

WILL THE STORK RETURN TO EUROPE AND JAPAN? UNDERSTANDING FERTILITY WITHIN DEVELOPED NATIONS

James Feyrer¹

Dartmouth College, james.feyrer@dartmouth.edu

Bruce Sacerdote

Dartmouth College and NBER, bruce.sacerdote@dartmouth.edu

Ariel Dora Stern

Dartmouth College, ariel.d.stern@gmail.com

June 9, 2008

Abstract

Only a few rich nations are currently at replacement levels of fertility and many are considerably below. We believe that changes in the status of women are driving fertility change. At low levels of female status, women specialize in household production and fertility is high. In an intermediate phase, women have increasing opportunities to earn a living outside the home yet still shoulder the bulk of household production. Fertility is at a minimum in this regime due to the increased opportunity cost in women's foregone wages with no decrease in time allocated to childcare. We see the lowest fertility nations (Japan, Spain, Italy) as being in this regime. At even higher levels of women's status, men begin to share in the burden of child care at home and fertility is higher than in the middle regime. This progression has been observed in the US, Sweden and other countries. Using ISSP and World Values Survey data we show that countries in which men perform relatively more of the childcare and household production (and where female labor force participation was highest 30 years ago) have the highest fertility within the rich country sample. Fertility and women's labor force participation have become positively correlated across high income countries. The trend in men's household work suggests that the low fertility countries may see increases in fertility as women's household status catches up to their workforce opportunities.

We also note that as the poor nations of the world undergo the demographic transition they appear to be reducing fertility faster and further than the current rich countries did at similar levels of income. By examining fertility differences between the rich nations we may be able to gain insight into where the world is headed.

¹ We thank James Hines, Andrei Shleifer, Jeremy Stein, Timothy Taylor, Oded Galor and David Weil for helpful comments and editorial suggestions. We thank Ann Norman for superb editing. We thank the National Science Foundation and the Institute for Education Sciences and Dartmouth College for generous support. This paper was prepared as part of a *Journal of Economics Perspectives* Symposium.

The last 30 years have witnessed a social change unprecedented in human history: a variety of high-income nations have experienced fertility declines so large that these countries are far below replacement-level fertility. Total fertility rates in 2005 are as low as 1.3 children per woman in Italy, Spain, Germany, and Japan (according to <http://unstats.un.org/>). Within the high-income countries of the world, no countries are solidly above the fertility rate of 2.1 children per women that is needed to replace the population at a constant level, with only the United States, New Zealand, Ireland, Iceland, and France above 1.9 children per woman. Absent any change in immigration policy, populations in Italy, Spain, and Germany will all be declining within the next two decades. Japan's population began declining in 2005 and will continue to fall for the indefinite future. While other cultures have had brief episodes of less-than-replacement-level fertility, this is the first time in recorded history that large populations with high and growing per capita income have failed to reproduce themselves over an extended period of time.

This phenomenon is unlikely to be restricted to the currently high-income countries. Fertility rates in the majority of developing countries are rapidly moving toward levels below replacement. If recent evidence from Asia offers any indication, developing countries may be on a trajectory toward lower long-run fertility than high-income countries. Korea, Singapore, and Hong Kong all have estimated total fertility rates below 1.5 children per women in 2005, compared to values in the range of 3.5 to 6.0 children per woman in 1970. Chinese total fertility rates are near replacement levels nationally and substantially below replacement levels in urban areas. Hong Kong has the lowest fertility rate in the world at 1.0 child per woman. India's current fertility rate of about 3.2 children per women is above replacement rate, but represents a substantial decline from the 4.5 children per woman rate of 20 years ago.

As fertility rates around the world rapidly converge towards the fertility rates of the high-income nations, it seems useful to investigate why some high-income nations have birth rates near replacement level while others are substantially below. We consider a variety of possible theories to explain the differences in fertility rates across high-income countries. Our particular focus is on how increases in women's status over time affect fertility.

Our underlying assumption is that certain forces that are exogenous with regards to fertility are increasing the opportunities of women in the workforce. One mechanism may be

technological change that favors human capital over physical labor (Galor and Weil, 1996). Assuming that women are at a comparative disadvantage in physical labor, this gradual change will tend to increase relative wages for women over time. This increase in women's labor force opportunities interacts with preexisting social attitudes about the relative status of women at home.

We assume that technological trends are increasing labor market opportunities everywhere, but that predetermined social differences will generate heterogeneity in the timing of changes in female status on a country-by-country basis. In particular, we are interested in the interaction between the increasing status of women in the workforce and their status in the household, particularly with regards to child care and home production. The latter may be more affected by longstanding societal attitudes than the former.

We observe three distinct phases in women's status generated by the gradual increase in women's workforce opportunities. In the earliest phase, characteristic of the 1950s and 1960s in the United States, women earn low wages relative to men and are expected to shoulder all of the child care at home. As a result, most women specialize in home production and raising children.

In an intermediate category, women have improved (but not equal) labor market opportunities but their household status lags. Women in this stage are still expected to do the majority of child care and household production. Increasing access to market work increases the opportunity cost of having children and fertility falls. Female labor force participation increases. Working women in this phase of development have the strongest disincentives to having additional children since the entire burden of child care falls on them.

In the final phase of development, women's labor market opportunities begin to equal those of men. In addition, the increased household bargaining power that comes from more equal wages results in much higher (if not gender-equal) male participation in household production.² Female labor force participation is higher than in the intermediate phase. The increased participation of men in the household also reduces the disincentives for women to have additional children, and fertility rates rise compared to the intermediate phase.

² It is also reasonable to think that social attitudes move more slowly than the labor market in recognizing the changing role of women.

The intermediate, low-fertility phase might describe Japan, Italy, and Spain in the present day. Labor market opportunities for women in these countries (as proxied by participation rates) are somewhat lower than the other high-income countries, but more importantly, the participation of men in household production is much lower in these countries. The Scandinavian countries, the Netherlands, and the modern-day United States may be entering the final phase. Male participation in household production is relatively high (and rising) in these countries, and fertility has risen modestly over the last decade or so despite continued increases in female participation rates.

This framework can explain at least two key facts in the data: First, high-income countries such as Italy, Spain, Germany, and Japan, where men do the smallest fraction of the household chores and child care (as detailed in the next section), are also the high-income countries with the lowest fertility rates. Second, within the high-income countries, the cross-country relationship between fertility and labor force participation has changed markedly over the last 40 years. In the 1960s and even 1970s, fertility rates and labor force participation rates were negatively correlated across countries. In the most recent data, the two rates are positively correlated.

We think that causality is running from changes in female status to fertility, not the other way around. The heterogeneity in women's status is generated by two factors. First, changes in the nature of work are raising the relative wages of women in the workforce over time. These changes are a byproduct of human-capital-augmenting technological change and are therefore exogenous with regards to fertility. Second, heterogeneity between countries is driven by longstanding cultural differences which move more slowly than fertility rates. In the long run, cultural attitudes are being driven by common fundamental economic forces, but in the short run, cultural differences generate timing differences.

Therefore, the increase in women's status may eventually reverse fertility trends in Europe and Japan. In particular, men in all high-income countries appear to be taking on a larger share of household duties, which could lead to a large positive increase in fertility.

We also explore various possible market causes of differences in fertility across time and across developed countries, namely population density and housing prices, but find little evidence that these factors matter much. We do find that policies that reduce the burden of caring for children make a difference. Government spending on family support and publicly

provided day-care services is positively correlated with fertility. This result is consistent with the notion that reducing the household cost of having children increases fertility.

However, given the large cost of raising a child in wealthy, modern societies, it is somewhat hard to believe that the current subsidy levels can make a significant impact. Peer effects may play an important role. Because many people imitate their friends, siblings, and parents in choosing their number of children (Fernandez and Fogli, 2006), policies or exogenous shocks that have modest effects on fertility at the individual level may have very large impacts at the macro level thanks to peer effects. This social multiplier could work through a variety of mechanisms in addition to simple imitation. Societies with larger numbers of children may develop more family-friendly infrastructure. Businesses in high fertility countries may cater more to families. This hypothesis also implies that when the pendulum in Italy, Japan, Germany, and Spain swings back towards higher fertility, it may swing far enough that these countries could have a baby boom in later decades.

Birth Rate Trends and Patterns

Our analysis will make repeated use of some key conceptual terms: birth rate, total fertility rate, and completed fertility rate. A *birth rate* is the number of children born to a group of women in a given year divided by the group size.

