



IMF Working Paper

Can Women Save Japan?

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Asia and Pacific Department

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Abstract

Japan's potential growth rate is steadily falling with the aging of its population. This paper explores the extent to which raising female labor participation can help slow this trend. Using a cross-country database we find that smaller families, higher female education, and lower marriage rates are associated with much of the rise in women's aggregate participation rates within countries over time, but that policies are likely increasingly important for explaining differences across countries. Raising female participation could provide an important boost to growth, but women face two hurdles in participating in the workforce in Japan. First, few working women start out in career-track positions, and second, many women drop out of the workforce following childbirth. To increase women's attachment to work Japan should consider policies to reduce the gender gap in career positions and to provide better support for working mothers.

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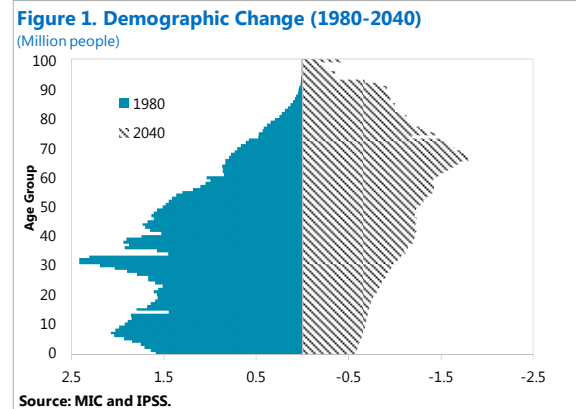
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I. INTRODUCTION

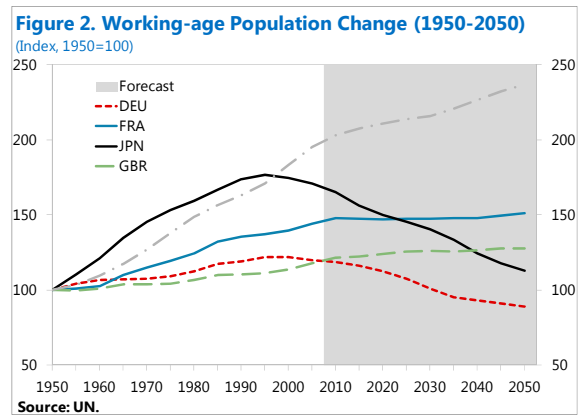
1. Japan's potential growth rate is steadily falling with the aging of its population. Against this backdrop, this paper explores the extent to which raising female labor participation (FLP) can help slow this trend—that is, can women save Japan?

2. Japan is growing older faster than anywhere else in the world. After experiencing a demographic dividend of a rapidly growing labor force and a falling birth rate from the 1960s to 1980s, Japan is now facing the consequences of a rapidly aging society.

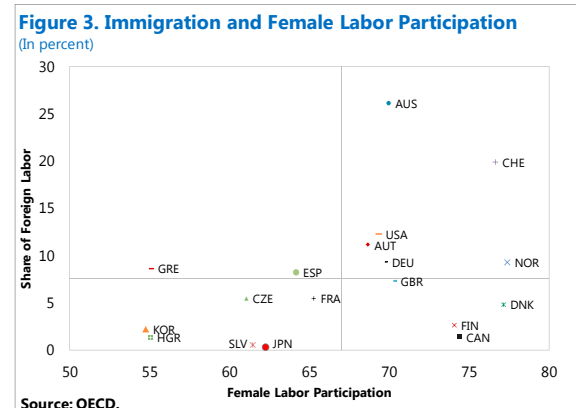
Population projections suggest that the share of the population over age 65 will rise from 9 percent in 1980 to 36 percent in 2040 (Figure 1). Other Asian countries—such as Korea and Taiwan Province of China—are not far behind and will likely look to Japan for ways to cope with the economic and social consequences of a rapid rise and subsequent decline in the population.



3. The consequence of this rapidly aging society is the sharpest labor force decline among advanced economies. The size of Japan's working-age population, ages 15–64, will fall from its peak of 87 million in 1995 to about 55 million in 2050 (Figure 2). This is approximately the size of the workforce at the end of World War II. Unless output per worker rises at a faster rate to offset the decline in the number of workers, Japan's GDP is likely to fall behind that of many of its neighbors. Japan has already ceded second place in global economic size to China, and India is not far behind. By some estimates Japan and Indonesia will be the same size by the middle of this century (*Economist*, 2010).



