0203	0.0185
	(8.8)	(6.05)
Log % Government employment	0.198	−2.4998
	(2.56)	(−2.56)
Sq. log % Government employment		0.4419
		(2.68)
Replacement rate x Weeks maternity leave		0.0115
		(4.53)
% Employed part-time		−0.184
		(−4.74)
Haussman		
Prob > chi2	14.17	
0.0774	6.63	
0.8286		
Levin-Lin[b]	8.74	7.08
N. Observations	518	323
N. Countries	23	17
	OECD	Europe
	1975–97	1975–97

share of self-employment in the economy. In results not shown here, different measures of unemployment alone -total and age-specific for both genders- significantly depress TFR in all estimates. The intensity of this effect has grown as unemployment has increased during the last 20 years. Model 2 includes both female and male unemployment. The strong negative and highly significant coefficient for the female unemployment, as opposed to a positive but insignificant coefficient for the male unemployment, corroborates this finding. A similar specification was estimated across all age groups with the same results. In Models 3 to 5 I include age-specific unemployment rates together with their interaction with the share of self employment. Joint tests of unemployment, self-employment and the interaction of both are strongly significant in all models. Although the size of the coefficient for unemployment rates of women 25 to 34 years old, in Model 5, is similar to that of Model 1 for female unemployment, the higher disparity of unemployment of women 25 to 34 across countries, from under 5% in Luxembourg, Iceland,

Switzerland and Austria in 1997 to over 30% in Spain, implies larger differences in fertility. A high unemployment rate of men 25 to 34 years (Model 3) also has a negative income effect on fertility, jointly significant with self-employment, similar to that shown in Ahn and Mira (2001) for the Spanish case.[13] In short, persistent and high unemployment rates are as central to explaining recent changes in fertility behavior as they were in the interwar period and the 1930s depression (Kirk 1946, Murphy 1992).[14] This procyclical behavior of fertility is in line with Easterlin's (1975) theoretical expectation since parents, attempting to replicate the standard of living of their own childhood, reduce the family size in bad times.[15]

Interestingly, the share of self-employment enters negatively in all estimations. Although self-employed workers are, in principle, more flexible to make arrangements during childbearing, two reasons may account for this result. First, with the exception of some high-powered professionals, self-employed workers are more likely to be at the bottom of the earnings distribution (i.e., small retail, cleaning services), face more income uncertainty and be unable to take advantage of maternity benefits as payroll workers do. Secondly, during recent years employers subcontracted the services of self-employed workers, who were then *de facto* working full time in the firm, as a means to reduce non-wage costs, such as social security contributions.[16] This is a common practice in Southern Europe, particularly in Italy. Similarly, other workers were hired by temporary work firms at low wages and with no perspective of stability. Interestingly, most countries with a large share of self-employment in the 1990s had both the largest agricultural sectors in the mid 1970s and the highest unemployment rates in the OECD since the mid 1980s. The exclusion of the share of agricultural employment, particularly in the earlier years of the sample, affects the stability of the coefficient of self-employment. For the first years of the sample period, a large fraction of self-employment is agricultural

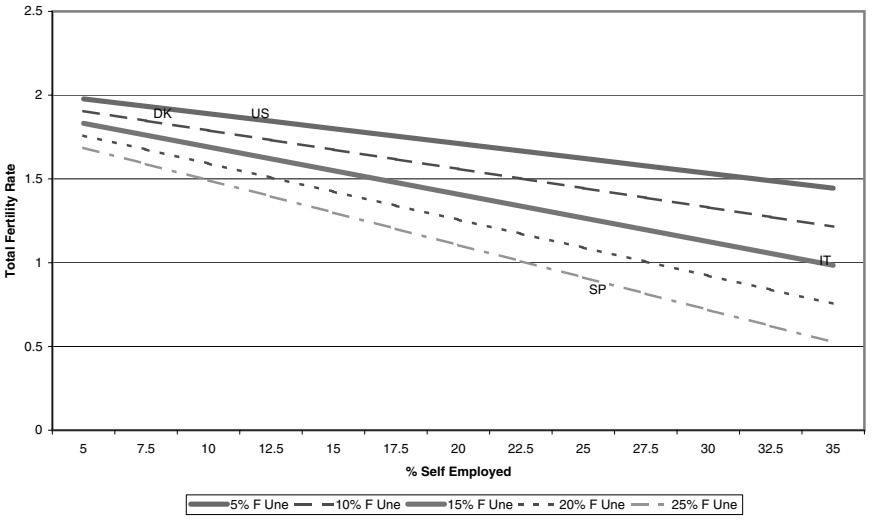

Fig. 1. Combined effect of female unemployment, self-employment and their interactive on total fertility rate from 1975–1997 for OECD

