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Trends and Determinants of Fertility Rates: The Role of Policies

Anna Christina D'Addio,

Marco Mira d'Ercole

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SUMMARY

1. This report tries to explain observed changes in fertility rates across OECD countries, with an emphasis on socio-economic considerations. It aims to extend the understanding of fertility-related behaviours in different ways: first, by explaining recent developments in fertility rates and their relationships to other social drivers; second, by developing and testing new and expanded models to explain the cross-country variation in fertility rates due to labour markets, social and fiscal policies, and individual characteristics; third, by exploring which polices, through their effects on particular variables at micro and macro levels, have the biggest effect on fertility rates.

2. This report addresses three main issues.

- First, it describes trends in fertility rates across OECD countries, focusing in particular on the postponement of childbearing. While fertility rates have declined dramatically over the past decades in all OECD countries, the pace of this decline — and the levels achieved — differ across countries. A decomposition of changes in total fertility rates between younger and older cohorts in three different sub-periods shows that the behaviour of younger and older women has moved in different ways over time, and that different OECD countries are at different points of their demographic transition. Cohort indicators of fertility indicate that, despite postponement of first childbirth, recuperation at higher ages is only partial and — if that trend continues — completed fertility is unlikely to return to replacement levels in most OECD countries. Postponement of childbearing is also accompanied by an increase in the share of children without siblings, by higher frequency of childlessness among women in their 30s and 40s, and by greater risks of some health problems for mothers and their children. At the same time, there is also evidence of an important gap between desired and observed fertility rates and of an increase in this gap over time.

- Second, it identifies some of the structural determinants of the delay in childbearing and decline in fertility rates. The analysis highlights two set of factors that have contributed to current fertility trends: (i) higher education and employment of women, and changes in patterns of family formation; and (ii) shifting values of younger women towards a less traditional role of women within family and society. Women with paid jobs, with higher education and income, and who are not married have lower births than other women. As their share in the population increased, these factors have contributed to reducing total fertility rates. Childbearing has also increased rapidly among non-married women, leading to sharp rises in the share of birth outside marriage. These changes in childbearing behaviours are partly explained by shifts in the values of individuals with respect to family and gender roles.

- Third, it describes how a range of policies may affect the cost of children and it analyses the relation between these policies and total fertility rates. Tax credits, cash benefits, and support to help families to meet their childcare costs all reduce the direct cost of children, but their importance varies widely across countries. Childcare availability and leave provisions have also the potential of modifying the opportunity costs associated to motherhood. Cross-country analysis suggests that total fertility rates are higher in OECD countries with wider childcare availability, lower direct costs of children, higher part-time availability and longer leaves. Panel-data estimates — based on models that allow for dynamic effects and endogeneity of some of the explanatory variables, and that account for possible heterogeneity between countries — show that transfers to families with children, as well as provisions that allow mothers to better cope with family and career responsibilities all help in removing obstacles to childbearing. Simulations of the possible effects of various reforms show that a package of policies relaxing some of the constraints to childbearing may significantly raise total fertility rates and, thereby, the size of the population and of the labour force. For example, in the case of Japan, such policies may raise the total fertility rate to a level of 2.0, which would leave the population in 2050 at 94% of the 2000 level, as compared to 79% projected by national authorities.

RESUMÉ

3. Ce rapport essaye d'expliquer les évolutions observées dans les taux de fécondité dans les pays de l'OCDE, l'accent étant mis sur un angle socio-économique. Il tend à faire comprendre les comportements liés à la fécondité de plusieurs manières : premièrement, en expliquant les évolutions récentes des taux de fécondité et leur relation avec les autres facteurs sociaux ; deuxièmement, en développant et en testant des modèles nouveaux et élargis afin d'expliquer les différences des taux de fécondité observées dans les pays en fonction des caractéristiques du marché du travail, des politiques sociales et fiscales et des caractéristiques individuelles ; troisièmement, en essayant d'identifier les politiques qui ont la plus grande incidence sur les taux de fécondité de par l'effet qu'elles ont sur des variables particulières aux niveaux micro et macro.

4. Ce rapport se développe autour de trois chapitres :

- Premièrement, il décrit les évolutions des taux de fécondité dans les pays de l'OCDE, en insistant particulièrement sur le report de la maternité. Alors que les taux de fécondité ont considérablement baissé ces dix dernières années dans tous les pays de l'OCDE, le rythme de ce déclin – ainsi que les niveaux atteints – ne sont pas les mêmes dans tous les pays. Une décomposition des variations des taux de fécondité totale entre les cohortes plus jeunes d'une part et les cohortes plus âgées d'autre part dans trois différentes sous-périodes montre que le comportement des jeunes femmes et des femmes plus âgées a changé de différentes manières dans le temps et que quelques pays de l'OCDE sont à différents moments de leur transition démographique. Les indicateurs de fécondité d'une cohorte montrent que malgré le report de la naissance du premier enfant, la récupération à des âges plus élevés est seulement partielle et que la fécondité complète n'a peu de chance de revenir à des taux de remplacement dans la plupart des pays de l'OCDE si les tendances récentes devaient continuer. Le report de la maternité est aussi accompagné par une augmentation de la part des enfants uniques, par une plus grande fréquence de femmes sans enfant ayant la trentaine ou la quarantaine et par des risques plus grands de problèmes de santé pour les mères et leurs enfants. Il apparaît aussi qu'il existe un important écart entre les taux de fécondité observés et désirés et que cet écart se creuse dans le temps.

- Deuxièmement, il identifie quelques-uns des déterminants structurels du report de la maternité et du déclin des taux de fécondité. L'analyse montre deux catégories de facteurs qui ont contribué à l'évolution actuelle de la fécondité : i) une meilleure éducation et emploi des femmes et le changement dans les tendances de formation des familles ; et ii) une mutation des valeurs des jeunes femmes vers un rôle moins traditionnel des femmes au sein de la famille et de la société. Les femmes ayant des emplois rémunérés, avec un niveau d'éducation ainsi que des revenus plus élevés, et non mariées, ont moins d'enfants que les autres femmes. Comme leur part dans la population a augmenté, ces facteurs ont contribué à réduire les taux de fécondité totale. Le nombre de naissance a aussi rapidement augmenté parmi les femmes non mariées, menant à une croissance marquée dans la part des naissances hors mariage. Ces changements de

comportements en matière de maternité s'expliquent en partie par les changements de valeurs des individus par rapport à la famille et des rôles hommes-femmes.

- Troisièmement, il décrit comment un ensemble de politiques peut avoir un impact sur le coût des enfants et il analyse la relation entre ces politiques et les taux de fécondité totale. Les crédits d'impôts, les prestations en espèces et l'aide apportée aux familles pour couvrir les coûts de garde d'enfants, tout ceci réduit le coût direct des enfants, mais leur importance varie grandement d'un pays à l'autre. La possibilité de faire garder son enfant et d'avoir des congés peut aussi modifier les coûts d'opportunité associés à la maternité. Les analyses empiriques suggèrent que les taux de fécondité totale sont plus élevés dans les pays de l'OCDE qui ont des capacités de gardes d'enfants plus importantes, des coûts directs des enfants plus bas, des possibilités de temps partiel plus importantes et des congés plus longs. Les estimations qui utilisent des données longitudinales – basées sur des modèles dynamiques qui tiennent compte de l'endogénéité de quelques-unes des variables explicatives et de la possible hétérogénéité entre les pays – montrent que les transferts aux familles avec enfants, de même que les dispositifs qui permettent aux mères de mieux pouvoir concilier leur vie de famille et leurs responsabilités professionnelles aident à supprimer les obstacles à la maternité. Des simulations de possibles effets de diverses réformes montrent qu'un nombre de politiques éliminant certaines des contraintes à la maternité pourrait faire augmenter de manière significative les taux de fécondité totale et par là-même la population et les forces de travail. Dans le cas du Japon, par exemple, ces politiques pourraient relever le taux conjoncturel de fécondité à un niveau proche de 2. Par le biais de cette augmentation, la population en 2050 pourrait atteindre un niveau équivalent à 94% du niveau de 2000 par rapport au 79% anticipé par les autorités nationales.

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INTRODUCTION

5. Is the decline of fertility rates a temporary phenomenon that will be reversed in the future? Has the change in childbearing behaviour affected all women in a similar way? How, and under which circumstances, can policies help fertility rates to recover from their record-low levels? This report addresses these questions. It aims at explaining observed childbearing behaviour across OECD countries, giving emphasis to socio-economic considerations. Its purpose is to extend the understanding of trends and determinants of fertility rates as well as of behaviours related to childbearing by: first, explaining recent developments in fertility rates and their relationships to economic and social changes; second, developing and testing different models to explain variations in fertility rates due to labour market institutions, social and tax policies, and individual characteristics; and third, identifying which policies might influence fertility rates. This report builds on the review recently undertaken for the OECD by Sleebos (2003), as well as on other publications (European Foundation, 2004; Castles, 2004; Council of Europe, 2003).

6. Chapter 1 analyses recent trends in reproductive behaviour, with the aim of determining whether low fertility rates are a temporary or permanent phenomenon, and describes some of the consequences of the postponement of childbearing for individuals. Chapter 2 describes the relation between fertility rates and some of its societal and individual determinants. Chapter 3 considers policies that might affect the costs of children, with a focus on taxes and benefits, childcare availability and costs, and parental leave provisions. It also presents empirical analyses of the determinants of total fertility rates based, first, on static cross-section data for 19 OECD countries and, second, on dynamic panel data for 16 OECD countries. Estimates from the cross-section analysis are then used to simulate the potential increase in fertility rates that would result from various policy reforms. The final section concludes.

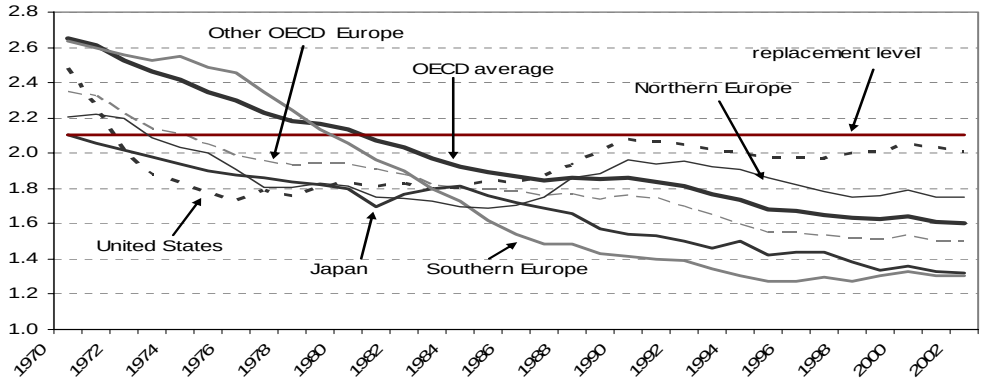
CHAPTER 1. DECLINE, POSTPONEMENT AND RECUPERATION OF CHILDBEARING: PAST AND CURRENT TRENDS

1.1. Introduction

7. Cross-country patterns of childbearing can be measured by both cohort and period indicators. Cohort indicators assess the birth rate of women born in a given year as they attain the end of their reproductive cycle. Period indicators – the total fertility rates – measure the rate of birth to women of different ages in a given year, assuming that they behave according to hypothetical schedules of specific cohorts.[1] Total fertility rates are subject to larger variations than cohort fertility rates; they are however often used in international comparisons owing to their wider availability and because they allow one to track recent changes.

8. Total fertility rates declined dramatically over the past few decades, falling from an average of 2.7 children per women of childbearing age in 1970 to 1.6 in 2002 (Figure 1). By 2002, the total fertility rate was below its "replacement" level – a cohort fertility rate of 2.1 would ensure the replacement of the previous generation, and therefore population stability, under assumptions of no immigration and of no change in mortality rates – in all OECD countries except Mexico and Turkey. The timing and pace of decline, however, varies widely from country to country. In Nordic countries, for example, the decline started early, but came to a halt in the early 1990s, stabilising at a level of around 1.8. Southern European countries, conversely, have shown a decline in fertility rates beginning in the mid-1970s, but have now reached an extremely low level of 1.3 children per women, the same level as recorded in Japan and Korea.

Figure 1. Trends in total fertility rates in OECD countries



Note: Data refer to total fertility rates.
Source: For detailed sources see OECD (2005a), *Society at a Glance – OECD Social Indicators*, OECD, Paris.

1 . The total fertility rate represents the ratio between the number of births in a given year and the average number of women of reproductive age. In all OECD countries, the age considered for the calculation of total fertility rates spans from 15 to 49 years. However, due to recent advances in fertility-enhancing therapies, a small but increasing number of women are giving birth at age 50 and above.

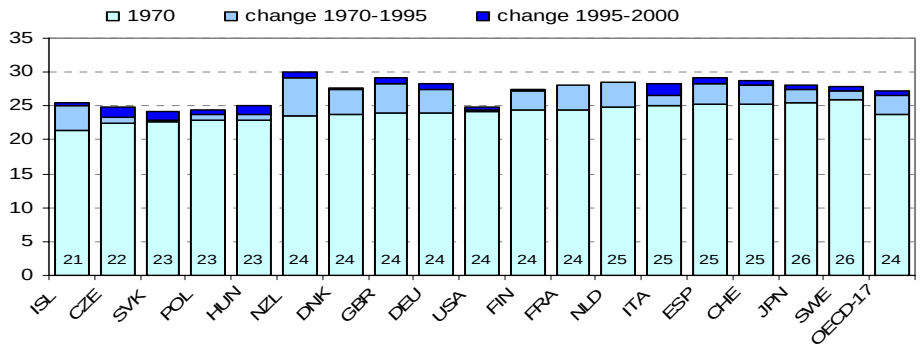
9. Demographers, social scientists and policy-makers have engaged a lively debate on the causes of low fertility rates and on the prospects for further change (Chesnais 1996, 1999; Calot and Sardon, 2001; Lesthaeghe 2001; Lesthaeghe and Willems 1999; McDonald 2000a,b,c; Gauthier, 1996, 2001, 2004; Atoh *et al.,* 2001; Sardon, 2002; Ogawa, 2003; Frejka and Sardon, 2004). Low fertility rates, combined with low mortality, imply rapid ageing of the population and declines in its size in the future. The most immediate consequence of population ageing is the loss of reproductive potential, measured in terms of women at childbearing ages. Population ageing has, however, other financial and economic consequences, which have been extensively discussed. Growing public spending on pensions and health care, due to population ageing, may put pressures on public budgets, compromising financial stability and crowding out other expenditure programmes (e.g. those devoted to families with children). An older labour force may be less willing or capable to adapt to changes, in terms of both geographical and occupational mobility. In turn, changes in the size and structure of the population may affect economic growth: as younger cohorts shrink, the number of people holding jobs falls, the pool of domestic savings in the economy gets smaller, with negative consequences on productive investments (Oliveira Martins *et al.*, 2005; Burniaux *et al.*, 2004). The growing number of older people may also imply risks of greater tensions between generations. Finally, with only two, one or perhaps no children at all, questions about the availability of family carers for adults in their old age are set to become more important over time (Ogawa, 1997; Ogawa *et al.*, 2004).

10. Low fertility rates may be either a temporary or a persistent phenomenon. Understanding the transitory or permanent character of the decline in fertility rates is essential if we are to anticipate future population developments. Section 1.2 focuses on the extent of postponement of childbearing, looking in particular at whether it can be reversed. Section 1.3 describes some the implications of delaying childbirth on mothers' and children health..

1.2. Postponement and recuperation of childbearing

11. Postponement of the first childbirth is probably the most important event of what has been labelled as the "second demographic transition" that is characterizing most OECD countries (van de Kaa, 1987). Postponement results in the rise in the mother's age at childbirth (see Gustaffson and Wetzels, 2000). An indicator that is often used to describe this phenomenon is the mean age of mothers at first childbirth. For the seventeen countries depicted in Figure 2, this mean age at first childbirth has increased, on average, from 23.8 to 27.2 years over the period 1970-2000, an increase of over 1 year per decade.[2]

Figure 2. Mean age of mothers at first childbirth in selected OECD countries



Note: The total height of each bar is the mean age of mothers at first childbirth in the year 2000 (also shown as the value at the bottom of each bar). Countries are ranked in increasing order of the mean age at first childbirth in 1970.

Source: Computations based on data from OECD (2005a), *Society at a Glance – OECD Indicators*, OECD, Paris.

2 . See, on this issue, Frejka and Calot (2001a).

12. If successive cohorts have the same average number of children per woman, but delay their childbearing until later in life, this will lead to a temporary reduction in the period fertility rate; the opposite would occur if each cohort of women advanced the timing of their childbirths.[3] Changes in the mean age at first childbirth for different cohorts of women can therefore generate cyclical swings in the period fertility rate (a decline, followed by recuperation) even when the cohort fertility rate is unchanged.[4] The use of total fertility rates, when postponement of childbirth is occurring, will thus overestimate the short-run effect of the decline in fertility rates.

13. Postponement can be analysed through both period and cohort indicators. Both approaches are pursued below, as they provide complementary perspectives.

- First, birth rates patterns are described by decomposing changes in total fertility rates over time between that part attributable to the behaviour of women aged less than 30 and the part due to women above that age. In this context, "recuperation" manifests itself in lower birth rates for younger women followed by increased birth rates for older ones (Section 1.2.1).

- Second, cohort profiles are examined. This allows describing the extent of delay and recuperation among cohorts of women that have completed their reproductive cycle. The childbearing trajectories of the most recent cohorts can also be projected into the future, based on the patterns observed for the older cohorts: this provides insights about the scope for a recovery in birth rates in the near future (Section 1.2.2).

1.2.1. Period indicators: postponement using period indicators

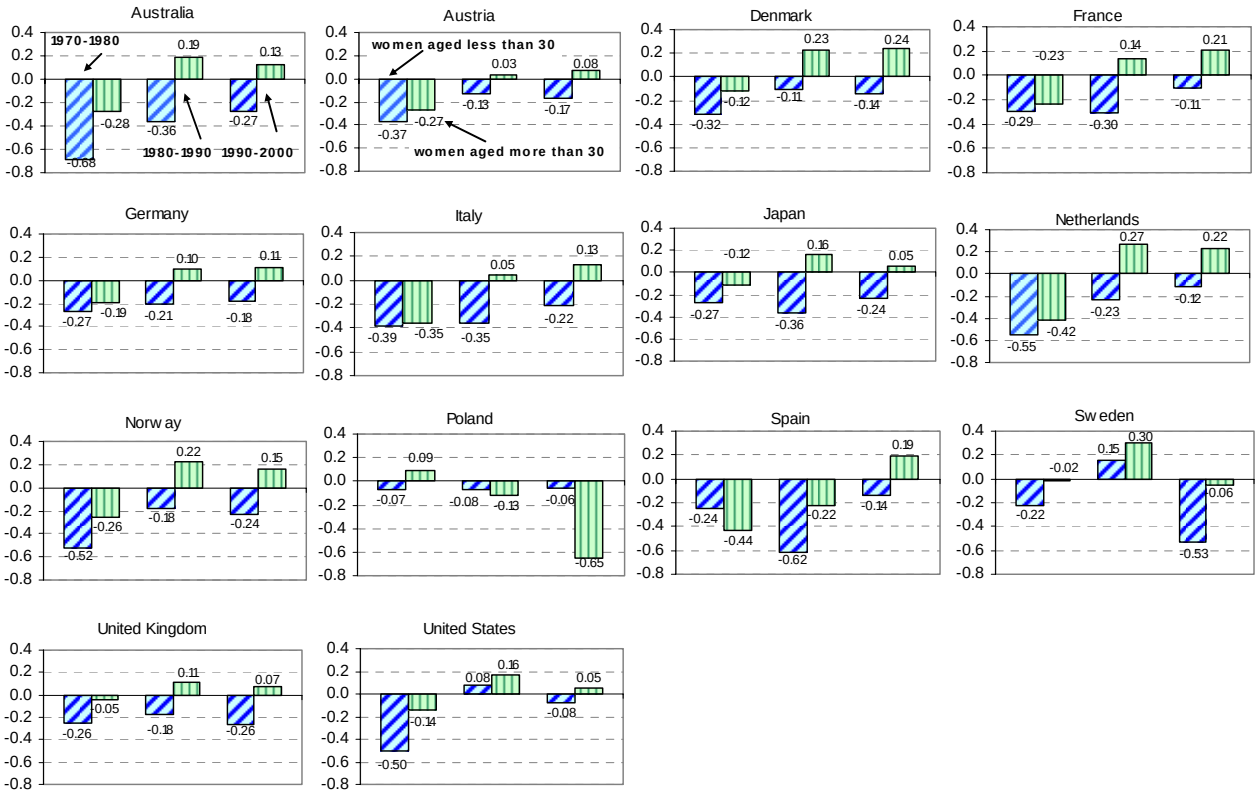
14. The approach proposed by Lesthaeghe and Moors (2000) is used below to describe changes in childbearing schedules using period indicators. The change in the total fertility rates from 1970 to 2000 is decomposed into the changes that occurred in three different sub-periods: between 1970 and 1980; between 1980 and 1990; and between 1990 and 2000. For each of these sub-periods, the contributions of younger women (those aged less than 30) and older women (those aged more than 30) are distinguished.[5] Box 1 provides details about this decomposition. For data comparability reasons, the analysis is limited to Australia, Austria, Denmark, France, Germany, Italy, Japan, Netherlands, Norway, Poland, Spain, Sweden, United Kingdom and the United States (Figure 3).

3 . In France, for example, Toulemon and Mazuy (2001) and Ní Bhrolchaín and Toulemon (2002) have shown that, despite fertility postponement, cohort fertility is broadly stable.

4 . Descriptions of the methods used to link cohort and period measures of fertility are provided by Ryder (1980); Bongaarts (1998, 2001); Bongaarts and Feeney (1998).

5 . Two main reasons justify the choice of the age of 30 as dividing line: first, in most countries, mean age at childbirth is now clustered around this level; second, the age-specific fertility rates used here are available only for five-year intervals.

Figure 3. Decomposition of changes in fertility rates according to the contribution of mothers at different ages



Note: The chart shows changes in the period total fertility rates, computed over three different ten-year periods (1970-80, 1980-90, 1990-2000) of women aged below and above 30 years of age. For each country, three pairs of bars are shown, one for each period considered; the first bar of each pair, shaded with diagonal lines, refers to the cumulative change in the period fertility rate of women aged less than 30, and the second, shaded with vertical lines, to the changes in the period fertility rate of women aged over 30 in the same period.

Source: Data from Council of Europe (2003) for European countries; National Institute for Population and Social Security Research (2003a), *Population Statistics of Japan* for Japan; US Census Bureau (2004), the *International Data Base* for the United States.

Box 1. Decomposition of changes in total fertility rates

Total fertility rate in the year 2000 can be written as follows:

$$TFR_{2000} = TFR_{1970} + \delta ASFR_{<30}^{1970-1980} + \delta ASFR_{\geq 30}^{1970-1980} + \delta ASFR_{<30}^{1980-1990} + \delta ASFR_{\geq 30}^{1980-1990} + \delta ASFR_{<30}^{1990-2000} + \delta ASFR_{\geq 30}^{1990-2000}$$

where TFR is the total fertility rate in the years 1970 and 2000, and δASFR is the variation in the age-specific fertility rates (ASFR) for the age-group 15-29 ($\delta ASFR_{<30}$) and the age-group 30-49 ($\delta ASFR_{(\geq 30)}$), respectively, over the years considered. This expression can also be written as follows:

$$\delta TFR_{1970-2000} = \sum_{i=1}^{3} \delta ASFR_{(<30)_i} + \sum_{i=1}^{3} \delta ASFR_{(\geq 30)_i}$$

where the subscript *i=1,2,3* refers to the periods: (1) 1970-1980; (2) 1980-1990; and (3) 1990-2000.

In other words, the changes in the total fertility rates over the years 1970-2000 can be expressed as the sum of changes in the age-specific fertility rates before and after age 30.

15. Figure 3 suggests that OECD countries are at different stages of the process of childbearing postponement:

- In the period between 1970 and 1980, fertility rates declined for both younger and older women. In most countries, the decline of age-specific fertility rates of younger women is larger than that of older women. These countries were, in this period, at the onset of the childbearing postponement. Only Poland (where the age-specific fertility rates of older women increased) and Spain (where the decline in the fertility rate of older women exceed that of younger cohorts) present a different pattern.

- Between 1980 and 1990, the fertility rates of younger and older women moved in different directions in most countries: the fertility rates of women aged 30-49 increased, while that of women aged 15-29 continued to fall. This suggests the onset of childbearing recuperation in most countries. There are, however, exceptions: in Sweden and the United States, the age-specific fertility rates increased for both groups of women, a pattern which *prima facie* suggests that recuperation had been completed; in Spain and Poland, age-specific birth rates declined for both younger and older women, as these countries lagged the patterns of other OECD countries.

- Between 1990 and 2000, the fertility rates of younger and older women kept moving in opposite directions for most countries considered. This suggests that recuperation continued, but at a lower pace. In Sweden and Poland, however, fertility rates of older women resumed their decline. It should also be noted that, in most of the countries considered, the reduction in the fertility rates of younger women was smaller than that registered over the previous decades: exceptions are Japan, Denmark and Sweden (where reductions in the fertility rates of younger women are higher than those observed in the previous decades). Also, the increase in the fertility rates of older women is higher than that recorded over the previous decades, with the exceptions of Japan, Denmark and the United States.

16. The decomposition presented in Figure 3 helps understanding whether lower fertility rates in one period, due to reductions in fertility rates at younger ages, are compensated by increased fertility rates in subsequent periods. However, it does not allow determining whether full recuperation is occurring.[6] This reflects two factors. First, postponement alters the contribution of the two groups of women to the total fertility rates: even an increase in fertility rates of older women in one period that exactly matches the decline of younger ones in the previous decade may leave the total fertility rate below the level that prevailed before the onset of postponement. Second, period indicators give only a cross-sectional view of what is unfolding at the cohort level. To get a better appreciation of the extent of postponement and recuperation, attention has to be turned to cohort indicators.

1.2.2. Cohort analysis: postponement and recuperation

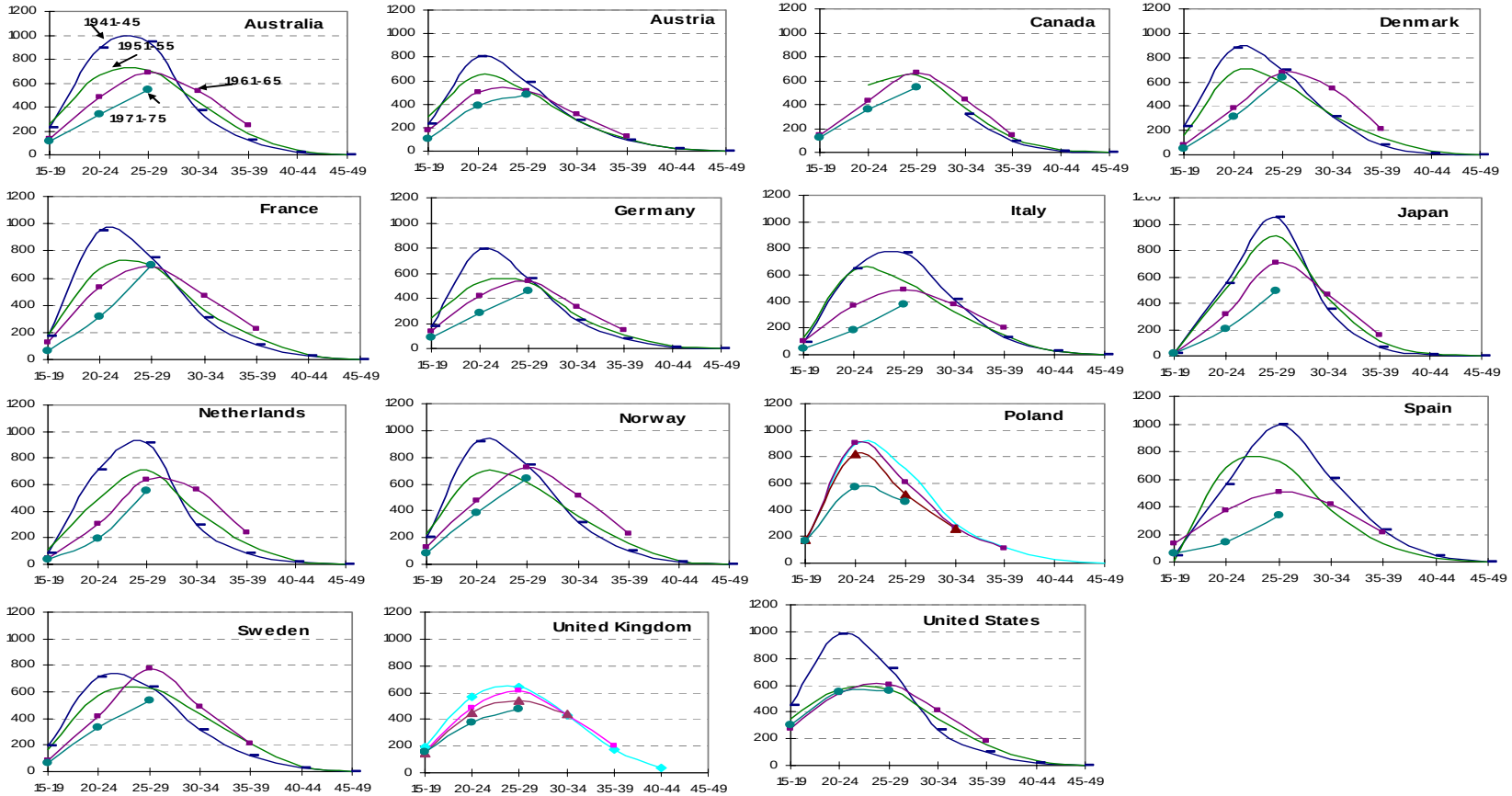
17. A comparison of the behaviour of younger and older cohorts allows identifying both the features that are common and those that differ across countries. In addition, trends in fertility rates of the youngest cohort provide information about the likely development of fertility rates in the future. To investigate childbearing behaviour at the cohort level, age-specific fertility rates for various birth cohorts are used for 15 OECD countries. Data for different cohorts refer to age-specific fertility rates observed at five-year intervals, i.e. to so-called "synthetic birth cohorts".[7] The data shown in Figure 4 refer to four cohorts of women born, respectively, in 1941-46, 1951-56, 1961-66 and 1971-76.