To calculate a *total fertility rate* for a given year, one first calculates birth rates by age for all women of child-bearing age (for example, ages 15–45). The total fertility rate is the sum of these birthrates by age. Conceptually the total fertility rate is the number of children a woman entering her child-bearing years would expect to have *if* the expected number of births during each year of her life were equal to the current age-specific birth rates being experienced by women of child-bearing ages in the current year. A total fertility rate of 2.1 births per woman is estimated to be the rate at which the population of developed nations will replace itself; the replacement rate is slightly above 2.0 children per woman because of infant and child mortality.

Completed fertility rates are a simpler concept: one computes the number of births per woman for women who have completed their child-bearing years. For example, in Spain completed fertility for women born in 1940 is equal to 2.9 compared to 1.6 for women born in

1963. In our calculations, completed fertility for both cohorts excludes births to women 45 and older, though the number of such births is small relative to the mean. Completed fertility rates reveal the actual experience for an identifiable group of women. But completed fertility rates by definition ignore available information on fertility for women who are currently in their child-bearing years. Total fertility rates have the disadvantage of summing across different cohorts of women who may have different age-specific fertility rates, but have the advantage of incorporating the most recent information on birth rates for women of child-bearing age in the population.³

Figure 1 shows total fertility rates over time for the United States, France, Germany, Italy, and Japan. The United States in 1955 has a total fertility rate of about 3.5 births per woman. This rate falls quite rapidly throughout the 1960s and 1970s and flattens out in the 1980s at roughly 1.8 births per woman. Total fertility then rises modestly during the 1990s and reaches roughly replacement level by 1995.

Total fertility in France is 2.7 births per woman in 1955 and declines steadily until 1995 to 1.7. At this point, the trend reverses and total fertility climbs to 1.9 births per woman. What is behind the increase in fertility in France? While definitive causal statements are impossible, it is widely believed that the French government was able to engineer increased fertility by offering a combination of more generous tax incentives to families with children, more generous maternity leave, and several forms of subsidized day care (Moore, 2006). Gatenio-Gabel and Kamerman (2006) calculate that annual federal subsidies per child in France rose from \$1,793 per child in 1980 to \$3,056 per child in 2000 (calculated in 1995 purchasing power parity dollars). These incentives, working together with a social multiplier effect (Maurin and Moschion, 2006), may explain some of the increase in French fertility.

In contrast to the French experience, total fertility in Japan, Italy, and Germany has continued to decline and in 2005 was down to 1.3 children per woman. Italy decreased its federal subsidies per child from 1980 to 2000, while Germany increased subsidies per child 67 percent to \$2,216 (Gatenio-Gabel and Kamerman, 2006).

³ Because total fertility rates are an average over many cohorts, these rates are known to be biased downward if there is a trend toward fertility occurring later in a woman's life. However, the low fertility rates in the high-income countries are sufficiently persistent that the observed changes cannot be explained by timing effects.

Convergence in Fertility Rates

The most striking fact about fertility rates across countries is the degree of absolute convergence. Regardless of income levels or income growth, countries around the world appear to be heading toward a total fertility rate of something less than 2 children per woman. We show this graphically in Figure 2, using United Nations data on total fertility in 1970 and 2000 for 110 countries. The x-axis is the total fertility rate in 1970 and the y-axis is the change from 1970 to 2000. Almost every country saw a decrease in total fertility during the 30-year period, and these decreases were linearly related to the initial level. Countries that had 1970 total fertility rates of 4–5 children per woman had decreases on the order of 2–3 children per woman over the subsequent 30 years (for example, Cuba, Chile, and Fiji). Countries with 1970 fertility in the range of 3–4 children per woman had decreases on the order of 1 to 2.2 children per woman over the same period (for example, China, Portugal, Romania, and New Zealand). The countries in the upper right of Figure 2 are countries that had small fertility decreases given their initial level. Countries in sub-Saharan Africa are overrepresented in this group. Though there is a clear negative relationship between income and fertility levels (the correlation in the cross-section is -0.65), convergence in fertility rates has occurred despite a lack of convergence in income per capita. The initial level of fertility is by far the most important right-hand-side variable in any attempt to understand changes in fertility rates across the full set of countries for which we have data.⁴

Extensive Versus Intensive Margins

How much of the long-run decrease in fertility has come from fewer women having any children (the extensive margin) versus the number of children per woman among those that have any (the intensive margin)? Both margins are important and the answer varies country by country. We compared completed fertility rates for 15 high-income countries for women born in 1940 and women born in 1963. (The latter group is the youngest cohort of women for which we can reliably estimate completed fertility since they are 44 years old in 2007.) For each country, we decomposed the total change in completed fertility into the portion attributable to

⁴ For more details on convergence in fertility rates across countries, see Appendix Table A1, available with this paper at <http://www.e-jep.org>.

the change in the number of women having any children and the portion attributable to the change in children per women conditional on having children.⁵

At one extreme, Ireland saw a drop in total fertility of 1.37 births per woman from the 1940 cohort to the 1963 cohort. The bulk of the change in Ireland (0.99 of the 1.37) was attributable to the intensive margin and the rest was attributable to fewer women having children at all. In contrast, Germany had a drop of 0.59 births per woman, and this was nearly all due to the extensive margin. In 10 of the 14 countries we considered (Ireland, Spain, Portugal, Belgium, France, Netherlands, Italy, Iceland, Norway, and Denmark), the intensive change in fertility was greater than the extensive; in the other four countries (West Germany, United Kingdom, Finland, and Sweden) the extensive margin was larger. Perhaps not surprisingly, the intensive margin plays a larger role for the countries with the largest decreases in completed fertility over the period: Ireland, Spain, and Portugal.

Determinants of Fertility: Men's Work at Home, Women's Market Work, and Childcare Subsidies

The twentieth-century decrease in fertility in high-income countries is commonly associated with five major factors: 1) increases in the demand for human capital (Galor and Weil, 2000), which increased the desire of parents to produce high-human-capital children; 2) increases in income which increased the opportunity cost of men's and women's time (Becker, 1981); 3) the long-run increase in women's labor force participation (Mira and Ahn, 2002; Brewster and Rindfuss, 2000); 4) declines in childhood mortality; and 5) the availability of easy-to-use and effective contraception for women (Goldin and Katz, 2000, 2002).⁶ However, we argue that the changes brought about by the pill or associated with the first waves of women entering the work force en masse had largely played themselves out by the 1990s, and

⁵ For a detailed breakdown of these figures by country, see Appendix Table A2, available with this paper at <<http://www.e-jep.org>>. Completed fertility rates are calculated from birth records data available from Eurostat at <<http://epp.eurostat.ec.europa.eu>>. We ignore births to women 45 and older in this table in order to estimate completed fertility for the most recent cohort possible.

⁶ Galor (2005) argues from both empirical and theoretical grounds that the demand for human capital is a more plausible explanation for the demographic transition than a pure income effect or a childhood mortality effect. The association between women's labor force participation and fertility could work through an increase in the opportunity cost of women's time relative to men's if the gender gap is narrowing at the same time that women are entering the workforce (Galor and Weil 1996).

so these factors do little to explain the substantial cross-sectional differences in fertility across the high-income countries in the early twenty-first century.

Female Labor Force Participation and Fertility Rates

Higher female labor force participation is generally associated with lower fertility. For illustration, Figure 3 plots female labor force participation versus total fertility rates for 83 countries in 1995. The relationship is highly significant. A ten-percentage-point increase in female labor force participation is associated with 0.45 fewer children per women. This slope has been relatively constant over time in the large sample.

However, the same relationship for high-income countries has shifted over time (see also Mira and Ahn, 2002). In 1970, high-income countries with low female labor force participation were also the ones with high fertility. The coefficient on this relationship in the 1970 sample is not significantly different than in the 83-country sample in Figure 3. However, among high-income countries, this negative coefficient moves toward zero and becomes significantly different than the larger sample by 1980. By 1990, the coefficient in high-income countries between female labor force participation and fertility is not significantly different from zero. By 2000, the high-income country relationship between fertility and female participation is upward-sloping.⁷ Figure 4 shows the relationship between female participation rates and fertility rates in high-income countries for 1995, the last year with complete data. The slope is 1.3 and is significant at the 5 percent level. Ireland is an obvious outlier. Dropping Ireland from the sample increases the slope to 2.0 with a significance level of 0.5 percent; in other words, a 10 percent increase in female labor force participation is associated with an increase in total fertility of 0.20 births per woman.