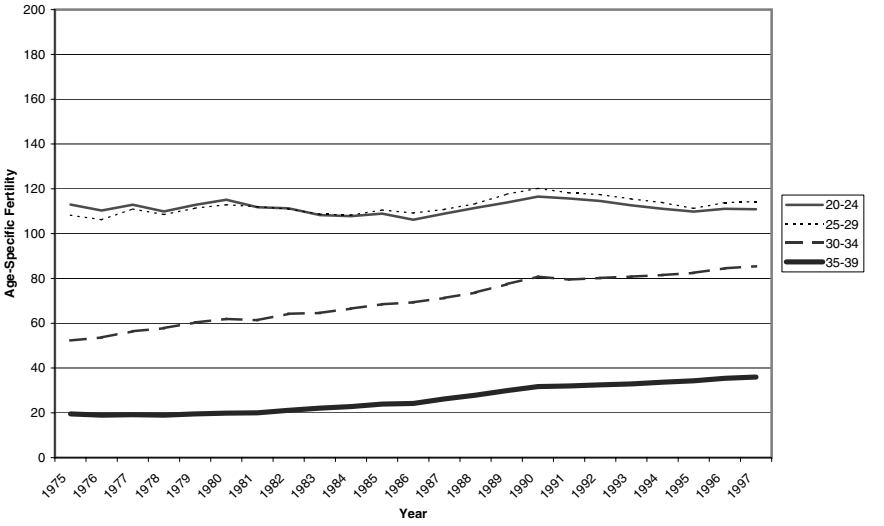

Fig. 2a. USA age-specific fertility rates

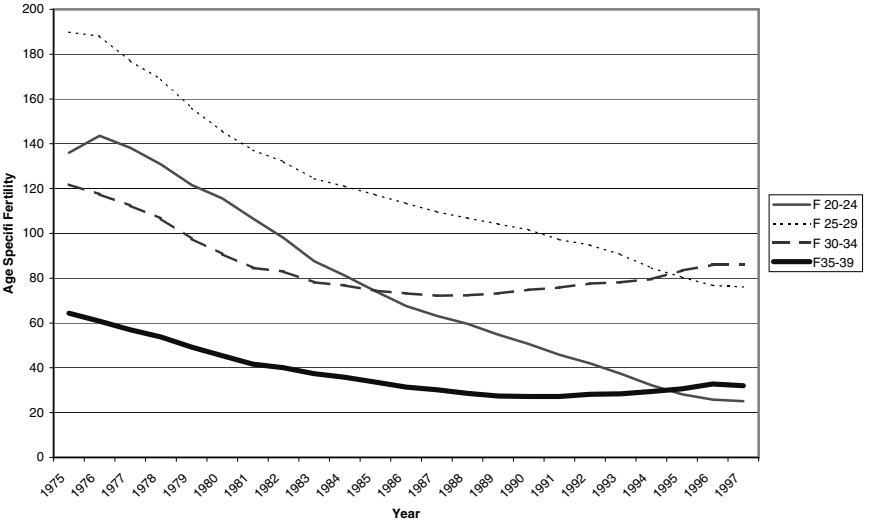

Fig. 2b. Spain age-specific fertility rates

employment and, as a result, its negative coefficient is effectively compensated by the positive coefficient on agriculture. For the most recent years, however, the share of agricultural self-employed workers on total employment is small. Unfortunately I do not have separate data on agricultural and non-agricultural self-employment.

The effect of the interactive variable between any measure of unemployment and self-employment is sizable. Its inclusion reduces somewhat the significance of the two variables alone and even changes the sign of female

Table 4. Log Age-Specific Fertility 25–29 years

	(1)	(2)	(3)
Constant	9.005	8.860	8.313
	(14.46)	(14.41)	(9.23)
Log GDP per capita (PPP 91)	−0.2582	−0.2723	−0.215
	(−4.42)	(−4.72)	(−2.86)
% Urban population	0.0041	0.0035	0.0094
	(2.20)	(1.87)	(5.16)
Log % government employment	−1.4651	−1.241	−1.728
	(−7.99)	(−6.62)	(−5.98)
Sq. log % government employment	0.2752	0.2346	0.331
	(8.61)	(7.15)	(6.59)
% Agriculture employment	0.0075	0.0046	0.0093
	(3.16)	(1.89)	(2.96)
Weeks maternity leave	0.0035	0.0034	0.0029
	(4.71)	(4.60)	(3.42)
% Self-employed	−0.0023	0.0011	0.0059
	(−1.26)	(0.56)	(2.21)
Trend (1960 = 1)	−0.0044	−0.0048	−0.0038
	(−3.34)	(−3.67)	(−2.46)
% Female unemployed	−0.0076	0.0021	
	(−4.95)	(0.8)	
% Female 25–34 y. unemployed			0.0075
			(2.67)
% Female unemployed x % self-emp.		−0.00045	
		(−4.55)	
% Female 25–34 y. unemployed x % self-emp.			−0.00067
			(−5.28)
Joint chi2(3)[a]	N/A	49.52	42.44
Haussman	12.78	11.17	58.68
Prob > chi2	0.1728	0.3447	0.000
Levin-Lin[b]	10.22	9.14	9.8
N. Observations	741	741	524
N. Countries	23	23	23
	OECD	OECD	OECD
	1960–97	1960–97	1964–97

Note: Unbalanced panel random-effects T-statistics calculated from robust errors.
[a] Joint test of % Female Unemployed, % Self-employed and their interactive.
[b] Unit root test for errors with country-specific intercepts.

unemployment in Model 7. The estimated coefficient increases to –0.0011 and –0.0009 in Models 6 and 7 when the sample is restricted to the last two decades.

In Fig. 1, I use Model 6 in Table 3 to simulate fertility rates for different levels of female unemployment and self-employment, by setting all the other variables at their median level for the period 1975–1997. A large share of self-employment magnifies the depressing effect of unemployment on fertility. In the graph I also include the estimated fertility rate in four countries in 1997. Predicted fertility rates for Italy and Spain, with a perverse combination of high female unemployment and a large share of self-employed, are close or below the unity, that is, not far from their actual fertility rates. On the other extreme, rates for both the US, with low unemployment rates, and Denmark, a representative of Nordic countries, with moderate unemployment and a very small share of self-employment, are closer to the replacement level.