18. The childbearing patterns observed for these four birth cohorts confirm that, in all countries, recent generations of women have fewer children at early stages of their reproductive cycle and more children at later ages. In general, however, the higher number of children that women have when old does not fully compensate for the lower number of children that women have when young: for example, in the case of Australia, the age-specific fertility rates of different cohorts decline by significant amounts at age 25 to 29, when moving from the oldest to the youngest cohorts, while they increase by small amounts at age 35 to 39. Sweden and other Nordic countries are exceptions, as the increase of age-specific fertility rates at age 30 to 34 is much larger than in other countries. In Sweden, in addition, the median value of the distribution shifts to the right, reaching a higher level than that recorded in the previous period; in other words, by the time Swedish women reach age 25 to 29, the cohort born in the years from 1961 to 1965 had a higher fertility rate than the maximum attained by the cohort born from 1941 to 1945.

6 . In a period perspective, full recuperation occurs when the increase in the fertility rates of older women more than offsets the reduction in the fertility rates of younger women.

7 . For example, data on the cohort of women born from 1941 to 1945 are based on the age-specific fertility rates of women aged 15-19 in 1960, 20-24 in 1965, 25-29 in 1970, 30-34 in 1975, 35-39 in 1980, 40-44 in 1985 and 45-49 in 1990.

Figure 4. Profiles of cohort fertility rates in selected OECD countries



Note: Age groups are shown on the horizontal axis; the number of children (x 1000) on the vertical one. The different curves refer to different birth cohorts as illustrated in the panel for Australia.

Source: Data from Council of Europe (2003) for European countries; National Institute for Population and Social Security Research (2003a), *Population Statistics of Japan* for Japan ; US Census Bureau (2004), the *International Data Base* for the United States; Australia Bureau of Statistics (2004), *Births, Australia*. Cat. N. 3301.0.

19. A different way of representing the evolution of fertility rates across cohorts is to plot the fertility rate of women at a given age (e.g. 20 to 24) for different birth-cohorts, an approach that is better suited to highlight acceleration or period distortions (Lesthaeghe and Moors, 2000). Figure 5 suggests that:

- The age-specific fertility rates of women aged 20-24 have fallen strongly over time in all the countries considered, although with differences in the timing of such decline — which begins only in the 1970s in Japan, Italy and Spain, and in the 1980s in Poland. In the United States, this decline ended in the early 1970s.

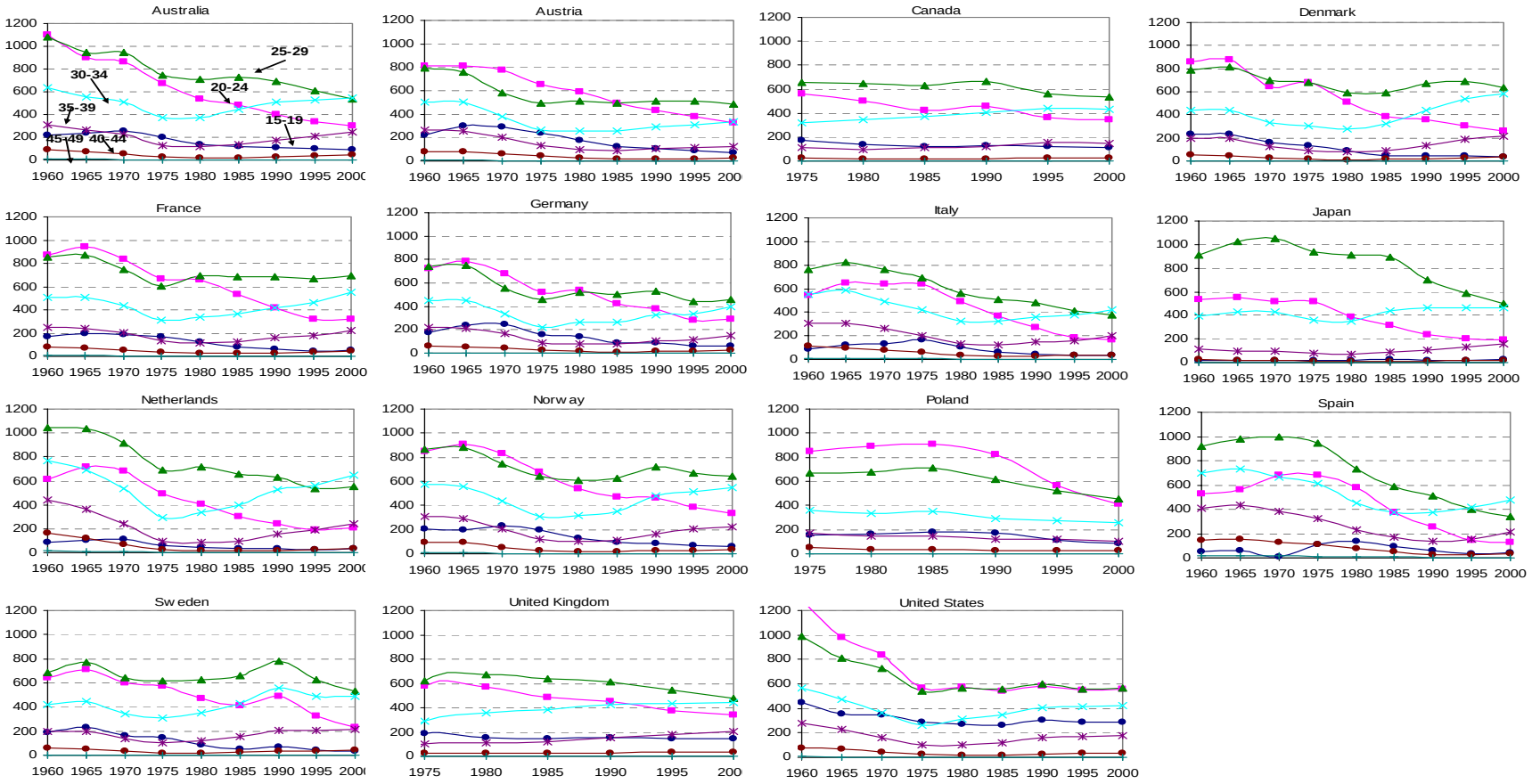
- Cross-country childbearing patterns for women aged 25-29 differ significantly. In the Nordic countries, after a slight decline in the early 1970s, births to women aged 25-29 increased in the following decade, followed by a renewed decline in the 1990s. Conversely in Austria, France, Germany and the United States birth rates among women aged 25 to 29 have increased slightly over time. In other countries, fertility rates at this age declined steadily over time, with the pace of the decline being especially pronounced in Italy, Spain and Japan.

- Age-specific fertility rates increase steadily over time for women aged 30 to 34 and 35 to 39. In most of the countries considered, the fertility rates of women aged 30-34 started rising in the early 1980s, this rise being particularly important in the Nordic countries, the Netherlands and Italy. Women in the age group 35-39 have still low fertility rates today, although these rates are rising in most countries.

- Beyond the age of 40, and even more so beyond the age of 45, women have very low childbearing in all countries and years. Despite recent medical advances, very little recuperation takes place above this age.

In sum, for each birth cohort, a much larger proportion of childbearing takes place today when women are in their 30s.

Figure 5. Age-specific fertility rates across different cohorts of the same age in selected OECD countries



Note: Data refer to the age-specific fertility rates of different birth cohorts observed at the same age (e.g. 15-19). Birth cohorts of women are reported on the horizontal axis.

Source: Data from Council of Europe (2003) for European countries; National Institute for Population and Social Security Research (2003a), *Population Statistics of Japan* for Japan; US Census Bureau (2004), the *International Data Base* for the United States; Australia Bureau of Statistics (2004), *Births, Australia*. Cat. N. 3301.0.

1.2.3. Can the delay in childbearing be recovered?

20. Comparisons of childbearing schedules across cohorts help to understand the extent of the recovery in childbirths, if any (see Frejka and Sardon, 2004). The approach followed by Frejka and Calot (2001b) rests on the computation of cumulative fertility rates for a given cohort, up to and after a specific age that acts as a divider. This approach allows comparing the amount of childbearing that takes place before and after a specific age for various cohorts. Table 1 presents results for two (synthetic) cohorts of women that have completed their reproductive cycle: that born in the years 1941-45 and that born in 1951-55. The first three columns show the age-specific fertility rates before the age of 30 for these two cohorts of women (1st and 2nd columns), and the differences in the childbearing between the two (3rd column). The second three columns present the same information for age-specific fertility rates after age 30; the cohort born in 1951 to 1955 would achieve full recuperation of childbearing (relative to the older cohort) when the reduction in the birth rate before the age of 30 is more than compensated by the increase in the birth rates of women after that age (6th column). The last two columns show the completed fertility rate achieved by these two (synthetic) cohorts of women in different OECD countries.

Table 1. Extent of childbearing recuperation after age 30 for women born in 1951-55

	Childbearing realised before age 30 by cohorts born in		difference in childbearing between cohort I and II before age 30	Childbearing realised after age 30 by cohorts born in		difference in childbearing between cohort I and II after age 30	Full Recuperation	Completed fertility of cohort born in	
	1941-45 (I)	1951-55 (II)		1941-45 (I)	1951-55 (II)			1941-45 (I)	1951-55 (II)
Australia	2.07	1.63	-0.44	0.51	0.66	0.14	no	2.58	2.29
Austria	1.61	1.45	-0.16	0.38	0.38	0.00	no	1.99	1.83
Denmark	1.81	1.43	-0.37	0.40	0.49	0.08	no	2.21	1.92
France	1.87	1.55	-0.32	0.45	0.56	0.11	no	2.31	2.10
Germany	1.52	1.29	-0.22	0.32	0.39	0.07	no	1.83	1.68
Italy	1.50	1.33	-0.17	0.58	0.50	-0.07	no	2.08	1.83
Japan	1.62	1.45	-0.17	0.43	0.56	0.13	no	2.06	2.01
Netherlands	1.71	1.32	-0.40	0.40	0.58	0.18	no	2.11	1.90
Norway	1.86	1.52	-0.34	0.44	0.54	0.11	no	2.30	2.06
Spain	1.60	1.42	-0.18	0.89	0.53	-0.35	no	2.49	1.95
Sweden	1.54	1.36	-0.18	0.46	0.68	0.22	yes	2.00	2.04
United States	2.15	1.48	-0.67	0.38	0.54	0.16	no	2.53	2.02
Unweighted average	*1.74*	*1.44*	*-0.30*	*0.47*	*0.53*	*0.07*	..	*2.21*	*1.97*

Source: Computations based on data from Council of Europe (2003) for European countries; National Institute for Population and Social Security Research (2003a), *Population Statistics of Japan* for Japan; US Census Bureau (2004), the *International Data Base* for the United States; Australia Bureau of Statistics (2004), *Births, Australia*. Cat. N. 3301.0.

21. Based on these calculations, full recuperation in childbearing for the cohort of women born in 1951-55 only occurred in Sweden, where a (0.18) decline of childbearing before the age of 30 is more than offset by higher childbearing after that age (0.22), resulting in a cohort fertility rate for women born in 1951-55 (2.04) that slightly exceeds that of the previous cohort. In other countries, the increases in childbearing after age 30 realised by women born in 1951-55, relative to the older cohort, are not enough to compensate for the decline realised before age 30. In Italy and Spain, fertility rates of women born in 1951-1955 fell, relative to the levels attained by the older cohort, both before *and* after age 30. On average, when comparing the cohort born in 1951-1955 to than born in 1941-1945, recuperation after the age of 30 accounts for only ¼ of the decline realised before that age.

22. The experience of two cohorts of women that have completed their reproductive cycle, however, does not provide much guidance for the behaviour of younger cohorts. In general, the data on the age-specific fertility rates achieved by age 30 for younger cohorts of women suggest that the extent of the

fertility rates shortfall relative to the previous cohort has increased over time.[8] In this setting, is a recovery of fertility rate likely, or even feasible, among these younger generations? One way of answering this question is presented in Table 2, which considers four cohorts of women that have not yet completed their reproductive cycle: those born in 1956-60, in 1961-65, in 1966-70 and in 1971-75, respectively. For each of these cohorts, Table 2 shows:

- The actual childbearing, as observed in the year 2000, realised by each (synthetic) cohort of women at that age (1st column).

- The projected fertility rate over its remaining reproductive years, based on the assumption that this increases at the same pace as that realised by the previous generation (2nd column).[9]

- The cumulative fertility rates of each cohort of women, computed as the sum of their actual childbearing and of that projected over their remaining reproductive years (3rd column). Comparing these values with those attained by the latest cohort that has completed its reproductive cycle (that born in 1951-55) provides guidance on whether full recuperation is likely to occur.

23. It should be stressed that mechanical projections like the ones presented in Table 2 may both underestimate the likely childbearing of women in each cohort (e.g. by neglecting the possible effect of new technologies in delaying the end of reproductive life) and overestimate it (e.g. to the extent that medical impediments to childbearing are highest at the very end of reproductive life); their uncertainty also increases the further away women in each cohort are from the year where they will reach the end of their childbearing years.

24. Bearing these caveats in mind, Table 2 suggests that women born in 1956-60 are likely to experience a further significant reduction in their total fertility rate relative to the level realised by the previous cohort in Austria, Italy, Japan and Spain, while possibly recording a recovery in France, Norway, Sweden and the United States. The average decline in completed fertility rates increases for later cohorts (as "projected childbearing" over their full reproductive cycle declines from a level of 1.89, for women born in 1961-65, to 1.81 for those born in 1966-70 and to 1.77 for those born in 1971-75), before recovering slightly for the cohorts born in 1976-80. For women born in this later period, fertility rates are slightly above those needed to ensure replacement of the population in France, Netherlands and the United States, while Austria, Japan, Poland and Sweden have fertility rates of around 1.5 or lower. In these and other countries, the size of recuperation in fertility rates required to bring birth rates back to the levels achieved by the cohorts born in 1951-55 is very large: on average for the cohort born in 1971-75, the extent of recovery required is 54%, and this rises to 65% or more in Italy, Japan and Spain. While still being "feasible" in biological terms, the pace of such recovery would be without historical precedents. This

8 . For example, on average for the countries studied, women born in 1951-1955, by the time they reached age 30, would have to recover 17% of their delayed childbearing (corresponding to the ratio of the third to the first column in Table 1, i.e. 0.30/1.74) in order to achieve the same fertility rate realised by women born in 1951-1955.

9 . For example, for women born in 1956-60, which are only 5 years away from the end of their reproductive cycle, their age-specific fertility at age 45 to 49 is computed as the rate realised by women born in 1951-55 times the rate of increase realised by that cohort compared to the previous one (women born in 1946-50).

suggests that the decline in fertility rates observed over the past three decades on the basis of period and cohort indicators is likely to be lasting.[10]

Table 2. Actual and projected childbearing for different cohorts of women that have not yet completed their reproductive cycle

	Women born in														
	1956-60			1961-1965			1966-1970			1971-1975			1976-1980		
	Actual childbearing realised by age 44	Projected childbearing over the remaining reproductive years	Projected childbearing over full reproductive cycle	Actual childbearing realised by age 39	Projected childbearing over the remaining reproductive years	Projected childbearing over full reproductive cycle	Actual childbearing realised by age 34	Projected childbearing over the remaining reproductive years	Projected childbearing over full reproductive cycle	Actual childbearing realised by age 29	Projected childbearing over the remaining reproductive years	Projected childbearing over full reproductive cycle	Actual childbearing realised by age 24	Projected childbearing over the remaining reproductive years	Projected childbearing over full reproductive cycle
Australia	2.23	0.00	2.23	2.08	0.06	2.14	1.67	0.35	2.02	0.99	0.97	1.96	0.40	1.54	1.93
Austria	1.74	0.00	1.74	1.62	0.03	1.65	1.40	0.17	1.57	0.97	0.56	1.52	0.41	1.07	1.48
Canada	1.89	0.00	1.89	1.82	0.03	1.85	1.56	0.17	1.73	1.03	0.59	1.62	0.47	1.10	1.57
Denmark	1.89	0.00	1.89	1.90	0.04	1.94	1.68	0.29	1.97	0.99	0.96	1.96	0.30	1.65	1.95
France	2.16	0.00	2.16	2.04	0.06	2.10	1.72	0.36	2.08	1.07	1.11	2.18	0.37	2.07	2.43
Germany	1.67	0.00	1.67	1.58	0.03	1.61	1.30	0.24	1.53	0.83	0.78	1.62	0.35	1.46	1.81
Italy	1.73	0.00	1.73	1.54	0.05	1.59	1.16	0.32	1.48	0.61	0.87	1.48	0.20	1.38	1.58
Japan	1.91	0.00	1.91	1.66	0.03	1.69	1.31	0.22	1.53	0.72	0.73	1.45	0.21	1.20	1.42
Netherlands	1.88	0.00	1.88	1.79	0.04	1.84	1.46	0.37	1.83	0.78	1.23	2.00	0.24	2.04	2.28
Norway	2.08	0.00	2.08	2.07	0.05	2.11	1.78	0.31	2.09	1.11	0.94	2.05	0.40	1.65	2.05
Poland	2.19	0.00	2.19	2.06	0.02	2.08	1.78	0.12	1.90	1.20	0.35	1.54	0.52	0.72	1.24
Spain	1.84	0.00	1.84	1.65	0.05	1.69	1.22	0.37	1.59	0.54	1.06	1.60	0.17	1.63	1.80
Sweden	2.07	0.00	2.07	1.98	0.04	2.02	1.66	0.27	1.92	0.93	0.77	1.70	0.28	1.24	1.51
United Kingdom	2.04	0.00	2.04	1.89	0.05	1.94	1.58	0.28	1.86	1.01	0.77	1.78	0.49	1.25	1.73
United States	2.03	0.00	2.03	2.01	0.04	2.04	1.83	0.23	2.06	1.42	0.68	2.10	0.85	1.27	2.13
Unweigthed average	*1.96*	*0.00*	*1.96*	*1.84*	*0.04*	*1.89*	*1.54*	*0.27*	*1.81*	*0.95*	*0.82*	*1.77*	*0.38*	*1.42*	*1.79*

Note: For each cohort, the projected childbearing over its remaining reproductive years is based on the assumption that the age-specific fertility rates increase at the same pace realised by the previous cohort.

Source: Computations based on data from Council of Europe (2003) for European countries; National Institute for Population and Social Security Research (2003a), *Population Statistics of Japan* for Japan; US Census Bureau (2004), the *International Data Base* for the United States; Australia Bureau of Statistics (2004), *Births, Australia*. Cat. N. 3301.0.

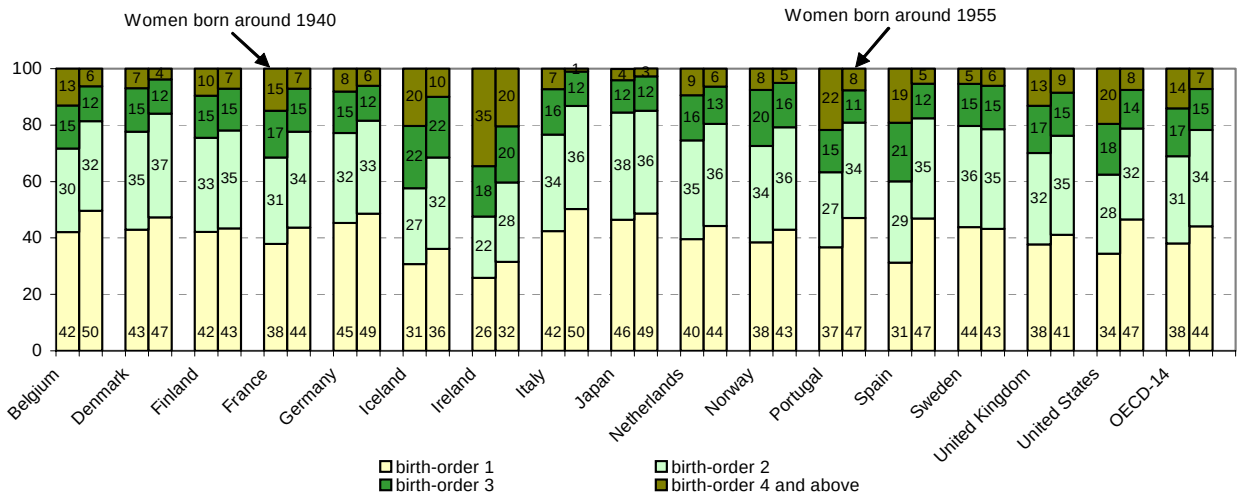
1.3. Some permanent consequences of postponement

25. Besides contributing to decline of fertility rates, postponement of childbearing has other lasting consequences that affect both children and mothers. These consequences take the form of changes in the distribution of children according to their birth rank; of increases in the extent of childlessness among women of different ages; and of higher health risks for both mothers and children.

26. With reference to the first, when mothers have their first child in their 30s, the time left to have other children is cut by half relative to those who had their first children in their 20s. Data on the distribution of children born to mothers belonging to different cohorts (born in a given years, in the case of Japan) are shown in Figure 6. These distributions are derived from data on cohort fertility rates by birth orders of children (from 1 child to 4 children or more) in the case of the United States and European countries, and on period fertility rates for Japan; in addition, they refer to women born in a specific year (e.g. 1940) for European countries, and to women born over a given period (e.g. from 1936 to 1940) in the United States. Despite these limits, Figure 6 highlights some significant changes in the distribution of children according to their birth order. First, the share of children of order 4 or above (i.e. children with 3 or more brothers and sisters) has almost halved over the period considered, with most of the decline accounted by women born in 1950. A smaller decline is recorded among children of order 3, which account on average for 15% of all children but considerably more in some countries. These declines are offset by higher shares of children of order 2 and especially, of order 1, which now represent close to 50% of all children in Belgium, Germany, Italy and Japan.

10 . This conclusion is in line with that of Frejka and Sardon (2004), who concluded that: "Throughout Europe (…) as well as in Japan, the fertility rate is almost certain to remain low (…) and it is likely to decline further in the first decade of the 21st century and perhaps even beyond".

Figure 6. Distribution of children born to mothers of different ages by birth order, selected OECD countries

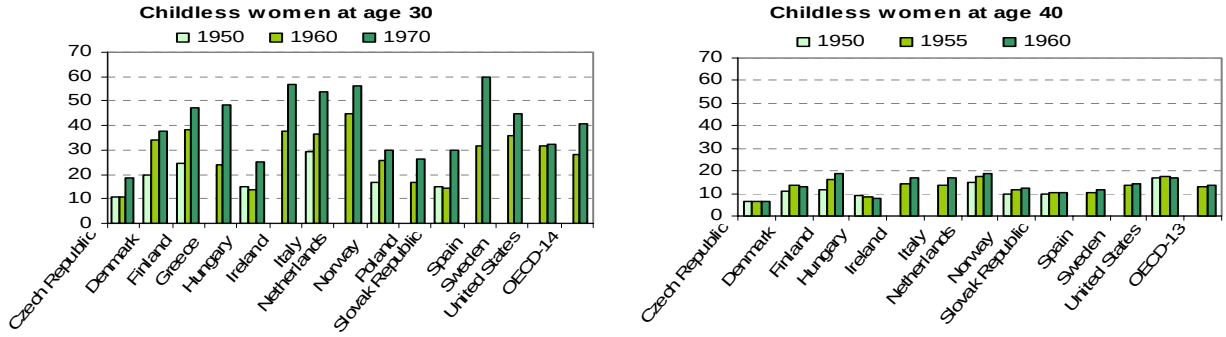


Note: The Figure presents the distribution of children by the rank of the childbirth (e.g. children of order 1 refers to the first childbirth of mothers, those of order 2 to the second childbirth, etc) for women born in various years (1940 and 1955 for European countries; the years 1936-40 and 1951-55 for the United States). For Japan, data refer to children born in 1965 and 2000. This implies that the interpretation of Japanese data is not the same as for other countries.

Source: Calculations on data extracted from Eurostat (2004), *New Cronos database* for European countries; the National Center of Health Statistics (2003), *National Vital Statistics*; the National Institute for Population and Social Security Research (2003a), *Population Statistics of Japan* for Japan.

27. Postponement also increases the probability that women remain childless, or that they have fewer children than desired. Figure 7, which shows data on the frequency of childlessness among women belonging to different birth cohorts at age 30 and 40, suggests strong increases in several OECD countries. At age 30, on average, around 41% of women born in 1970 are childless, with an increase of over one third relative to the cohort born in 1960. Part of this increase may simply reflect postponement of first births; however, even at age 40, the share of women that are childless is significantly higher than that prevailing 10 years earlier in several countries (with the exceptions of the United States and Denmark for the cohort born in 1960). These patterns extend to other OECD countries that are not included in Figure 7. In Japan, data from the 11th Fertility Survey (limited to married couples) show that, for marriages that have lasted less than four years, the proportion of childless couples increased from 39% in 1987 to 43% in 1997; in Australia, the proportion of childless women increased from 35% in 1981 to 59% in 2001, among women aged 25-29, and from 8% to 13% among women aged 40-44 (Australian Bureau of Statistics, 2001).

Figure 7. Proportion of women in different cohorts that are childless at age 30 and 40, selected OECD countries



Source: Data from national sources

28. Whether or not past increases in the number of women who remain childless will continue in the future will partly depend on the success of fertility-enhancing therapies in extending reproductive life.[11] In the United States, women aged 50 to 54 accounted for 255 births in the year 2000, an increase of close to 50% relative to 1999 (National Center of Health Statistics, 2002; see also Paulson *et al.*, 2002). Preliminary data on assisted reproduction in 22 European countries — collected by doctors from the Fertility Clinic at Copenhagen University — show that the availability of assisted reproduction techniques is highest in Denmark, followed by the Netherlands and the United Kingdom.[12] In Japan, around 1 in 10 couples (almost 300,000 patients) underwent fertility treatments in 1999, with about 12,000 babies – 1 in every 100 – conceived with the aid of fertility technology (Japan Society of Obstetrics and Gynaecology); this ratio is expected to rise strongly in the future with the diffusion of *proception* technology (which may help especially women aged between 35 and 45). While this medical progress might alleviate the fertility consequences of further delays in childbearing, it may also encourage expectations that medical solutions will allow responding to all difficulties in conception — while, in reality, chances of success of assisted fertilization remain quite low.

29. Postponement of births may also affect the health and well-being of both child and mother, as medical risk factors differ widely by maternal age. Data for the United States (National Center of Health Statistics, 2003) show that:

- Older mothers are more prone to chronic conditions such as *diabetes* and *chronic hypertension,* whose incidence is 7 and 9 times higher for women aged 40-54 than for those aged less than 20. Other risk factors, such as *pregnancy-associated hypertension*, follow a U-shaped pattern, with the highest levels attained by women aged more than 45. Because of these patterns, the

11. Assisted reproductive technologies available today include artificial insemination, cryogenic preservation, surrogacy, fertility drugs, and IVF — which allows for the fertilized egg of a third party to be implanted in a woman for gestation. This process can be used by women who are postmenopausal because it does not require the egg of the mother; however, use of the egg of a donor raises complex ethic issues.