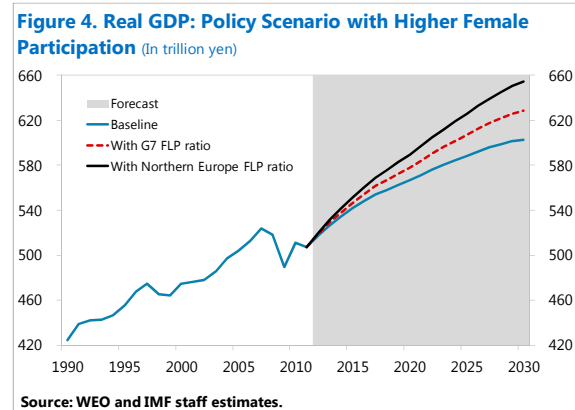
4. Yet there is much Japan can still do to help mitigate the decline in the size of its workforce. Both immigration and FLP rates are well below Organization for Economic Cooperation and Development (OECD) country averages (Figure 3). Attitudes and political sentiment about immigration, however, do not change quickly. In the near



term, there is much Japan can do to encourage its highly educated female population¹ to participate more actively in the workforce. Getting more women in the workforce would mean not only a larger labor force, but possibly a more skilled labor force given that Japanese women on average have completed more years of education than their male counterparts.

5. We estimate that if Japan were to raise its FLP ratio to the level of the G7 (excluding Italy and Japan), GDP per capita would be permanently higher by approximately 4 percent than under the baseline scenario (Figure 4).

These back-of-the-envelope calculations assume a rise in the FLP rate from 63 percent in 2010 to 70 percent in 2030.² Raising FLP rates further—to the level of northern Europe, say—could increase GDP per capita by an additional 4 percent. The impact of these two scenarios on potential GDP growth (in the transition years) would be about 0.2 percentage



point under the first scenario and 0.4 percentage point in the second scenario. A transformation of this magnitude is not without precedence, with the Netherlands, for example, experiencing a similar dramatic increase in the past few decades (Box 1). Against this backdrop, this paper focuses on the following questions:

- What explains differences in FLP rates across advanced economies?
- What keeps Japan's FLP rate below the OECD average?
- What policies can be adopted to increase FLP in the near to medium term?

Previous studies have found that FLP is positively associated with a more neutral tax treatment of second earners, child care subsidies, and paid maternity leave; and according to OECD statistics, Japan provides much fewer of all these benefits.³ Thus, the focus of this paper is to identify barriers to FLP, drawing on shared experiences across countries where women face similar challenges in managing work and family life. At the same time, we remain agnostic on country differences that may arise due to existing work and cultural preferences.

¹ Japan's younger generation of women is more educated than their female peers elsewhere. In 2010, the cohort in their late 20s had on average 14.3 years of schooling, surpassed among advanced economies only by New Zealand.

² The effect on growth reflects the impact of the increase in labor input and does not include any additional increase in productivity from, perhaps, better reallocation of resources. Thus, we consider these estimates to be a lower bound of the possible impact.

³ Spending on maternity and parental leave payments (OECD, 2004; Chart PF2.1.B) per child is less than one-half the OECD average, with Japan in the bottom quarter of the distribution. Similarly, Japan is also in the bottom quarter of the distribution for public expenditure on child care and early education services.

6. Our findings suggest that both demographics and policy matter in explaining FLP rates. Among demographic variables, family size and education explain many of the changes within countries over time, whereas family-friendly policies, like the provision of child care, are important in explaining differences across countries. We argue that Japan needs to do two things. First, it must end the gender gap in hiring and promotion practices. Japan has by far the lowest rate of female managers among advanced economies. Increasing the number of women role models would influence women's career choices. Second, Japan must do more to support working mothers. A more flexible work environment and better child care facilities would help stanch the outflow of women from the workforce after childbirth. We think these policies would also be effective in reducing the high incidence of poverty among single mothers.

7. To achieve these changes, the following measures could be considered: (1) reallocating public resources away from monetary benefits to in-kind benefits, such as child care facilities, that would help support working mothers; (2) deregulating the child care industry to help increase the number of facilities; (3) extending the duration and broadening the coverage of parental leave policies; (4) eliminating institutional exemptions on spousal income in the social security and tax systems; (5) reducing disparities between part-time and full-time workers; (6) encouraging firms to adopt more flexible work environments; (7) ensuring that current promotion and employment policies are enforced equitably to help increase the number of female career employees; (8) introducing a new, more flexible labor contract for career employees that would reduce hiring risks for firms; and (9) possibly establishing new rules for the number of female directors on corporate boards.