Table 5. Log Age-Specific Fertility 30 to 34 years

	(1)	(2)	(3)
Constant	16.68	16.54	16.80
	(17.57)	(17.54)	(12.92)
Log GDP per capita (PPP 91)	−0.89458	−0.9151	−0.894
	(−10.06)	(−10.35)	(−8.17)
% Urban population	0.0006	−0.0005	0.006
	(0.21)	(−0.18)	(1.827)
Log % government employment	−2.498	−2.2154	−2.996
	(−8.94)	(−7.71)	(−7.22)
Sq. log % government employment	0.358	0.3065	0.454
	(7.34)	(6.1)	(6.32)
% Agriculture employment	−0.0009	−0.0048	0.0003
	(−0.25)	(−1.28)	(0.06)
Weeks maternity leave	0.0048	0.0048	0.0024
	(4.31)	(4.25)	(1.91)
% Self employed	−0.01405	−0.0097	−0.014
	(−5.12)	(−3.28)	(−3.59)
Trend (1960 = 1)	0.0231	0.0227	0.0275
	(11.57)	(11.44)	(12.24)
% Female unemployed	−0.0054	0.0069	
	(−2.3)	(1.73)	
% Female 25–34 y. unemployed			−0.00125
			(−0.314)
% Female unemployed x % self-emp.		−0.0006	
		(−3.78)	
% Female 25–34 y. unemployed x % self-emp.			−0.00015
			(−0.82)
Joint chi2 (3)[a]	N/A	49.22	25.78
Haussman	21.55	15.61	11.32
Prob > chi2	0.01	0.1114	0.333
Levin-Lin[b]	9.41	9.01	2.86
N.Obs	741	741	524
N. Countries	23	23	23
	OECD	OECD	OECD
	1960–97	1960–97	1960–97

Note: Unbalanced panel random-effects estimates. T-statistics in brackets.
[a] Joint test of % Female unemployed, % Self-employed and their interactive.
[b] Unit root test for errors with country-specific intercepts.

A second important finding is the changing relevance of government employment on TFR during the last 30 years. As noted, government employment is expected to have a positive effect on TFR, if any, by providing more stable opportunities for women's employment during economic downturns as well as more liberal leave programs. With a linear specification of government employment, results change with the period of estimation. In a subsample from 1960 until the late 1970s, the estimated coefficient for the log share of government employment is either not significant for the OECD sample or even slightly negative for the European sample. These results, not shown here, are available from the author. By contrast, during the period 1975–1997, the log of government employment enters positively in the fertility equation for all OECD countries (Model 6).[17]

A non-linear specification of government employment provides the best empirical fit. This is the structure estimated in Table 3, where fertility and

Table 6. Difference Log Age-Fertility 30–34 years (1975–1997)

	(1)	(2)	(3)
Δ Log GDP per capita (PPP 91)	0.2613	0.2736	0.2665
	(2.71)	(2.59)	(2.71)
Δ% Urban population	0.0117	0.0103	0.0166
	(0.72)	(0.56)	(1.02)
Δ Log % Government employment	−2.755	−2.0004	−3.676
	(−4.3)	(−2.2)	(−7.04)
Δ Sq. log % Government employment	0.469	0.3304	0.647
	(3.98)	(2.1)	(6.97)
Δ% Agriculture employment	0.0034	0.00074	0.0046
	(0.81)	(0.17)	(1.44)
Δ Weeks maternity leave	0.00132	0.00114	0.0009
	(1.38)	(0.88)	(0.8)
Δ% Self-employed	−0.0025	−0.0034	−0.0045
	(−1.12)	(−0.76)	(−1.54)
Δ% Female unemployed	−7.56E−06	−9E−05	
	(−0.002)	(−0.024)	
Δ% Female 25–34 y. unemployed			−0.00233
			(−1.43)
Δ (% Female unemployed x % self-emp.)	−0.00014	−0.00011	
	(−1.28)	(−0.89)	
Δ (% Female 25–34.unemployed x % self-emp.)			0.000013
			(1.78)
Δ Log % employed part time		0.038	
		(1.83)	
Joint Chi (3)[a]	2.5	1.13	2.43
R Square	0.137	0.117	0.21
N. Obs	514	436	421
N. Countries	23	23	23
	OECD	OECD	OECD
	1975–97	1975–97	1975–97

Note: OLS with White robust errors. T-statistics calculated from robust errors.
[a] Joint test of difference % female unemployed, difference % self-employed and their interactive.

public employment are related through a U-shaped function. In models 1 and 2, which encompass the whole period of analysis, the minimum of this concave function, that is, the lowest predicted TFR, takes place for a government share of employment of 28% – this means that the effect of government employment on TFR is effectively negative for almost all observations. However, that minimum shifts to a lower level of government employment as we restrict the sample to a more recent period. For example, for the more recent period 1975–1997, employed in Model 7, the simulated fertility rate reaches its minimum around a share of government employment of 16%. Ceteris paribus, in those European countries with a share close to 16% in 1997 – Portugal, Italy or Spain, the predicted TFR is 0.05 points lower than in those with the smallest government sectors – around 12% in Greece, or Ireland – and 0.2 lower than in countries with the biggest sized governments – around 32% in Denmark, Norway or Sweden.

Interpreting these results requires an understanding of the evolution of public employment during the period of analysis. On average, the share of government employment has systematically grown during the last three decades. Within this pattern of expansion, we can ascertain two phases. Until

the early 1970s public employment was over all small across the OECD, representing 7 to 15% of total employment, yet larger in more developed economies. Starting in the mid 1980s, the size of public employment diverged widely following different policy choices.[18] Countries with social democratic governments, such as Nordic countries and to some extent France, opted for large public sectors to employ increasing numbers of working women. For example, the expansion of the Swedish public sector accounts for all the employment growth in that country since the early 1960s, mainly through female employment in local councils (Rosen 1996). By contrast, in economies with highly flexible labor markets, such as that in the USA, Australia and both the UK and New Zealand in 1990s, governments remained small. These two types of solutions, with either a small public sector and flexible labor markets or a large force of public employees, are, as discussed in the model, the best strategies to reconcile fertility and participation rates. They provide the two extremes of the U-shape structure we encounter in our empirical estimations. By contrast, in Southern Europe neither public employment has grown enough to absorb an important portion of female work nor labor market regulations were altered to encourage private job creation. Those countries, which currently have the lowest fertility rates in the OECD and the world, are located around the minimum of the U-shaped function.