The underlying process here is that female labor force participation is rising in all high-income countries from one decade to the next. The coincident changes in fertility suggest that the relationship between fertility and female labor force participation is U-shaped over time and that we just observe different pieces of the function in each decade. Below female labor force participation rates of 50–60 percent, there is a steep negative relationship between female

⁷ The relationship between fertility and female labor force participation for each of 1970, 1980, 1990, and 2000 is shown graphically in Appendix Figure A1, available on-line with this paper at <<http://www.e-jep.org>>.

labor force participation and fertility. Above 50–60 percent labor force participation for women, fertility rises modestly with additional female labor force participation.⁸

By the year 2000, women in countries like Denmark, Iceland, and Canada, faced relatively attractive conditions both in the labor market and in child-raising, and thus they supplied more market labor and more children relative to women in Japan and Italy. As Apps and Rees (2004) note, within Europe the countries with the lowest fertility are among those with the lowest rates of female labor force participation.

Male Partners and Child Care

Our hypothesis is that social attitudes towards women, both in the labor force and with regard to child-rearing, are affecting both labor force participation and fertility rates. Once the labor force is freely open to women, cross-country differences in fertility are driven both by social norms (specifically how much of the child-rearing burden falls on the mother) and by societal priorities as expressed by the amount of federal and state subsidies that governments provide to assist families and to encourage natality. The variables most positively correlated with fertility rates across the high-income countries appear to be: 1) the share of child care performed by male partners; and 2) the size of federal subsidies for day care. In other words, the more help women receive in raising young children, the more children they are willing to produce.

Low-fertility countries like Italy and Japan are also the ones in which men contribute the least in terms of child care relative to their spouses and partners. This pattern appears in a variety of datasets using several different measures of men's effort in child rearing or attitudes about the appropriate division of labor between mothers and fathers. Our results confirm those of De Laat and Sevilla Sanz (2006), who also use the International Social Survey Program (ISSP) data. Fernandez and Sevilla Sanz (2006) show with time use data that in Spain even women who earn more than their husbands perform a disproportionate share of the child care. Clearly, one needs to acknowledge the potential endogeneity of male production of child care and the possibility of reverse causality. Changes in fertility may cause changes in attitudes or

⁸ The direct effect of women entering the workforce (which means facing an increased opportunity cost of their time relative to the increase for men) on fertility may be negative, but the total effect across countries is positive when we consider that areas with higher status for women in the workplace also offer higher status for women in the household.

in male child care. In our view, two basic forces drive these societal changes in attitudes. First, labor markets are evolving in female-friendly directions in all countries around the world. For example, Galor and Weil (1996) argue that technological change has raised the relative market wages of women over time. This trend leads to increasing female participation rates over time. This change is related to the basic nature of work in technologically advanced societies and is exogenous with respect to fertility. The second factor generating heterogeneity in outcomes is longstanding attitudinal differences across countries.⁹ These differing attitudes generate the observed variation in fertility across the high-income countries in Europe and North America.

Figure 5 shows the share of “housework and caring for sick children” that is done by men (as assessed by the female partner) on the horizontal axis and the total fertility rate for the country on the vertical axis. Data on men’s share of housework/child care is available in the 1994 International Social Survey Program. Because we are seeking to focus on the share of housework/child care done by fathers as assessed by mothers, we limit the sample in each country to women with children under age five. At the country level, the “housework and caring for sick children” variable has a mean of 0.235 and a standard deviation of 0.041. The high fertility countries in this group—the United States, New Zealand, Denmark and Norway—are also the ones with the most equal division of labor between genders when it comes to housework/child care.¹⁰

One could also use time use data to measure how equally childcare responsibilities are divided between men and women. Guryan, Hurst, and Kearney (in this symposium) examine time spent performing child care by gender, across countries. The pattern they see across countries is broadly consistent with the ISSP measure we use. For example, their data imply that in the U.S. men spend about 48 percent as much time doing child care as women. In contrast, men in Germany spend about 37 percent as much time as women doing child care; the same number for Italy is 39 percent.

⁹ Time use data and participation rate data suggest that attitudes toward women are highly correlated over time within countries. Female participation rate rankings among the rich countries are relatively static between 1970 and 2000.

¹⁰ The microlevel relationship between men’s percent of the housework/child care and family size goes consistently in the opposite direction: families in which the man does only a small fraction of the housework/child care are on average larger families. We interpret this pattern as reflecting sorting into family types—for instance, families where men are working and women are staying home with many children would contribute to this pattern.

In Table 1, we further investigate the connection between men's housework/child care and fertility. Column 1 of the table shows the regression coefficient from Figure 5. The coefficient on men's share of the housework/child care is 4.2, which implies that a one-standard-deviation increase in men's share of housework/child care is associated with an increase in the fertility rate of 0.17 children. In the second column, we use as the independent variable the female labor force participation rate in the 30–35 age group. The coefficient is positive but not significant.

In the third column, we use per-child government spending on families as the independent variable. For these data, we use the OECD Social Expenditure (SOCX) 2007 database, which measures governmental social spending on a variety of topics.¹¹ We use federal government spending on families, which includes both cash benefits, such as family allowances and payments for maternity leave, and also in-kind benefits, including childcare subsidies or state-provided child care. We convert these data from percent of GDP to dollars per child in year 2000 (purchasing power parity) dollars. We use the log of spending per child under 15 as our right-hand-side variable. Column 3 of Table 1 shows that in a regression where log spending per child is the only regressor, a doubling of spending is associated with an increase in the fertility rate of 0.15 children, which is marginally significant, at the 10 percent level. This coefficient is consistent with the results of numerous (much more detailed) studies which find that pro-natalist policies work. For example, Björklund (2006) finds that large increases in family spending in Sweden during 1960–1980 raised completed fertility rates by 0.4 children per women relative to other Scandinavian countries. Milligen (2005) finds that the elasticity of child subsidies to fertility rates in Quebec data is 0.107. In other words; in the long run, a doubling of subsidies (a 100 percent increase) leads to a 10.7 percent increase in birthrates, and hence total fertility rises by about 0.21 children. Whittington, Alm, and Peters (1990) estimate a 12 to 24 percent increase in the birthrate from a doubling of the personal exemption in the U.S. tax code, which corresponds to a 0.24 to 0.48 child increase in the total fertility rate. For similar results, see Sundström and Stafford (1992) for Sweden and McNown and Ridao-cano (2004) for Canada.

¹¹ This is available at
<http://www.oecd.org/document/9/0,3343,en_2649_34819_38141385_1_1_1_1,00.html>.

When all three regressors are included (column 4 of Table 1), the share of housework/child care done by men is more correlated with fertility than is female labor force participation or family spending. Family spending and share of male housework/child care are, however, very highly correlated with each other. Societies that are more effective at sharing the burden of children across the genders also tend to be more generous in supporting children in the public sphere.¹²

We also investigated possible connections between fertility rates and societal attitudes towards fathers performing child care and towards working mothers, using data from the World Values Survey. For example, we ran a regression with countries' total fertility rates as the dependent variable and as the explanatory variable, the share of adults (men and women) who strongly agreed with the statement that "fathers are as suited as mothers for childcare." We found a large and statistically significant relationship with fertility: a one-standard-deviation increase in the percent of people in a country who agreed with that statement is associated with a 0.13 child increase in total fertility. Similarly, we ran a regression with the total fertility rate as the dependent variable and, as the explanatory variable, the percent of people in a country who agreed or strongly agreed with the statement that "a working mother can establish just as warm and secure a relationship with her children as a mother who does not work." A one-standard-deviation increase in the percent of respondents who agreed with that statement is associated with a .17 increase in the total fertility rate. This coefficient is statistically significant at the 5 percent level.

Types of Government Family Subsidies and Fertility

In Table 2, we use the same OECD data to look more deeply at the effects of various forms of government family subsidies on fertility. We have data on the number of legally required weeks of paid maternity and paternity leave, as well as various forms of family-related spending by the government as a percentage of GDP. Column 1 regresses the total fertility rate on federally mandated full-time equivalent paid weeks of maternity and paternity leave. An additional week of paid paternity leave is associated with a relatively small increase in total

¹² We ran similar regressions using data from the 1994 wave of the ISSP and found similar results.

fertility of 0.03 children. The coefficient on weeks of maternity leave is negative and statistically significant in the “wrong” direction, although the effect is small. This finding may reflect the endogeneity of pro-child policies (countries with low fertility may respond by increasing maternity leave). The correlation between maternity and paternity leave is surprisingly small, but the general results are robust to including these coefficients separately.