8. The remainder of this paper is structured as follows. In the first section, we explore the determinants of differences in FLP rates across OECD countries. Next, we use these findings to inform an analysis of why Japan is different. Finally, we apply these findings to help inform the policy debate on how best to raise Japan's FLP rate.

II. EXPLAINING DIFFERENCES IN FLP RATES ACROSS OECD COUNTRIES

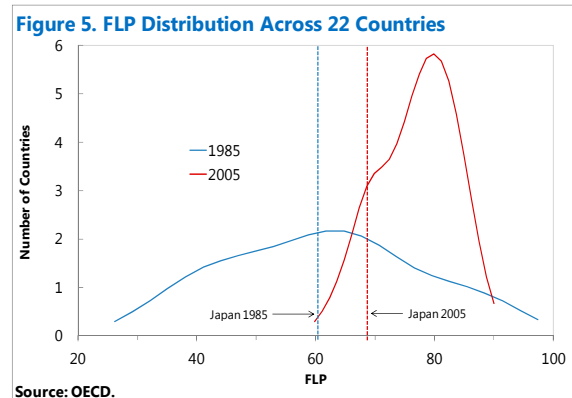
9. This section aims to explain changes over time and differences across countries in FLP rates. The policy analysis focuses mainly on married women with children, for whom actual participation rates are well below women's expressed preferences (Jaumotte, 2003). A number of policy instruments are analyzed, such as child care subsidies, maternity leave, and elimination of wage gaps. The role of demographic determinants is also considered.

10. The strength of this analysis is the large number of countries examined and the extensive period of time covered (OECD countries during 1960–2008). As far as we know, ours is only the second study to look at this question using macroeconomic data. Relative to the first study (Jaumotte, 2003) our coverage is significantly broader—using the latest version of Gauthier's comparative family policy database (Gauthier, 2010 and 2011)—and our estimation techniques, we believe, are an improvement. Relative to other single country

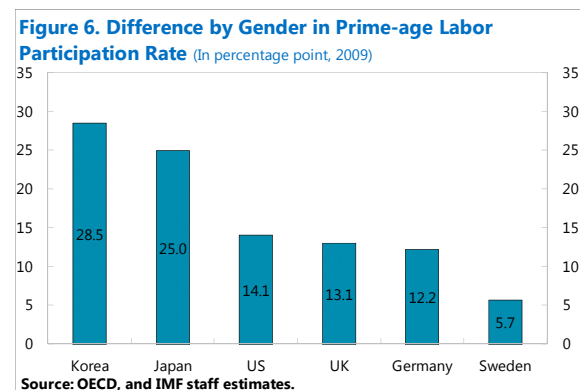
studies, our analysis provides estimates of the aggregate impact of policy instruments. (In the final section we draw on relevant policy lessons from Japanese micro studies.)

11. Our basic framework for analyzing the female labor supply is Becker's time allocation model (1965). This model recognizes that women make not only a choice between labor and leisure, but also between types of labor (home or market). Women choose between leisure, supplying labor to the market and earning a wage, and supplying labor to home production (namely, child rearing). A woman's decision thus is influenced not only by the return on labor in the marketplace but also by the costs and quantity of home production.

12. The main focus of our empirical analysis is on labor participation rates of women between the ages of 25 and 54. This so-called prime-age group allows us to abstract from most education and retirement decisions. Across the OECD FLP rates have indeed been rising, with the mean of the distribution increasing from 61.2 to 76.9 percent between 1985 and 2005 (Figure 5). At the same time, participation rates have started to converge, with the width of the distribution narrowing considerably. In Japan too, FLP rates have increased from 60.3 to 68.8 percent, but at a much slower pace compared with the median country. As a result, within the distribution Japan has lost ground to many of its peer countries.



13. This is particularly noticeable in a comparison of male and female labor participation rates across countries (Figure 6). The labor participation rate for females in Japan is 25 percentage points lower than for males. Korea is the only country in the OECD with a higher difference, with most countries showing differences of about 10 percentage points. In some northern European countries, where support for working mothers is very generous, the differences are as low as 5 percentage points.