12 . Data on assisted reproductive technology presented at the 20th conference of the European Society of Human Reproduction and Embryology confirmed that the availability of assisted reproductive technologies is highest in Denmark (with 1,923 cycles per million of the population in 2001 (the most recent year for which information was available), followed by the Netherlands (with 963 cycles per million) and the United Kingdom (with 593 cycles per million). These levels are well above those recorded in the United States (with 200 cycles per million). Costs of an infertility treatment vary largely across Europe (e.g. from € 2,407 in Hungary and Slovenia, as compared to between €2,995 and 5,990 in the United Kingdom; Ryan, 2004).

risk of miscarriage increases by 50% among women aged 42 relative to women aged 20. A few pathologies (e.g. *anemia*) are, however, less frequent for older than for younger mothers. [13]

- Some health problems of infants, such as *Down's syndrome*, *heart malformation* and *other chromosomal anomalies,* increase with maternal age (e.g. the incidence of the Down's syndrome is 14 time higher for births to women aged 40-54 than to women aged less than 20; other chromosomal anomalies are more than 4 times more frequent in the case of births to women aged 40-54 than to women aged less than 20).
- The probability of occurrence of several complications at birth also varies with the age of the mother. This is most notable for three of the most frequently reported complications: the highest rates of occurrence of *meconium*, *foetal distress*, and *premature rupture of membrane* are reported for mothers under 20 years of age and for those aged 34 or above; complications due to *placenta previa* affect 8 times more women aged 40-54 than women aged less than 20.

30. More generally, postponement of childbirth to higher ages may lead to decline of fertility rates owing to the aging effect that reduces fecundity of women: US studies suggest that the number of women in their childbearing years who suffered from infertility increased by 25%, (from 4.9 to 6.1 million) from 1988 to 1995, an increase partly attributed to the fact that many women are waiting longer to have their children (Borland, 2003).

1.4. Conclusions

31. The evidence presented in this chapter shows that the decline in fertility rates has proceeded at different paces within the OECD area. As a result, total fertility rates are now at very low levels in some countries while remaining significantly higher in others. The decline in birth rates that has characterised the past few decades is unlikely to be reversed in the near future.

- Decomposition of birth rates of younger and older cohorts in three different sub-periods — showing that the fertility rates of younger and older women keep moving in opposite directions for most countries considered — suggests that recuperation continues, but at a lower pace.
- Analysis of cohort fertility rates, while showing that recent generations of women have fewer children in their early years and more children at later ages, confirms that the higher number of children that women have when old does not fully compensate the lower number that women have when young in most OECD countries except Sweden. While a recovery to replacement level is still possible in the United States and France, it is highly unlikely for most countries.
- Postponement of childbearing has important consequences on both the number of children women have over their life and on the mother's and child's health. Close to half of all children are growing up without siblings in several OECD countries; the share of women that remain childless at ages 30 and 40 has increased strongly over time; and the risk of some health problems for mothers and their children has also risen.

All these stylised facts underscore the importance of better understanding the determinants of the delay and decline of fertility rates. This is the purpose of the next chapter.

13. Both gestational diabetes and pre-existing hypertension increase the chances of pre-eclampsia, a complication characterized by high blood pressure, swelling of the face and hands, and protein in the urine. Pre-eclampsia can impair the nervous system function, leading to seizures, stroke or other serious complications. Also, the chances of having a Caesarean delivery among older mothers are about 40% higher than for a younger woman.

CHAPTER 2. DETERMINANTS OF THE POSTPONEMENT AND DECLINE OF CHILDBEARING

2.1. Introduction

32. Several factors, related to both individual characteristics and societal conditions, have contributed to postponement and decline of childbearing: higher educational attainment of successive generations of women; their growing aspirations to be economically active and financially independent; the reduced importance attached to parenthood relative to other goals for life satisfaction; the difficulties of combining parenthood and paid employment; the need for parents to secure financial security before considering having children.

33. This chapter provides evidence about changes in a number of societal and individual characteristics which may have influenced childbearing behaviour. Section 2.2 describes some structural determinants such as education, income, labour market and marital status. Section 2.3 explores views expressed by women from different cohorts on gender and family roles, and differences in their views relative to men. Section 2.4 presents evidence on desired fertility rates and how it relates to realized childbearing, while Section 2.5 concludes.

2.2. Structural influences on the decline and delay of fertility rates

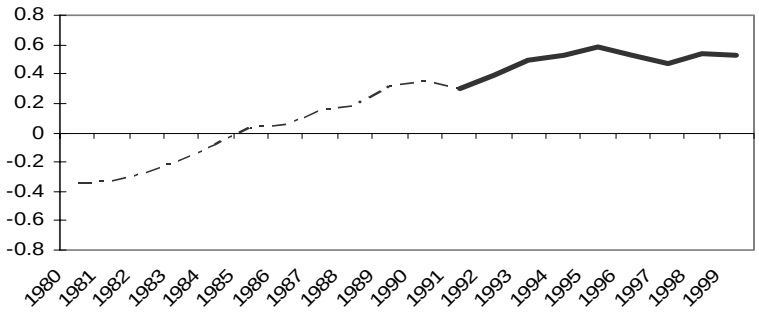
34. Structural conditions may affect both the timing and quantum of births because of their influence on the income and employment status of couples and individuals.

2.2.1. Education

35. Women, in all OECD countries, are today much more educated than those in previous generations. Longer periods in education have increased the mean age of women at first childbirth and reduced the number of years in which they can have additional children. In addition, higher educational achievement has contributed to higher female labour force participation, changed their desires for children as compared to other goals, and provided them with greater autonomy in many spheres of life. Better educated women are also more aware of health problems and contraception technologies and thereby more capable of avoiding undesired pregnancies and births.

36. Figure 8 highlights some significant changes in patterns of associations between women's participation in higher education and total fertility rates across OECD countries. In the past, OECD countries with higher rates of women's enrolment in tertiary education were also those featuring lower fertility rates. In the 1990s, however, this association has changed its sign, i.e. OECD countries where women education is higher also have higher fertility rates.

Figure 8. Correlation between women enrolment rates in tertiary education and total fertility rate in OECD countries over the period 1980-1999



Note: The values shown refer to the cross-section correlation coefficient between the total fertility rate and the rate of female enrolment in tertiary education for each year over the period 1980-1999. Data refer to Australia, Austria, Belgium, Canada, Denmark, Finland, France, Greece, Ireland, Italy, Japan, Korea, the Netherlands, Norway, New Zealand, Portugal, Spain, Sweden, Switzerland, the United Kingdom and the United States. The solid bold line indicates that the correlation coefficient is statistically significant at the 5% level.
Source: The World Bank Group (2004), *World Development Indicators* and OECD (2005a), *Society at a Glance – OECD Social Indicators,* Paris.

37. Several studies have provided evidence of a negative association between fertility rates and education at the level of individuals (e.g. United Nations, Department for Economic and Social Information and Policy Analysis, 1995; Adsera, 2004; Blossfeld *et al.* 1995; Corjin and Klizijng, 2000; Hullen, 2000). One reason is that, as education and income are related, the opportunity cost of leaving (even temporarily) the labour market (and therefore the cost of interrupting their career) is higher for more educated women than for less educated ones. The delay of motherhood due to longer periods in schooling is an important concern in countries where the link between marriage and childbearing is strong (e.g. Japan and the Southern European countries): as educational attainment increases, women will enter marriage later, with a knock-on effect on the timing of childbirth (Hirosima, 2001).

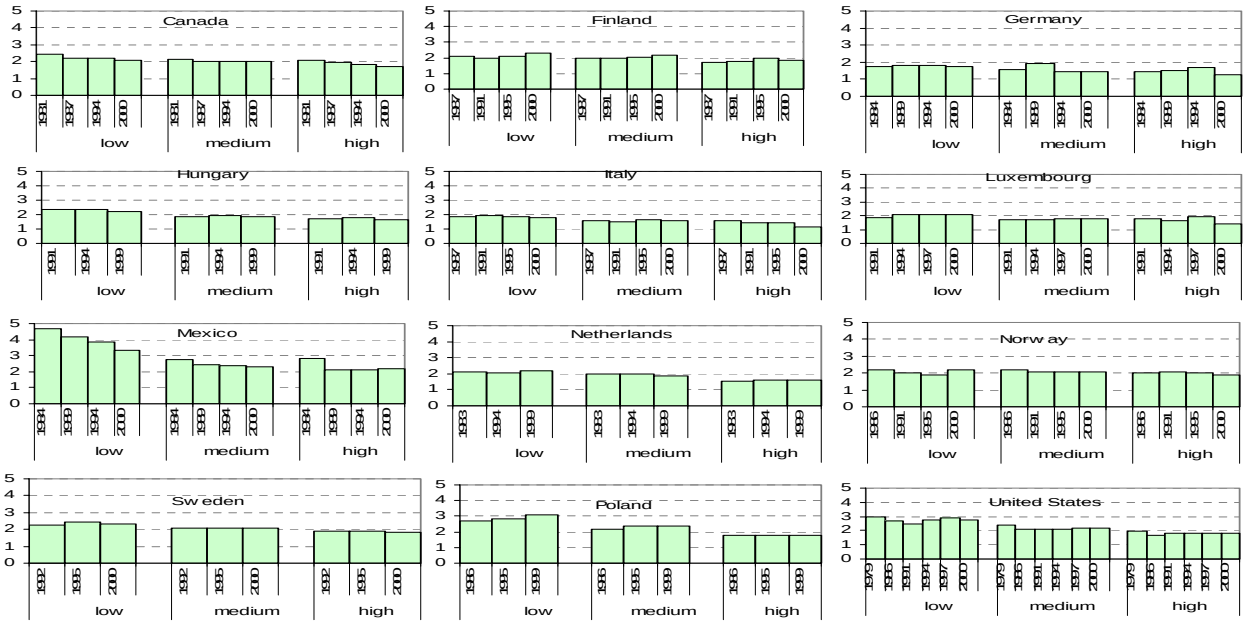
38. Figure 9 illustrates a proxy measure of fertility rates among married women aged 30-39 at each survey's date according to their educational attainment, using data from the Luxembourg Income Study (LIS) for a number of OECD countries in various years.[14] Two main patterns stand out.

- First, more educated women have fewer children than less educated ones in all countries and years considered. This negative association is also evident in Japan (a country not included in Figure 9), where the number of children falls for each level of (higher) education (Shirahase, 2000, Retherford *et al.* 2004). Fertility rates differentials by education may become wider over time to the extent that they are transmitted from generation to generation (Box 2).

14 . To know whether more educated women have less children compared to other women — and how this gap has changed over time – one would need data that track the same household at the time of the first and the last birth. This requires information on the number of children ever born to a women of given age and the date of birth of the last child. While this type of information is available for the United States through the "Fertility Supplement" to the June *Current Population Survey* (US Department of Commerce, Bureau of the Census), similar data are not available for most OECD countries. To overcome this problem, this (and the next) section relies on data from household income and expenditure surveys, as compiled by the *Luxembourg Income Study* (LIS). One problem of LIS data is that only children aged 18 or less are recorded as "children" in the household: to avoid counting as "childless" mothers of children that are aged above 18, the analysis is limited to married women aged between 30 and 39 at each survey's date. These data are used to investigate the relation — over time and across countries — between fertility rates, on the one hand, and educational attainment and income level of women, on the other hand.

- Second, no consistent pattern exists across countries when looking at *changes* in childbearing by education of mothers. In general:
  - *More educated women* have fewer children today than in the past in Canada, Italy, Luxembourg and Norway — as well as Germany, Hungary, Sweden and Finland in the second half of the 1990s. Exceptions to this pattern are Mexico, the Netherlands and (until 1995) Finland and Germany, where fertility rates of higher educated women have increased; and the United States and Poland, where the number of children of most educated women is stable over time.
  - *Women with intermediate education* have a similar number of children today as in the past in most countries. However, the fertility rates of these women have increased in Finland, Luxembourg and the United States, while they have declined in Italy and the Netherlands.
  - *Less educated women* have a higher number of children today than in the past in Poland, the Netherlands and, until recently, in the United States and Sweden. The opposite pattern occurs in other countries, especially in Mexico — where the reduction in the number of children for less educated women is larger than among more educated ones.

Figure 9. Fertility rates of women with different educational attainments in selected OECD countries



Note: Data refer to married women aged between 30 and 39 at each survey's date. The number of children is reported on the vertical axis, while education levels are on the horizontal axis. The education variable has been built by using the LIS standardization routine. Education can take three values: (1) *Low,* corresponding to lower secondary education or less, which includes no education, pre-primary, primary, lower secondary education and sometimes basic vocational education; (2) *Medium,* corresponding to upper secondary education and post-secondary non-tertiary education, and which includes upper secondary general education, most basic vocational education, secondary vocational education and post-secondary education (including either shorter vocational courses or programs preparing for courses on tertiary level); (3) *High,* corresponding to tertiary education, which includes specialized vocational education and university/college education on all levels.
Source: Elaboration on data from the Luxembourg Income Study (LIS), various waves.

39. A simple average across the countries shown in Figure 9 suggests that the decline in fertility rates, while common to all education categories, is stronger for less educated women than for other

women.[15] Despite similar levels of education between young women and men in most OECD countries — which would suggest that the influence of education in lowering fertility rates could become less important in the future — trends towards greater assortative mating of partners according to their education could lead to the opposite effect (Box 2).

Box 2. Assortative mating by education of partners and its influence on fertility rates

The probability that the influence of education on fertility rates will increase over time partly depends on the extent to which unions are increasingly formed by partners with similar characteristics. Recent studies have provided evidence that husbands and wives are not randomly matched but choose each other on the marriage market (Behrman and Rosenzweig, 1999). Among the characteristics that influence their choice is the education of partners. *Educational homogamy* or *assortative mating* by education (i.e. the union of two persons with similar educational profiles) is of particular importance because of the role that education plays in the intergenerational transmission of social benefits and in shaping demographic and socio-economic outcomes (Mare, 1991; Behrman and Rosenzweig, 2002). One potential consequence of an unequal distribution of educational opportunities is a polarization in family formation between more and less educated women having different levels of childbearing.

The reasons underlying educational homogamy are multiple. For example, better-educated women may be more keen to secure a good match on the marriage market in order to protect themselves from the high opportunity costs of leaving paid employment (Oppenheimer, 1988); higher educational homogamy may also enhance productivity both in the labour market and at home; further, educational homogamy may increase the symmetry between what men and women can expect from each other. Park and Smits (2003) and Brinton and Lee (2001) have underlined the strategic role played by the education system in Japan and Korea in generating "marriage market returns". According to these authors, the high demand for education among young women in these countries is more often aimed at marrying men with a high socioeconomic potential than at increasing their own skills and labour market prospect. Several studies have provided evidence that assortative mating based on education has increased over time: in the United States, for example, the educational resemblance between spouses has increased by between 25-30% from 1940 to 1990 (Mare, 2000). In particular, while in the past women tended to marry men with higher education than their own, this has lessened over time (Pencavel, 1998; Smits *et al.*, 1998, Blossfeld and Timm, 2004). In Austria, most of changes occurred in the highest and lowest educational group, which are now almost mutually exclusive (Spielauer *et al.,* 2003). Gustaffson *et al.* (2002) show that high-educated couples wait significantly longer to enter the union after finishing education than lower educated couples. The authors also found that the higher the education of partners, the more likely the postponement of parenthood.

While the complexity of the links between education and other factors related to childbearing makes it difficult to generalize, trends towards higher assortative mating by education and higher intergenerational transmission of education could translate into larger fertility differentials between women with different levels of education in the future, and a stronger influence of education on total fertility rates.

2.2.2. Income

40. Income also affects demographic behaviour. Figure 10 shows the cross-country relation between GDP per capita and both the total fertility rate (right-hand panel) and the mean age at first childbirth (left-hand panel) across OECD countries. Both correlations are significant: in other words, richer OED countries combine both higher fertility rates and later childbearing (a pattern that mainly reflect the inclusion in the sample of Eastern European countries). The nature of the relation between income and reproductive behaviour is indeed complex:

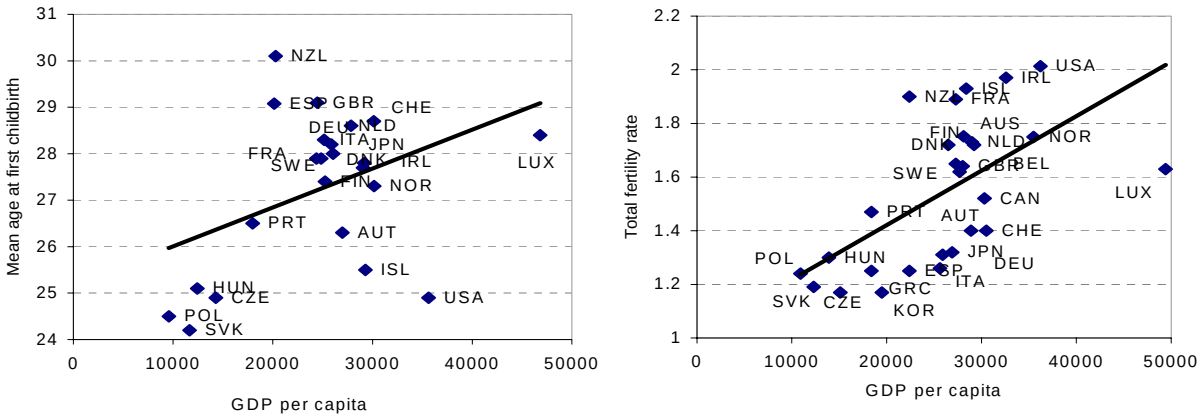
- First, fertility rates may reflect the income of each cohort relative to the previous one rather than its absolute level. According to Easterlin (1980; 1987), the relative income of each cohort is partly related to its size: when a large generation (e.g. the "baby boomers") enters the labour

15 . Over the period 1979 to 2000, on average, the cumulative decline in the number of children born to women aged between 30 and 39 at the survey date is 24% for less educated women, 19% for medium educated women and 13% for those with high education.

market, its entry wages decline; as aspirations for material prosperity are shaped by conditions in childhood, a wider gap between expectations and outcomes will tend to delay marriage and reduce childbirths. As a result of these patterns, total fertility rates may display large changes over time, as changes in the size of various cohorts lead to opposite movements in their relative income.

- Second, disentangling directions of causation is complex, as relations are both ways. Barlow (1998), for example, reports evidence that output growth is lowered by higher levels of *current* birth rates (which lead more women to withdraw from the labour force) but increased by higher levels of *past* birth rates (which raise the size of the labour force). The aggregate relation between income levels and fertility rates is therefore ambiguous, and will also depend on how income is distributed across households.[16] Changes in fertility rates may also generate shifts in the risks of poverty among households of different size.[17]

Figure 10. Cross-country relation between GDP per capita, mean age at first childbirth and total fertility rates



Note: Gross domestic product is expressed in purchasing power parities. Data of the left-hand panel refer to 2002; data for the right-hand panel refer to 2000.

Source: Various issues of *Society at a Glance – OECD Social Indicators*.

41. The influence of income on childbearing behaviour is also evident at the level of individuals and households. The theory of the allocation of time, along with the assumption that children are time-intensive with respect to mother's time, implies that women's income and earnings are key influences on childbearing and that total fertility rates and female labour force participation will be inversely related. As childrearing competes with paid work of mothers, higher earnings increases the opportunity cost of not working.

16 . The relation between changes in fertility rates and in income distribution will depend on both *dependency* and *acquisition* effects (IUSSP, 1998). The first refers to the worsening of income inequality that occurs if the fertility decline is concentrated among richer households (i.e. new births are increasingly concentrated in poorer households). The second measures the impact of a lower ability of poorer households to achieve the same level of well-being when (because of higher fertility) their household size increases. The size of acquisition effects will reflect, *inter alia*, changes in the costs of each additional child and the labour supply response of parents to changes in family needs; for example, when births lead to an increase in the labour supplied by parents, the acquisition effect falls and income inequality narrows.

17 . In the United Kingdom, for example, although the risk of child poverty increases with family size, recent reductions in the proportion of children in low-income households seem to have been concentrated in larger families (UK Parliament, *Second report on Child Poverty for the United Kingdom*, 2004).

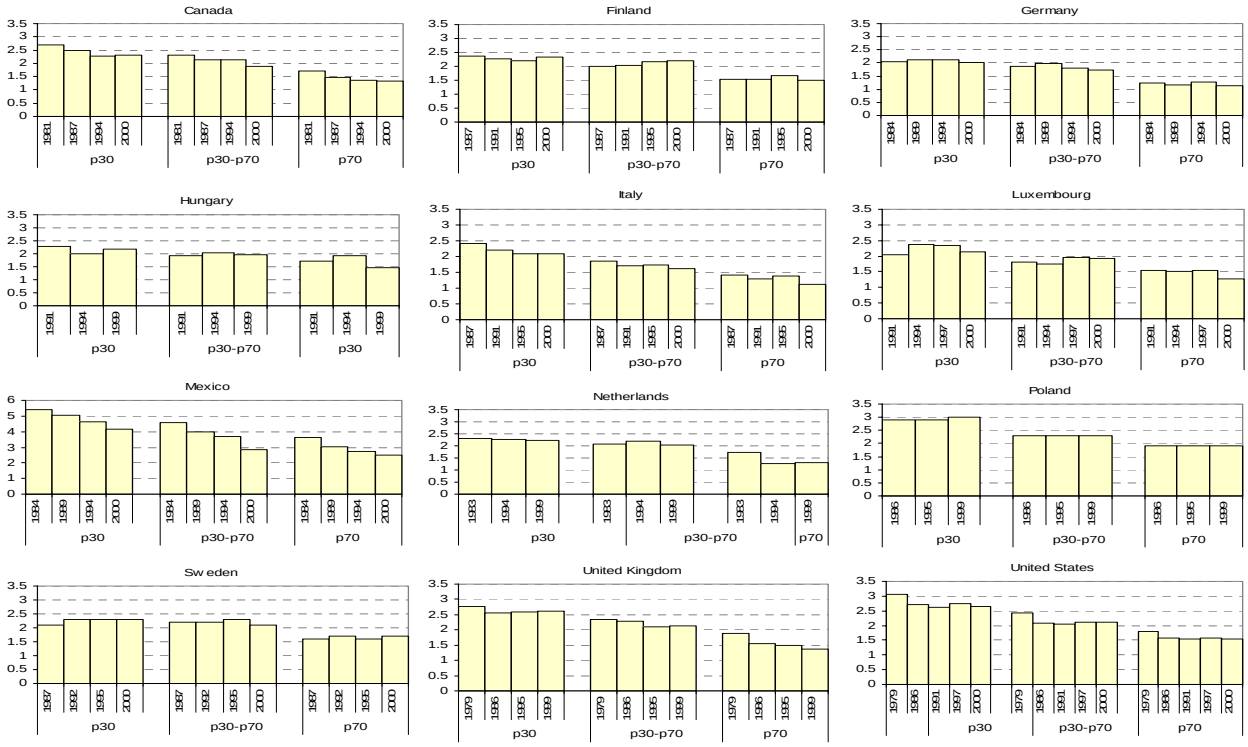
42. Figure 11 depicts the relation between the "equivalised" household income of women and the number of children living with them, using data from the Luxembourg Income Study (LIS). For each woman in the sample, household disposable income (i.e. gross household income net of income taxes and social security contributions paid by household members) is "equivalised" based on the squared root scale; women are then ranked by levels of equivalised income and sorted in three groups ("low income", i.e. women with equivalised income in the three lowest deciles; "middle income", i.e. women with equivalised income between the third and the seventh deciles; and "high income", i.e. women with equivalised income in the top three deciles). In general, in all countries women with higher levels of household income have fewer children than other women (although interpretation is made complex because of the impact of "equivalising"). No simple pattern emerges, however, when considering changes over time:

- *Among women with lower household income,* the number of children declined in Canada, Germany, Italy, Mexico, Netherlands, Luxembourg, the United States; while it increased or remained constant in other countries.

- *Among women with average levels of household income,* the number of children has fallen over time in Canada, Germany, Hungary, Italy, Luxembourg, Mexico and the Netherlands; it has slightly increased or remained constant in the other countries.

- *Among women with higher levels of household income,* the number of children has increased in Sweden, Netherlands and remained broadly constant in Poland, Canada and the United States; very small reductions are observed in the United Kingdom and Mexico (and, in the latter country, the reduction in the number of children is smaller than that observed among women with lower income); in other countries, the number of children has declined over time.

Figure 11. Fertility rates of women with different levels of income in selected OECD countries

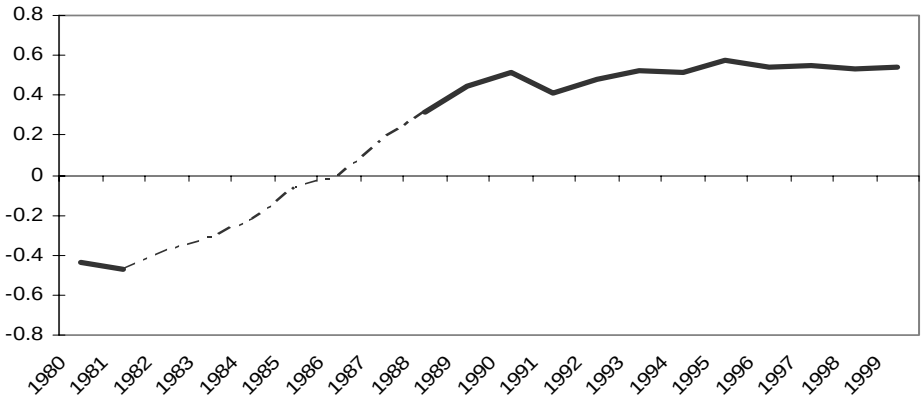


Note. Data refer to married women aged between 30 and 39 at each survey's date. Women are ranked by the level of "equivalised" household disposable income (based on the square root of household size).
Source: Elaboration on data from the Luxembourg Income Study (LIS), various waves.

2.2.3. Labour market conditions

43. Women's higher educational attainment is associated with their higher labour market participation. This, in turn, has led many more women to confront the difficulty of combining professional and family life. The relation between female employment and fertility rates is complex. At the level of individuals, several studies have postulated theoretically and documented empirically the existence of an inverse relationship between fertility rates and labour market participation of women.[18] However, the relation between these two variables differs when observed across countries. Several authors have stressed that, in recent years, the sign of the cross-country correlation between female employment rates (or labour force participation rates) and total fertility rates has changed (Ahn and Mira, 2002; Del Boca *et al.* 2003), suggesting that the assumptions underpinning the "traditional" relation between fertility rates and female labour market participation — i.e. that fathers are the primary breadwinner of the family, and that mothers are the primary caregivers — are less valid today than in the past. A reversal in the cross-country correlation between female employment rates and total fertility rates is confirmed by Figure 12. This reversal suggests that, for different reasons (e.g. risk of unemployment and union disruptions), the male breadwinner model is no longer dominant in several OECD countries.

Figure 12. Correlation between female employment rates and total fertility rates in OECD countries over the period 1980-1999



Note. Values shown refer to the cross-section correlation coefficient between the total fertility rate and the employment rates of women aged 15-64 for each year over the period 1980-1999. Data refer to Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Korea, the Netherlands, Norway, New Zealand, Portugal, Spain, Sweden, Switzerland, the United Kingdom and the United States. The solid bold line shows when the correlation coefficient is statistically significant at the 5% level.

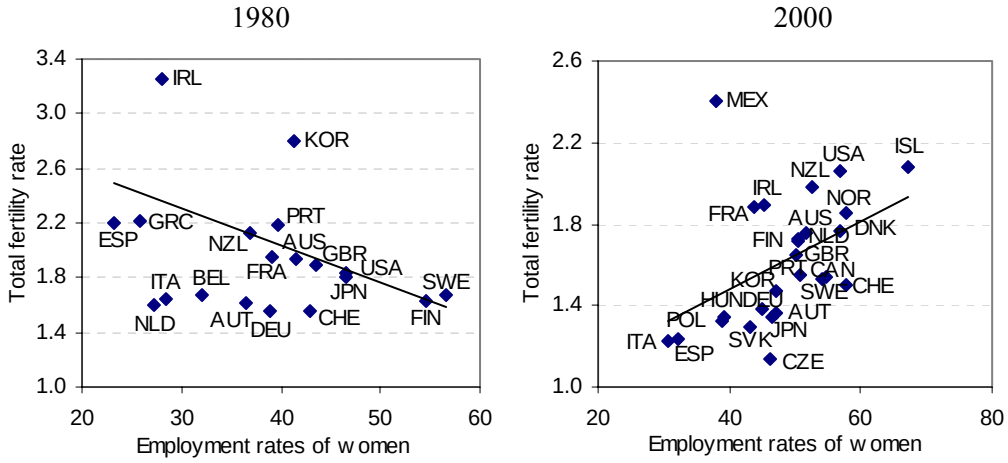
Source: Computations on OECD, *Society at a Glance – OECD Social Indicators*, various issues.