In column 2, we switch to examining the effects of government spending on families on fertility. A one-percentage-point increase in spending as a percent of GDP (which would be roughly equal to doubling the level of spending at the mean, or an increase of two standard deviations) is associated with an increase of 0.12 children per woman. In column 3, we experiment with separating government spending on families into cash subsidies, federally provided services, and tax subsidies. The coefficients on all three categories are similar and only the coefficient on cash subsidies is marginally significant. All three forms of pro-family government spending appear to be associated with higher fertility, but we can't distinguish among their effects.

In column 4, we separate from the “services” category publicly provided preschool and day care. “Publicly provided day care” has the largest coefficient (0.37) relative to the other categories, although this variable is significant only at the 10 percent level. A doubling of spending on day care (from 0.37 percent of GDP to 0.74) is associated with 0.13 more children per woman. We take this as some evidence that publicly provided day care may be an effective pro-natalist policy. This finding is consistent with Blau and Robins (1989) and with Del Boca (2002), who finds large effects on fertility in Italy from increasing the availability of free day care for young children.

It may seem counterintuitive that modest levels of effort by men around the house, federal subsidies of a few thousand dollars per year, or even free day care can have a large effect on fertility, given that the time-related costs of raising a child remain very large. The financial costs of raising a child may be on the order of \$11,600 per year (Lino, 2006). It may be that intuition is misguided here, and individuals' fertility decisions are in fact very elastic with respect to cash subsidies and low-cost day care. However, there may also be peer effects or “social multipliers” in couples' choices about number of children. It seems likely that people use their friends, family, and neighbors as a cue to decide how many children to have. For example, Fernandez and Fogli (2005) offer evidence on cultural effects on fertility, and Maurin

and Moschion (2006) present evidence on neighborhood effects. The post–World War II baby boom in the United States was far larger than would be justified by catching-up delayed fertility. Indeed, many of the cohorts of women who contributed to the baby boom were not even of child-bearing age during World War II.

In short, social attitudes and norms and subsidies to families, and day care in particular, play an important role in determining levels of fertility and appear to have enough influence to push developed countries above or below replacement level fertility.¹³ These norms directly affect the opportunity costs that women face when they choose to have children, on both the extensive and intensive margins.

Housing as an Equilibrating Mechanism for Fertility

One additional hypothesis sometimes suggested to explain differences in fertility across the high-income countries is that exogenous differences in housing costs might be driving different preferences for family size. After all, land is comparatively plentiful in the United States, and median housing sizes are much bigger in the United States than in Italy or Spain. The hypothesis that housing costs affect fertility also suggests an equilibrating mechanism for fertility. For example, low fertility could reduce the demand for housing, making housing less expensive and thus encouraging greater fertility.

However, using country-level data or regional data within the United States, there is no evidence that housing prices have been a major driver of fertility. For the high-income countries as a whole, looking at housing cost data obtained from the OECD, neither levels nor changes in housing prices seem correlated with fertility rates. For regions within the United States, we calculate state-level total fertility from the 1980 and 2000 Censuses using the Individual Public Use Micro data, and gathered housing price data from the Office of Federal Housing Oversight’s repeat sales index (available at <http://www.ofheo.gov/>). If anything, the U.S. states and metropolitan statistical areas that have seen the largest increases in housing prices have also seen the largest relative increases in total fertility.

¹³ For example, a doubling of government spending on families is associated with an increase in the total fertility rate of 0.13 child, and a one-standard-deviation increase in the fraction of household work done by men is associated with an increase in the total fertility rate of 0.21 child. Combining these effects would be enough to move France, Norway, or the United Kingdom from below replacement rate fertility to above. However, Italy, Spain, Germany, and Japan had total fertility rates of 1.3 in 2005 and thus would not be moved above replacement rate fertility in this calculation.

One can certainly argue that either the endogeneity of house prices and population or omitted variables (like income) make these correlations (or the lack of such correlations) impossible to interpret. We suspect that the positive correlation between house price changes and fertility changes across U.S. states is partly driven by convergence in fertility rates across the states. The rural high fertility states in the Midwest (North Dakota), far West (Wyoming, Alaska), and South (Oklahoma) have seen rapid convergence towards the lower fertility levels of the Northeast and West Coast. Meanwhile the Northeast and California have had modest increases in fertility. However, the large increases in housing costs on the West Coast and in the Northeast likely have little to do with birth rates.

Will the Fertility Trend in Europe and Japan Reverse?

The arguments of this paper suggest that, for a variety of reasons, high-income countries with the lowest fertility rates are likely to see an increase in fertility in the coming decades. If we think of labor force participation rates as a crude index of women's status in the labor market, many of the European countries with the lowest birthrates also have the lowest levels of women's labor force status. If the labor force status of women is gradually increasing (and all indications suggest that it is), the U-shaped relationship between female participation rates and fertility suggests that we should see modest increases in fertility in these high-income countries over the coming decades.

Similarly, we have identified two indicators of the degree to which society shares the child-rearing burden with women: government spending on families (especially day care) and men's share of time spent on child care. Both of these indicators have a steep positive association with fertility and each appears to be trending upward in European countries. There has been a steady increase in men's share of child care throughout the high-income countries during the last 25 years. Using the Multinational Time Use Survey, we compute the total hours per week of child care for own children produced by both men and women. We included all categories of child-related activities such as bathing children, cooking for children, caring for sick children, reading to children, and so on. We limit the samples to men and women ages 25–55 with children age five and under in the household. At the country level, we calculate the fraction of such hours supplied by women. Figure 6 shows the results for five countries. In the

United States, for example, women were providing roughly 83 percent of the child care in 1975, falling to 62 percent by 2000. The time trend was similar in the United Kingdom, the Netherlands, Canada, and Norway.

In Italy in the 1990s, women were doing about 73 percent of the child care—about 10 percentage points more than U.S. women at the time. If Italian men were to increase their fraction of child care to the level of the U.S. men (and if we take our coefficients in Table 1 to represent a causal relationship), Italy would see a large 0.5 children per women increase in the total fertility rate. This calculation is of course speculative. In fact, men doing housework is probably not precisely the true variable of interest. Rather, it is a marker for how societies view the burden of raising children. Low-fertility, high-income countries have considerable scope for greater equality in the allocation of the burdens of child care between men and women.

Public policy may play a role in raising birth rates as well. In general, government pro-family spending has been trending upward over time. Average government spending on day care in the high-income countries of the OECD has more than doubled over the last 20 years. France appears to have generated a substantial increase in fertility in part by doubling child subsidies over the past 20 years. If the voters in Spain and Italy want to affect the same demographic transformation, it may be possible in these countries as well.

Fertility rates in the high-income countries of the world appear to be determined by an array of social processes that go beyond the effects of relative wages, income, and labor force participation. A massive convergence in national fertility rates is leading to a world that looks very much like the low-fertility European countries in terms of the number of children per woman. However, in the lowest fertility European countries the progress of women is limited both in the workforce and in the household relative to other high-income countries. We see this as a temporary state. The social structure in these countries and the division of child care has led women to choose to have fewer children than did their mothers, but we see no reason why these social factors cannot also work in the other direction and lead to future increases in fertility. However, we readily confess that much remains to be learned about the effects of men's and women's allocation of childcare and household responsibilities and about the effects of pro-family government subsidies on changes in fertility rates.

References

- Alvarez, Begoña, and Daniel Miles. 2003. "Gender Effects on Housework Allocation: Evidence from Spanish Two-Earners Couples." *Journal of Population Economics*, 16(2): 277–42.
- Apps, Patricia, and Ray Rees. 2004. "Fertility, Taxation and Family Policy." *Scandinavian Journal of Economics*, 106(4): 745–63.
- Becker, Gary. 1981. "A Treatise on the Family." Cambridge, MA: Harvard University Press, pp. 93–112. (Revised and Enlarged in 1991.)
- Björklund, Anders. 2006. "Does Family Policy Affect Fertility? Lessons from Sweden." *Journal of Population Economics*, 19(1): 3–24.
- Blau, David M., and Philip K. Robins. 1989. Fertility, Employment, and Child-Care Costs, *Demography*, 26(2): 287–99
- Brewster, Karin L., and Ronald R. Rindfuss. 2000. "Fertility and Women's Employment in Industrialized Nations." *Annual Review of Sociology*, vol. 26, pp. 271–96.
- De Laat, Joost, and Sevilla Sanz, Almudena. 2006. "Working Women, Men's Home Time and Lowest-Low Fertility." ISER Working Paper 2006-23, Institute for Social and Economic Research, University of Essex.
- Del Boca, Daniela. 2002. "The Effects of Child Care and Part Time Opportunities on Participation and Fertility Decisions in Italy." *Journal of Population Economics*, 15(3): 549–73.
- Dunn, Robert, Jr. 2003. "Subsidies for Childbearing and Fertility Rates." *Challenge*, 46(5): 90–99.
- Fernández, Cristina, and Almudena Sevilla Sanz. 2006. "Social Norms and Household Time Allocation." ISER Working Paper 2006-38, Institute for Social and Economic Research, University of Essex.
- Fernández, R., and A. Fogli. 2005. "Culture: An Empirical Investigation of Beliefs, Work, and Fertility." NBER Working Paper 11268.
- Fernández, R., and A. Fogli. 2006. "Fertility: The Role of Culture and Family Experience." *Journal of the European Economic Association*, April–May, 4(2–3): 552–56.