14. To capture the FLP dynamics we model countries' FLP rates as a function of three categories of variables: demographics (D), policies (Z), and other controls (X). Our main interest is the role of demographics and policies in explaining the differences across countries and within countries over time. Our starting econometric specification is as follows:

$$\begin{aligned}
flp_{it} = & \alpha + D_{it}\beta^1 + Z_{it}\beta^2 \\
& + X_{it}\beta^3 + \theta_i \\
& + \delta_t + \varepsilon_{it}
\end{aligned} \tag{1}$$

where flp_{it} is the prime-age FLP rate in country i at time t . D , Z , and X are vectors for demographic, policy, and control variables, respectively, which vary by country and over time. The parameter α is a constant, θ is a country dummy, δ is a time dummy, and ε is the error term.

15. As with any cross-country regression the potential for omitted-variable bias is considerable. In addition, the dependent variable is nonstationary, which complicates estimation. We thus try to limit some of these challenges by differencing. More specifically, we postulate that the same control variables (vector X) that affect FLP also impact male labor participation (MLP). Examples include the rigidity of the labor market and macroeconomic conditions, both of which affect overall participation rates and are not necessarily confined to female or male participation. Differencing out male participation would result in the following specification:

$$\begin{aligned}
flp_{it} - mlp_{it} = & \alpha + D_{it}\beta^1 \\
& + Z_{it}\beta^2 \\
& + X_{it}[\beta^3 \\
& - \beta^m] + \theta_i \\
& + \varepsilon_{it}
\end{aligned} \tag{2}$$

where mlp_{it} is the prime-age MLP rate in country i at time t , and β^m is the vector of scalar coefficients relating the effect of the control variables in vector X on MLP. The set of unobservable variables in vector X , thus, differences out if $\beta^3 = \beta^m$. This is plausible, for example, for macroeconomic conditions that are likely to affect participation rates of both men and women.⁴ This equation also implicitly assumes that female demographics (the variables in vector D) and female policy initiatives (the variables in vector Z) do not affect MLP in the same manner.

16. We next difference the equation over time. Because the panel is small in N , but large in T , several of the variables in the equation exhibit unstable time-series properties and are integrated of order 1 (I(1)).⁵ In the sample period tested this includes FLP and the demographic trend variables. Differencing the equation helps resolve this problem by

⁴ This includes the impact of time dummies, as well as changes in the statistical definitions that affect the measurement of both male and female labor force participation.

⁵ This resulted in an unstable relationship when the equation was estimated in levels. Im-Pearsan-Shin panel unit root tests estimated with trend for FLP, fertility, and education cannot reject the null hypothesis that all the panels contain unit roots. The same test for marriage rates cannot be rejected when estimated without a trend but can be rejected with a trend. The null can be rejected for all the variables in differences. We conclude that FLP, fertility, and education are likely I(1) with marriage rates of either I(0) or I(1).

creating variables that are integrated of order zero (I(0)).⁶ The differencing also eliminates the country fixed effect. Our final difference-in-difference estimator is thus as follows:

$$\begin{aligned} \Delta flp_{it} - \Delta mlp_{it} &= \alpha + \Delta D_{it}\beta^1 \\ &+ \Delta Z_{it}\beta^2 \\ &+ \varepsilon_{it} \end{aligned} \quad (3)$$

where Δ represents changes over time.

17. To examine this relationship, we build a cross-country data set covering 22 OECD countries between 1960 and 2008. The data set includes variables on labor force participation, demographics, and policies. The data set, however, is unbalanced, with demographic variables and the G7 countries generally covering longer time periods. We use OECD.Stat as our main data source and supplement this information with several policy variables from the Comparative Family Policy Database ver.3 (Gauthier, 2010 and 2011) and relative marginal tax rates on second earners from the data set of Bassanini and Duval (2006). A full description of the variables and their sources can be found in Appendix II.