Estimates in Models 1 to 6 indicate that a longer period of maternity leave boosts up fertility, especially among European women (Model 5). Estimates in Model 1 predict that a country with no weeks of maternity leave such as the United States or Australia should have a fertility rate 0.1 points lower than a country with 28 weeks of leave, such as Norway or Denmark in the 1990s. To show the robustness of results to alternative measures of maternity benefits, I include in Model 7 the number of weeks of leave times the replacement rate. The coefficient in Model 7 indicates that, during the 1990s, European countries with an index of maternity benefits close to 25, such as Denmark or Norway, and those with benefits close to 40, such as Sweden or Finland, should have 0.15 and 0.32 extra points of fertility respectively as compared to those with benefits close to 12, such as Greece, Spain or Belgium. As these benefits have increased from an OECD average of 13 in the mid 1970s till around 17 in the mid 1990s, its significance on TFR has also gone up.[19]

The log of part-time employment enters with a negative sign in Model 7. The available sample, though, is relatively small. The overall expected effect of part-time employment for the whole sample of women might be hard to predict given the differences between voluntary and involuntary part-time workers. While the first group might welcome employment flexibility to bear more children, a negative income effect might deter the second group from childbearing. Interestingly, as shown in next section, part-time employment enters positively for 30–34 year old women in Table 6. For that age-group, women are expected to have more established careers and voluntary part-time employment is expected to be more prevalent.

Log of income per capita, and the shares of agricultural employment and urban population are included in all models as standard controls for development. The estimated coefficient for log per capita income, around -0.85, implies that a country with a per capita income of \$10,000 (the majority of OECD countries in the 1960s or Greece in 1997) has a fertility rate 0.35 points higher than one with \$15,000 (such as Spain or New Zealand in the late

1990s) or 0.6 points higher than a country with $20,000 of per capita income (such as Canada, Denmark or Japan at the end of the sample period). Except for the first two models, larger shares of agricultural employment and of urban population boost fertility. Differences in predicted TFR implied by the size of the agricultural sector are substantial for the 1960s, when many OECD countries had not yet undergone a structural transformation,[20] but small for later dates when all countries, with the exception of Greece and Portugal, had converged to a moderate agricultural sector. However, those differences are partially closed by the negative effect of self-employment (very common in agricultural settings). On the other hand, the degree of urbanization increased in all OECD countries, especially after the mid 1970s, though not dramatically. In terms of net predicted fertility, these opposing time trends partially cancel each other out.[21]

Results are robust to the inclusion of additional variables such as measures of the Employment Protection Legislation (EPL) from *Employment Outlook* of the OECD, available for the 1980s and 1990s, and Family Services expenditure and Family Cash private and public mandatory allowances as a percentage of GDP, available since 1980 from the *OECD Social Expenditure Database*.[22] Ceteris paribus, fertility is lower in countries with stricter employment legislation, even though this measure is highly correlated with unemployment. Both public expenditure in family services, such as day-care centers,[23] and, particularly, in cash allowances boost up fertility. Again these expenditures are highly correlated with the size of government. During the 1990s, public expenditures in family services ranged from 2 to 1.5% of GDP in Nordic countries to 0.1% in Spain and New Zealand. Cash allowances ranged from 2% in Nordic countries to around 0.2% in Japan and Spain. Overall a country with a combined cash and family services expenditure of 3.5% of GDP was projected to have fertility 0.3 points higher than a country with a combined expenditure of 0.35%.

To control for changes in wages I have gathered hourly earnings in manufacturing by gender for 17 OECD countries from the International Labor Organization and from some national sources.[24] Fertility increases with male earnings and decreases with female earnings. However, the small sample size, selectivity problems and the decreasing relevance of manufacturing limit the significance of these estimates.

Similarly, I have included the proportion of adult population that attends church at least once a week from the *World Values Survey*. Religious practice increases fertility for the panel estimates (although at a declining rate in recent years). Still, all the previous results remain unchanged.

In addition, to control for the educational attainment of women, I have used either the average number years of schooling of women from the Barro-Lee data set, available through 1990, or the percentage of females enrolled in tertiary education from the United Nations database through 1995, not available for Germany until 1990. Both higher average years of schooling and a higher percentage of women in tertiary education reduce total fertility (and fertility across all age groups). During the last three decades, the share of women in total tertiary education enrollment has steadily converged to about 50% and it is even higher in some of the countries with the lowest fertility rates where limited opportunities in the labor market increase women's interest in pursuing further education.[25] As a result a higher enrollment is to some extent caused by the same factors that cause low fertility.

Finally, the proportion of employees on fixed-term contracts, available for the 15 European Union countries for 1985 and 1990–1997 from the European Commission, significantly depresses fertility by undermining skill acquisition and increasing employment uncertainty. This finding is robust to the exclusion of Spain, which with more than 30% of employment in fixed-term, is an outlier in the sample. Since the mid 1980s, several countries, such as Spain, introduced new labor legislation that lowered employers' costs of hiring young workers through fixed-term contracts in the hope that many of those jobs would eventually become permanent. The result was a high rotation of workers through a string of six-months contracts that ended when fiscal incentives expired.[26]

3.3. Institutional determinants of the timing of births

While fertility has certainly declined across OECD countries during the last three decades, the reduction has not been homogeneous across age-groups and fertility in older groups has even slightly recovered in recent years. Figures 2 (a) and (b) portray the behavior of age-specific fertility rates for 1975–1997 in the United States and Spain, which respectively had the highest and the lowest fertility rates in the OECD by the end of the 1990s. Whereas fertility rates for the younger groups drastically declined in Spain, age-specific rates in the USA remained relatively stable and even recovered for older groups. Spanish women 30 to 34 years are now more fertile than those in their mid twenties and women 35 to 39 have, on average, more births than those aged 20 to 24. If we superimpose both figures, the similarity in age-specific fertility rates for older women and the huge disparity in those for younger women in both countries is striking during the 1990s. One must conclude that the dissimilar behavior of young women is the basis for the big breach in fertility rates between both countries. In this section I analyze the behavior of the age-specific fertility rates to examine whether distinct institutional features either hinder or encourage childbearing at particular ages.