44. An alternative way of depicting the reversal in the cross-country relation between fertility rates and female employment rates is shown in Figure 13. In 1980, OECD countries where female employment rates were lower recorded higher total fertility rates (left-hand panel). By the year 2000, countries with a lower female employment rate recorded a *lower* fertility rate than countries where paid employment for women is more common. This change in the patterns of cross-country association between the two variables is not affected by which measure of birth rates is used (i.e. cohort or period fertility rates). Across OECD countries, there is also little association between the *changes* in female employment and the

18 . The seminal papers, at the theoretical level, are those by Becker and Lewis (1973) and Willis (1973). A negative relation between paid employment and childbearing has been empirically documented by Butz and Ward (1977) for the United States and by Mincer (1985) on a cross-country basis.

changes in fertility rates: in other words, countries where employment rates of women have increased the most from 1980 to 2000 do not consistently record larger declines in fertility rates.

Figure 13. Cross-country relation between female employment rates and total fertility rates, 1980 and 2000

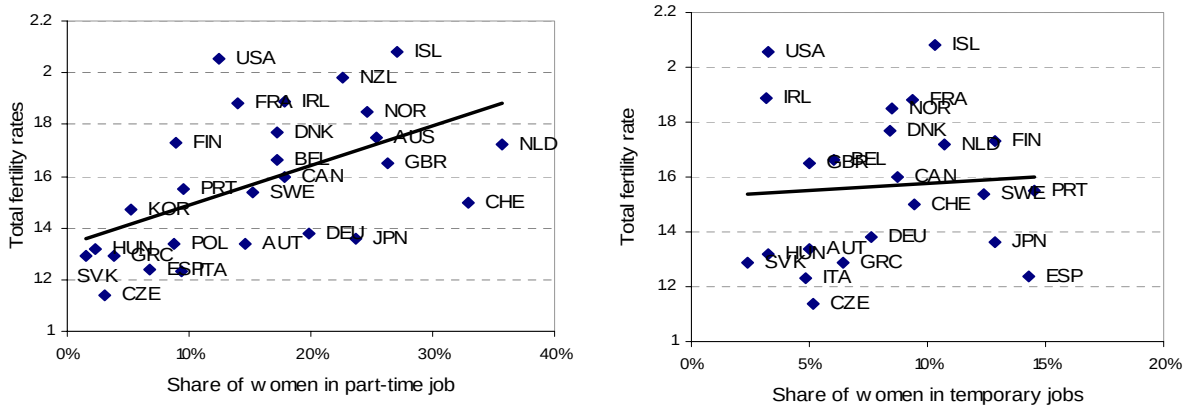


Note: Employment rates refer to women aged 15-64.

Source: Computations on data from *Society at a Glance – OECD Social Indicators* and OECD (2005a), Labour market indicators.

45. Total fertility rates in 2000 were also higher in OECD countries where a higher share of women held part-time jobs (Figure 14, left-hand panel). Conversely, there is much diversity in country experiences in terms of the share of women holding temporary jobs: total fertility rates are low in some of the countries where a large proportion of women work in temporary jobs (Spain and Japan), but also in some of the countries where temporary jobs among women are less common (e.g. several Southern and Eastern European countries, right-hand panel).

Figure 14. Cross-country relation between women in part-time and temporary jobs and total fertility rates, 2000



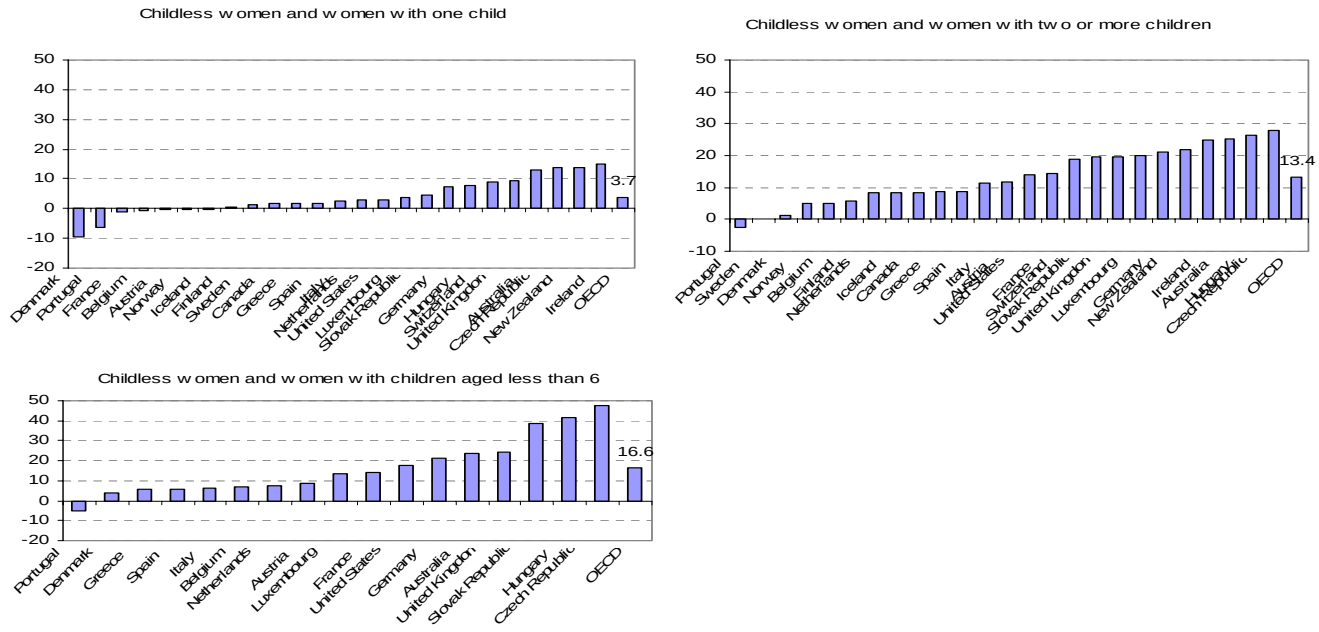
Source: Computations on data from *Society at a Glance – OECD Social Indicators* and OECD (2005), Labour market indicators.

46. Can we reconcile evidence that women in paid jobs have (within each country) lower fertility rates than those without jobs with that suggesting that countries with higher rates of female employment have higher fertility rates than others? The answer to this potential paradox is likely to lie in considering the difficulties of combining work and childbearing across countries. Information about these difficulties is

provided by data on employment rates of women with and without children, both at a point in time (Figure 15) and across generations (Figure 16):

- Figure 15 shows employment rates of women with one child, with two or more children and with a child aged less than 6, relative to women with no children (positive differences imply that childless women have higher employment rates than women in the three other groups).[19] When values are averaged across OECD countries, the employment rate of women with no children is higher than that recorded among women with one child (by around 4 points) and, more significantly, among women with two or more children (13 points) and with a child aged less than 6 (17 points). However, in Denmark, Portugal, France, Belgium, Austria, Norway, Iceland and Finland employment rates of women with one child are *higher* than those of women without children; differences in employment rates among the two groups of women are very small also in Sweden and Canada. Women with two or more children have higher or similar employment rates than childless women in Portugal and Sweden, while Portuguese women with a child aged less than 6 are more likely to have a job than childless women.

Figure 15. Difference in employment rates between women aged 15 to 64 with and without children



Note: Data refer to women aged 15 to 64.

Source: Detailed sources are provided in OECD (2001a), *OECD Employment Outlook*, Paris.

- Figure 16 compares employment rates of women with no children, with one child and with two or more children among older (45 to 54) and younger (35 to 44) women in European countries in 2003. While employment rates of younger women are generally higher than for older women,

19 . Labour force survey data generally refer to children in the household aged 18 or below; as a result, women living with a child aged more than 18 may be considered "childless" in the data reported above. Also, for some OECD countries, differences in employment rates between women with and without children would be lower if all women on child-related leave were counted as employed in labour force surveys: in general, labour force surveys regard people as employed if they have a job but are on leave for "care for children" (Sweden) or in "maternity and parental leave" (Finland); however, women on leave arrangements that last until the child reaches the age of 3 are not counted as employed in Finland while they are in Austria.

irrespective of the presence or absence of children, the size of the gap declines with the number of children. Also, while in most countries younger women with two or more children have a higher employment rate than older ones, this does not happen in some countries (Italy, Spain and the United Kingdom).

Figure 16. Employment rates of women of different ages with and without children, selected European countries in 2003



Source: Data extracted from the European Labour Force Survey (2003)

47. Both figures suggest that, while in some countries women can increase the extent of their participation to the paid labour market irrespective of the number of children they have, in other countries this is not feasible: when this occurs, women that want to increase their labour force participation have no choice other than to reduce their birth rates.

48. To the extent that getting a foothold in the labour market is important before women consider having a child, unemployment is also likely to play a role. The effects of unemployment on the timing of births and number of births are, however, ambiguous. When unemployment is high, youths may decide to remain in the parents' home, or to stay longer in schools, both of which contribute to postponing partnership formation and childbearing. However, unemployment may also increase fertility rates, as each woman may expect a lower probability of finding jobs and lower wages, both of which reduce the opportunity costs of childbearing (Gauthier and Hatzius, 1997; Adsera, 2004). Figure 17 illustrates the cross-country correlation between unemployment rates (for both men and women) and total fertility rates. It also suggests a reversal in the sign of the relation between unemployment and total fertility rates. While in the past the correlation coefficient was positive, it has become negative in recent years: total fertility rates are today higher in OECD countries where unemployment rates are lower.[20]

20 . In most OECD countries fertility rates are higher in periods of low unemployment and lower when unemployment is high. There are some exceptions: in Korea both fertility and unemployment rates have declined over the past twenty years; in Canada, Australia and New Zealand, as well as several Nordic countries, swings in unemployment rates are not associated with significant changes in fertility rates. Conversely, in Southern European countries, higher unemployment strongly reduces fertility, as the low female participation in the labour market implies that the substitution effect arising from a decrease in the opportunity cost of the woman's time is small compared to the income effect from the loss of male income (Ahn and Mira, 2002). See also Meron and Widner (2002). The negative association between

Figure 17. Correlation between total unemployment rates and total fertility rates, 1977-2000



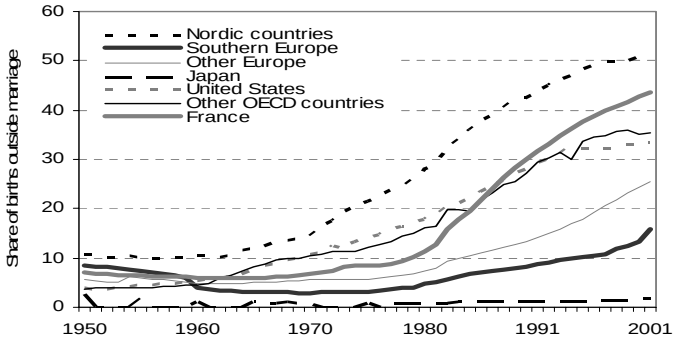
Note: Values shown refer to the cross-section correlation coefficient between the total fertility rate and the unemployment rates of men and women aged 15-64 for each year over the period 1980-1999. Data refer to Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Korea, the Netherlands, Norway, New Zealand, Portugal, Spain, Sweden, Switzerland, the United Kingdom and the United States. The solid bold line shows when the correlation coefficient is statistically significant at the 5% level.

Source: Computations based on data from OECD, Society at a Glance – OECD Social Indicators, various issues.

2.2.4. Marital status

49. Trends in fertility rates are also affected by marital status of mothers. While information is sparse, in most countries married women have a higher fertility rate than unmarried women. As the share of women that are unmarried has increased over time, this may be expected to have depressed total fertility rates. However, childbearing patterns of non-married women have also changed significantly over this period. One manifestation of these changes is the increasing importance of birth outside marriage, as a share of all births. More than half of all births occur today outside marriages in the Nordic countries, as compared to 1 in 10 in 1960; the same share is close to 45% in France, and to 35% in the United States and other OECD countries; much lower shares are observed in Southern Europe and Japan (Figure 18).[21] OECD countries where the share of out-of-wedlock births is higher in 2000 also display a higher total fertility rate (Figure 19). Countries where the share of out-of-wedlock births increased over the period from 1980 to 2000 also recorded a smaller decline in their total fertility rate, although there are large differences across countries and the relation is not significant.

Figure 18. Share of births outside marriage, 1970-2001



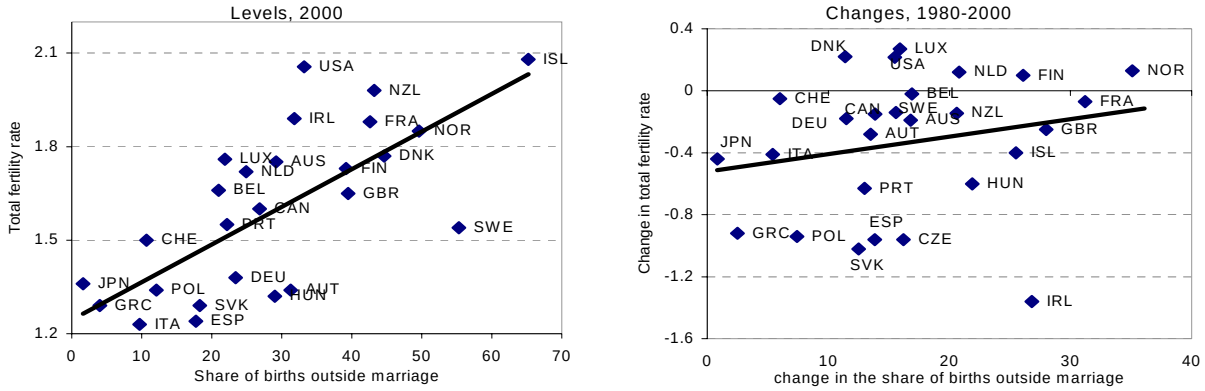
Source: Data from Council of Europe (2003), *Recent Demographic development in Europe* (2003) for European countries; and national sources for other countries.

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unemployment and fertility rates seems to hold also when considering the female unemployment rate instead of the overall unemployment rate. See Adsera (2004).

21 . See, on cohabitation, Atoh (2001) for Japan and Toulemon (1996) for France. See also Sardon (1996).

Figure 19. Cross-country relation between the share of births outside marriage and the total fertility rate



Source: Calculations based on different issues of *Society at a Glance – OECD Social Indicators,* Paris.

2.2.5. Other determinants of the delay and decline of fertility rates

50. The range of structural and societal characteristics that may explain long-term trends fertility rates is larger than those discussed above. In particular, two important factors relate to structural changes in the economy — in particular, the decline in agricultural employment — and the maturing of pensions systems. Both effects, by reducing the need by parents for offspring, have weakened the "economic" benefits provided by larger families that characterise more traditional societies, and increased the importance of cultural values and costs considerations for decisions to have children.[22]

2.3. Women's attitudes towards family and gender roles

51. One important set of theories about changes in childbearing behaviour stresses the importance of fundamental changes in women' values and attitudes towards childbearing and gender roles (Gilbert, 2005; Hakim, 2003). Higher educational attainment and labour market participation among women have fuelled the diffusion of new values — such as autonomy and financial independence — among younger cohorts of women, and greater awareness of the "incompatibility" between professional and family roles that still characterise many OECD countries. Liefbroer and Corijn (1999) distinguish between "structural-role" incompatibility, i.e. between the actual opportunities available to women and the constraints that they face when trying to take advantage of these opportunities; and "cultural" incompatibility, which relates to the broad ideologies, values and norms concerning the role of women in the society. This section presents evidence on the latter, and on their role on childbearing behaviour. Data from the 2000 wave of the *World Values Survey* are used to describe differences in attitudes to family and gender roles between two cohorts of women (those aged between 15 and 34, and between 35 and 50 in 2000) and between women and men.

52. Table 3 presents information on the share of women in the two age groups that agree or strongly agree with a range of statements that reflect the "traditional" role of women in families and society. Survey

22 . Boldrin *et al.* (2005) observed that the increase in public old-age pensions is strongly correlated with a reduction in fertility rates. Using cross section data, they find that differences in the level of old-age pensions account for between 55 and 65% of the observed differences in fertility rates between Europe and the United States (both across countries and over time) and for over 80% of the observed variation in a broad cross-section of countries; they also suggest that access to capital markets accounts for the other half of the observed decline in fertility rates realised in industrialised countries over the past 70 years. See also Ehrlich and Kim (2005).

questions relate to whether respondents agree that: i) "when jobs are scarce men should have more right to work than women"; ii) "marriage is not an outdated institution"; iii) "women need to have children to be satisfied"; iv) "disapprove women as lone parents"; v) "working mothers cannot have the same warm and stable relation with children"; and vi) "being a housewife is as fulfilling as working in paid job". For each of these six questions, higher values shown in Table 3 denote a prevalence of more traditional views with respect to family and gender roles. The data highlight large differences across countries in the mean values of responses to these questions.

- The share of women agreeing that men should have priority in paid work when jobs are scarce is lower among younger women than among older ones in most countries. On average, only 12% of younger women agree with this statement.
- The share of women believing that women need children to be fulfilled in life is also lower among younger women (with an average value of 39% across OECD countries) than among older women (45%).
- On average, 80% of both younger and older women believe that marriage is *not* an outdated institution. There is almost no difference between the opinions expressed by the two cohorts of women although the share of women agreeing with this view is, higher among young women than among older ones in some countries (e.g. Belgium, Denmark, France).
- The share of respondents disapproving of women being lone parents is lower among younger women (a little over one fourth, on average) than among older ones in almost all countries.
- There is much diversity in how attitudes have changed with respect to whether working mother can have a good relation with their children. On average, 17% of younger women consider that working mothers have a worse relation to their children, a share that is marginally lower than among older women.
- While a majority of women still regard being a housewife as being as satisfying as having a paid job, the proportion of young women agreeing with this statement is 3 points lower than among older women. There are wide cross-country differences in responses.

Overall, Table 3 points to a mixed picture, with little difference between young and older women on average with respect to the institution of marriage and the status of being a housewife as opposed to a paid worker), but larger regarding lone parenthood, the need of children for women to be fulfilled and the presence of women in the formal labour market.[23]

23 . It is of course also possible that people's views evolve with their age, i.e. that differences shown in Table 3 are also due to age effects and not only to cohort effects.

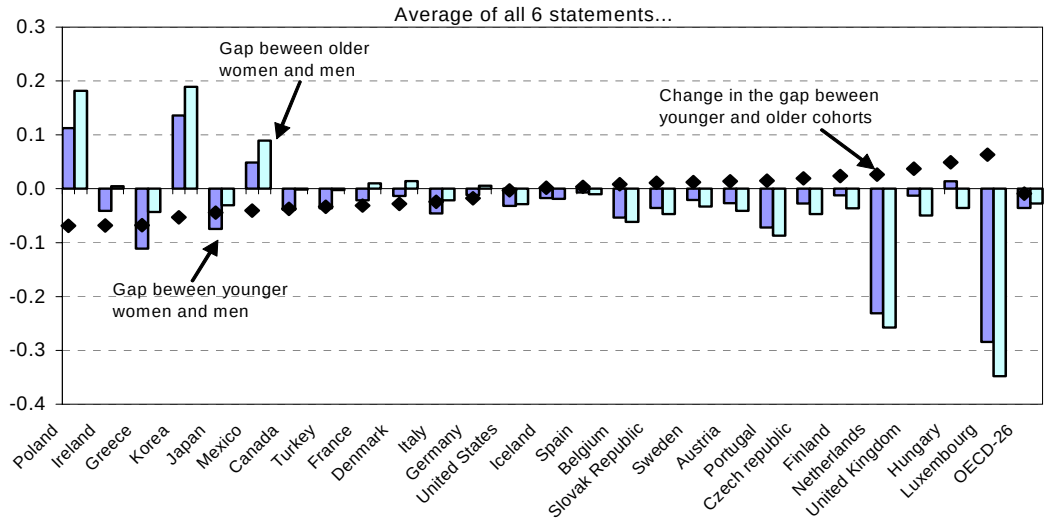
Table 3. Values of women of different ages with respect to gender and family roles, 1999-2001

	Women aged	When jobs are scarce men should have the priority to work	Difference between younger and older women	Women need to have children	Difference between younger and older women	Marriage is not an outdated institution	Difference between younger and older women	Disapprove women as lone parents	Difference between younger and older women	Working mothers can't have a warm and stable relation with children	Difference between younger and older women	Being a housewife is fulfilling as working in a paid job	Difference between younger and older women
Austria	15 to 34	14%	-6%	26%	-3%	75%	-3%	15%	-9%				
	35 to 50	20%		30%		78%		24%					
Belgium	15 to 34	12%	-12%	25%	4%	76%	12%	24%	-1%	14%	-2%	55%	4%
	35 to 50	24%		22%		64%		24%		16%		51%	
Canada	15 to 34	7%	-6%	14%	-3%	77%	-2%	31%	-3%	18%	0%	77%	1%
	35 to 50	12%		16%		79%		34%		18%		76%	
Czech republic	15 to 34	13%	-1%	35%	-6%	80%	-11%	18%	-7%	21%	8%	68%	-4%
	35 to 50	14%		41%		91%		24%		12%		72%	
Denmark	15 to 34	1%	-2%	71%	-6%	87%	2%	32%	-2%	16%	8%	46%	-10%
	35 to 50	3%		77%		85%		34%		8%		57%	
Finland	15 to 34	2%	-2%	8%	0%	76%	-11%	20%	0%	5%	4%	78%	1%
	35 to 50	5%		8%		86%		19%		1%		77%	
France	15 to 34	13%	-8%	60%	-6%	67%	6%	19%	-7%	17%	0%	53%	-9%
	35 to 50	21%		66%		61%		26%		17%		62%	
Germany	15 to 34	16%	-3%	40%	-14%	74%	-7%	19%	-5%	21%	-13%	31%	-10%
	35 to 50	18%		54%		81%		25%		34%		41%	
Greece	15 to 34	8%	-10%	73%	-8%	83%	-1%	26%	-19%	17%	-1%	24%	-16%
	35 to 50	17%		81%		84%		45%		18%		40%	
Hungary	15 to 34	21%	1%	93%	-4%	83%	-1%	24%	-6%	18%	-8%	55%	4%
	35 to 50	21%		97%		85%		30%		26%		51%	
Iceland	15 to 34	2%	0%	26%	-3%	91%	-5%	11%	3%	10%	6%	59%	-7%
	35 to 50	3%		29%		96%		8%		4%		66%	
Ireland	15 to 34	2%	-12%	4%	-6%	69%	-9%	18%	-11%				
	35 to 50	14%		11%		78%		28%					
Italy	15 to 34	12%	-10%	46%	-10%	81%	-5%	31%	-3%	25%	0%	39%	-10%
	35 to 50	22%		56%		85%		34%		25%		49%	
Japan	15 to 34	16%	-11%	39%	-14%	86%	-7%	14%	-10%	3%	-1%	81%	-5%
	35 to 50	27%		53%		93%		24%		5%		86%	
Luxembourg	15 to 34	12%	-7%	31%	-1%	68%	3%	25%	-3%	15%	-4%	54%	-3%
	35 to 50	18%		32%		66%		28%		19%		57%	
Mexico	15 to 34	26%	-5%	37%	-11%	82%	5%	34%	-8%	28%	2%	70%	-1%
	35 to 50	31%		48%		77%		41%		26%		71%	
Netherlands	15 to 34	2%	-9%	2%	-1%	78%	7%	19%	5%	12%	-3%	37%	-8%
	35 to 50	11%		3%		71%		14%		14%		45%	
Poland	15 to 34	19%	-10%	51%	-15%	91%	-1%	12%	-4%	34%	-4%	54%	7%
	35 to 50	29%		66%		91%		16%		38%		47%	
Portugal	15 to 34	21%	-4%	57%	-18%	75%	5%	38%	-6%	22%	-14%	39%	-4%
	35 to 50	25%		75%		70%		44%		36%		44%	
Korea	15 to 34	14%	-30%	82%	-10%	75%	-9%	61%	-24%	9%	-6%	95%	2%
	35 to 50	44%		93%		84%		84%		15%		93%	
Slovak Republic	15 to 34	12%	-2%	42%	-3%	88%	-4%	23%	-3%	12%	-6%	64%	1%
	35 to 50	14%		45%		92%		26%		18%		63%	
Spain	15 to 34	10%	-4%	35%	-9%	74%	-7%	5%	-4%	14%	1%	46%	-5%
	35 to 50	14%		43%		81%		10%		14%		52%	
Sweden	15 to 34	1%	0%	25%	4%	88%	16%	36%	1%	11%	-1%	47%	-3%
	35 to 50	0%		21%		71%		35%		12%		50%	
Turkey	15 to 34	49%	-9%	71%	-10%	92%	0%	87%	-4%	26%	-4%	73%	-4%
	35 to 50	58%		81%		92%		92%		31%		77%	
United Kingdom	15 to 34	9%	-8%	14%	-4%	67%	-11%	21%	-5%	21%	0%	58%	2%
	35 to 50	16%		19%		78%		26%		21%		56%	
United States	15 to 34	8%	1%	10%	-5%	89%	-1%	36%	-6%	13%	-4%	76%	-1%
	35 to 50	7%		16%		91%		42%		18%		76%	
OECD-26	*15 to 34*	*12%*	*-6%*	*39%*	*-6%*	*80%*	*-1%*	*27%*	*-5%*	*17%*	*-2%*	*58%*	*-3%*
	35 to 50	*19%*		*45%*		*81%*		*32%*		*19%*		*61%*	

Source: Calculations based on data extracted from different waves of the World Values Survey.

53. There are also important differences in attitudes towards family and gender roles between women and men of the same age. Figure 20 represents the average differences between the shares of women and men of the same age that agree with all the six statements referred to above (negative values denote that the share of women agreeing with the statement is less than that of men, i.e. that men have more traditional view on gender roles); differences between the shares for the two age-groups are shown as a diamond (positive values denote that difference in view between women and men shrinks over time). Figure 20 suggests that men have more traditional views than women about family and gender roles in most OECD countries (with the exceptions of Poland, Korea and Mexico); and that these gender gaps have narrowed over time (i.e. they are lower among younger cohorts than for older ones) in a majority of countries (e.g. Poland), while widening in others (e.g. Luxembourg).[24]

Figure 20. Values of men and women towards gender roles, 2000



Notes: The bars refer to the average difference between the shares of women and of men agreeing with each statement (a negative value denotes that men have more traditional view on gender roles); the first bar refers to the younger cohort, the second bar to the older ones. The series represented with a diamond refers to the change in the gap between genders over time (i.e. positive values means that the gender differences in values shrinks among the younger cohort). Countries are ranked, from the lowest to the highest, according to the size of this difference.

Source: Computations based on data from the World Values Survey (2000).

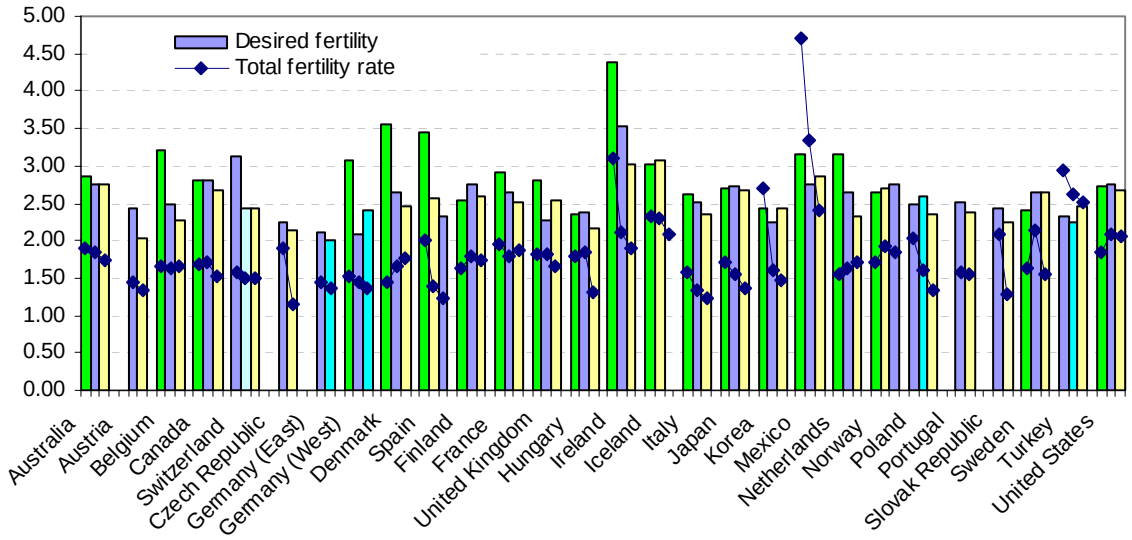
2.4. A widening gap between desired and observed fertility rates

54. While changes in structural conditions and life styles are contributing to delay and decline of birth rates, the effects of these changes on the number of children that women will have over their reproductive life have been exacerbated by the constraints that individuals and couples face in everyday life, by the emergence of new risk factors confronting them (labour market insecurity, difficulties in finding suitable housing, unaffordable childcare) and by the failure of social policies to provide adequate support. Indications about the potential role of these constraints on women's childbearing decisions can be

24 . An application of hierarchical cluster analysis to the data shown in Table 3 (to identify countries with more homogeneous characteristics in terms of women' attitudes towards family and gender roles) is presented in Annex 1. The results highlight that dissimilarities among cluster of countries get smaller among younger women, irrespectively of their birth rates. They also show that, while changes in values may have contributed to delaying childbearing in all countries, there is no unique mapping in terms of the fertility rates that each country achieves. This suggests that, beyond women's values, fertility rates are the outcome of a complex interaction between opportunities and constraints (McDonald, 2000a; 2000b).

derived from answers to questions about the "desired" or "ideal" numbers of children provided from opinion surveys. While interpreting survey evidence from these questions is not without problems[25], the evidence summarised in Figure 21 highlights a number of consistent patterns.[26]

Figure 21. Desired and observed fertility rates in selected OECD countries in different years



Note: Observed fertility rate is measured by the total fertility rate of each country in that year. The three bars shown for each country refer to data for 1981, 1990 and 2000, with the exceptions of Austria, the Czech Republic and the eastern länder of Germany, (where data refer to 1990 and 2000), and of Switzerland, Poland and Turkey (where the data refer to 1990, 1995 and 2000).
Source: Data from the World Values Survey (1981, 1990, 2000) and Eurobarometer (2002) as in European Foundation (2004).