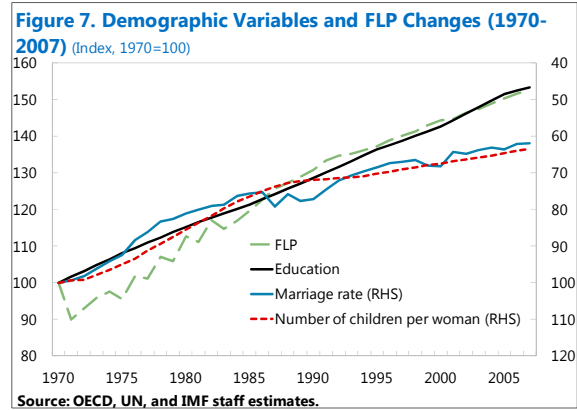
A. Empirical Results: The Role of Demographics

18. Demographics play an important role in explaining changes in FLP. In this section we concentrate on three variables of interest: marriage rates, the number of children per woman, and education levels. Each in turn nicely fits within Becker's FLP time allocation model.

- **Marriage rate:** Married women tend to have both a higher reservation wage and higher elasticity to the market wage when home production is a viable alternative. In advanced economies marriage is increasingly delayed and marriage rates have steadily declined, which could be associated with higher FLP.
- **Number of children per woman:** Similarly, the number of children per woman increases opportunities for home production and thus the reservation wage and the elasticity of the female labor supply to the market wage. Thus, the trend decline in fertility rates across the OECD could also be associated with recent increases in FLP rates.
- **Education:** A high level of education strengthens the attachment of women to the labor market by increasing their potential earnings and reducing the scope for specialization within the marriage. Higher education could thus have also led to an increase in FLP.

⁶ Another time-series property of concern is cointegration. If the original time series are cointegrated, the difference equation will suffer from omitted-variable bias if the error correction term is excluded. We thus test for cointegration in the panel but are unable to reject the null hypothesis that there is no cointegration between the demographic variables and FLP.

19. There are two potential difficulties in assessing the effect of the demographic variables on labor participation. The variables increase over time with little variation in slope (Figure 7), making it difficult to detect their relative impact on labor force participation. Moreover, endogeneity is a major concern for both the marriage and children variables, because an increase in FLP may also lead to fewer marriages and fewer children. In our econometric specification we instrument with lagged values to help correct for this concern.⁷



20. Both the log number of children per woman and the log of education are statistically significant across specifications and have the expected sign.⁸ This is also evident in the scatter plots in Figure 28 (for levels) and Figure 29 (for three-year changes) in Appendix I, which demonstrate a robust correlation between the demographic explanatory variables and FLP. Measured in standard deviation terms, both a 1 standard deviation decline in the number of children per woman and a 1 standard deviation increase in education are roughly associated with a 3 percentage point increase in FLP. Interpreted individually:

- The coefficient on the **number of children per woman** suggests that for every 10 percent decline in the ratio there is a corresponding 1.6 percentage point increase in the FLP rate (Table 1).⁹
- The coefficient on **education** suggests that for every 10 percent increase in education levels there is a corresponding 1.1 percentage point increase in the FLP rate (see Table 1).

Table 1. Gap between FLP and MLP, and Demographic Variables

Variables	Three-year Change of the Gap between FLP and MLP			
	(1)	(2)	(3)	(4)
	OLS	IV	IV	IV
Log (Number of children per woman)	-12.386** [4.839]	-16.345*** [6.017]	-25.009*** [7.375]	-37.345 [29.206]
Log (Education)	11.627*** [3.390]	10.765*** [3.428]	5.586 [3.487]	3.054 [6.771]
Marriage rate			-0.760* [0.410]	-3.872 [7.125]
Observations	231	229	174	174
F-test (Number of children per woman)		217.76	193.26	160.30
F-test (Marriage)				6.44

Clustered standard errors in brackets
 *** p<0.01, ** p<0.05, * p<0.1
 Note: We introduced structural break terms for Germany (1991), Ireland (1985), Japan (1968), Netherlands (1987), and Portugal (1978) due to structural breaks. Number of children per women is instrumented in column 2, 3, and 4, and marriage rate is instrumented in column 4.
 Source: Fund staff calculations.

21. The results for marriage, however, are mixed. Before instrumentation, the coefficient on the marriage rate is both significant and of the correct sign.¹⁰ The magnitude of the

⁷ The instrument for the change in the independent variable from t to $t+1$ is the lagged change in the same variable from $t-1$ to t . Thus, for three-year changes between 1980 and 1983, the lagged instruments are changes between 1977 and 1980.

⁸ The estimated coefficient on the number of children per woman also increased after instrumenting, with reported F -statistics greater than 200.

⁹ We do not consider the age structure of children due to limited data. However, it is possible that the coefficient is different depending on the age structure of children.