Galor, Oded. 2005. "From Stagnation to Growth: Unified Growth Theory." In *Handbook of Economic Growth, Volume 1A.*, ed. Philippe Aghion and Steven N. Durlauf. Amsterdam: Elsevier.

Galor, Oded, and David Weil. 1996. "The Gender Gap, Fertility, and Growth." *American Economic Review*, 86(3): 374–87.

Galor, Oded, and David Weil. 2000. "Population, Technology and Growth: From Malthusian Stagnation to the Demographic Transition and Beyond." *American Economic Review*, 90(4): 806–28.

Gatenio-Gabel, Shirley, and Sheila B. Kamerman. 2006. "Investing in Children: Public Commitment in Twenty-one Industrialized Countries." *Social Service Review*, 80(2): 239–63.

Gauthier, Anne Helene, and Jan Hatzius. 1997. "Family Benefits and Fertility: An Econometric Analysis." *Population Studies*, 51(3): 295–306.

Goldin, Claudia, and Lawrence F. Katz. 2000. "Career and Marriage in the Age of the Pill." *The American Economic Review*, 90(2): 461–65.

Goldin, Claudia, and Lawrence F. Katz. 2002. "The Power of the Pill: Oral Contraceptives and Women's Career and Marriage Decisions." *Journal of Political Economy*, 110(4): 730–70.

Lino, Mark. 2006. "Expenditures on Children by Families, 2005." U.S. Department of Agriculture, Center for Nutritional Policy and Promotion, Miscellaneous Publication 1528-2005. <http://www.cnpp.usda.gov/Publications/CRC/crc2005.pdf>.

Maurin, Eric, and Moschion, Julie. 2006. "The Social Multiplier and Labour Market Participation of Mothers." IZA Discussion Paper 2513, Institute for the Study of Labor.

McNown, Robert, and Cristóbal Ridao-cano. 2004. "The Effect of Child Benefit Policies on Fertility and Female Labor Force Participation in Canada." *Review of Economics of the Household*, 2(3): 237–54.

Milligin, Kevin. 2005. "Subsidizing the Stork: New Evidence on Tax Incentives and Fertility." *Review of Economics and Statistics*, 87(3): 539–55.

Mira, Pedro, and Namkee Ahn. 2002. "A Note on the Changing Relationship between Fertility and Female Employment Rates in Developed Countries." *Journal of Population Economics*, 15(4): 667–82.

Moore, Molly. 2006. "As Europe Grows Grayer, France Devises a Baby Boom." *Washington Post*, Wednesday, October 18, p. A01.

Sevilla Sanz, Almudena. 2007. "Division of Household Labor and Cross-Country Differences in Household Formation Rates." Economics Series Working Paper 325, University of Oxford, Department of Economics.

Sundström, Marianne, and Frank P. Stafford. 1992. "Female Labour Force Participation, Fertility and Public Policy in Sweden." *European Journal of Population*, 8(3): 199–215.

Whittington, Leslie A., James Alm, and H. Elizabeth Peters. 1990. "Fertility and the Personal Exemption: Implicit Pronatalist Policy in the United States." *American Economic Review*, 80(3): 545–56.

Table 1

Total Fertility Rate versus Male Housework/Childcare, Female Labor Force Participation Rate, and Federal Government Spending on Children

	(1)	(2)	(3)	(4)
	<i>Total fertility rate 2002</i>	<i>Total fertility rate 2002</i>	<i>Total fertility rate 2002</i>	<i>Total fertility rate 2002</i>
<i>Male housework/child care</i>	4.182 (1.431)***			5.23 (2.207)**
<i>Female labor force participation rate, ages 30–35</i>		0.659 (0.564)		-0.725 (0.726)
<i>ln(spending per child)</i>			0.146 (0.082)*	0.046 (0.106)
<i>Constant</i>	0.025 (0.558)	1.148 (0.433)**	0.511 (0.634)	-0.199 (0.643)
<i>Observations</i>	18	18	17	17
<i>R-squared</i>	0.348	0.079	0.176	0.425

Sources: Total fertility rate is from United Nations data. “Spending per child” is the federal government’s family spending per child and is calculated from data at the OECD Social Expenditure Database. Female labor force participation is from the OECD. The male housework and childcare variable is from the 2002 waves of the International Social Survey Program.

Notes: We limit the sample to women with children in the household. The relevant question asks what portion of the housework and caring for sick children is done by their spouse or male partner. Standard errors are in parentheses.

* significant at 10%; ** significant at 5%; *** significant at 1%.

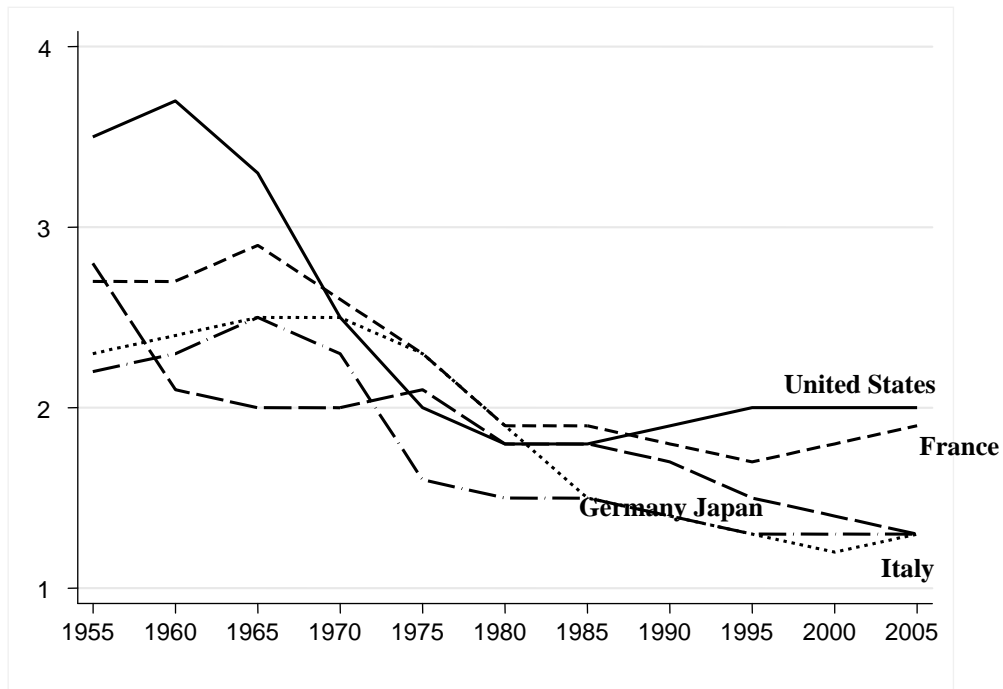
Table 2
Total Fertility Rate versus Family Leave and Various Forms of Government Spending on Families

	(1)	(2)	(3)	(4)
	<i>Total</i>	<i>Total</i>	<i>Total</i>	<i>Total</i>
	<i>fertility rate</i>	<i>fertility rate</i>	<i>fertility rate</i>	<i>fertility rate</i>
	2000	2000	2000	2000
<i>Federally mandated paid maternity leave</i> <i>(full-time equivalent weeks)</i>	-0.024 (0.007)***			
<i>Federally mandated paid paternity leave</i> <i>(full-time equivalent weeks)</i>	0.030 (0.015)*			
<i>Federal family spending</i> <i>(as a percent of GDP)</i>		0.122 (0.046)**		
<i>Cash subsidies</i> <i>(as a percent of GDP)</i>			0.114 (0.061)*	
<i>Federally provided family services</i> <i>(as a percent of GDP)</i>			0.137 (0.086)	
<i>Tax subsidies to families</i> <i>(as a percent of GDP)</i>			0.122 (0.174)	
<i>Publicly provided preschool education</i> <i>(as a percent of GDP)</i>				-0.129 (0.370)
<i>Publicly provided day care</i> <i>(percent of GDP)</i>				0.367 (0.180)*
<i>Constant</i>	1.865 (0.099)***	1.324 (0.125)***	1.322 (0.135)***	1.552 (0.130)***
<i>Observations</i>	23	23	23	22
<i>R-squared</i>	0.404	0.254	0.256	0.203

Note: Standard errors are in parentheses.