- *Women generally have fewer children than they desire.* Exceptions to this pattern — in Turkey (in all years) and Mexico and Korea (in 1980s) — are limited to countries that are (or were) characterised by lower per capita income and lower diffusion of contraception.[27]

- *The gap between desired and observed fertility rate is higher in countries where fertility rates are lowest*. Some of the OECD countries where fertility rates are lowest (Japan, Italy and

25 . Among these problems are the difficulty in distinguishing between personal desires for their own conditions and societal norms about what is considered to be the "ideal" family size; the dependence of responses on conditions that may change over the life-course of the individual; the adaptation of fertility intentions to actual experience; and the fact that survey questions often do not specify the determinants of fertility intentions.

26 . Survey evidence about desired fertility, as available for most OECD countries, is based on data from the various waves of the *World Values Survey* (1981, 1990, 1995/1997 and 2000), as well as from European Foundation (2004) for European countries (based on a *Eurobarometer* survey undertaken in 2002). Data on "desired fertility" need to be interpreted with care, given differences in the wording of the questions in the two surveys. The question in the *World Values Survey* is: "What do you think is the ideal size of the family - how many children, if any?"; the question in *Eurobarometer* is: "For you personally, what would be the ideal number of children you would like to have or would have liked to have had?".

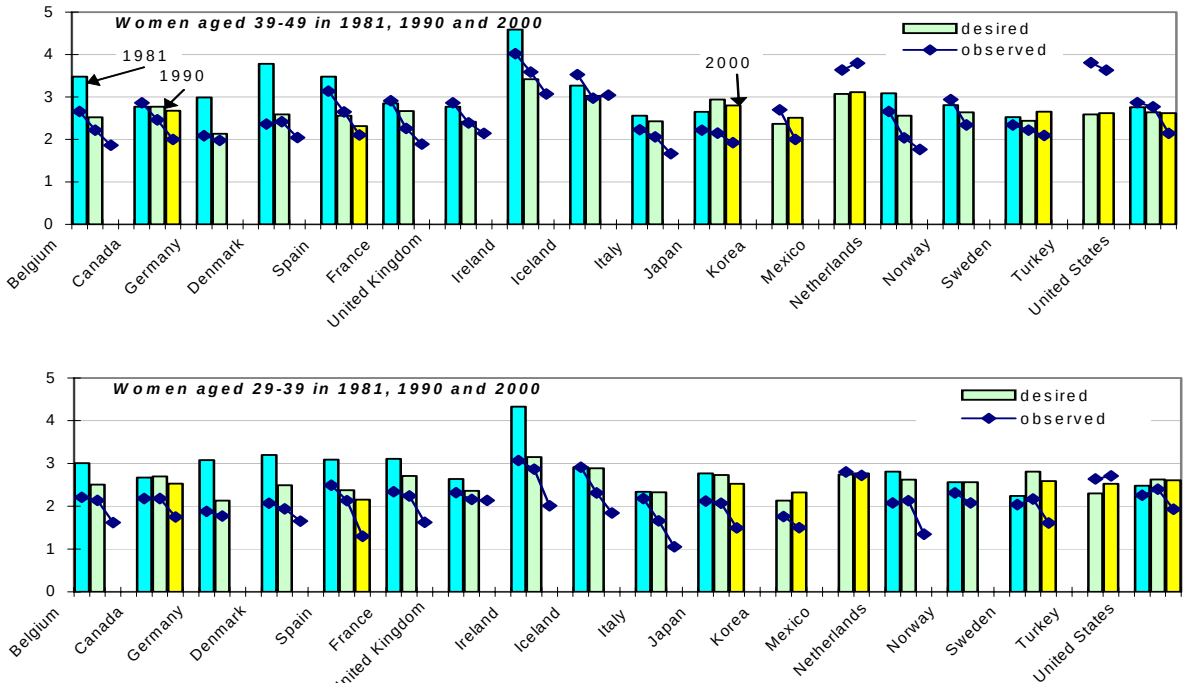
27 . Findings are similar when the observed number of children that survey respondents declare is used in place of the total fertility rates. Data on completed fertility rates, as available for women that have reached the end of their reproductive cycle, have not been used as they may not reflect the behaviour of younger generations.

Spain) in 2000 recorded the largest gaps between desired and actual fertility rate, while countries with higher fertility rates (United States and France) show smaller gaps.

- *The gaps between desired and actual fertility rates have increased over the past ten to twenty years.* On average, across the countries for which data are available in each of the three years shown, the gap between desired and actual fertility rates grew from 1980 to 1990 and from 1990 to 2000.

- *The gaps between observed and desired fertility rates have increased among different cohorts of women.* Aggregate changes in the gap between desired and observed fertility rates are partly affected by changes in the demographic composition of women (i.e. a growing share of older women who are close to the end of their reproductive life). Information about changes in desired and observed fertility rates among different cohorts of women can be obtained by looking at women of the same age (29 to 39, and 39 to 49) at 10-year intervals. Figure 26 highlights that among younger women the gap between desired and observed fertility rates increased strongly over time, as postponement of childbearing led to sharp falls in observed fertility rates. Among older women the gap between desired and observed fertility rates also widened, but by a smaller amount: most women in this group, who in several OECD countries in the 1980s had more children than they desired, declared in 2000 that they desired more children than they actually had. For women who are close to the end of their reproductive cycle, postponement of childbearing is a less plausible explanation of this widening gap between desired and actual fertility rates: despite the effects of medical advances in extending childbearing until higher ages, women in this age group are unlikely to realise fully their childbearing intentions.

Figure 22. Desired and observed fertility rates among women of different ages in selected OECD countries



Note: Observed fertility rates are measured by the number of children that women of different ages declared in the survey. Data for Germany refer to western länder only.

Source: Data from the World Values Survey (1981, 1990 and 2000),

2.5. Conclusions.

55. This chapter has highlighted two set of factors at the roots of the delay and decline in fertility rates. The first are structural conditions that have led to changes in the role of women in societies, i.e. higher education and employment of women, and changes in patterns of family formation. The second are shifts in the values of younger generations of women towards greater financial independence, less deference to traditional family roles and greater equity in gender relations. Beyond these factors, both of which have led more women to delay family formation and childbearing, however, there is also evidence of a gap between women's childbearing desires and realisation, a gap that is increasing over time and that is higher in countries where realised fertility rates are lower. This divergence between desired and observed fertility rates suggests the presence of constraints that prevent women to achieve their expectations about children. The next chapter illustrates how governments may help to weaken those constraints through a wide set of policies that affect the costs of children.

CHAPTER 3. THE IMPACT ON FERTILITY RATES OF POLICIES TO REDUCE THE COSTS OF CHILDREN

3.1. Introduction

56. Demographic trends that impair both the sustainability of government budgets and the well-being of individuals give salience to questions about the type of polices to adopt, their ambition, and the individuals they should target. The vast literature on the costs and benefits of children suggests that government can modify both through a range of interventions: for example, publicly-funded programmes that explicitly seek to affect family size, or legislation that influences the values and beliefs of citizens with respect to marriage and childbearing, or measures that affect economic opportunity, social mobility, and gender relations. This chapter considers a wide range of policies that affect the costs of children.

57. Government measures aimed at influencing decisions about family size potentially raise difficult ethical questions about the legitimacy of interventions in a critical domain of private life. However, whether deliberately or not, various policies contribute to make childbearing more or less attractive, by either relaxing or strengthening the constraints that parents face in combining work and family responsibilities This is especially important when female labour force participation becomes more common. While paid work and childbearing represent alternative uses of women's time, various policies may reduce the extent to which they are incompatible with each other. When policies contribute to reduce the incompatibility between work and childbearing, childbearing decisions may be supported, and any postponement of childbearing may be followed by recuperation at higher ages.

58. The chapter is organized as follows. Section 3.2 presents evidence on OECD governments' views about fertility levels and policies to affect them, while Section 3.3 discusses the concept of the costs of children, present evidence on their size and identifies the different ways in which government policies can affect these costs. Section 3.4 describes specific policies that help parents to reduce the costs associated to childrearing and to spread them more widely in society — tax benefits and cash transfers to families with children, childcare arrangement and leave provisions related to the presence of children — and offers a narrative description of how these (and other) policies have shaped the evolution of fertility rates. Section 3.5 describes methodological problems confronting empirical analysis and present results based on cross-section and panel data. These results are used in Section 3.6 to simulate the potential effects that various reforms might have on fertility rates. Section 3.7 concludes.

3.2. Government's views about fertility levels and the desirability of policy interventions

59. A useful starting point for discussing the role of government policies in affecting childbearing decisions is provided by surveys of governments' views about the levels of fertility in their countries and the desirability of governments' interventions in this field. Such information is collected regularly in surveys of the views of government officials undertaken by the UN Population Division. Responses to such surveys, summarised in Table 4, highlight two main features:

- First, most OECD governments have radically changed their views concerning fertility levels. Less than 30 years ago, the overwhelming majority of OECD governments considered the level

of the fertility rates prevailing in their country as "satisfactory", with only a few countries considering it as either "too high" (Korea, Mexico and Turkey) or "too low" (Finland, France, Greece and Luxembourg). This started to change in 1996, and the change has generalised by 2003. Today, most OECD countries consider the fertility rate prevailing in their country as "too low", with only Mexico and Turkey regarding it as "too high" and a (sizeable) minority of (12) OECD countries regarding it as "satisfactory" (Australia, Belgium, Canada, Denmark, Finland, Iceland, Ireland, Netherlands, New Zealand, Sweden, United Kingdom and the United States).

- Second, policy developments have lagged this change in perceptions about fertility rates. Despite growing concerns that fertility rates are too low, most (15) OECD governments continue to favour no explicit interventions in this field. However, the number of countries expressing a preference for explicit policies in this field has increased over time (from 4 in 1976 to 10 in 2003) and includes today one of the countries (Korea) that in the recent past supported interventions aimed at lowering fertility rates.

60. The reluctance of most OECD countries to undertake explicit pro-natalist policies reflects obvious historical and cultural reasons.[28] However, whether deliberately or not, institutions and policies critically shape the environment in which the childbearing decisions of individuals take place. Policies may help parents to overcome the obstacles to childrearing that families face in everyday life — such as finding suitable accommodation and childcare, striving to reconcile work and family responsibilities — or create new constraints that accelerate the fall in fertility rates — e.g. when they remain embedded in outdated stereotypes about family and gender relations.

28 . Common cultural factors may explain why government officials in all Anglo-Saxon countries tend to regard the birth rate prevailing in their country as "satisfactory". In the XXth century, explicit pro-natalist policies featured in the experience of several industrialised countries, as a way of assuring strong national populations (big workforces, big armies) and expansion abroad. These policies were often associated with measures favouring the deliberate breeding of people for certain selected heritable traits (eugenics).

Table 4. Governments' views about fertility and policy interventions aimed to raise fertility rates in OECD countries

	Governments' views on fertility levels:		
	Satisfactory	*Too low*	*Too high*
1976	Australia, Austria, Belgium, Canada, Switzerland, Denmark, Spain, United Kingdom, Hungary, Ireland, Iceland, Italy, Japan, Netherlands, Norway, New Zealand, Poland, Portugal, Sweden, United States	Finland, France, Greece, Luxembourg	Korea, Mexico, Turkey
1986	Australia, Austria, Belgium, Canada, Switzerland, Denmark, Spain, Finland, United Kingdom, Ireland, Iceland, Italy, Japan, Netherlands, Norway, New Zealand, Poland, Portugal, United States	France, Greece, Hungary, Luxembourg, Sweden	Korea, Mexico, Turkey
1996	Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Spain, Finland, United Kingdom, Ireland, Iceland, Italy, Korea, Netherlands, Norway, New Zealand, Poland, Sweden, United States	Switzerland, Germany, France, Greece, Hungary, Japan, Luxembourg, Portugal, Slovak Republic	Mexico, Turkey
2003	Australia, Belgium, Canada, Denmark, Finland, United Kingdom, Ireland, Iceland, Netherlands, New Zealand, Sweden, United States	Austria, Switzerland, Czech Republic, Germany, Spain, France, Greece, Hungary, Italy, Japan, Korea, Luxembourg, Norway, Poland, Portugal, Slovak Republic	Mexico, Turkey

	Governments' policies on fertility levels			
	No intervention	*Maintain*	*Raise*	*Lower*
1976	Australia, Austria, Belgium, Canada, Switzerland, Denmark, Spain, United Kingdom, Iceland, Italy, Japan, Netherlands, Norway, New Zealand, Portugal, Sweden, United States	Hungary, Ireland, Poland	Finland, France, Greece, Luxembourg	Korea, Mexico, Turkey
1986	Australia, Austria, Canada, Switzerland, Denmark, Spain, Finland, United Kingdom, Iceland, Italy, Japan, Netherlands, Norway, New Zealand, Portugal, Sweden, United States	Belgium, Ireland, Poland	France, Greece, Hungary, Luxembourg	Korea, Mexico, Turkey
1996	Australia, Austria, Belgium, Canada, Switzerland, Czech Republic, Germany, Denmark, Spain, United Kingdom, Iceland, Italy, Japan, Korea, Netherlands, Norway, New Zealand, Poland, Portugal, Sweden, United States	Ireland	Finland, France, Greece, Hungary, Luxembourg, Slovak Republic	Mexico, Turkey
2003	Belgium, Canada, Switzerland, Germany, Denmark, Spain, Finland, United Kingdom, Italy, Netherlands, Norway, New Zealand , Portugal, Sweden, United States	Australia, Ireland, Iceland	Austria, Czech Republic, France, Greece, Hungary, Japan, Korea, Luxembourg, Poland, Slovak Republic	Mexico, Turkey

Source: Data extracted from United Nations (2004), *World Population Policies 2003*

3.3. The importance of the costs of children for childbearing decisions

61. Most empirical analyses of the impact of policies on childbearing decisions have their root in the economic model pioneered by Becker (1960) and Leibenstein (1957), where demand for children is a function of their costs and of individuals' preferences, for a given income level.[29] Underlying this model is the idea that children are a special type of capital good, i.e. a long-lived asset that produce a flow of services that enter the utility function of parents.[30] Within this framework, cash benefits and tax credits to

29 . Further extensions of this model are provided in Becker and Lewis (1973), Becker (1981) and Cigno (1991; 1994).

30 . Demand for children is jointly determined by "substitution" and "income" effects. When the substitution effect prevails on the income effect, quality will be preferred over quantity of children. This theory suggests a negative relation between family size (quantity) and resources devoted to each child (quality). In practice, empirical evidence is more diverse — e.g. Black et al., (2004) show that in Norway the negative effect of family size on child education vanishes once the birth order is controlled for.

families with children, by reducing the cost of children, have a positive effect on fertility rates and family size — to the extent that their "income effect" (i.e. higher household income will increase parents' demand for children, unless they are an inferior good) is stronger than the "substitution effect" (higher incomes will also lead to a higher demand for "quality" of children, thereby reducing the number of children demanded by parents). The effects of these policies may differ among individuals and groups because of the heterogeneity of their preferences: for example, cash benefits may have a stronger effect on fertility rates of jobless women than on women with well-paid jobs while, conversely, the length and generosity of maternity leave will play a more important role for working mothers than for those that are not (Gauthier and Hatzius, 1997; see also Hakim, 2003b).

62. The costs of children may be divided in two groups:

- *Direct* costs are the additional costs incurred by households when children are present (e.g. food, clothing, childcare, education, housing, etc.).

- *Indirect* costs refer to the loss of income incurred by parents as a consequence of the presence of children, for example when the mother drops out of employment or reduces working hours to care for children, or when her career prospects decline following the birth of a child.

The economic literature on childbearing decisions has often focused on direct costs. While the assessments of their size raise difficult methodological issues (Box 3), estimates of the direct costs of children exist in several countries. In general, these estimates suggest that direct costs of children increase with the age of the child and decline with family income, and that economies of scale in consumption reduce the direct costs for second-born (and higher-order) children.

Box 3. Methodological issues and empirical estimates of the direct costs of children

Evaluating the direct costs of children is complex. While, in theory, one might think of these costs as the increment in family expenses due to the presence of a new born child, in practice these costs cannot be observed directly. The increase in family expenses is the outcome of a process through which families adjust their expenses following the birth of a child; some expenditure components will rise, others will fall, others yet will be incurred for the first time. Direct costs of children vary with parental income and preferences, with the age and number of children and with societal standards. Moreover, simple comparisons between the spending of a couple without children to that of a couple with one child (a proxy for the direct costs of the child) raise the problems of determining what proportion of "indivisible goods" (e.g. cars, housing, etc.) should be attributed to a child; of capturing other costs such as those related to holidays; of accounting for changes in spending patterns as children age; of controlling for changes in household income that may accompany the birth of a child (e.g. when one of the parents temporarily leaves work to care for the child); and of accounting for higher savings to confront the (future) needs of children.

Estimates of the direct costs of children rely on three main approaches (McDonald, 1990):

- Opinion surveys, based on a representative sample of families that answers questions about how much children cost;

- A budget approach, based on calculating the costs of a standard "basket" of goods and services that a child of a given age is deemed to need;

- An expenditure-survey approach, which compares household expenditures of couples with and without children that have the same standard of living.

Expenditure-survey estimates are among the most common and reliable. However, the inability to observe directly the utility of different families requires the use of proxy measures. For a couple without children, at a given income, the birth of a child will raise spending to meet the child's needs and decrease that devoted to satisfy parents' needs. While costs of children may be approximated by the extra income needed to bring adults back to the previous level of well-being, results will differ according to the techniques used to evaluate adults' well-being. Some of the most common methods include the Engel estimator (based on the share of expenditures that a family devotes to food) and

the Rothbarth estimator (based on actual expenditures on adult goods).[a] To illustrate the differences in results associated to different estimators, the following table shows the expenditure on food, adult goods and other goods of a family without children – Family A – and two families with a child – Family B and C – (Lewin/ICF, 1990); both Family A and Family C devote 30% of their total expenditures to food, while Family B and Family A spend the same amount ($2000) on adult goods.

	Family A No children	**Family B** One child	**Family C** One child	**Family A** No children	**Family B** One child	**Family C** One child
	Actual expenditures			Shares in total expenditures		
Food	6,000	8,000	9,000	30%	33%	30%
Adult goods	2,000	2,000	3,000	10%	8%	10%
All other goods	12,000	14,000	18,000	60%	58%	60%
Total expenditures	20,000	24,000	30,000	100%	100%	100%

Source: Lewin /ICF, 1990

- Based on the Engel method, Family A and Family C are equally well off since they devote the same share of their spending to food. In other terms, $10,000 will be needed to make Family C as well off after the birth of one child as it was before: this amount represents the estimated direct costs of a child.

- According to the Rothbarth method, Family A and Family B are equally well off since they spend the same amount on adults' goods. In other terms, $4,000 will be needed to make Family B as well off after childbirth as it was before: this amount represents the estimated direct costs of a child.

Because of these differences in methodological approaches, estimates of direct costs of children are difficult to compare across countries. Some examples of these estimates for different OECD countries are provided below:

• In Australia, Percival and Harding (2002) have estimated the direct costs of children by comparing the expenditures of couple families, with and without children. The direct costs of one, two and three children are estimated to be equivalent to, respectively, 14%, 23% and 31% of gross household income. These costs decline as household income rises, from 35% in the case of two children in a low-income family to 19% for high-income ones; and increase as the child ages, from 8% of gross family income for a child aged less than 4 to 24% for a child above 15.

• In the United States, Rothe *et al*. (2001) present estimates of direct costs using different methods. Direct costs, as a share of household income for one, two and three children are estimated at 18%, 25% and 27%, based on the Rothbarth method; and at 23%, 34% and 41%, based on the Engel method.

• In France, Olier (1999) suggests that the direct costs of one child range between 20% and 30% of the income of a couple with no children, and that these costs increase as the child gets older. The first child costs relatively more than higher order births. In the case of single-parent families, costs of children are higher than for couple families.

• In Italy, the additional average expenditures for one child range from 20% (based on a Ray estimator) to 36% (with the Engel estimators, Polin, 2004).

• In Japan, Oyama (2004a, b) provides estimates of the direct costs of one child based on the Rothbarth estimator. These estimates suggests that a married couple would face additional costs (as a share of household expenditure, rather than income) of 13% for a child aged less than 19 (12% for a child aged less than 6, and 26% for both a child aged between 7 and 18).

• In the United Kingdom, Lyssiotou (1997) concluded — based on a variant of the Engel estimator — that, to maintain its standard of living, a couple without children would require a 14% increase in its household income to meet the needs of a child aged less than 12 (25% in the case of two children, and 32% in the case of three children aged less than 12), and 22% in the case of one child aged between 12 and 17 (44% for two children of the same age).

a. Other techniques have relied on implicit assumptions about the identity of family members that consume a given share of each type of good (the per-capita estimator, the Family Economics Research Group and the Prais-Houthakker estimators) and on particular mathematical relationship between expenditures on each category of goods and the level of well-being of the household (e.g. the Barten-Gorman and the Ray estimators).

63. Beyond direct costs are the indirect (or opportunity) costs associated to childbearing. If direct costs may be shared among parents, indirect costs fall almost exclusively on mothers. While the difficulties of estimating their size are even larger than in the case of direct costs, it is very likely that the size of these indirect costs rises alongside the higher employment opportunities available to mothers.[31] For women that — because of their education and preferences for financial autonomy — can get a foothold in the labour market, the decision of having a child will affect their career opportunities. They may have to withdraw from the labour market, at least temporarily, shortly before and after childbirth; they may not be able to return to work after childbirth, or may have to work part-time or under atypical schedules; or they may find that, in the longer term, their career prospects have worsened relative to childless women and to men. Often, one immediate consequence of these changes in work arrangements following childbirth is a loss of income. Further, as the longer a mother stays out of the labour market the more difficult it becomes for her to re-enter it, indirect costs of children increase as the mother ages.[32]

64. Lack of appropriate data makes it difficult to assess the relation between the costs of children and fertility rates (see Di Prete *et al.*, 2002). A negative relation between the two variables is, however, assumed in much of the discussions on demographic trends in modern societies: parents, and potential ones, will decide to have fewer children when the costs of children are "too high" (Ringen, 1998). Affordability is also likely to have become more important in modern societies than in traditional ones: while in the past most mothers did not sacrifice any earnings in the event of childbirth, this is common today. As a result, policies to distribute the indirect costs associated to rearing children more widely in society have become more important means to achieve the twin goals of higher female employment and higher fertility rates. It should be stressed, however, that policies aimed at removing the barriers that prevent women to realize fully their desires about family size should be compatible with individuals' preferences; to solve the conflict between family and work responsibilities, women need to be able to choose what is best for them. For example, women that want to pursue both a career and family life should not incur losses in earnings, human capital or career prospects because of childbirth; at the same time, women that prefer to remain outside the paid labour market need resources to ensure the healthy development of their children.

3.4. Which policies most affect the costs of children?

65. A wide range of policies may influence childbearing decisions. A description of many of these policies is provided in OECD (2005d). This section focuses on those that are most likely to influence the costs of children: tax benefits and cash transfers; childcare; and parental leave.

3.4.1. Tax benefits and cash transfers

66. Traditionally, government support to families with children has aimed at reducing poverty and supporting child development within a "cohesive" family environment. However, tax benefits and cash transfers to families with children also affect their costs and, indirectly, the childbearing decisions of

31 . For example, in Italy the presence of a child reduces drastically female labour market participation (by around 30% among women aged 30 to 39 in 2001). As a result, the additional direct costs for children are accompanied by large indirect costs (i.e. further reductions in household disposable income following childbirths).

32 . Since paid work and childbearing represent alternative uses of mothers' time, policies aimed at reducing indirect costs may increase childbearing at the cost of lowering women's labour force participation. For example, cash transfers granted at the birth of each child, if large enough to alter childbearing decisions, may lead mothers to withdraw (or not enter) the paid-labour market in order to rear their children instead. Conversely, policies that reduce the labour market penalty associated to having children will generally encourage women both to work more and to have more children.

families. In general, the form of the support provided through the tax and benefit system varies across countries. For example, in Mediterranean countries — characterised by lower labour force participation of women and by a close link between marriage and childbearing — tax and benefit systems have mainly taken the form of support for dependent spouses granted to the male breadwinner; by contrast, in Nordic countries — where female labour force participation is considerably higher and cohabitations are more common — tax and benefit systems have aimed to support financial autonomy of all individuals, irrespective of the family where they live.

67. Family or child benefits and allowances exist in all OECD countries, although they differ in terms of the person to whom the benefit is paid, whether they are universal or income-tested, and other conditions restricting eligibility. Support to families with children is also provided through the tax system. Nearly all tax systems have redistributive effects that operate both vertically (i.e. from higher to lower income families) and horizontally (i.e. between households with different number of children). Because of this redistribution, tax systems can affect individual choices concerning employment, union formation and childbearing. For example, tax policies that treat differently married families and cohabitations (e.g. in terms of inheritance laws) may lower the number of children in the latter type of households; these differences in treatment may also affect the overall level of childbearing if risk-averse individuals opt for a lower number of children to protect themselves from risks of family separation.[33]

68. Tax systems provide preferential treatment to families with children through specific tax deductions, choices about the unit over which income is assessed[34], and whether family benefits are taxed or exempted. In practice, it is impossible *a priori* to say which features of the tax systems matter most for achieving horizontal redistribution: alternative means can attain the same goal. First, even countries that rely on separate taxation for determining the amount of income taxes due grant specific tax deductions to families with children, and the generosity of such deductions may more than offset the advantage to larger families provided by joint taxation. Second, social security contributions are levied on individuals and (generally) do not depend upon whether they have children: as a result, tax systems in all OECD countries operate *de facto* under systems that combine features of both "separate" and "individual" taxation.

69. Figure 23, based on OECD Tax and Benefit models, compares the combined advantage that the tax and benefit system provides to two-earner couples with and without children (shown on the vertical axis) with that of singles with and without children (on the horizontal axis). Comparisons refer to households with two different levels of income (gross household income equivalent to 100% of the earnings of an APW, left-hand panel; and gross household income equivalent to 200% of the earnings of an APW, right-hand panel). Negative values indicate that the average effective tax rates for households with children are lower than for those without children (and that this advantage increases in size the more

33 . In recent years, concerns about low-fertility rates have led to the introduction of specific cash benefits aimed at making childbearing more attractive in several OECD countries. In France, beginning in January 2004, mothers of each newborn child are awarded a lump-sum payment of € 800. In Italy a lump-sum benefit of € 1000 was paid at the birth of the second child in 2004. In Germany, provisions in 2004 increased the contribution to the general nursing scheme paid by families without children (relative to those with children), thereby sharing the costs of raising children more broadly. However, because of the small amounts provided, specific benefits are unlikely to change reproductive decisions by much. Of greater importance is how the full range of benefits to families with children impact on their costs.

34 . The choice of the income tax unit can significantly alter the size of benefits provided to families with children. Under "separate" taxation, the tax schedule is applied separately to each individual in the households. Conversely, under "joint" taxation, the income of all household members is jointly considered in order to compute the amount of income taxes due. In general — for a given degree of progression of the income tax schedule and for given deduction granted to larger families — joint taxation systems achieve greater "horizontal redistribution" than "separate taxation", but this comes at the cost of reducing work incentives for second earners. In practice, few systems fall neatly in the two categories.