¹⁰ The coefficient on education is likely insignificant due to selection.

coefficient indicates that a 1 standard deviation decline in the marriage rate is associated with an approximately 1 percentage point increase in FLP (see Table 1). However, like the number of children, the marriage rate is affected by endogeneity with the dependent variable and could be negatively biased away from zero. Indeed after instrumenting, the coefficient is not significantly different from zero, but the instruments are weak and it is impossible to draw robust conclusions from this result.¹¹

22. The coefficients also change when we examine different spans of time. We reestimated the model in column 2 of Table 1 over several different time periods, with changes in FLP for one to five years (Table 2). The regressions indicate that the elasticity of FLP to the number of children increases over longer time spans. We interpret this increase as the difference between short-term and long-term elasticities, which are especially important for life decisions such as the number of children women have (that is, whose effects are not instantaneous). The coefficients on education remained largely unchanged over time.¹²

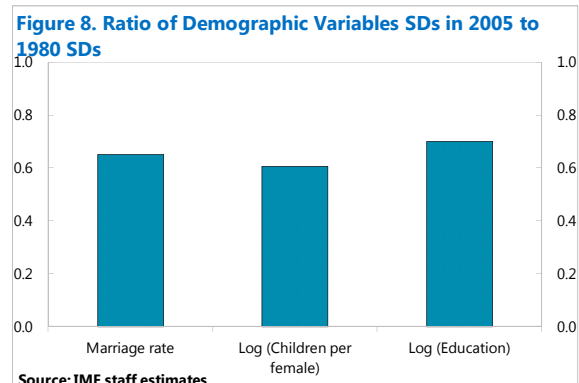
Table 2. Change Over Time in Number of Children and Education Effects

Variable	(1)	(2)	(3)	(4)	(5)
	One-year	Two-year	Three-year	Four-year	Five-year
Log (Number of children per woman)	-10.014** [4.936]	-14.197** [6.135]	-16.345*** [6.017]	-21.905*** [7.354]	-24.977** [10.913]
Log (Education)	10.932*** [3.609]	10.945*** [3.269]	10.765*** [3.428]	8.271** [3.592]	4.484 [3.256]
Observations	729	348	229	169	118

Source: Fund staff calculations

B. Empirical Results Continued: The Role of Policies

23. In this section we turn to the role of policies in explaining changes in FLP. Policies may become an increasingly important factor as demographics of the OECD countries converge, with for example the standard deviation in the number of children per woman, marriage, and education each declining by $\frac{1}{3}$ to $\frac{1}{2}$ in our sample period (Figure 8).



¹¹ Squared terms were also tested to account for nonlinearity in the relationship between demographics and FLP, but were found to be insignificant for all three variables. Other factors not included in the regression, but likely to have contributed to the rise in FLP, include new household technologies that have freed women up to participate in the labor force and improved working conditions in general.

¹² We use three-year differences for our baseline regression because these regressions represent a balance between capturing the long-term impact and maximizing the number of observations.

24. Our analysis looks at the impact of both “pull” and “push” government policies on FLP decisions. Pull policies are those that raise the return to work and therefore entice more women to enter the workforce. These include the following:

- **Tax penalty:** Tax systems can create distortions in labor supply decisions of married women more than for men and single women. This arises from most governments’ original tax policy of treating families rather than individuals equally. Since the 1970s the pendulum has shifted toward equal taxation of individual income, but in most countries the tax rate on the second earner remains significantly higher, and the higher this rate the lower the incentive for women to work.
- **Wage gap** (at the same level of education and experience): Gender discrimination in pay and promotion opportunities reduces the return on women’s market work and tends to reduce the female labor supply. Thus, in countries with a smaller gender pay gap—perhaps thanks to gender-specific antidiscrimination laws—the FLP is expected to be higher.