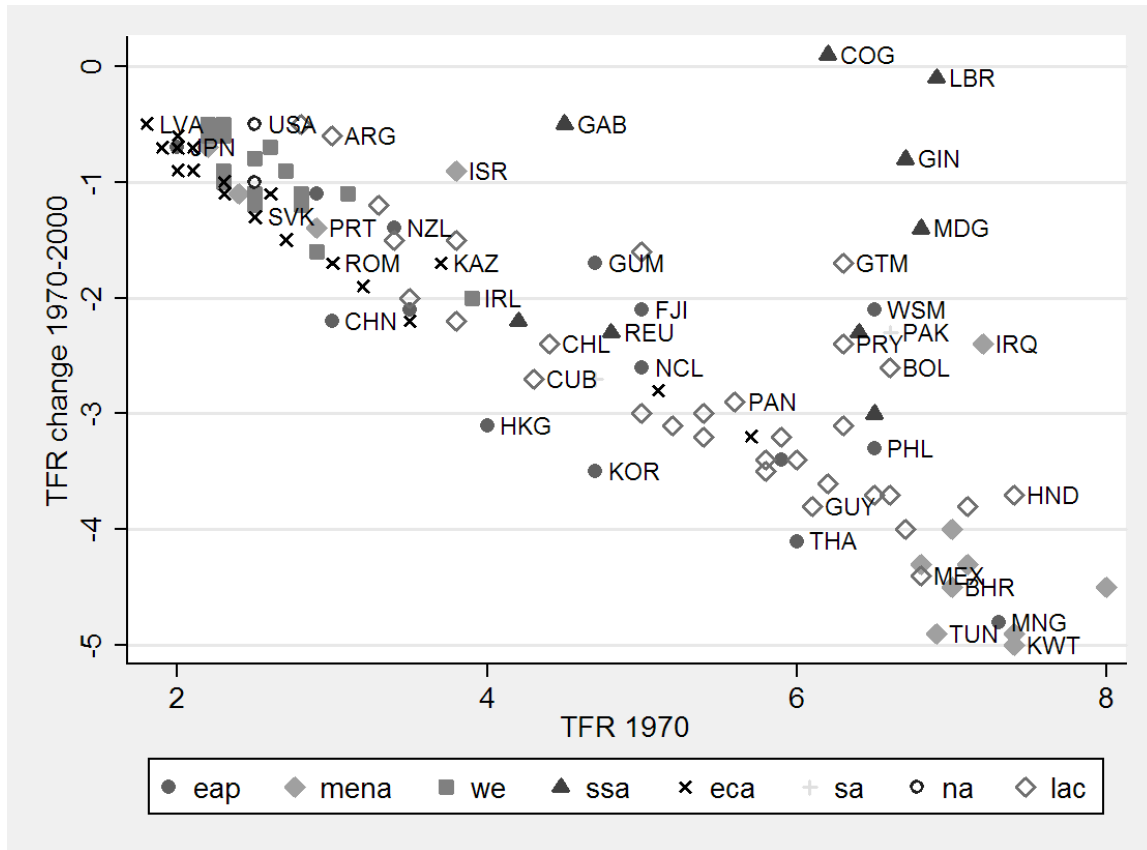
* significant at 10%; ** significant at 5%; *** significant at 1%.

Figure 1
Total Fertility Rates over Time



Source: Data are from the United Nations and are available at <<http://unstats.un.org/unsd/default.htm>>.

Figure 2
Convergence in Fertility at the Country Level: Change in Total Fertility 1970–2000 versus Initial Level

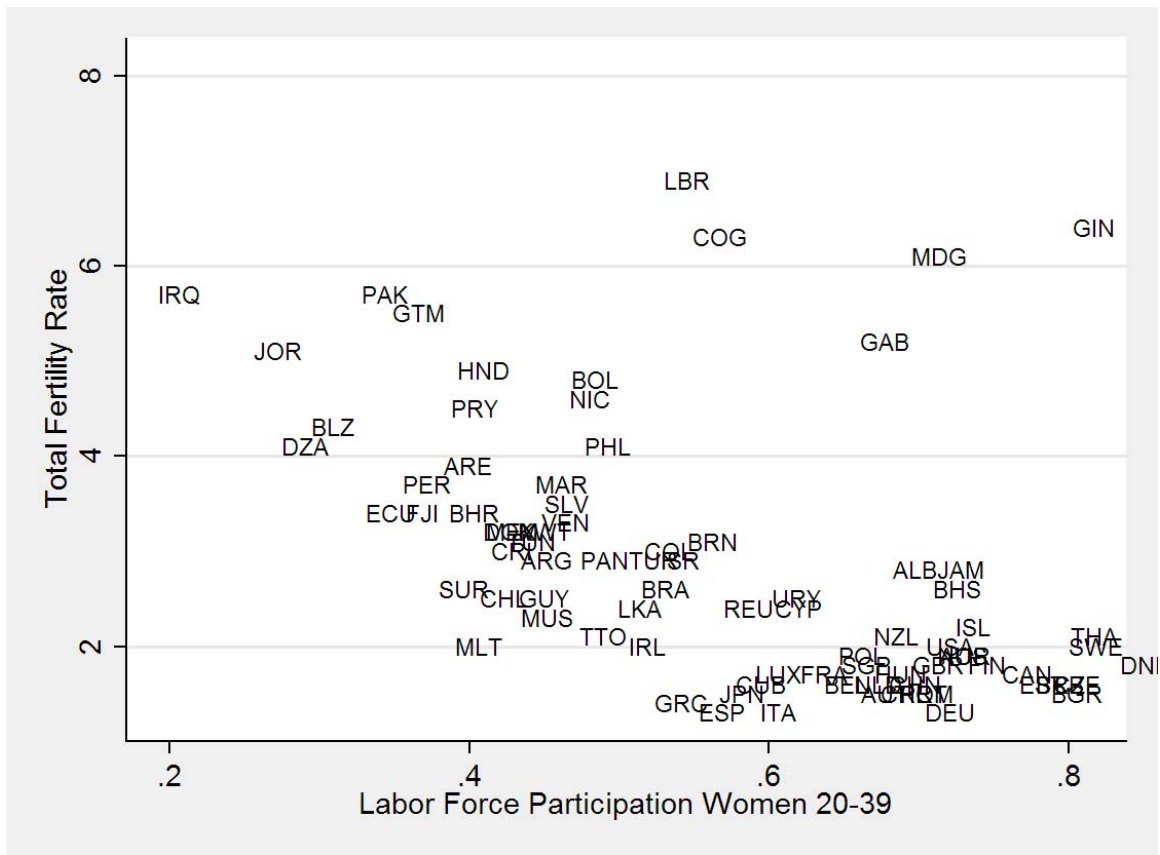


Source: Total fertility rates and changes are from United Nations data.

Note: Points on graph are labeled using standard World Bank/UN country abbreviations available at <http://unstats.un.org/unsd/methods/m49/m49alpha.htm>.

eap- East Asia and Pacific, mena – Middle East and North Africa, we – Western Europe, ssa – Sub Saharan Africa, eca – East Central Asia, sa- South Asia, na – North America, lac – Latin America and Caribbean