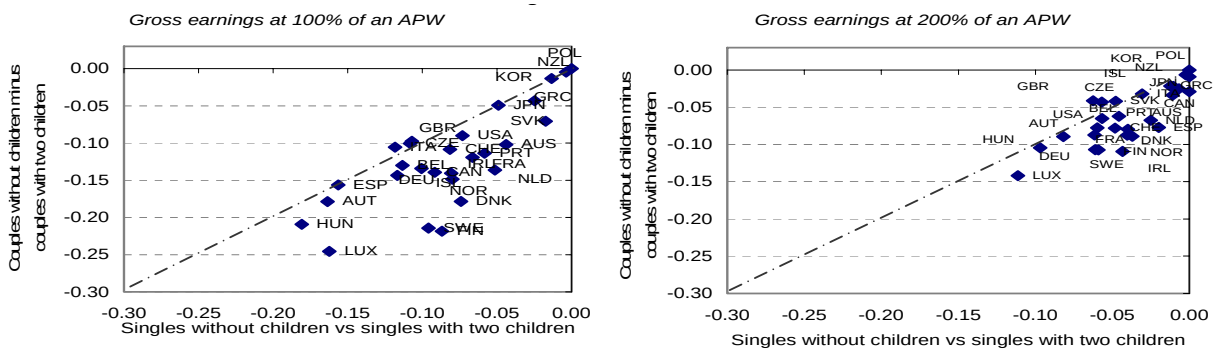
we move along the diagonal line); values to the left of the diagonal line denote a greater tax advantage for couples with children relative to single parents. Three features stand out:

- First, there are significant differences across countries in the size of the tax advantage provided to families with children. When household income equals 100% of the earnings of an APW, the advantage provided to couples with two children is highest in Hungary and Luxembourg (above 15%) but also in Spain and Italy, while it is negligible in Greece, Japan, Korea and New Zealand. Nordic countries and the United States — where fertility rates are relatively high — achieve intermediate levels of "horizontal redistribution".

- Second, in most countries the advantage granted to households with children is higher in the case of couples than for single parents. With respect to households with gross income of 100% of an APW, this is most evident in Demark, Finland and Sweden (countries further to the left of the diagonal). Despite these differences, countries that provide higher deductions to couples with children are also those that are more generous with single parents.

- Third, the advantage granted to families with children declines at higher levels of household income. For example, in the case of Luxembourg, couples and singles with children are taxed at rates that are, respectively, 25 and 15 points lower than those without children, for household income at 100% of APW; this advantage declines to 15 and 10 points, respectively, for household income at 200% of the earnings of an APW.

Figure 23. Differences in the average effective tax rates between household with and without children, 2002



Note: Average effective tax rates include income taxes, social security contributions and cash transfers available to a couple with two children aged 4 and 6. The values shown on the vertical axis refer to the difference between the average effective tax rate of a two-earner couple with two children and that of a childless couple (more negative values indicate a more favourable tax treatment for a couple with children). The values shown on the horizontal axis refer to the difference between the average effective tax rate of a single parent with two children and that of a single without children. Values are shown for two levels of gross household income (100% of the earnings of an average production worker, left-hand panel; and 200% of the earnings of an average production worker, right-hand panel).

Source: Data extracted from OECD (2004), *Tax and Benefit models* database

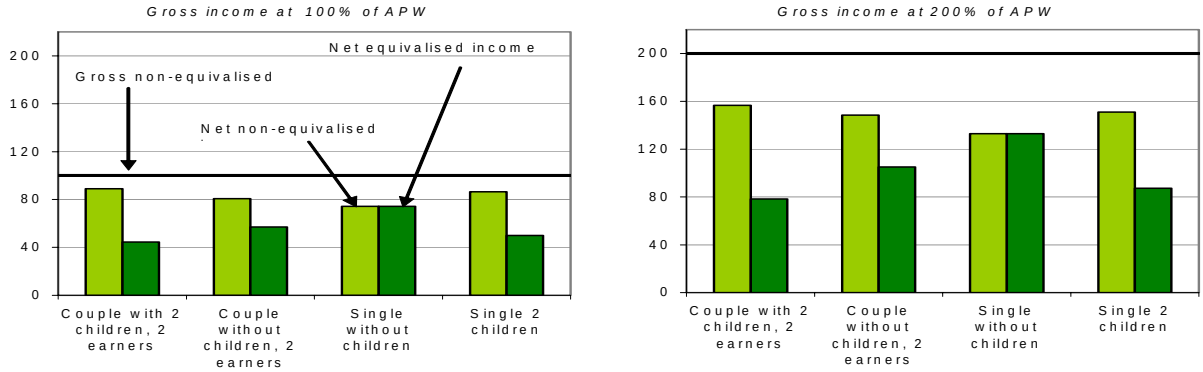
70. While all OECD countries provide preferential tax advantages and cash benefits to families with children, however, their size is smaller than estimates of the higher household costs of larger families that are implicit in the square-root elasticity used in comparative research to "equivalise" total household income.[35] Figure 24 illustrates this result with respect to the *average* OECD values shown in Annex 2,

35 . This value implies that a couple with one child incurs additional costs equivalent to 22% of its gross household income, of 41% of gross income in the case of two children and of 58% in the case of three; these costs are within the range of direct estimates presented in Box 3 — and close to their central value.

Table A.2.1, for two levels of gross household income (earnings of 100% and 200% of those of an APW) and four family-types. Despite their lower tax rates, couples with two children have a lower equivalised disposable income relative to couples without children and, to a larger extent, of singles without children; their equivalised net income is also lower than that of single parents with two children, although the differences narrows at higher levels of gross income.

Figure 24. Equivalised incomes for couples and singles with and without children in 2002, OECD average

At different levels of gross household income



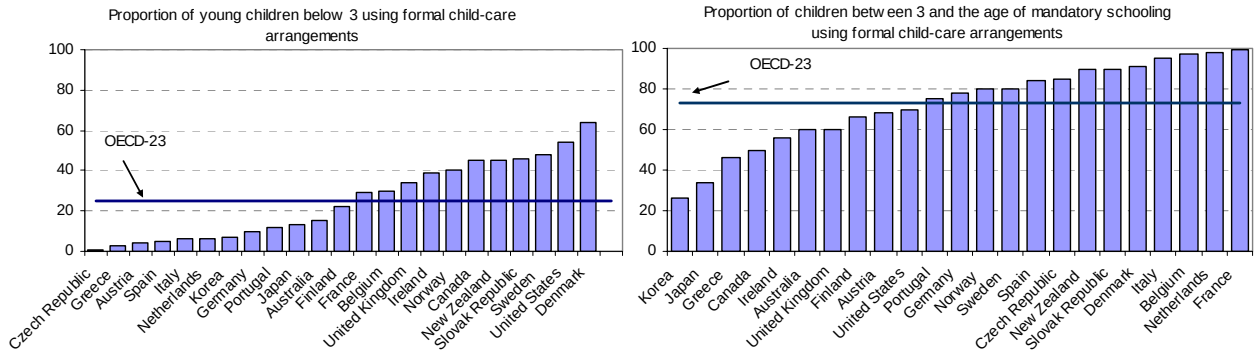
Source: Computations on data extracted from OECD (2004), *Tax and Benefit models* database

3.4.2. Childcare provision: alternative pathways to share the costs of children

71. Affordable and quality childcare is important not only for raising fertility rates but also to make this goal compatible with that of encouraging higher female employment and of investing in children. When childcare is unaffordable, of low-quality, or difficult to access, parents may opt for atypical work schedules in order to share care and work responsibilities, with possible negative consequences on the stability of the parental unions and on the well-being of children; further, mothers' attachment to the labour market may decline, as they opt to care for their children at home.

72. From the perspective of families, two of the most important features of childcare relate to access and costs. With reference to the first, the share of children aged less than 3 attending formal childcare ranges between more than 60% in Denmark to less than 5% in the Czech Republic, Greece, Austria, Spain and Italy; and between close to 100% in Belgium, the Netherlands and France and a little over 20% in Korea, in the case of children aged between 3 and 6 (Figure 25). A significant proportion of these formal childcare facilities is directly provided by governments, and translates into significant budgetary costs: different indicators of public spending on childcare facilities highlight large differences in public childcare spending per child across OECD countries, with very high spending levels in the Nordic countries and much lower in Southern European countries, Japan and Korea — especially for children below the age of entry into pre-primary education (Jaumotte, 2003).

Figure 25. Share of children of different ages attending formal childcare arrangement



Source: Data collected from national sources, as reported in OECD (2001b), *Society at a Glance – OECD Social Indicators,* Paris.

73. When children are cared for outside the family home, childcare costs can represent a large component of the costs of young children. Cross-country differences in these costs will vary according to the form of provision. For example, countries that rely more on private provision may achieve wide access but at relatively high costs for households, while countries where public provision is more common may lower these outlays but at the costs of high marginal tax rates and greater disincentive to work and save. Government can also help parents to meet the cost of childcare in different ways. First, childcare may be provided by the government with little financial participation by families. Second, public cash transfers may be paid to families according to their income, family type, age or number of children in childcare, so as to allow families to purchase care services on the market.[36] Finally, some countries may use tax provisions to mitigate the costs of childcare (e.g. Belgium, France, Germany, Greece, Luxembourg, the Netherlands, Portugal and the United Kingdom).

74. Figure 26 shows estimates of *actual* childcare costs for households with two children aged 2 and 3, cared for on a full-time basis in a public or a publicly recognised day-care facility. These estimates — based on information provided by national experts, and referring to specific cities within countries — relate to *actual* childcare costs borne by families, net of the various public childcare benefits available to parents, as a proportion of gross household income for couples and single parents at different earnings levels (Immervoll and Barber, 2005). These benefits may take the form of cash transfers paid to families that use external childcare facilities, subsidies paid to private providers, and — in a few countries — cash benefits paid to mothers who opt to care for their young children at home.[37] While public in-kind provision of childcare seems to play a more dominant role relative to cash transfers paid to families, both will lower the "actual" childcare costs of families. Figure 26 highlights two main features:

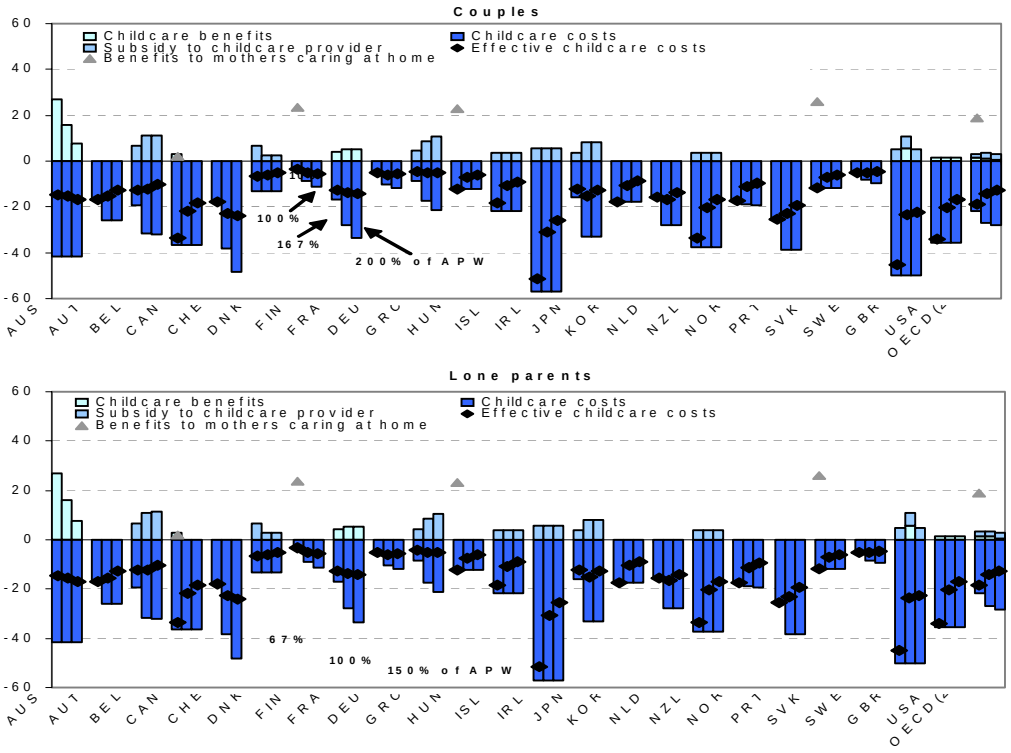
- First, there are important differences in the childcare costs borne by families (before taking into account the effect of different public transfers in reducing them) across countries. In the case of families with two pre-school children, these costs range between 50% of gross household income in Ireland and the United Kingdom and 10% or less in Sweden. These differences mainly reflect the importance of in-kind service provision in several OECD countries.

36 . France, Denmark, Netherlands, Luxembourg and Belgium provide higher cash benefits for very young children, to compensate for higher childcare cost at this age.

37 . These benefits (available to families with two children aged 2 and 3) are distinct from those shown in Annex Table A.2.1, which refer to families with two children aged 4 and 6.

- Second, as a result of different programmes, the out-of-pocket childcare costs borne by families vary significantly across countries: at gross income levels of 100% of the earnings of an APW, they range from more than 40% of gross family income in Ireland and the United Kingdom to less than 10% in Denmark, Finland, Germany, Greece and Sweden; at gross income of 200% of the earnings of an APW they range between more than 20% in Ireland, Switzerland and the United Kingdom and less than 10% in Denmark, Finland, Germany, Greece, Hungary, Iceland, the Slovak Republic and Sweden. Despite these various programmes, childcare costs — as a proportion of household income — are generally higher for low-income families than for higher-income ones.

Figure 26. Childcare costs for two children aged two and three in full-time public care as a share of gross household income in 2001-2002



Source: Data extracted from the *Tax and Benefit models database,* OECD (2005)

75. Childcare costs can play an important role in shaping reproductive decisions. The cross-country correlation between childcare costs and the total fertility rate is indeed negative (i.e. countries where actual childcare costs are lower also display higher fertility rates), although not statistically significant. However, research suggests that it is the combined effect of childcare availability *and* costs that is most important. For example in Italy (a country not included in Figure 26), where childcare availability is limited and costs are generally believed to be high, a high number of working mothers relies on family support (mainly from grandparents) or informal child minders (Del Boca *et al.* 2003).[38]

38 . The educational system also plays an important role to help parents with work responsibilities. Four features are particularly important: i) the age at which children start compulsory schooling (lower ages reduce proportionately the need of childcare); ii) the length of the school opening hours; iii) the availability of after-school care; and iv) the length and distribution of school holidays.

3.4.3. Maternity and parental leaves: their impacts on the indirect costs of children

76. Maternity leave provisions are well-established features of OECD social protection systems. While maternity leave provisions (both their duration and benefits) are important for the well-being of children and families — they provide both employment protection for working mothers and care for infants in a critical phase of their development (OECD, 2001a) — their design might harm mothers' career prospects and financial security.[39] In particular, very long periods of maternity leave might lead to detachment from the labour market, dimming the employment and earnings prospects of mothers relative to other women and to men, thereby increasing the indirect costs of childbearing (Leigh, 1983)

77. Maternity leave is granted to mothers immediately before and after childbirth. Statutory paid maternity leave, often remunerated, exists almost everywhere (exceptions include the United States, Australia and, until recently, New Zealand).[40] Statutory paid maternity leave equivalent to 13 weeks of pay or more was instituted before the end of the 1970s in Finland, Norway, Sweden, Italy, Austria, Germany and France; by the end of the 1990s, this level had been exceeded in 16 countries; today the total duration of maternity/childcare leave (paid or unpaid) is a year or more in over 20 OECD countries. Entitlement to maternity leave (and childcare leave, where it exists) is often conditional on previous work experience on a continuous and full-time basis as an employee over a certain period (usually for a year). Exceptions include the Scandinavian countries (where most women are covered), the Netherlands (where some temporary and part-time workers are covered) and Germany (where mothers in education or who are unemployed are covered). In Southern European countries, entitlement often depends on having a contract for permanent employment.

78. In general, the wage replaced through maternity leave is set in relation to previous earnings and is often paid at a full (100%) rate. However, as salary support often decreases as the leave lengthens, not everybody can afford to use it fully. Indeed, Kamerman (2000) argues that, while maternity leave tends to increase labour market participation of women, it also leads to reductions in their incomes, or to changes in the job situation and in the hours worked relative to their situation before the leave.

79. Because of changes implemented since the early 1980s, most OECD countries have replaced statutory maternity leave policies with parental leaves and rely today on a combination of different types of leaves. Duration, the size of benefits to which parents are entitled and legal enforcement of leave policies, however, vary widely among OECD countries and this affects their probability of being accessed (Figure 27). Leave policies are also intrinsically dependent on socio-cultural attitudes: in those countries where childrearing is considered solely as the mother's responsibility, maternity leave provisions tend to be stronger. [41]

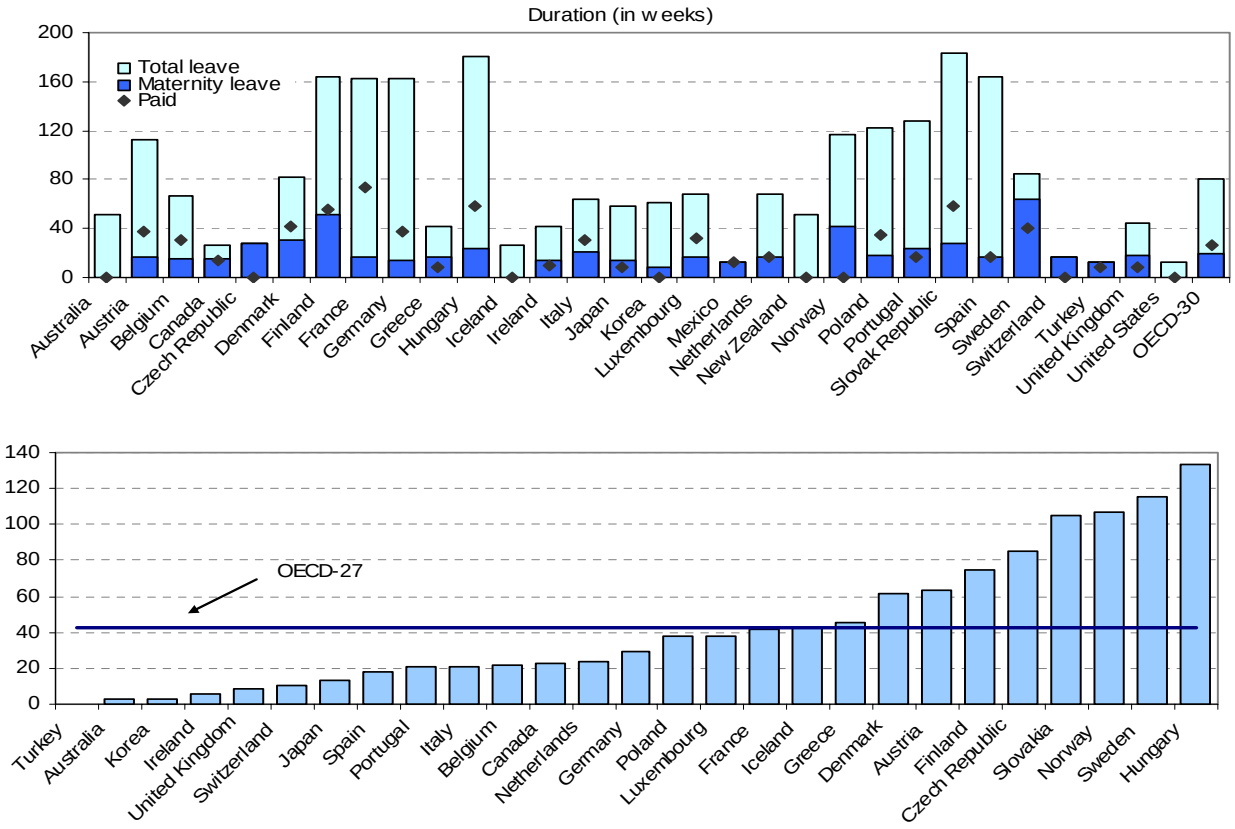
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39 . To remedy these potential effects, subsidies are provided in Germany to employers who grant retraining programmes and childcare provision to favour the return of mothers into work.

40. In Australia and the United States, where no statutory national paid leave exist, such leave is often provided through collective bargaining and local legislation. In Australia, women who work for the government (approximately 17% of the female workforce) are entitled to paid maternity leave; and, since 1994, legislation provides unpaid leaves of up to 52 weeks for childcare of a newborn (or adopted) child. In the United States, 5 states provide maternity leave as part of mandatory disability insurance (California, Hawaii, New Jersey, New York, and Rhode Island); and the *Family and Medical Leave Act*, enacted in 1993, provides for job-protected leaves of up to 12 weeks for workers in firms with 50 or more employees.

41 . As a further step towards greater sharing of the indirect costs of children, some OECD countries have introduced paternity leave entitlements. Paternity leave provisions exist today in 11 OECD countries. Their duration varies from 3 days (or less) in Greece, Portugal, Spain, the Netherlands, Belgium and France to 10 days in Sweden, 14 days in Denmark, Iceland and Norway, and 18 days in Finland; during these periods,

Figure 27. Parental leave provisions in selected OECD countries, 2002



Note: Benefits per birth are computed by dividing total spending on benefits for maternity leave by the number of births in each country. They are subsequently expressed as a percentage of the APW wage.

Source: Data on leave duration are from OECD (2005b), *Reconciling Work and Family Life – Social Policies for Working Families*, forthcoming. Data on benefits paid for leaves are from the OECD Social Expenditures Database (SOCX).

3.5. The impact of various policies on total fertility rates: empirical analysis

3.5.1. Methodological considerations and results from previous research

80. The empirical analysis of how policies influence childbearing is complex for various reasons:

- First, the range of policies that can influence fertility rates is broad, including characteristics of the tax and benefit system, educational policies, and measures that influence the labour market opportunities of women and men; even when analysis is restricted to "family policies", the range of instruments covered is wide, and no universal definition of family policies exists.

wages are usually fully replaced. In general, although fathers' use of leave time is much lower than that of mothers', these policies have had some impact in favouring shared parenting.

- Second, sudden policy changes are rare and potentially long and variable lags in the adjustment of reproductive behaviour to policy reforms may make it difficult to capture the specific contribution of the policy change.

- Third, some explanatory variables are endogenous (e.g. the choices of both working and of having children are jointly determined at the individual's level, since women's childbearing decisions will affect their decision regarding labour supply, and *vice versa*). Endogeneity may also be an issue when estimating the impact of transfers to families on birth rates, since other countries' characteristics not included in the model may be correlated with both fertility rates and family transfers' expenditures.

- Fourth, the difficulties in observing values of certain key variables complicate empirical estimation. For example, direct costs of children cannot be observed directly, and (at the margin) they depend upon how many children parents choose to have (Pollak and Wachter, 1975). Also, the opportunity cost of a woman's time — typically proxied by the woman's (potential) market wage rate — cannot be observed for women not in paid jobs;[42] its values may also be affected by financial and time incentives associated with policy reforms, which may also impact on other factors like labour market institutions and arrangements, social values and gender attitudes.

- Last, lack of comparable data in longitudinal form makes estimation difficult.

81. Box 4 provides a summary of some of the main results from past empirical studies. Sleebos (2003), based on a review of this literature, concluded that "most empirical analyses suggest a weak positive relation between reproductive behaviour and a variety of policies; findings are however often inconclusive and contradictory, partly because of methodological differences among studies, and partly because of differences in the range of policies considered".

42 . One approach, used by some studies, to proxy the wage rate of non-employed women is to impute them a wage based on their personal and labour market characteristics: this imputed wage is based on the assumption that they could earn the same wage as their employed counterparts with comparable characteristics. However, this assumption has been questioned. For example, because of the possibility of sample selection or selectivity bias, Heckman (1979) argued that the structure of wages among employed women is different from that for other women. This argument implies that the imputation procedure just described would give biased estimates of the opportunity cost of time for non-employed women. Heckman and others have developed techniques to adjust for sample selection bias. These techniques typically entail a two-stage or maximum-likelihood estimation procedure in which first, the likelihood of a woman being in the workforce is determined as a function of her characteristics and second, this likelihood is used to generate unbiased estimates of the opportunity cost of time for all women.

Box 4. An overview of the empirical literature about the determinants of childbearing levels in OECD countries

Empirical studies of fertility rates have used qualitative (e.g., Neyer, 2003; Atoh and Akachi, 2003) and quantitative techniques. Many of the latter have focused on the relation between labour market participation and childbearing decisions (while controlling for other socio-economic factors) either at country- or individual-level. Several authors have sought to address the issue of endogeneity of childbearing decisions with respect to labour force participation through the use of instrumental variables (Browning, 1992). The main difficulty with this approach is the identification of suitable instruments. When both childbearing behaviour and labour market participation are recognized as the joint result of household's maximization of their expected lifetime utility – under budget and time constraints, and using an explicit dynamic framework – both variables will depend on the whole sequence of prices and wages (which themselves may be endogenous) and on household preferences.

Despite the potential importance of policies, few studies have investigated the relation between fertility rates and policy interventions at cross-country level, mainly because of the lack of comparable data on some relevant variables (e.g. childcare provisions). Most of the available evidence on the impact of policies on fertility rates relies on research based on individual data for specific countries. Among the latter:

- Many studies have reported that childcare availability is very important to help women to combine career and family responsibilities. The results of Blau and Robins (1998; 1989) suggest that public childcare availability has an important effect on fertility rates, while higher childcare costs have the opposite effect. Similar results for Italian women are reported by Del Boca *et al.* (2003), using a model where women's decisions to participate in the labour market and to have children are jointly determined. Ermisch (1989) also concludes that availability of market-provided childcare in some OECD countries has lessened the reduction of fertility rates associated to higher labour force participation of women.
- As to financial incentives, Barnby and Cigno (1988) found that child benefits speed up the onset of motherhood in the United Kingdom. Ermish (1988a, b) also reports that financial transfers affect the timing of births but not family size. Conversely, Whittington *et al.* (1990) and Whittington (1992) found that a tax relief in the United States had positive effects on family size, and similar results are reported for Canada by Zhang *et al.* (1994). Laroque and Salanié (2004) suggest that the 1994 French reform may have increased births of parity 2 by 11%, while also reducing births of parity 3 by around 2%; their estimates also suggest that the wide-ranging reform of family benefits in 2004 (*Prestation d'Accueil au Jeune Enfant*), which had explicit pro-natalist objectives, may have increased births by close to 5% (see also Landais, 2003).
- Fewer results are available with respect to the effect of maternity and parental leave provisions on fertility rates. Rønsen (2004) concludes that the extension of maternity leave has had a positive impact on fertility rates in Norway and Finland (especially in the latter country) and for higher order births. Andersson (2001) suggests that the introduction of a "speed premium" in the parental-leave system of Sweden accelerated childbearing decisions, by reducing the spacing between the first and second births.

Only a few cross-country studies have investigated the effect of policies on fertility rates in industrialised countries using either cross-section or time-series or longitudinal data. Among the former, Castles (2004) has analyzed the role of some factors on birth rates in 20 OECD countries for the year 1998. Among those using longitudinal data, Ekert-Jaffé (1986) and Blanchet and Ekert-Jaffé (1994) investigate the effect of family benefits using data for 7 and 11 countries, respectively, over the period 1970-1983; Gauthier and Hatzius, (1997) model the dynamic relation between fertility rates and policies for 22 OECD countries over the period 1970-1990; and Adsera, (2004) studies the relation between fertility rates and institutions in 21 OECD countries. All of these studies report a positive relation between fertility rates and a range of policies.

3.5.2. Empirical results

Static cross-section analysis

82. This section presents results based on a model that investigates cross-country profiles of total fertility rates as a function of various policies. To meet data availability requirements, the analysis refers to the year 1999 and is limited to 19 OECD countries (Austria, Belgium, Canada, Czech Republic, Germany, Denmark, Finland, France, Greece, Ireland, Italy, Japan, Korea, the Netherlands, Portugal, Spain, Sweden,

the United Kingdom and the United States).[43] Explanatory variables used in the analysis are described in Box 5.