Tables 4 and 5 present estimates for log fertility rates of women 25–29 years old and 30–34 years old respectively. To overcome nonstationarity problems, first-differences are used in Tables 6 and 7 for some of the models of women 30–34 years old and for all estimations of those 20–24 years old respectively. Due to limited space, only models with female unemployment rates -both total and age-specific-are included. Specifications with male unemployment, included in Table 3 are, also, available for each age group from the author.

In Model 1 of Table 4, female unemployment alone significantly depresses fertility of 25–29 years old women. From Model 1, in 1995 predicted log fertility of 25–29 years old in Spain, with female unemployment around 30%, was 0.16 points less than a country with an unemployment rate around the average of 9%, a deviation to an age-specific fertility of 95.4 from the European average of 112 that year. Again the perverse combination of high unemployment and self-employment, estimated in Models 2 and 3, has the utmost impact on fertility. In Model 3, the coefficient of the interactive term between unemployment of young females and self-employment is particularly large. Young female unemployment is clearly a Southern European phenomenon where, also, unstable contractual practices and self-employment are common place. In 1995, while unemployment for women 25 to 34 was around

Table 7. Difference Log Age Fertility for 20–24 years

	(1)	(2)	(3)
ΔLog GDP per capita (PPP 91)	−0.531	−0.498	−0.4434
	(−5.98)	(−6.05)	(−4.59)
Δ% Urban population	−0.0058	0.0032	−0.0035
	(−0.40)	(0.37)	(−0.61)
ΔLog % government employment	1.4161	1.3058	1.6352
	(2.8)	(3.18)	(3.8)
ΔSq. log % government employment	−0.2861	−0.2693	−0.3103
	(−3.17)	(−3.69)	(−4.0)
Δ% Agricultural employment	0.0041	0.01326	0.00196
	(0.43)	(2.54)	(0.46)
Δ Weeks maternity leave	−0.00064	−0.00051	−0.0011
	(−0.89)	(−0.59)	(−2.85)
Δ% Self-employed	−0.0027	−0.0089	0.0007
	(−0.4)	(−1.76)	(0.16)
Δ% Female unemployed	0.00225	−0.0118	
	(0.15)	(−2.54)	
Δ% Female 20−24 y. unemployed			−0.0037
			(−2.74)
Δ (% Female unemployed x % self-emp.)	−0.0002	4.01E−05	
	(−0.73)	(0.23)	
Δ (% Female 20−24.unemployed x % self-emp.)			−4.9E−05
			(−7.09)
Joint chi2 (3)[a]	0.97	6.85	20.81
R square	0.03	0.25	0.45
N. Obs	715	551	499
N. Countries	23	18	21
	OECD	Europe	OECD
	1960–97	1960–97	1964–97

Note: OLS with White robust. T-statistics in brackets. [a]Joint test of difference % female unemployed, difference % self-employed and their interactive. Female unemployed of 20–24 years old is N/A for Netherlands and Switzerland.

6% in the US, New Zealand, Australia or Japan, it averaged 11% in Europe and it reached 20% and 34% in Italy and Spain respectively.

A large government sector encourages fertility of women in their mid-twenties. Coefficients in Models 1 to 3 indicate an increasingly positive effect once public employment rises over 12–14% of total employment. Similarly, higher maternity benefits significantly boost fertility.[27]

Table 5 includes the same specifications employed in Table 4, but now for the fertility of 30–34 years old. Whereas errors are well behaved for Models 1 and 2, which use female unemployment and a longer sample, we cannot reject the presence of a unit root for Model 3, which employs the relatively shorter sample of age-specific unemployment. As a result, Table 6 includes a similar specification for the series in first-differences.

Again, unemployment depresses fertility of older women. Still, both the strength of the effect and its significance are smaller than for the 25–29 years old. In Table 6, unemployment, self-employment and their interactive are not even jointly significant for the sample of OECD countries -they are, however, when the estimation is restricted to European countries. This is possibly due to the fact that, since women in Europe, particularly in Southern Europe,

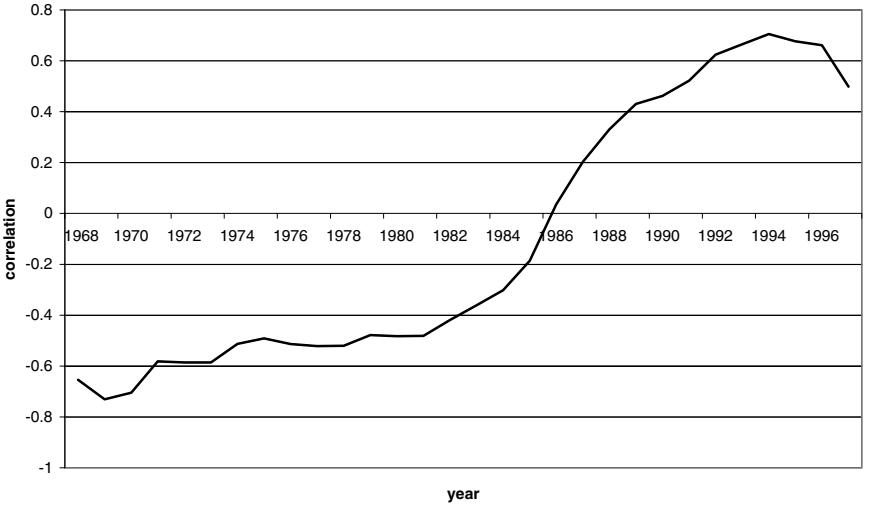

Fig. 3. Yearly correlation between female activity rate and total fertility rate across OECD countries

postpone maternity to older ages, fertility rates for 30–34 years old in those countries do not differ much from the rest of OECD. This matches the patterns of fertility observed in Spain and the US.