Figure 3
Total Fertility versus Female Labor Force Participation in 1995

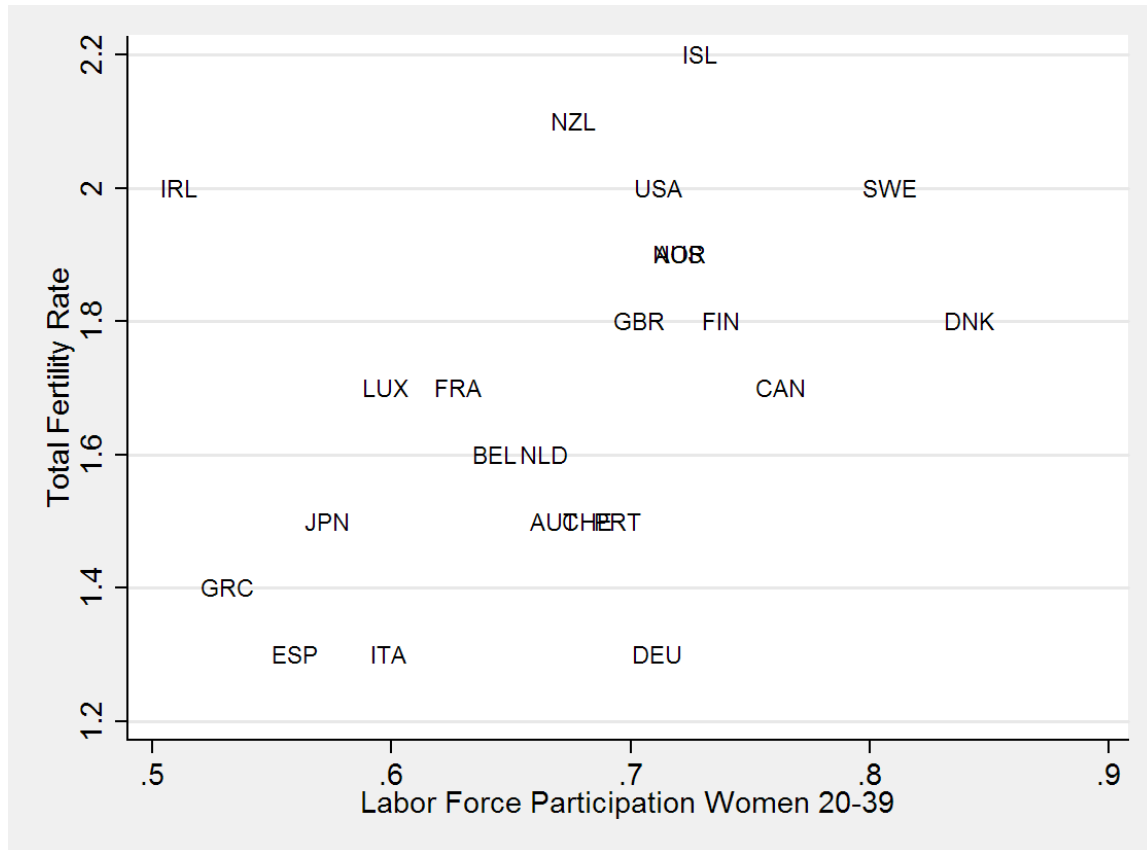


Source: Total fertility rates are from United Nations data. Labor force participation rates are from the International Labour Organization.

Note: Points on graph are labeled using standard World Bank/UN country abbreviations available at <http://unstats.un.org/unsd/methods/m49/m49alpha.htm>.

Figure 4

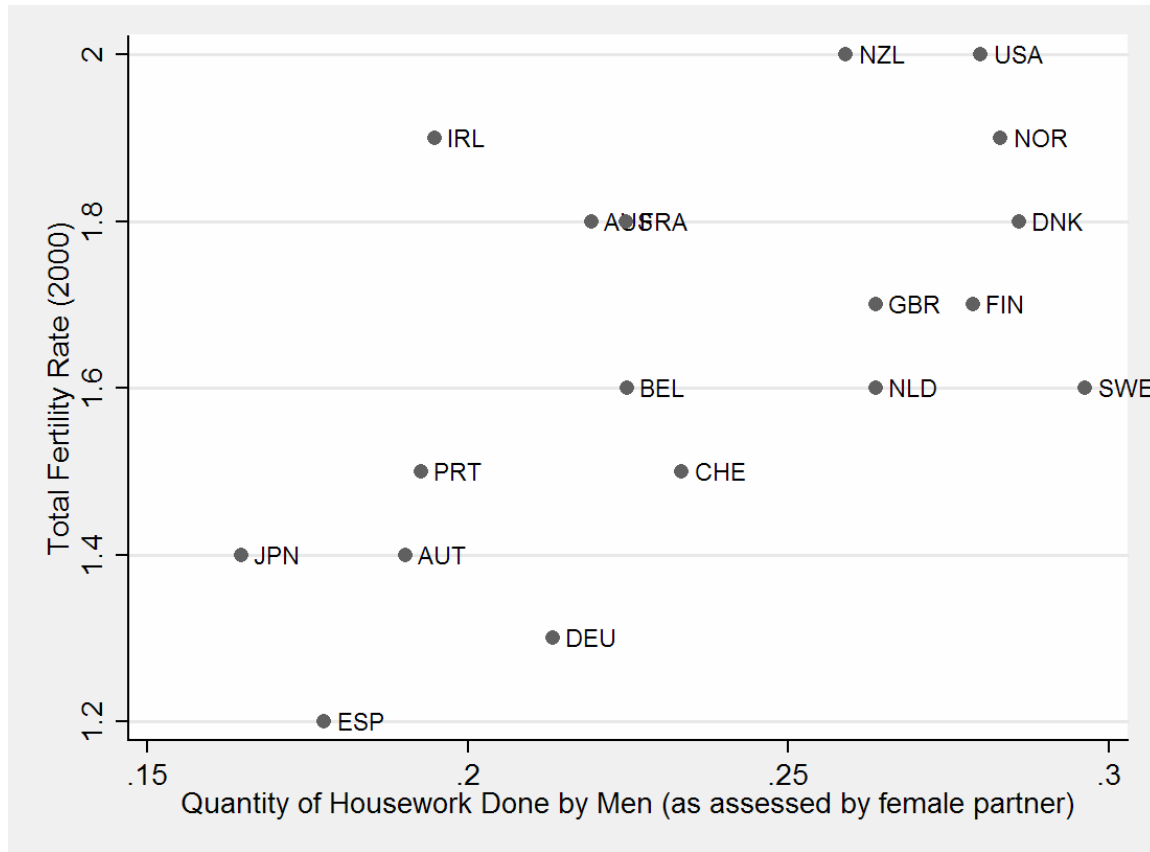
Total Fertility versus Female Labor Force Participation in High-Income Countries, 1995



Source: Total fertility rates are from United Nations data. Labor force participation rates are from the International Labour Organization.

Note: Points on graph are labeled using standard World Bank/UN country abbreviations available at <http://unstats.un.org/unsd/methods/m49/m49alpha.htm>.

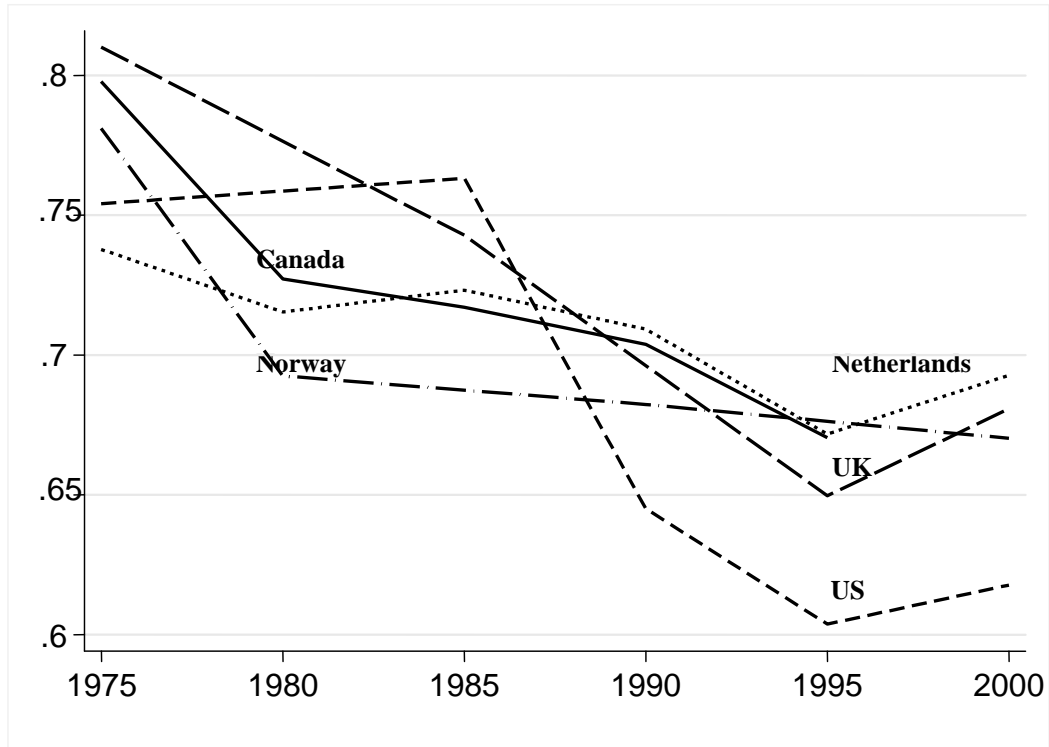
Figure 5
Total Fertility Rate versus Share of Housework/Child Care Done by Men in 2000



Sources: Total fertility rates are from United Nations data. Data on men's work are from the 2002 wave of the International Social Survey Program.