Box 5. Variables used in the analysis of cross-country differences in total fertility rates

Variables used to explain cross-country differences in the level of total fertility rates are:

1. *A proxy for the direct costs of children*: the difference between the equivalised disposable income (accounting for income taxes, social security contributions and family benefits) of a two-earner couple without children and that of a two-earner couple with 2 children, where the principal earner earns 67% of the earnings of an APW, and the spouse 33%.
2. *A proxy for opportunity costs of children:* the difference in equivalised disposable income between a couple formed by one earner without children and a couple with two earners without children. The one–earner couple is assumed to earn 100% of the earnings of an APW; parents in the two-earner couple earn 100% (principal earner) and 67% of the earnings of an APW (spouse).
3. *A measure of the gap between the values of young* (aged 15-34) *men and women with respect to women's role in society.* This variable has been introduced to account for the possible importance of a mismatch between young men and women with respect to gender roles and partnership formation (i.e. countries with a larger mismatch in the values of young men and women may face lower rates of partnership formation, and lower fertility rates). The data relates to the questions analysed in Chapter 2. For each of these questions, we have computed the share of respondents who agree with different statements relating to family gender roles, then calculated the gap between men and women, and finally standardised the results (values are expressed relative to the cross-country mean, and divided by the standard deviation). The retained variable refers to the "average" of the responses to all questions.
4. *Employment to population ratio for women aged between 15 and 64.*
5. *Share of part-time workers among all women employed.*
6. *Share of children aged 0-3 enrolled in formal childcare.*
7. *Percentage of the wage replaced during maternity leave.*
8. *Total length of parental leave.*

Variables (1) and (2) are derived from the OECD Tax and Benefits models for the year 2001/2002. Variable (3) has been built using individual data from the World Values Survey 1999/2000. Variables (4), (5), (6), (7) and (8) are extracted from OECD data sources for the year 1999.

83. Results are shown in Table 5. All variables have the expected sign, but not all coefficients are statistically significant and results are affected by thesmall number of degrees of freedom. Total fertility rates are (significantly) higher in OECD countries where direct costs of children are lower, where the share of women working part-time is higher, where the length of the total parental leave is longer, and where childcare enrolment rates are higher. Other variables that appear with the predicted sign, but with insignificant coefficients, include the female employment rate, opportunity costs of children and the difference in values with respect to the family and gender role between young men and women. The level of pay during parental leave (i.e. the share of previous earnings paid during the parental leave) was also included, but the coefficient was not significant and had the wrong sign.[44]

43 . The equation to be estimated is of the form $y_i = \beta_0 + \beta' x_i + \varepsilon_i$, with y_i being the dependent variable, i.e. the total fertility rate, β' the parameters of interest to be estimated, *x* a set of explanatory variables – accounting for specific policies that could affect fertility but also for some characteristics of the countries considered – and ε_i being the error term. Standard errors are robust to heteroskedasticity.

44 . To assess the sensitivity of results, the model was re-estimated using different specifications. For example, by omitting variables which are potentially endogenous such as employment and part-time work. To

Table 5. Coefficients of the cross-section analysis

Explanatory variables	Coefficients	Std. Err.
Proxy for Direct Costs	**-0.0459****	(0.0202)
Proxy for Opportunity costs	-0.0061	(0.0088)
Standardized average gap in values between men and women	-0.0359	(0.0470)
Employment pop ratio (female 15-64)	0.0004	(0.0048)
Part-time share (women)	***0.0055****	(0.0027)
Percentage of leave paid	-0.0029	(0.0019)
Total parental leave (weeks)	***0.0018****	(0.0009)
Enrolment children aged 0-3	**0.0089****	(0.0024)
Constant	***0.8732****	(0.3664)

Note: Coefficients that are statistically significant at the 1% level are marked with a "**" (and shown in bold); coefficients that are statistically significant at 5% level are marked with a "*" (and shown in bold and italic characters).

84. This evidence is consistent with the results from other studies relying on both cross-sectional data (Castles, 2004) and data for individuals in specific countries (e.g. Del Boca, 2002; Rønsen, 2004).[45] However, the coefficients' estimates shown in Table 5 are in fact based on a model which does not allow for country-specific and dynamic effects, for interaction of the various policies, and for the possible endogeneity of fertility rates and employment decisions; other restrictions relate to missing values for each of the variables. Results should therefore be interpreted with care.[46]

Dynamic panel-data analysis

85. To overcome some of these problems, a dynamic panel data model was used to explain the changes of total fertility rates across OECD countries. The model is estimated on data for 16 OECD countries (Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, the Netherlands, Portugal, Spain, Sweden, the United Kingdom and the United States) over the period 1980-1999. The variables included in the fertility-rate equation, and their trend over the period, are described in Box 6. Details of the econometric approach are given in Annex 3. The approach used extends the model of Gauthier and Hatzius (1997) — one of the few studies using a dynamic specification to link (birth-order) fertility rates and various policies — to a broader range of policy variables, while also allowing for country-heterogeneity in the dynamic effects.

control for potential outliers, the model was also estimated with different groups of countries. Despite the small sample size, these procedures do not qualitatively change the results.

45 . The coefficients shown in Table 5 imply that a 10% change in the enrolment rates of children aged 0-3, in the total length of parental leave, in the direct costs of children and in the share of women in part-time work would lead respectively to a change in the total fertility rate of 2.12%, 1.58%, -5.56% and 1.33%.

46 . Instrumenting part-time work through the marginal tax rate on second earners does not change qualitatively the results. Moreover, the Durbin-Wu-Hausman test does not reject the null hypothesis of exogeneity of the employment variable.

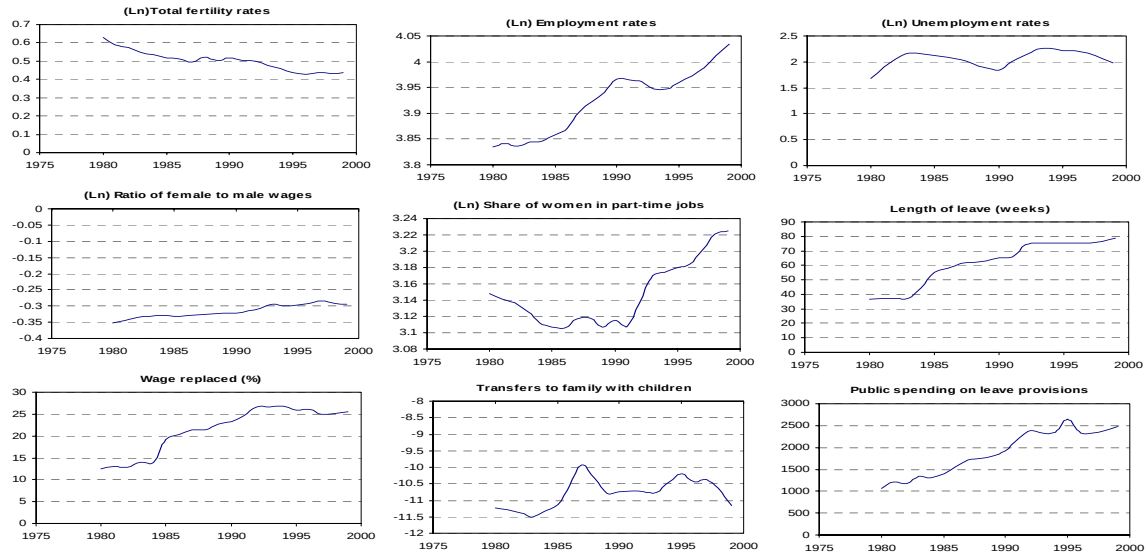
Box 6. Variables used in the panel data analysis

The specifications used for the panel data analysis are dynamic and include thus, among the explanatory variables, the lagged dependent variable (total fertility rate at time t-1). Various explanatory variables have been introduced in the fertility rate equation to account for policies and institutional factors that may affect childbearing decisions. They are:

1. *Net transfers to family with children*, computed as the difference between the average effective tax rates of singles without children earning 100% of an APW and a married couple with two children aged 6 and 4, where one spouse earns 100% of an APW (the higher the difference, the higher is the advantage given to families with children). Data are derived from various issues of *Taxing Wages in OECD countries*.
2. *Length of parental leave* in weeks, as defined in Jaumotte (2003).
3. *Percentage of wage replaced during maternity leave,* as defined in Jaumotte (2003).
4. *Employment to population ratio of women aged 15-64* (in logarithm).
5. *Ratio of female to male hourly earnings in manufacturing* (in logarithm). This variable is used as a proxy for opportunity cost (the lower the gap between male and female wages, the higher is the foregone income loss for women deriving from career interruptions linked to maternity). This variable can also be seen as an index for segregation in the labour market. (In both case we expect a higher gap to be associated with higher fertility rates). OECD data are completed with those from the ILO database on wages.
6. *Maternity leave benefits per birth* as a percentage of the earnings of an APW.
7. *Share of women in part-time jobs* (in logarithm).
8. *Total unemployment rates* (in logarithm) that is intended to capture general economic prospects in the labour market and (part of) opportunity costs.

Potential endogeneity of employment, unemployment, the share of women in part-time work and the ratio of female to male hourly earnings are accounted for with the GMM estimator (see Annex 3). The PMG estimator (see Annex 3) which separates short-run dynamics from long-run effects deals differently with endogeneity since simultaneity is expected to play a role in the short-run while over the long-run is should be less severe.

Trends of the variables at the OECD level over the period considered in the analysis are shown below.



86. Table 6 presents results based on models that both exclude (the first three columns) and include time effects (the last three columns). Estimates are obtained using "pooled ordinary least squares", a "generalized method of moments" (GMM-system) and a "pooled mean group" (PMG) estimator. In general, the trend terms are always significant. Coefficients in the last three columns have high stability

and are robust to various misspecification tests.[47] Based on these results, the PMG estimates — which allow for long and short-run effects to differ — are those preferred: all coefficients have the expected sign and are statistically significant. Despite these positive features, the results should be taken with caution. First, findings are based on aggregate data that may hide large variations across individuals. Second, because of data limitations, some important variables that might affect childbearing and fertility rates are excluded from the analysis. Third, the analysis does not address the differential impact of the policies on sub-groups of the population (e.g. with different levels of income, or education). Finally, the analysis does not differentiate policy impacts according to birth order. However, these results broadly confirm that different policies might make childbearing more attractive: fertility rates increase with higher cash transfers to families, higher replacement wages during parental leave, higher female employment rates and higher shares of women working part-time, and decline with higher unemployment rates and opportunity costs for mothers, and longer parental leave. Finally the coefficient of the lagged dependent variable is always significant, suggesting that policy changes take a long time to have their full effect on fertility rates.

47 . With respect to the GMM estimates, both the Sargan test for over-identifying restrictions and the m2 test of second-order correlation in first differences of the error terms do not reject the null hypothesis of misspecification. With respect to the PMG estimators, the Hausman test — which compares the "pooled mean group" and the "mean group" estimates – does not reject this specification; the SB criterion of search of the lag order pointed at the existence of an ARDL(1,0) – auto-regressive distributed lag process – in most countries (Canada, Denmark, Finland, France, Greece, Italy, Ireland, Japan, Portugal, Spain and Sweden). For data parsimony, the coefficient estimates are obtained using a partial adjustment model. When comparing estimates from the GMM and PMG models, the signs are robust to estimation methods, but the estimated effects of the employment rate and the share of women in part-time work on fertility are much larger when the GMM estimator is used. Finally, it should be noted that the estimates reported in the 1st, 2nd, 4th and 5th columns are obtained without accounting for country fixed effects; introducing country fixed effects would reduce even further the number of variables with statistically significant coefficients.

Table 6. Panel data analysis: coefficients' estimates for the period 1980-1999

Variables	Without time effects			With time effect		
	POLS	GMM-SYS	PMG	POLS	GMM-SYS	PMG
(Ln) Total fertility rate (t-1)	**0.8890****	**0.8887****	**-0.488****	**0.8981****	**0.8979****	**-0.648****
	[0.0200]	[0.0196]	[0.120]	[0.0208]	[0.0185]	[0.115]
(Ln) Female Employment rates	**0.0746****	**0.0744****	**0.0316****	**0.0715****	**0.0713****	**0.0307****
	[0.0169]	[0.0217]	[0.008]	[0.0176]	[0.0211]	[0.009]
(Ln) Ratio of women to men wages	-0.0250	-0.0248	**-0.0316****	-0.0223	-0.0222	**-0.0339****
	[0.0247]	[0.0117]	[0.055]	[0.0244]	[0.0112]	[0.010]
(Ln) Share of employed women in part-time jobs	0.0196	**0.0189***	**0.0109****	0.0193	**0.0186***	**0.0161****
	[0.0100]	[0.0075]	[0.003]	[0.0099]	[0.0078]	[0.002]
(Ln) Total unemployment rates	**-0.0190***	-0.0187	-0.021	**-0.0184***	-0.0181	**-0.032****
	[0.0089]	[0.0150]	[0.014]	[0.0093]	[0.0148]	[0.013]
Total length of parental leave (weeks)	**-0.0000****	-0.0000	**-0.003****	**-0.0000****	-0.0000	**-0.003****
	[0.0000]	[0.0001]	[0.0000]	[0.0000]	[0.0001]	[0.0000]
Percentage of wage replaced during maternity leave	-0.0014	0.0004	0.00000	-0.0016	0.0004	**0.009****
	[0.0008]	[0.0003]	[0.001]	[0.0008]	[0.0003]	[0.001]
Transfers to families with children	-0.0000	-0.0014	**-0.010****	-0.0000	-0.0016	**-0.010****
	[0.0001]	[0.0010]	[0.001]	[0.0001]	[0.0009]	[0.001]
Public spending in leave benefits	0.0004	**-0.0000****	**-0.015****	0.0004	**-0.0000****	-0.000
	[0.0003]	[0.0000]	[0.0000]	[0.0003]	[0.0000]	[0.0000]
Time effect	No	No	No	Yes**	Yes**	Yes**
Sargan test (p-value)		1.000			1.000	
m1 test (p-value)		0.059			0.035	
m2 test (p-value)		0.205			0.161	

Note: The 1st and 4th columns report estimates from the pooled OLS regression model where there is a common slope and common parameters (POLS) for specifications without and with time effects; the 2nd and 5th columns report estimates obtained with the GMM-system (GMM-SYS) estimator that allows for different slopes that vanish in first-differencing; the 3rd and 6th columns report estimates obtained through the pooled mean group (PMG) estimator. It should be noted that in the PMG column what is presented in the table is the adjustment parameter $\varphi = -(1-\lambda)$, while in the GMM-SYS column what is shown in the table is the λ – see Appendix 3 for details –. In other terms the GMM-SYS parameters of adjustment is equal to -0.111 in the second column and to -0.102 in the 5th column. Intercept is also estimated as part of the short-run dynamics in the PMGE and in the GMM-system and POLS estimator. Robust standard errors are reported in brackets. Coefficients that are statistically significant at the 1% level are marked with a "**" ; coefficients that are statistically significant at 5% level are marked with a "*"

87. Considering the PMG estimates with time effects (6th column in Table 6), several features stand out[48]:

- A higher unemployment rate, by increasing income uncertainty, lowers fertility rates. This results is consistent with finding from other studies (e.g. Gauthier and Hatzius, 1997; Adsera, 2004; Kravdal, 2002) suggesting that unemployment is an important concern for those women who decide to have a child.

- A longer parental leave lowers fertility rates, although the interpretation of this result is not easy since leave provisions are more important in countries with fewer out-of-home caring facilities.[49] Previous studies are more ambiguous as to the effect of longer parental leave on fertility rates;

48 . The coefficients in the 6th column of Table 6 imply that a 1% change in female employment rates, the share of women in part-time work, the ratio of female to male hourly earnings and the unemployment rates translate into a change in the total fertility of 3.07%, 1.61%, -3.39% and 3%, respectively. A 10% change in the length of parental leave, percentage of wage replaced and transfers to family with children implies a change in total fertility rates of 2.4%, 2.3% and 1.12%, respectively.

49 . While controlling for childcare availability might have allowed testing for this hypothesis, this was not possible due to the lack of childcare data in longitudinal form.

however, most of these evaluations — that provide indirect evidence on the opportunity costs of childbearing for the mothers — have focused on the effects of length of maternity leave on female labour supply, rather than on childbearing decisions *per se*.[50]

- A higher wage replaced during maternity leave contributes to higher fertility rates. This highlights the importance of looking at the combined effect of the duration and generosity of child-related leave.[51]

- Higher transfers to families that reduce the costs for children also raise fertility rates.[52]

- The coefficient of the variable used as a proxy for opportunity costs is significantly negative. This implies that higher gaps between male and female wages lead to higher fertility rates. Part of the effect linked to gender segregation in the labour market may be captured by this coefficient.[53]

- The positive coefficient on the female employment rate seems to confirm empirically the reversal of the sign between employment and fertility rates highlighted in Figure 13. This result suggests that increasing the financial security of women through their participation to the paid labour market may have an important positive effect on their childbearing decisions.

- The positive coefficient for part-time employment suggests that flexibility in working hours may allow women to remedy the absence of caring structures. This finding is consistent with other evidence (see Del Boca, 2002; Cette et al, 2005; Zuzanek, 2001).

88. The values of coefficients from the panel-data model can be compared with those from the cross-section analysis. According to Table 6, longer parental leaves have negative effects on fertility rates, while Table 5 suggests a positive effect: these differences in the sign of the coefficient between the two models may reflect different effects of parental leave on fertility rates in the short- and in the long-run. While

50 . Studies considering the effects of the duration of maternity/parental leaves on childbirth rates are Nizalova (2000), Gauthier and Hatzius (1997) and Adsera (2004). Nizalova reports results similar to those in Table 6 (a negative coefficient linking fertility rates and the duration of parental leave); Gauthier and Hatzius (1997) and Adsera (2004), however, both report a positive coefficient linking fertility and parental leave, which is however statistically significant only in the second study (which does not allow for dynamic effects).

51 . In general, evidence from the Nordic countries, where long leave entitlements – paid at almost a full rate – coexist with high female labour force participation rates, runs against the view that long leaves increase the indirect costs of children. Leave that is unpaid may be a more immediate concern for some families with children. In the longer term, mothers that return to work after childbirth appear to face high wage penalties and worsened earnings prospects in many countries (Ruhm, 1999). For mothers paid relatively high earnings, those penalties increase the indirect cost of childbearing.

52 . The magnitude of the effect of transfers to family with children on fertility rates in Table 6 can be compared to that reported by Gauthier and Hatzius (1997) and Ekert-Jaffé (1994), based on a dynamic and on a pure static model, respectively. For the year 1990, a comparable year, an increase in transfers to family with children by 25% raises fertility rates by 3% according to the coefficients shown in Table 6, thus translating into a long-run increase of 0.05 children per women. This increase is half-way between the increases of 0.04 children per women (following a 25% increase in the family benefit index) in Ekert-Jaffé (1994) and of 0.07 children per women (associated to a similar increase in the family allowance-earnings ratio) reported in Gauthier and Hatzius (1997).

53 . For example in the Nordic countries, where women are mainly locked in positions within the public sectors, wage differences between them and their male counterparts can be also very high.

leaving the labour market for a long time may have positive effects on birth rates in a static perspective, this might not be true in a dynamic context (as longer periods of detachment from the labour market may increase women's opportunity costs, especially for those who are better educated and in better paid jobs). The coefficients on female employment rates are positive in both models, but significant only in the panel specification. In both the cross-section and panel-data models, greater availability of part-time jobs has a positive effect on fertility rates: in countries where most women are employed, and no universal provision of childcare services exists, the reduction in working hours made possible by part-time jobs permits many women to meet simultaneous commitments to work and care. To be effective in supporting childbearing, however, these flexible arrangements need to provide the same protection as full-time permanent jobs, as otherwise women will not make use of them. This is particularly likely to occur where part-time or other flexible arrangements imply a lower hourly wage, and lack of pension or health coverage.[54] Availability of childcare appears as very important for fertility decision in the cross-section specification; however, due to lack of data in longitudinal form for all countries, it is not considered in the panel specification.[55]

3.6. Simulations of the possible impact of various policy reforms on fertility rates

89. The empirical estimates described in the previous sections may be used to simulate the possible impact of various policy reforms on the total fertility rates of selected OECD countries. It should be stressed that these results are not predictions of "most likely" outcomes, but simulations of the possible effects on fertility rates of various policies, based on a very simplified set of assumptions. Owing to the lack of data about childcare provisions in longitudinal form, simulations are based on the cross-country estimates shown in Table 5. Figure 28 provides one indication about the level of fertility rates that could be achieved in several OECD countries if various policies were to be set at the level prevailing in the three countries where these are currently highest. The policies considered are:

- taxes and transfers that lower the direct costs of children;
- greater availability of part-employment for women;
- longer periods of parental leave; and
- greater availability of formal childcare for pre-school children.

While these policies are considered as independent levers to affect childbearing decisions, longer periods of parental leave to care for children at home and greater availability of formal childcare for pre-school children are considered as alternatives.[56]

90. Despite these limitations, Figure 28 suggests that different policies can help parents to overcome some of the obstacles that prevent them from attaining their desired number of children. The effects of these policies are potentially significant, especially in some of the countries (e.g. Korea) where total fertility rates are currently very low. However this is not always the case: simulated effects are small in Spain and Germany — both countries where total fertility rates are currently low. In Germany, where parental leave is already the longest among the 19 countries considered, the scope for supporting fertility through greater childcare is assumed to be zero; different assumptions about the substitutability of different policies would lead to different results.

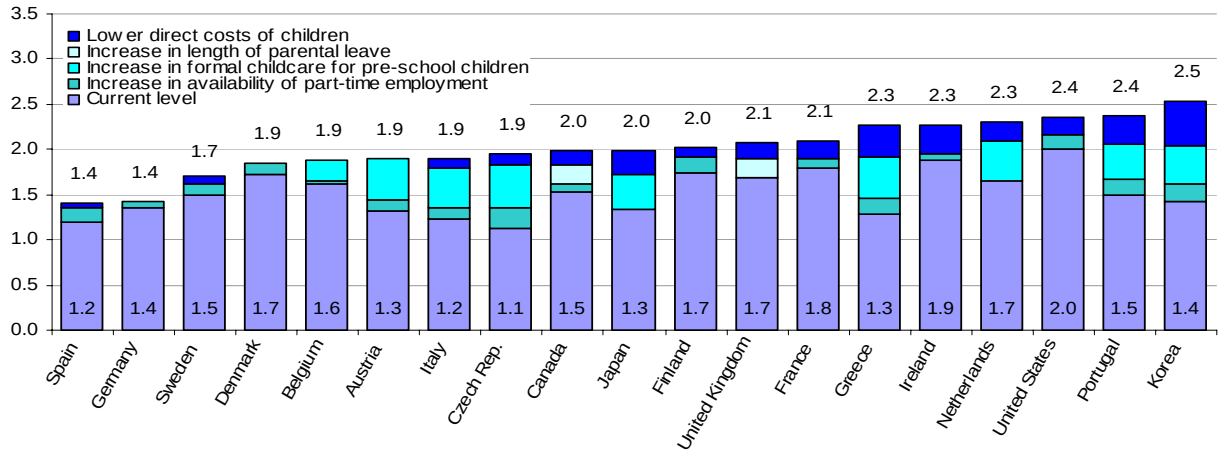
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54 . In the United States, for example, only 15% of part-time female workers participate to a private pension plan (Crittenden, 2001).

55 . Data on public spending in childcare per child before entry in primary school were used in a panel-specification estimated over the period 1983-1999 for 7 countries: while the coefficients are statistically significant, and their sign does not change relative to the cross-sectional analysis, their magnitudes do.

56 . For countries with intermediate levels of parental leave and formal childcare, the simulations refer to the policy that has the largest impact on fertility rates.

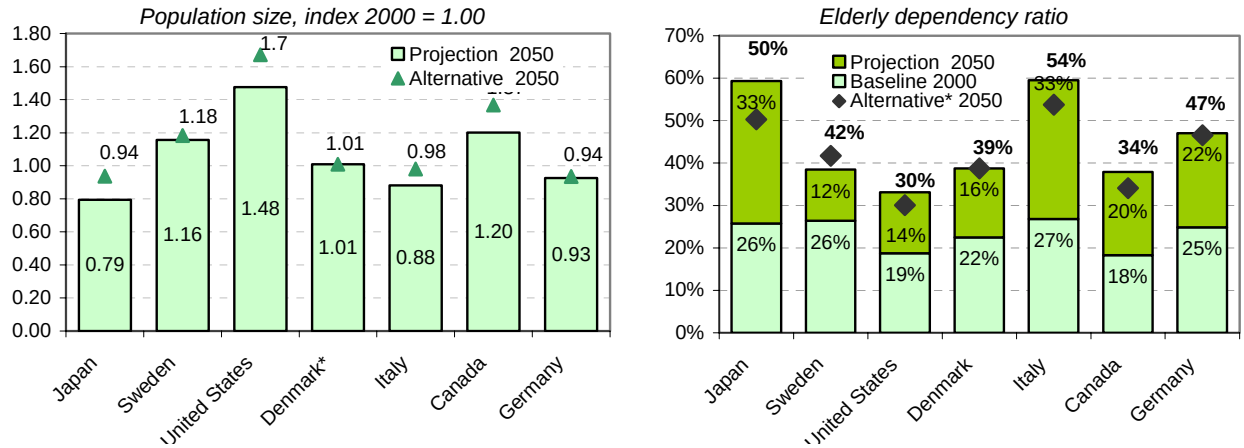
Figure 28. Potential impact of various policy reforms on total fertility rates



Notes. Countries are ranked in increasing order of the total fertility rates that could be achieved as a result of four sets of policies: *i)* a reduction in the direct costs of children (measured as the difference between the equivalised disposable income of a two-earner couple without children and that of a two-earner couple with 2 children, where the principal earner earns 67% of the earnings of an APW, and the spouse 33%.); *ii)* an increase in the availability of part-time employment to the level achieved in the three OECD countries where it is highest (Japan, the Netherlands and the United Kingdom); *iii)* an increase in the availability of formal childcare (the share of children below 3 years of age attending formal childcare) to the levels of the three countries where it is highest (Denmark, Sweden and the United States); and *iv)* an increase in the length of leave (both maternity and parental) to the levels of the four countries where it is highest (Germany, France, Spain and Finland). The simulations allow for the possibility of substitution between longer parental leave and greater childcare availability. The combined effect of these policies, e.g. in the case of Japan, is an increase of the total fertility rate from a level of 1.3 in 1999 to around 2.0.

91. The most obvious benefit of higher fertility rates is on the size of population and labour force. Population projections to 2050, based on the higher levels of fertility rates shown in Figure 28, are shown in Figure 29 for Canada, Denmark, Germany, Italy, Japan, Sweden and the United States. The "baseline" population levels shown in this figure are based on the same assumptions underlining national projections for the medium-term (or most likely) scenario (as collected by the authors). Figure 29 suggests that the set of policies described above could lead to an increase in the population size by 2050 that is quite large for low-fertility countries. For example, in the case of Japan, where national projections anticipate a decline in the size of the population by 2050 to 79% of the level prevailing in the base year, a recovery in fertility rates to the level of 2.0 (shown in Figure 28) would leave the population in 2050 at 94% of the 2000 level. Higher fertility rates also have significant effects on the old-age dependency ratio: in the case of Japan, the ratio between the population 65 and over and that of working age could decline by 2050 from around 50% in the national "central" projections to 33% in the alternative.

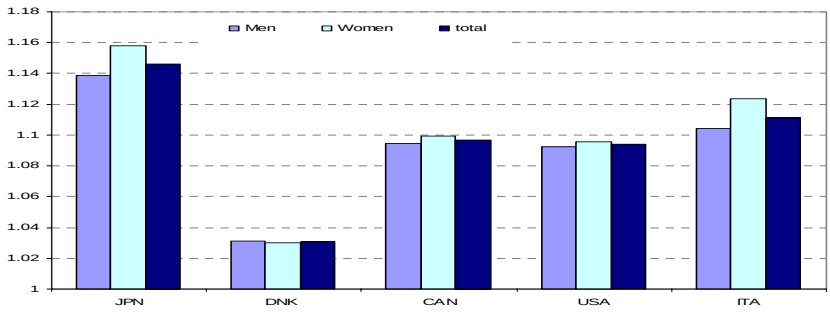
Figure 29. Impact of a recovery in fertility rates on population size and structure



Notes. Population size in 2050 is expressed relative to the level prevailing in the base-year (2000 for most countries). Elderly dependency rates are the ratios between the population 65 and over and the population of working age. These scenarios are produced using the "Rural Urban Projection" model of the International Programme Center of the US Bureau of the Census. The baseline scenario uses the same assumptions — on fertility, mortality and migration — that underlie the most recent national demographic projections of member countries ("central", or more likely, scenario) and are available from the authors upon request; the alternative projections use the total fertility rates shown in Figure 28. In the case of Denmark, where the national "central" projection is based on a total fertility rate in 2025 that is very close to that shown in Figure 28, the population projection under the alternative scenario is the same as in the baseline.