25. Push policies, in contrast, are policies that reduce the costs of child rearing and, subsequently, raise the relative return on work. Our main push variables include the following:

- **Child care and parental leave:** One common way governments can provide support for working mothers is through child care subsidies and allowances for maternity, parental, and child care leave. These benefits can boost FLP by helping women reconcile work and family obligations and by reducing the cost of child rearing (for example, by lowering the price of child care and therefore increasing the relative return on market work). The job security dimension of maternity leave can also strengthen the attachment of women to the labor market.
- **Part-time work:** Part-time work is often seen as a way to facilitate the integration of women in the labor market, by allowing them to combine market work with family responsibilities. Thus, the availability of part-time work may be crucial to participation.¹³ The female component of the total share of part-time work, however, is likely endogenous, with the share of part-time workers increasing with higher FLP. This would result in a positive bias in our estimation. To help address this concern, we instrument with both the lagged values of the total share of part-time workers and the contemporaneous values of the male share of part-time workers.
- **Income support for children:** Child benefits in the form of either cash allowances or tax credits can also be used to increase FLP. (In OECD countries, tax credits are usually larger and more common than cash benefits.) Their overall effect is, however, ambiguous. If liquidity constraints prevent the second earner from working because she is unable to pay for child care, an increase in income can lead to an increase in FLP. However, if the impact is solely an income effect, this could actually lead to a reduction

¹³ However, the availability of part-time work may also be the result of a dual labor market system, in which part-time workers have less-comprehensive employment protection benefits.

in FLP. Thus, although income support can be justified based on equity and its impact on child poverty, the impact on FLP is likely to be lower than for in-kind benefits such as child care.

26. Our econometric results largely confirm our assumptions about incentives. The results are hampered to some extent, however, by a data set that is uneven in its coverage of the various policy variables over time and countries.¹⁴ Nonetheless, several key results emerge from the econometric analysis.

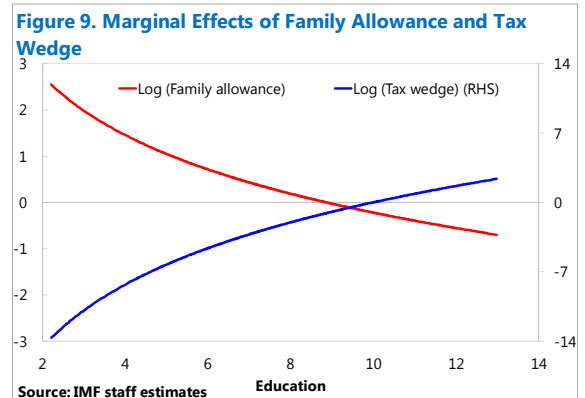
- There is no policy silver bullet.** Policy can make a difference, but the results are varied and are not as robust or as economically significant as the previous demographic results. We find a significant and positive effect from parental leave and family allowances and a significant but negative effect from tax wedges. The coefficients on the wage gap, tax benefits, and child care are inconsistent and for the most part do not differ significantly from zero. Furthermore, a 1 standard deviation change in policy is associated with less than a 0.5 percentage point increase in the FLP rate (Table 3). (The impact is measured at sample mean.)

Table 3. Effects on FLP by One S.D. Change of Each Variable

	Marginal Effect	Mean	S.D.	Effect by one S.D. Change (In percentage point)
Wage gap	-0.03	27.39	10.04	-0.27
Log (Family allowance)	0.20	1.20	0.70	0.14
Log (Leave)	0.23	3.67	1.61	0.36
Log (Child benefits)	-0.22	4.19	0.58	-0.13
Part-time incidence	-0.03	13.27	5.59	-0.19
Log (Childcare per child)	-0.02	6.88	1.69	-0.03
Log (Tax wedge)	-2.02	4.67	0.36	-0.73

Source: Fund staff calculations

- Women have strong preferences for part-time work.** FLP is significantly higher in countries with a higher share of part-time workers, which allows women to balance market work and family responsibilities. (See regression 6 in Table 8 and the scatter plots in Figures 28 and 29 in Appendix I.) However, causality likely runs in the opposite direction, with higher FLP leading to higher shares of part-time workers—not the other way around. This is confirmed in our instrumented regression in regression 7 in Table 8, in which the coefficient on part-time work becomes insignificant. An *F*-test also confirms that the instruments used are sufficiently powerful.
- The effectiveness of monetary support is income dependent.** This is because family allowances and tax wedges interact strongly with education levels (Figure 9). We interpret this result to mean that for women in low-paying jobs, tax incentives and cash payments could play a role in