Maternity benefits, on the other hand, appear to matter even more for older women. Comparing similar specifications of Model 2 in Tables 4 and 5, an increase from the OECD average of 20 weeks in 1995 to 40 weeks of leave increases the fertility of 25–29 years old by 5.6% from the OECD average of 114 and the fertility of 30–34 years old by 8.2% from the average of 92.

The size of public employment exerts, again, a positive influence, though only for the last twenty years -particularly in the European sub-sample. The U-shaped function linking public employment and fertility has a minimum around 17–20% in Table 6 and the predicted fertility difference is particularly large for Nordic countries. More interestingly, the extent of part-time employment boosts up the number of children that women have in their thirties (Model 2, Table 6). Whereas for a country with a 40% share of part-time, as the Netherlands, the projected fertility of 30–34 years old is 95, for a country with a share of part-time of 5%, as in Southern Europe, is 87 -the average of the sample was 92 in 1995.[28]

Table 7 presents the results for first-differences in log fertility of women who are 20–24 years old. I only include the estimates from the first-differences series because a presence of a unit root could not be rejected for the level estimates. Two important findings set the behavior of younger women apart from the other groups. First, the model does not fit the OECD sample as well as the one restricted to European countries when only total female unemployment rates are used. The r-squared for the OECD estimates in Model 1 is much lower than that for the European sample in Model 2. As expected, the variance explained goes substantially up in Model 3 when age-specific female unemployment is included instead of female unemployment.

Second, a large share of government employment reduces the fertility of younger women. The estimated effect of public employment in Table 7 has

now an inverted U-shape with a maximum around 12%–14%. In fact, this fits our expectations. In countries with large opportunities within the public sector, women opt for participating first in the labor market both to warrant employment after childbirth and to qualify for generous maternity benefits before carrying children. Similarly, maternity benefits depress this age group's fertility, though the coefficient is only significant in Model 3.[29] The increase of those benefits during the last two decades is, in part, responsible for the relatively faster decline of fertility of that age group across Europe.

Again, female unemployment, and especially, young female (and male) unemployment lower fertility for women aged 20–24. Comparing columns 1 and 2 it is clear that unemployment particularly affects the decisions of young European women. As noted in the model, the behavior of the youngest group in non-European countries may be affected by specific institutions – such as the welfare system in the US- that guarantee a minimum income independently of work experience and, as a result, make early childbearing an attractive alternative for those with little prospects in the market.[30]

4. Low participation and low fertility

Figure 3 presents the simple yearly correlation between fertility and female participation for all OECD countries from 1968 till 1997. Coinciding with the sharp reduction in fertility across the OECD, the correlation between fertility and female participation (and employment), which was negative during the 1960s and 1970s, became positive after 1986. From that year onward, fertility rates slightly recovered in those countries with higher female participation rates whereas they suffered a sharp decline in those with low participation.

As pointed out before, current microeconomic models of fertility are ill-prepared to account for this sharp reversal in the relationship between fertility and participation rates since they only predict a reduction of fertility with increased female participation as women trade-off children in favor of less time-demanding alternatives. Instead, the reversal in the traditionally negative correlation between fertility and participation rates must be seen as an upshot of the same underlying forces that account for the dramatic decline in fertility.

First, the reversal of the fertility and participation correlation occurred precisely at the time when unemployment rates climbed to stubbornly high levels, mainly in Southern Europe, where participation rates had traditionally been lower.[31] In Southern Europe, high unemployment rates and unstable contractual arrangements for young workers entailed a negative income effect stemming from a lower expected income not only for women who were in the labor market but, critically, for young men also. The employment insecurity of young men delayed marriage and childbearing even for women outside of the labor force. Of course, other institutional characteristics of those countries -absence of part-time schemes, dual markets, moderate maternity benefits- intensified the depressing effect of unemployment. Further, high unemployment temporarily discouraged additional participation when the cost of participation outweighed its expected reward. Conversely, in highly flexible settings, such as the US, or in those with large female government employment, women could temporarily leave employment to have children being highly certain about their prospects of getting back into work once they had taken care of the latter.

Second, in some Northern European countries, such as Norway and Sweden, generous maternity programs provide strong incentives for women to be employed full time before childbirth (Gustafsson et al. 1996; Ronsen and Sundstrom 1996; Rosen 1996), specially in the public sector, which guarantees stable job prospects after childbirth.[32] As noted by Gustafsson and Stafford (1994), in Sweden, "simply working without children means that one loses out on extensive benefits, and simply having children without labor market attachment implies a low standard of living. Combining the influence of the tax system with child dependent benefits, the full effect of the Swedish system is to encourage fertility and a career lifetime commitment to the labor market by women."(p. 342). Conversely, in countries with a large proportion of self-employed and moderate maternity benefits, such as in Southern Europe, that incentive is weaker.[33]

It is likely, however, that the positive correlation between fertility and female labor participation may fade away over time. A closer look at Fig. 3 already shows a recent reversion of the correlation towards zero. As women in countries with the lowest participation rates gradually enter the labor force, female participation rates will slowly converge across developed countries. However, if their fertility does not increase (due to lack of changes in labor market institutions), the relation between fertility and participation in the cross-section of OECD countries should become flat in the near future.

5. What lies ahead?

During the last two decades a silent demographic transformation with important economic and political consequences has taken place. First, fertility rates have sharply decreased in most developed countries to levels below replacement rates. Second, the correlation between fertility and female labor participation rates across the OECD countries has become positive.

Using a panel of 23 OECD nations for the last 35 years I have shown that the flexibility of the market to accommodate women's exit and entry decisions and the penalty that particular market arrangements impose on truncated careers -through forgone experience, delayed wage growth and increased risk of unemployment- are key to explaining those trends. Further, the structure of the labor market affects not only the size of the opportunity cost of childbearing but also how it varies with age at childbirth and labor market attachment.