92. A larger population would, in turn, affect employment. While the impacts are relatively small when assessed in terms of the employment levels that could be reached by 2050 (ranging for example from 3% in Denmark under the alternative to around 15% in Japan, Figure 30), they are significantly larger when considering the cumulative effects of higher fertility rates in terms of employment-years.[57]

Figure 30. Impact of a recovery in fertility rates on employment levels in 2050



Note: The impact of our alternative fertility-rate assumptions on the level of employment of men and women aged 15-64 in a subset of countries has been assessed by applying gender and age structure to labour force participation as in the base year 2000. The origin refers to the employment level in the base scenario.

57 . For example, when the total number if employment-years is considered (i.e. the cumulative sum of the additional employment due to higher fertility rates up to 2050), the gain is of around 77% of the initial stock in Japan.

3.7. Conclusion

93. Despite the limitations of the analysis undertaken in this chapter – which reflect the difficulty in considering the full range of factors that may contribute to cross-country differences in the levels and changes of fertility rates in OECD countries – the evidence presented suggests that changes in a range of policies may prove to be helpful in removing obstacles to childbearing faced by individuals and couples. Childcare arrangements, transfers to families that reduce the direct cost of children, as well as provisions that allow mothers to better cope with their family and career responsibilities all can help in removing obstacles to childbearing decisions. Illustrative simulations of the possible impact of a range of policy changes also point to significant increases in fertility rates of several OECD countries, with significant effects on population size (and structure) and with smaller but still large effects on employment levels.

CONCLUSION

94. Overall, the analysis presented in this paper suggests that fertility rates below replacement levels are likely to become a persistent feature for most OECD countries in the years to come. This reflects the existence of a range of deep-seated structural factors — such as higher educational attainment and employment rates for younger generations of women, and changes in their values towards greater financial autonomy and lower deference to traditional family roles — that are leading a greater number of women to postpone childbearing until they have a secure footing in the labour market, followed by only partial recuperation of childbearing in their later years. While higher migration flows from developing countries obviously hold the promise of helping to sustain population levels in the developed world — both in the shorter and in the longer term, due to the lower age and higher fertility of female immigrants — this is a path that several OECD countries seem to be unwilling to follow.

95. On the positive side, the analysis presented in this paper suggests that there is nothing inevitable in the abnormally low fertility rates (at or below 1.3 children per women of childbearing age) that currently characterise several OECD countries. OECD countries with very different characteristics such as the United States, France and several Nordic countries have fertility rates that are close to those needed to assure the stability of their population. While the configuration of factors that has led to this positive result differ across countries, these "successes" reflect, at least in part, the existence of policies and arrangements that have contributed to lower the costs of children borne by families: direct transfers and tax advantages, but also — and more importantly — investments in education and childcare facilities, access to a variety of caring arrangements, affordable housing, leave provisions and features of their labour market that do not penalise women for their decision to have children and that facilitate the sharing of family chores and the reconciliation of work and family life for young couples. The same range of policies holds the promise of being effective elsewhere.

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ANNEX 1. AN APPLICATION OF CLUSTER ANALYSIS TO DATA ON WOMEN' VALUES TOWARDS FAMILY AND GENDER ROLES

96. In this Annex, cluster analysis is applied to data on the views expressed by younger and older women with respect to gender and family roles presented in Table 3. Cluster analysis allows to group OECD countries in more homogeneous "classes". Results are summarised in the figure ("dendrogram") below.

Method

97. Cluster analysis is a statistical method that identifies groups of individuals (or countries) with similar characteristics. Clustering algorithms are of two types: hierarchical and non-hierarchical. Hierarchical algorithms allow establishing a tree-like structure that identifies the relationship between elements forming the classes. Non-hierarchical methods compute distances with respect to a central point that is chosen (usually randomly) by the clustering procedure. As identification of such a central position is not easy, hierarchical procedures are generally preferred.

98. Identification of the clusters can proceed by either separating dissimilar observations (*divisive method*) or by joining together similar observations (*agglomerative method*) within a data set. Hierarchical cluster analysis relies on the second approach, and on ranking (ordering) of observations. Ordering is determined either by the number of observations that can be combined at a time, or by whether the distance between two observations (or clusters) is not statistically different from zero. Different algorithms can be used to form the clusters, which differ in the way they define whether the "distance" between two clusters is statistically different from zero.

99. In two-dimensional space, the distance measure may be visualized by connecting two points representing two observations, i and j. The most widely used distance measure, the Euclidean distance, is the straight-line distance between the two points, calculated in N-space as:

$$d_{ij} = \sqrt{\left(x_{1i} - x_{1j}\right)^2 + \left(x_{2i} - x_{2j}\right)^2 + \ldots + \left(x_{Ni} - x_{Nj}\right)^2} \qquad \text{(A.1.1)}$$

Because the variables in this clustering problem have varying distributions, Z-score standardization is normally employed before calculating the distance matrix.

100. The better known algorithms for agglomerative clustering are average linkage, complete linkage, single linkage, Ward's linkage and *centroids* method. The analysis presented below relies on *Ward's linkage criterion,* which uses an analysis of variance to evaluate the distances between clusters: it minimizes the Sum of Squares (SS) of any two hypothetical clusters that can be formed at each step. More formally Ward's linkage uses the increase in the total within-cluster sum of squares as a result of joining clusters *r* and *s*. The within-cluster sum of squares is defined as the sum of the squares of the distances between all objects in the cluster and the *centroid* of the cluster. The equivalent distance is given by:

$$d^2(r,s) = n_r n_s \frac{|\overline{x_r} - \overline{x_s}|^2}{(n_r + n_s)} \qquad \text{(A.1.2)}$$

where | | is Euclidean distance; n_r and n_s are the number of objects in cluster *r* and *s*, respectively, x_{ri} is the *i*th object in cluster *r*, and $\overline{x}_r$ and $\overline{x}_s$ are the *centroids* of clusters r and s defined as:

$$\overline{x}_r = \frac{1}{n_r}\sum_i^{n_r} x_{ri} \;,\; \overline{x}_s = \frac{1}{n_s}\sum_i^{n_s} x_{si} \qquad \text{(A.1.3)}$$

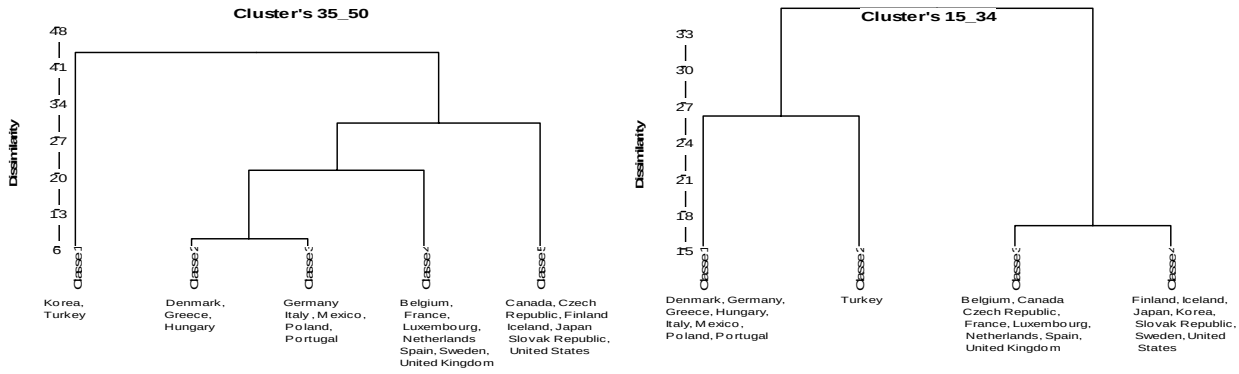
While this method is very efficient, it tends to create clusters of small size.

Findings

101. In hierarchical cluster analysis dendrogram graphs are used to visualize how clusters are formed. A dendrogram (Annex Figure A.1.1.) consists of many lines connecting objects in a hierarchical tree. The height of each line represents the distance between the classes of countries being connected. Results are presented below for older (left-hand panel) and younger women (right-hand panel). For each of the two groups of women:

- the height of each branch (vertically) measures the degree of dissimilarity (in other terms the distance) between classes (e.g. among younger women, classes 1 and 2 are more *dissimilar* among themselves than classes 3 and 4);
- classes belonging to the same branch could be grouped in a larger cluster (e.g., among younger women, classes 1 and 2 could be grouped together while, among older women, class 1 could not be grouped with any of the other).

Annex Figure A.1.1. Clusters of countries based on views expressed by older and younger women



Note: Data for the United Kingdom refers to Great Britain. The scale of the vertical axis corresponds to the *dissimilarity* or distance measured on the basis of the Ward's linkage criterion as defined in section 2A.1.

102. Two main results stand out for Annex Figure A.1.1:

- First, *dissimilarities* between clusters are greater for older than for younger women. In particular:
  - Among older women, class 1 (Korea and Turkey) is very distant from the other four classes.

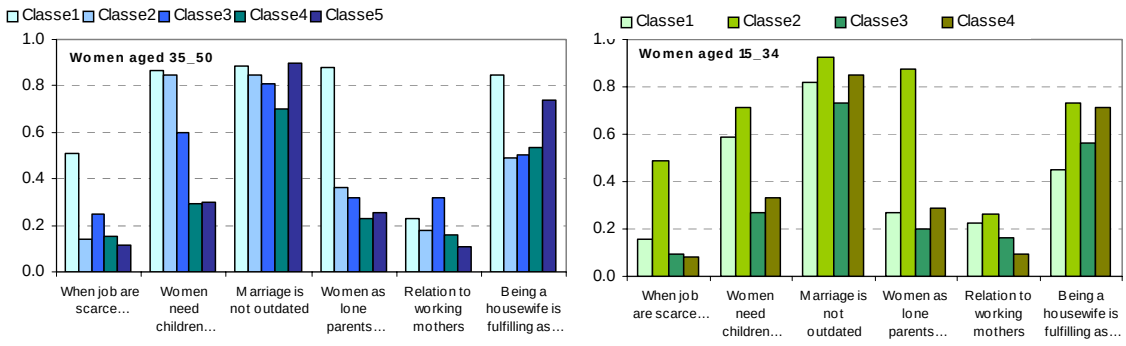
– Among younger women, each of the four classes is well separated from the others; classes 1 and 2 could potentially be aggregated together but at the costs of a significant increase in intra-class variance; the same applies to classes 3 and 4.

- Second, the list of countries belonging to each class varies according to women's age. For example, older Korean women have values that are very close to those of older Turkish women, while values of young Korean women are similar to those expressed by their peers in the United States, the Slovak Republic, Japan, Sweden, Finland and Norway. In other words, the values and attitudes of young women in countries where fertility is currently very low (Korean and Japan) match those expressed by women living in countries where fertility is much higher (the United States and Nordic countries).

103. Annex Figure A.1.2 presents information on women's answers to specific questions in countries that belong to similar classes. This figure also highlights differences across classes in terms of prevalence of traditional view.

– Among younger women, Class 2 is characterised by the highest share of women agreeing with all the statements considered; countries in this class (Turkey) can be unambiguously characterised as those where women have "more traditional" attitudes towards gender and family roles. Class 3 is characterised by the lowest share of women agreeing with the statement about the need for women to have children in order to be fulfilled, the consideration of lone parents and marriages, and by the second lowest share of women agreeing with view that men should have priority when jobs are scarce, about working mothers and fulfilment as housewife; countries belonging to this group (Belgium, Canada, the Czech Republic, France, Luxembourg, the Netherlands, Spain and the United Kingdom) could hence be characterised as less traditional. There is no simple ordering among other classes; for example, Class 4 contains the smallest share of women agreeing on the statement about the priority that men should have when jobs are scarce and the relation between children and working mothers, while class 1 has the lowest share of women thinking that being a housewife is fulfilling.
– Among older women, Class 1 displays the highest share of women agreeing that men should have priority when jobs are scarce, that women need children to be fulfilled, that disapprove of women as lone parents and who think that being a housewife is as fulfilling as having paid-job, and the second highest share of women thinking that working mothers don't have a good relation with children and that marriage is not an outdated institution; hence, countries in this class (Korean and Turkey) may be characterized as the most traditional. There is no simple ordering for other classes.

Annex Figure A.1.2. Share of women of different ages that agree with specific statements, within countries belonging to different clusters



ANNEX 2. NET TRANSFERS TO FAMILIES WITH CHIDREN: EVIDENCE FROM OECD TAX AND BENEFITS MODELS

104. Annex Table 2.A.1 below provides information on the size of net transfers to families at different levels of gross household income — 100% of the earnings of an average production worker (APW) in panel *a;* 133% of the earnings of an APW in panel *b;* 200% of the earnings of an APW in panel *c* — under different configurations about number of children (0 and 2), family type (singles and couples) and number of earners (1 and 2).

105. The *average effective tax rate* includes both income taxes and social security contributions paid by households, on one side, and the cash benefits they receive from the government, on the other. Each panel shows the average effective tax rate that applies to a couple with two children aged 4 and 6 where both parents work (2nd column), and its differences relative to a two-earner couple without children (3rd column), a person living alone (4th column) and a single parent with two children (5th column). Average effective tax rates of families with children are generally lower than those for families without children, but this vary according to the level of household income and other characteristics:

- *In the case of middle income households* (gross earnings at 100% of those of an APW, panel *a*), the average tax rate of a two-earner couple with two children (at 11% on average), when computed across all OECD countries, is 8 points lower than that of a couple without children (there are no differences between the two in Korea and Poland) and 15 points lower than that applied to a person living alone (with the difference being 25 points or more in several Continental European countries). Single parents with two children are taxed at rates that are 3 points higher than couples with children, with the exception of Nordic countries where tax rates on single-parent families are lower than those for couples.

- *At income levels that broadly correspond to those of a household with a spouse working full-time and a partner working part-time* (gross earnings at 133% of those of an APW, panel *b*), couples with two children are taxed, on average across all OECD countries, at a rate of 16%, 3 points lower than single parents with two children, 6 points lower than couples without children, and 12 points lower than persons living alone at the same income level.

- *At higher levels of gross household income* (gross earnings of 200% of those of an APW, panel *c*), the average tax rate of a two-earner couple with two children, computed across countries, rises to 21% on average, and its advantage relative to a childless couple declines to 3 points on average (while the difference between the two rates is zero in Australia, Korea, New Zealand, and Poland and Turkey). In all countries except Canada, Iceland, Netherlands, Poland and Spain, single parents with two children are taxed at higher rates than couples with the same number of children, while the disadvantage of persons living alone rises to 11 points on average.

Table A.2.1: Effective tax rates on couples with two children at different income levels, and differences relative to singles and childless couples, 2002

	Primary earner at 67% of APW, second earner at 33%				*Primary earner at 100% of APW, second earner at 33%*				*Primary earner at 100% of APW, second earner at 100%*			
	Couple with 2 children, 2 earners	*Difference in tax rates relative to:*			Couple with 2 children, 2 earners	*Difference in tax rates relative to:*			Couple with 2 children, 2 earners	*Difference in tax rates relative to:*		
		Couple without children, 2 earners	Single without children	Single 2 children		Couple without children, 2 earners	Single without children	Single 2 children		Couple without children, 2 earners	Single without children	Single 2 children
Australia	13	-4	-11	-1	17	-3	-12	-4	24	0	-11	-3
Austria	3	-16	-25	-7	13	-12	-19	-5	20	-8	-17	-5
Belgium	20	-11	-21	-8	29	-9	-17	-7	37	-6	-14	-2
Canada	8	-10	-16	-3	18	-4	-8	-2	24	-1	-5	2
Czech Rep.	9	-11	-14	-4	13	-9	-12	-6	18	-6	-10	-4
Denmark	32	-7	-12	6	35	-6	-13	0	40	-4	-14	-1
Finland	17	-9	-16	6	23	-7	-13	3	28	-4	-13	-2
France	15	-7	-12	0	17	-7	-12	-1	21	-6	-12	-2
Germany	17	-12	-24	-9	26	-9	-20	-7	35	-6	-13	-1
Greece	13	-2	-5	0	14	-3	-6	-3	17	-1	-10	-4
Hungary	4	-18	-26	-5	12	-15	-25	-9	20	-10	-22	-10
Ireland	-4	-8	-20	-6	5	-6	-18	-5	12	-4	-18	-5
Iceland	6	-9	-21	-7	16	-5	-14	-6	26	-1	-9	0
Italy	7	-12	-20	-10	19	-5	-12	-6	25	-3	-11	-1
Japan	13	-5	-7	-2	15	-4	-6	-4	18	-1	-6	-1
Korea	5	0	-2	-2	6	0	-5	-5	7	0	-8	-4
Luxemburg	-3	-16	-25	0	2	-14	-26	-4	9	-11	-25	-9
Netherlands	19	-5	-15	-1	25	-4	-7	3	31	-2	-7	2
Norway	15	-8	-14	1	20	-6	-13	-1	25	-4	-14	-3
New Zealand	18	-1	-3	-2	20	0	-4	-4	21	0	-8	-2
Poland	28	0	-3	-3	30	0	-2	-2	31	0	-2	2
Portugal	5	-6	-11	0	7	-7	-14	-4	12	-5	-13	-5
Slovak Rep.	10	-2	-10	-3	6	-12	-17	-11	13	-6	-13	-8
Spain	0	-16	-18	-3	15	-1	-7	4	17	-2	-7	4
Sweden	18	-10	-13	9	22	-7	-11	5	26	-5	-14	-3
Switzerland	6	-8	-14	-3	10	-7	-12	-2	16	-5	-9	-2
United Kingdom	4	-11	-19	-10	11	-8	-15	-7	17	-6	-12	-5
United States	12	-7	-13	-4	15	-7	-13	-4	17	-6	-15	-5
Unweighted average	11	-8	-15	-3	16	-6	-13	-3	22	-4	-12	-3

Note: The data compare the average tax rate of a two-earner couple with tow children aged 4 and 6 (2nd column) to that of a two-earner couple without children (3rd column), of a single person without children (4th column) and of a lone parent with two children (5th column), at different earnings levels. For example, in the case of Australia, the income of a two-earner couple with children, with a household earned income of 100% of the earnings of an APW (average production worker), is taxed at a rate of 13%, which is 4 points lower than the rate paid by a two-earner couple without children, 11 points lower than that paid by a single person without children, and 1 point lower than the one paid by a lone parent with two children.

Source: Our computations on data from OECD (2004), *Tax and Benefit* models database

ANNEX 3. ECONOMETRIC METHODS USED TO ESTIMATE A LINEAR DYNAMIC MODEL OF FERTILITY WITH PANEL DATA

106. The results presented in Chapter 3, Section 3.5.6, are obtained from the estimation of a linear dynamic model of fertility with panel data. Our model extends the specification used by Gauthier and Hatzius (1997) to account for the increase in female labour force participation and other labour market characteristics (incidence of part-time jobs). The specific feature of the formulation used by Gauthier and Hatzius is the introduction of the lagged dependent variable in the fertility rate equation, to account for potential long lags of the effects of policies on fertility rates.

Methods

107. The model used in Chapter 3, section 3.5.6, is as follows:

$$y_{i,t} = \lambda y_{i,t-1} + \beta' W_{i,t} + \delta' Z_{i,t} + \mu_t + \eta_i + \varepsilon_{i,t} \quad \text{(A.3.1)}$$

which is equivalent to:

$$y_{i,t} - y_{i,t-1} = (\lambda - 1) y_{i,t-1} + \beta' W_{i,t} + \delta' Z_{i,t} + \mu_t + \eta_i + \varepsilon_{i,t} \quad \text{(A.3.1a)}$$

where y is the logarithm of the total fertility rate, W is a set of variables accounting for labour market developments and proxies for economic opportunities, Z is a set of variables accounting for specific policy interventions; μ_t is a time-specific effect; η_i is an unobserved country-specific effect and ε is the error term, with the subscripts i, t referring to country and time-period respectively.

108. The estimation of equation (A.3.1 or A.3.1a) poses some specific challenges. First, given its dynamic specification, the presence of unobserved country-specific effects cannot be dealt with through the commonly used "fixed-effect" estimator; while first-differencing of each variable will eliminate country-specific effects, the presence of the lagged dependent variable (which is now correlated with the error term) implies that OLS cannot be used. Second, some explanatory variables may be endogenous with respect to fertility changes: the biases that could arise from simultaneous or reverse causation need to be controlled for. Third, an important question for estimation is whether the data should be pooled or not, i.e. whether the country-specific parameters are restricted to be uniform ($\lambda = \lambda_i$). Pooling can produce inconsistent and misleading estimates of the parameter values unless the slope coefficients are identical (Pesaran and Smith, 1995). The first and second issues can be addressed by Generalized Method of Moments (GMM) estimators, while heterogeneity can be addressed by either estimating one equation for each country, or by computing the means of the estimated coefficients. The latter method ('Mean Group' estimator) produces consistent results if the group dimension of the panel tends to infinity (Pesaran and Smith, 1995). As an alternative, the 'Pooled Mean Group' (PMG) estimator constrains the long-term coefficients to be the same but allows for different short-run coefficients. This estimator imposes fewer restrictions on the adjustment process, but the same restrictions on the long-term coefficients as standard panel models. However, it allows distinguishing between short and long-term dynamics, while also accounting for country heterogeneity. For these reasons, both the PMG and GMM estimators are used in the analysis of fertility rates in Chapter 3. The GMM estimator of Arellano and Bond (2001) has been

previously used for this purpose (see Gauthier and Hatzius, 1997) while to our knowledge no empirical study has yet applied the PMG estimator to the analysis of fertility.

GMM estimators

GMM estimators allow dealing with the simultaneity bias that is implied by the presence of the lagged dependent variable (Nickell, 1981; Kiviet 1995). Although the simultaneous equation bias vanishes as $T \to \infty$, it can still be an issue in our case (Judson and Owen, 1999). To avoid this problem the GMM-estimator developed by Arellano and Bover (1995) and Blundell and Bond (1998) (GMM-SYS) is applied here: this method is based on first, differencing regressions to control for unobserved effects, and second, on using past observations of the explanatory variables as instruments. If we call X the vector of explanatory variables – such that X={W,Z} as defined previously – and including a set of dummy variables to account for the specific period effects, equation (A.3.1) can be rewritten as:

$$y_{i,t} = \lambda y_{i,t-1} + \theta' X_{i,t} + \eta_i + \varepsilon_{i,t} \qquad \text{(A.3.2)}$$

and, in first differences:

$$\Delta y_{i,t} = \lambda \Delta y_{i,t-1} + \theta' \Delta X_{i,t} + \Delta \varepsilon_{i,t} \qquad \text{(A.3.3)}$$

where Δ is the first-difference operator.

109. As mentioned in Chapter 3, some explanatory variables (e.g. employment, part-time and opportunity costs) may be endogenous with respect to fertility rates. Potential endogeneity of (part of) the regressors and correlation between the terms $\Delta y_{i,t-1}$ *and* $\Delta \varepsilon_{i,t}$ (correlated by construction) may be dealt using instruments. For the appropriateness of the GMM, the error term should not be serially correlated. The GMM-difference estimator of Arellano and Bond (1991) exploits the following moment conditions:

$$\begin{aligned} &E\left[y_{i,t-l} \cdot \left(\varepsilon_{i,t} - \varepsilon_{i,t-1} \right) \right] = 0 \quad for\, l \geq 2; t = 3,...T \\ &E\left[X_{i,t-l} \cdot \left(\varepsilon_{i,t} - \varepsilon_{i,t-1} \right) \right] = 0 \quad for\, l \geq 2; t = 3,...T \end{aligned} \qquad \text{(A.3.4)}$$

110. Blundell and Bond (1998) show that lagged levels of the variables in the system may not be good instruments of current differences if the series is close to a random walk. The first-differenced GMM estimator also has poor finite-sample properties, in terms of bias and imprecision, when the lagged levels of the series are only weakly correlated with subsequent first-differences (Blundell and Bond 1998). In an AR(1) model this occurs either as the autoregressive parameter (λ) approaches unity, or as the variance of the individual effects (η_i) increases relative to the variance of error term. To avoid this problem, Blundell and Bond propose a GMM estimator derived from the estimation of a simultaneous system of two equations, the first being the level equation and the second being the differenced equation (with lagged levels of the dependent and the explanatory variables used as instruments). The instruments for the level equation are lagged differences of the variables, which are valid when these differences are uncorrelated with individual effects.[58] The additional moments for the regression in levels are:

58 . Blundell and Bond (1998) show that the system estimator has superior properties in terms of small sample bias and RMSE, especially for persistent series, under the additional assumption of "stationary property" (i.e. that changes in the right-hand side variables and the country-specific effects are uncorrelated).

$$E\left[y_{i,t-1} - y_{i,t-2} \cdot \left(\eta_i + \varepsilon_{i,t} \right) \right] = 0$$
$$E\left[X_{i,t-1} - X_{i,t-2} \cdot \left(\eta_i + \varepsilon_{i,t} \right) \right] = 0 \qquad \text{(A.3.5)}$$

111. To test for the validity of the models two tests are used in Table 6: the first is the Sargan test of over-identifying restrictions, which tests the overall instruments' validity (not rejecting the null hypothesis supports the appropriateness of the instruments used); the second is the m2-test which is used to check that error terms are not serially correlated of order two (non-rejection of the null is supportive of the model validity). While first-order serial correlation does not pose a problem, the test should confirm the absence of second-order serial correlation of the differenced residual. Rejection of the null hypothesis would in fact invalidate the model. In our analysis both tests confirm appropriateness of the estimation method.

PMG estimator

112. Heterogeneity can be an important issue when estimating a relation over countries that have been pooled together. Country heterogeneity is particularly relevant in short-run relationships, since changes in fertility rates may be affected by country-specific determinants; however, long-run relationships can be expected to be more homogeneous across countries. The PMG estimator allows addressing both country heterogeneity and the distinction between short and long-run dynamics. The approach proposed by Pesaran and Smith (1995) and Pesaran *et al.* (1999) does not require pre-testing for order-of-integration conformability, as they are valid whether or not the variables of interest are I(0) or I(1). Their estimation procedure, referred to as "autoregressive distributed lag (ARDL) approach" to long-run modelling requires only that: i) a long-run relationship among the variables of interest exists; and, ii) the dynamic specification of the model is augmented so that the regressors are strictly exogenous and residuals are not serially correlated. For an autoregressive distributed lag process of order (p,q), the model is written in terms of the current rather than lagged variables, as in Pesaran *et al.* (1999)[59]:

$$\Delta \ln y_{it} = \varphi_i \left(\ln y_{i,t-1} - \theta_{1i} \ln X_{it} - \theta_{0i} \right) + \sum_{j=1}^{p-1} \lambda_i^j \Delta y_{i,t-j+} \sum_{j=0}^{q-1} \delta_{ij}^{*'} \Delta x_{i,t-j} + \mu_i + \eta_t + \varepsilon_{it} \qquad \text{(A.3.6)}$$

where the term in brackets is the long-run component. We assume the maximum length of the process to be one, so that the previous expression simplifies to:

$$\Delta y_{it} = \varphi_i \left(\ln y_{it-1} - \theta_{0i} - \sum_{r=1}^{m} \theta_{r,i}' x_{r,it} \right) - \sum_{r=1}^{m} \delta_{r,it}' \Delta x_{r,it} \qquad \text{(A.3.7)}$$

where $\varphi_i = -(1-\lambda_i)$ is the adjustment coefficient and $\theta_{0i} = \frac{\mu_i}{1-\lambda_i}, \theta_{ri} = \frac{\delta_{r0i} + \delta_{r1i}}{1-\lambda_i}$ are the long-run coefficients of interest.

113. Assuming that there exists a long run relationship between y_{it} (the fertility rates) and x_{it} (i.e. the policy tools and institutions) with coefficients identical across groups, and that disturbances ε_{it} are normally and independently distributed across countries, the parameters in (7) are estimated using a Maximum Likelihood approach which involves maximising the log –likelihood function by means of the Newton-Raphson algorithm (Pesaran *et al.*, 1999). The restriction implied by the PMG estimator is that the element of the $\boldsymbol{\theta}_r$ are common to countries, while the mean group estimator does not put any restriction on the vector parameter. This 'Mean Group' estimator produces consistent estimates if the group dimension of the panel tends to infinity (Pesaran and Smith, 1995) – which is not the case in the small sample at hand.

59 . This writing in fact allows to consider an ARDL(p,q) where q=0 as a special case.

For our purposes therefore, the PMG estimator offers the best compromise in the search for consistency and efficiency. This estimator is particularly useful when the short-run adjustment coefficients are country-specific.[60]

60 . Furthermore, the PMG estimator is sufficiently flexible to allow for long-run coefficient homogeneity over only a subset of variables and/or countries. Homogeneity of the long-run coefficients and the error correction term can be tested using the Hausman test. Pesaran *et al.* (1999) argue that PMG estimators are consistent and efficient only if homogeneity holds. Conversely, if the hypothesis of homogeneity is rejected, the PGME estimates are not efficient. In that case the mean group estimators would normally be preferred. In our case, the Hausman test does not allow rejecting homogeneity.

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