Notes: Details on variable construction: We start with 4 survey question in which each household adult is asked who usually performs the following activities: 1) laundry, 2) caring for sick family members, 3) cleaning, 4) preparing meals. The possible responses in the raw data are 1) always me, 2) usually me, 3) about equal between me and my spouse, 4) usually my spouse, 5) always my spouse. We limit the sample to households with children under five and with both a man and woman present. We use the woman's responses and convert the raw data to the percentage done by the man, as assessed by the woman. We use the following recoding of the data: "always the woman" = 0 percent done by the man; "usually the woman" = 25 percent done by the man; "about equal" = 50 percent done by the man; "usually the man" = 75 percent done by the man; and "always the man" equals 100 percent done by the man. We then average the percent done by the man across the four categories of housework. Points on graph are labeled using standard World Bank/UN country abbreviations available at <http://unstats.un.org/unsd/methods/m49/m49alpha.htm>.

Figure 6
Women's Share of Total Childcare Hours: Multinational Time Use Survey Data



Source: Data are from the Multinational Time Use Survey.

Note: We limit the sample to men and women 25–55 who have children under five in the household. We calculate hours per week spent on child care for men and women and we average at the country level to find the proportion of those hours that are reported by women.

Appendix

Table A1
Convergence in Fertility across Countries

	(1)	(2)	(3)
	<i>Total</i>	<i>Total</i>	<i>Total</i>
	<i>fertility</i>	<i>fertility</i>	<i>fertility</i>
	<i>rate 2000</i>	<i>rate 2000</i>	<i>rate 2000</i>
<i>Total fertility rate 1970</i>	0.499 (0.057)***	0.531 (0.054)***	0.53 (0.082)***
<i>Female labor force participation rate, age 30–34, 1970</i>		1.854 (0.553)***	1.853 (0.574)***
<i>ln(GDP per capita) 1970</i>			-0.001 (0.186)
<i>Constant</i>	0.302 (0.277)	-0.556 (0.363)	-0.544 (1.951)
<i>Observations</i>	67	67	67
<i>R-squared</i>	0.541	0.61	0.61

Note: Total fertility rate, labor force participation rate, and GDP per capita data are from the United Nations database available at <<http://unstats.un.org/>>. Standard errors in parentheses.

* significant at 10%; ** significant at 5%; *** significant at 1%

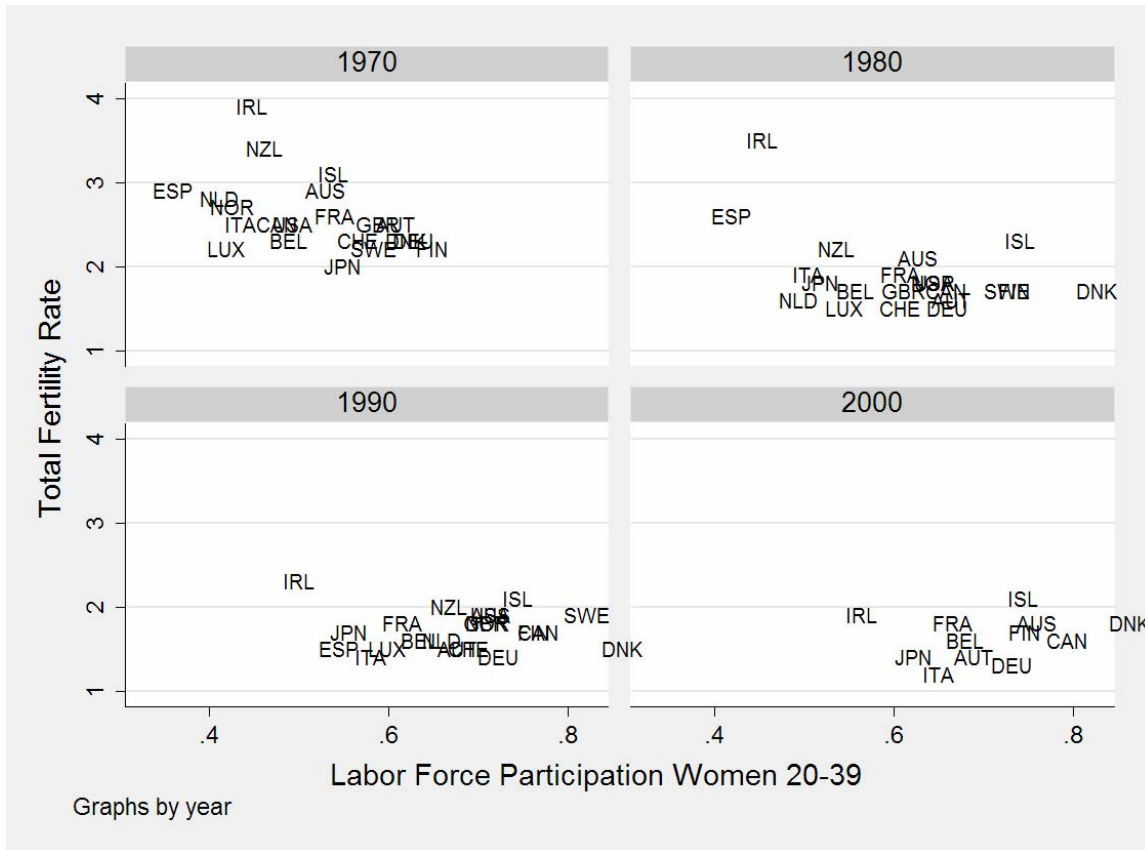
Table A2

**Change in Completed Fertility Rate for Cohorts of Women Born 1940 and 1963,
Extensive and Intensive Margins**

Country	Change in completed fertility 1940–1963			Levels of completed fertility for 1940 and 1963 cohorts					
	Completed fertility rate change	Extensive share	Intensive share	Completed fertility rate 1940	Completed fertility rate 1963	Extensive 1940	Extensive 1963	Intensive 1940	Intensive 1963
<i>Ireland</i>	-1.37	-0.38	-0.99	3.69	2.32	0.95	0.84	3.87	2.76
<i>Spain</i>	-1.36	-0.21	-1.15	2.94	1.58	0.92	0.84	3.19	1.89
<i>Portugal</i>	-0.81	-0.08	-0.73	2.58	1.76	0.94	0.91	2.73	1.94
<i>West Germany</i>	-0.59	-0.54	-0.05	1.97	1.38	0.89	0.65	2.21	2.14
<i>Belgium</i>	-0.59	-0.28	-0.30	2.17	1.58	0.91	0.78	2.38	2.02
<i>United Kingdom</i>	-0.52	-0.36	-0.16	2.36	1.84	0.89	0.75	2.65	2.45
<i>France</i>	-0.49	-0.17	-0.32	2.41	1.92	0.92	0.85	2.64	2.27
<i>Netherlands</i>	-0.45	-0.17	-0.28	2.21	1.76	0.88	0.81	2.52	2.19
<i>Italy</i>	-0.39	-0.12	-0.27	1.91	1.51	0.87	0.81	2.18	1.86
<i>Iceland</i>	-0.38	0.26	-0.65	2.90	2.52	0.89	0.98	3.25	2.56
<i>Norway</i>	-0.29	-0.04	-0.25	2.36	2.07	0.91	0.89	2.60	2.33
<i>Denmark</i>	-0.22	-0.04	-0.18	2.10	1.88	0.90	0.88	2.33	2.13
<i>Finland</i>	-0.12	-0.17	0.04	2.03	1.91	0.86	0.79	2.37	2.43
<i>Sweden</i>	-0.04	-0.05	0.01	1.98	1.94	0.87	0.85	2.28	2.29

Note: “Extensive margin” is defined as the percentage of women in the cohort having at least one child. “Intensive margin” is defined as the average number of children for women with at least one child. Completed fertility rates are calculated from birth records data available from Eurostat at <<http://epp.eurostat.ec.europa.eu>>. We take two cohorts of women (those born in 1940 and 1963) and calculate their completed fertility rates (children per woman). We decompose the change in completed fertility rate into the portions attributable to the extensive and intensive margins. We make use of the fact that “completed fertility rate” = “extensive margin” * “intensive margin.” We take logs and first-difference this identity to arrive at the decomposition.

Figure A1
Total Fertility versus Labor Force Participation: 1970, 1980, 1990, 2000



Note: Points on graph are labeled using standard World Bank/UN country abbreviations available at <http://unstats.un.org/unsd/methods/m49/m49alpha.htm>.