On the one hand, high levels of unemployment and both a high share of self-employment and fixed-term (unstable) contracts, which are common features to Southern European labor markets, depress fertility rates mainly among the 20–24 and 25–29 year group. Confronted with labor market instability, women postpone (or abandon) maternity since an early childbearing strategy may sharply reduce lifetime income and increase employment uncertainty. On the other hand, a large share of public employment, by providing employment stability, boosts fertility for women 25 years and older, who are more likely to be eligible for extended maternity leave programs, and reduces that of the youngest group. Similarly, maternity benefits, in most instances linked to employment, encourage fertility, especially for the 30–34 years old, but not for women aged 20 to 24.

As a result of these factors, three stylized equilibria can be distinguished across the OECD. First, in Northern Europe, the presence of both large

public sectors with a large share of female workers and generous maternity benefits conditional on employment guarantee a high level of female participation and keep the fertility rate barely below replacement rate. Second, in highly flexible markets, such as the United States, women leave the labor force knowing that they will be very likely to regain employment at re-entry. In those countries, fertility rates are among the highest in the OECD. Finally, in a third group of countries, including Southern Europe, high unemployment decreases the expected income of a family and discourages temporary exit of the labor market (to have children). In those same countries female participation is relatively low, part-time is uncommon, the size of the public sector is moderate and labor contracts for young workers are unstable. The combination of these institutional features has a strong depressing effect on fertility.

Appendix

In each period income is the maximum between the guaranteed income and the income obtained from work and/or benefits. In the first period, income equals $y_1 = Max\{w_1 h_1^w,\ y\}$. In the second period, income equals $y_2 = Max\{w_2(h_1^w)h_2 + M(h_1^w)(T - h_2), y\}$ if employed, or $y_2 = Max\{\theta(h_1^w)h_2 + M(h_1^w)(T - h_2), y\}$ otherwise. Income is divided between consumption and child expenditures $y_t = c_t + P_{tk}$. A woman compares the expected welfare from having a child in the first period V^{k1} given by

$$\begin{aligned} V^{k1} = {} & (1 - \rho_1 - \alpha)U(w_1(T - m) - P_k) + (\rho_1 + \alpha)U(y - P_k) + (1 + \beta)\psi \\ & + \beta\{(1 - \rho_1 - \alpha)[(1 - \rho(T - m))U(w_2(T - m)T) \\ & + \rho(T - m)U(\theta(T - m)T)] \\ & + (\rho_1 + \alpha)[(1 - \rho(0))U(w_2(0)T) + \rho(0)U(y)]\} \end{aligned} \tag{2}$$

with the expected welfare of postponing childbirth to the second period V^{k2} given by

$$\begin{aligned} V^{k2} = {} & (1 - \rho_1)U(w_1 T) + \rho_1 U(y) + \beta\psi \\ & + \beta\{(1 - \rho_1)[(1 - \rho(T) - \alpha)U(w_2(T)(T - m) + M(T)m - P_k) \\ & + (\rho(T) + \alpha)U(\theta(T)(T - m) + M(T)m - P_k)] \\ & + \rho_1[(1 - \rho(0) - \alpha)U(w_2(0)(T - m) - P_k) + (\rho(0) + \alpha)U(y - P_k)]\} \end{aligned} \tag{3}$$

where β is the discount rate. Similarly, she can also entertain the possibility of no maternity at all.

$$\begin{aligned} V^{nk} = {} & (1 - \rho_1)U(w_1 T) + \rho_1 U(y) \\ & + \beta\{(1 - \rho_1)[(1 - \rho(T))U(w_2(T)T) + \rho(T)U(\theta(T)T) \\ & + \rho_1[(1 - \rho(0))U(w_2(0)T) + \rho(0)U(y)]\} \end{aligned} \tag{4}$$

The analysis of these expressions brings a better understanding of the trade-off women face. Even though the expected welfare for each strategy V^{k1}, V^{k2} and V^{nk} decreases with m, γ and δ, the effect is larger for V^{k1}. An increase in P_k only depresses the welfare in the first two cases but particularly, in the first, so

that $(V^{k1} - V^{k2})$ decreases with P_k. Conversely, $(V^{k1} - V^{k2})$ and $(V^{k1} - V^{nk})$ increase with ψ and $\underline{y}$ since an increase in those parameters, though it improves expected welfare for all cases, it is particularly important for the first strategy. An increase in ρ_1 increases the attractiveness of the first choice, ceteris paribus. An increase of α works in the reverse direction. Increases in $\theta(.)$ and $M(.)$ exert a positive effect in all three options but relatively decrease the attractiveness of V^{k1}. If $\rho(.)_{h^w} < 0$ and $\rho(.)_{h^{w2}} > 0$, an increase in unemployment particularly depresses V^{k1}.

At the beginning of the second period, a woman already has full knowledge of her (and her spouse) probabilities of employment in the second period as well as the benefits/ wage they can expect and updates her choice.

Endnotes

[1] Among other, see Freeman and Katz (1994) and Adserà and Boix (2000).

[2] See Pampel (2001) for a first attempt to link the diversity of demographic behavior across the OECD to sociopolitical institutional variation.

[3] See Arroyo and Zhang (1997) and Hotz et al. (1997) for a review of the literature.

[4] If, alternatively, hours of work were defined continuously over the interval $h_t^w \in [h_t, 0]$, part-time could become easily available for young people to overcome long-term unemployment traps and ease women transition back into the market after childbirth.

[5] Joshi and Davies (1992) report important income losses from childbirth in different European countries. By constrast, some US studies are more optimistic on the ability of women to eventually recover, with some lag, their pre-existing wage (Mincer and Polachek 1974, Corcoran et al. 1983, Mincer and Ofeck 1982).

[6] Polachek (1981) argues that the depreciation rate varies by occupation and that those having children (or high preference for children) gravitate to occupations with low depreciation rates. However, those occupations may have lower wage growth prospects.

[7] In Heckman and Willis (1976), even if changes in wages are unrelated to the employment history but, for example, rise exogenously with age, households delay births until earnings have risen sufficiently. Conversely, as shown in Vijverberg (1984), if perfect capital markets allow to smooth consumption over time, the attractiveness of an early childbearing strategy increases for households facing a rising income profile.

[8] There is a positive relation between the size of public sector and subsidized child care programs which reduce childbearing costs P_k. In recent years, many government jobs have been added to care for the children and the elderly, particularly in Scandinavia (Rosen 1996).

[9] Supporting results in this paper, recent studies question Butz and Ward (1979) empirical results on the appearance of a countercyclical fertility (Macunovich 1995, Wright 1989).

[10] In general, workers with more experience should have stronger market power to negotiate part-time arrangements more easily, and therefore α should, in fact, be lower in the second period.

[11] Data are only available for Denmark, Luxembourg, New Zealand and Greece since the early 1980s, for Italy and Netherlands since the mid 1970s and for Austria, Iceland and Switzerland for the 1990s.

[12] Unit root test 10% critical values with individual-specific intercepts and 25 time periods are –6.03 for N = 15, –6.78 for N = 20 and –7.45 for N = 25. Results are available from the author.

[13] I have obtained similar results with long-term unemployment. Long-term unemployment rates (more than 12 months), available for 1979–1997, varies from about 60% – in Italy, Spain, Greece, Ireland or Portugal in 1995 – to around 10% – in Canada, Japan, USA or Sweden.

[14] Murphy (1992) refers to the following excerpt from a report of the Royal Commission on Population in 1949: "The heavy unemployment of the inter-war period must have affected the attitude to parenthood not only for the workers who at any one moment were out of work but also of the far larger number for whom it was an ever-present threat". See Southall and Gilbert (1996) for the effect of the business cycle on marriages (and births) in England and Wales during 1839–1914.

[15] In addition, parents, confronted with job market uncertainty and increasing demands of skills, would choose to limit their offspring and invest more per child to decrease the child's future risk of unemployment (Becker et al. 1990).

[16] Elswehere I use micro-data to study the fertility behavior of self-employed, among other types of employment, across the European countries (Adserà 2003).

[17] Results from estimating the size of government sector jointly with its interaction with a time trend indicate a change from a negative to a positive effect of government employment in Europe precisely in the mid 1980s.

[18] The simple sample correlation between income per capita and share of government employment is 0.61 for the period 1960–1980 but only 0.13 for the period 1981–1997, and 0.02 during the 1990s.

[19] Estimates across different time subsamples denote an increased relevance of maternity benefits on fertility since the mid 1980s.

[20] In rural economies, women work and care for children simultaneously in nonmodern production sectors (Durand 1975, Goldin 1994).

[21] While for sample of world countries, urban share should have a (strong) negative effect on fertility; the effect of urban share within the sample of OECD countries- where urbanization is already (or has become over the last 30 years) relatively high- is not so clear-cut. In addition, given the high correlation between shares of agriculture, urban population and self-employment, the positive coefficient on urban share may be picking up the fact that the particular type of self-employment predominant in countries where agriculture was still relatively important in 1960 has a larger negative effect on fertility than that of those that underwent structural changes one or two decades earlier. We thank an anonymous referee for calling this into our attention.

[22] Estimates of these alternative specifications are available upon request.

[23] By the mid 1990s, employment in public day care, excluding after-hour care of school children, accounted for 16 percent of public employment in Sweden (Rosen 1996).

[24] Data were not available for Austria, Canada, Iceland, Italy, Spain, and USA. Data for the ratio of women to men hourly earnings was obtained for more countries.

[25] Data from the latest *Education at a Glance* from the OECD shows that, in 1998, the countries with the highest unemployment rates for young women and the lowest TFR in the OECD, Italy and Spain, had the highest proportion of 25–29 year-old women studying, and not in the labour force, as well as the lowest proportion of women employed in that age group. Only Sweden had a similar proportion of young women in education, but a 20 point difference in the proportion of women employed.

[26] The duality of the labour market may explain why women in Spain fall in two groups: those who do not withdraw from the labor force after childbirth and those who withdraw and do not re-enter after their children arrive at school-age (Adam 1996). On the one hand, women who have a permanent job do not want to risk losing it. On the other, re-entry may be difficult because of high unemployment and the instability of contracts.

[27] In separate results, part-time employment is never significant for this age group.

[28] Although a large share of part-time employment can stem from a higher demand, differences in the legal framework across the OECD turn part-time into an expensive alternative for employers in areas such as Spain and Italy where the proportion of female unemployment is larger than the proportion of part-time employment (Adam 1996).

[29] In a different model, the levels of government employment and maternity benefits and differences in unemployment explain more than a third of the variance in the differences of fertility of young women. Maternity benefits alone reduce fertility, an indication of the incentive to postpone fertility until qualifying for substantial benefits. However, controlling for the size of government, benefits increase fertility.

[30] In alternative estimations, part time does not appear to be significant for the fertility behavior of that group. The increase in the percentage of women enrolled in tertiary education during the last decades, however, seems to have come hand in hand with a reduction in fertility for the younger group.

[31] See Ahn and Mira (2002) for a related analysis.

[32] Additionally, some statistics, particularly in Northern Europe, count some women on leave as employed, therefore boosting the level of employment and participation rates. Table 1 in

Gustafsson and Jacobsson (1985) shows that, already in the early 1980s, 20% of female workers were absent in Sweden, including those in parental leave.

[33] The sample correlation between female labor force participation and the shares of goverment employment and self employment are 0.55 and −0.5 respectively.

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