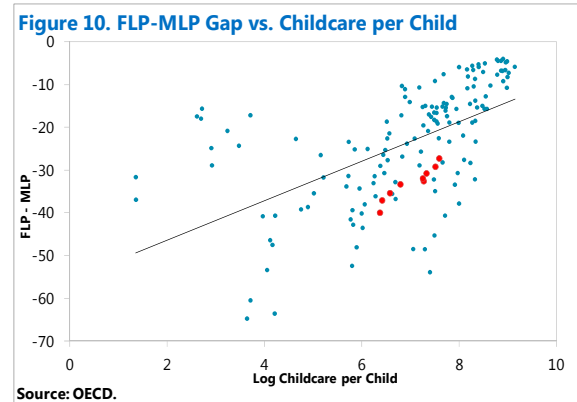


¹⁴ Education and the number of children per woman are included in all the regressions. The marriage variable is initially excluded to maximize the number of possible observations, and because its significance is less robust. Table 9 shows the same results with the noninstrumented marriage variable included. The conclusions remain largely unchanged.

determining labor market participation, but as women gain more education and hold higher-paying positions the effect of these policies becomes less important. Thus, for countries with higher levels of education, these monetary incentives—including Japan’s child allowance—may not lead to higher rates of FLP. (Nonetheless, within countries there is a possibility that these policies will affect the participation decision of women in low-income households.) The effect of tax benefits, meanwhile, is either close to zero or slightly negative.

- ***Parental leave policies must be generous to be effective.*** Leave policy is estimated with a squared term, with the results suggesting that the first term is negative and the second-squared term positive. Strictly interpreted leave policies are only effective at raising participation rates if sufficient leave time is provided (typically more than one and a half years). Thus, leave periods of two weeks or one month likely have no effect or a negative effect on participation.

27. One reason for the lack of robust policy results in Table 8 in Appendix I is that the variation in the independent policy variables is very small once we switch from an analysis on levels to an analysis on changes. Scatter plots in Figure 29 in Appendix I show that variation in many of our key policy variables—including, child care, leave, family allowance, and tax benefits—are stacked at zero. And the apparent strong positive correlation with FLP in the cross section, for example for child care, does not show up in the within-variation regressions (Figure 10 and Figure 28 in Appendix I).



28. To better understand the relationship in the cross section we also run decade-average regressions. The results are presented in Table 10 in Appendix I. With fewer observations it is more difficult to draw robust conclusions, but it is clear that both the wage gap variable and child care—which were insignificant in the within-variation country regressions—are strongly significant in the cross section. The size of the coefficients also suggests that changes in these policies are economically significant in the cross section. Either a 1 standard deviation decline in the gap between the wages of men and women (in manufacturing) or a 1 standard deviation increase in spending on child care can increase labor participation by as much as 7.5 percentage points (Table 11 in Appendix I). Parental leave also appears to be important, but due to multicollinearity with other family-friendly policy variables, it is insignificant in the multivariate regressions.

III. WHY IS JAPAN DIFFERENT?

29. To explore why Japan is different, this section uses the estimated econometric results from the previous section to quantify the impact of policies and demographics on FLP. This

exercise can be done for both changes over time within countries and differences across countries. Methodological details are provided in Appendix III.

Explaining Differences over Time within Countries

30. Figure 31 in Appendix I looks at differences over time within countries: we decompose the percentage point change in each country's FLP into contributions from the explanatory variables. The decomposition is based on the estimates in column 13 of Table 8 in Appendix I, with the impact of the interactive and squared terms evaluated at each country's average value over time. There are several interesting findings.

- ***Much of the variation within countries is associated with demographic shifts.*** The number of children per woman explains on average about one-fifth of the within-variable variation in the 22 OECD countries in the sample and more than one-half of the within-variable variation in three countries (Finland, Japan, Sweden). With education, demographics explain about one-quarter of the within-variable variation.
- ***The increase in FLP in Japan from 56.7 in 1980 to 70.3 in 2008 is in large part linked to the decline in the number of children per woman.*** A key factor driving this decline in the average number of children is the higher percentage of Japanese women choosing to remain single. In the past 20 years the percentage of unmarried women between the ages of 25 and 29 has more than doubled, to 59 percent in 2010 from 24 percent in 1980. As a result, there has been a steady rise in single-person households in Japan (Matsui, 2010).
- ***The number of part-time workers has increased with rising female participation rates.*** This is notably the case for Ireland, Italy, and the Netherlands. In the Netherlands, the FLP rate increased over two decades from one of the lowest to one of the highest in the OECD. Many attribute this rise to an increase in part-time work. However, whereas part-time work was a transitional phase in other advanced economies, in the Netherlands part-time work remains a popular choice. This is in part due to the existence of high-quality part-time work (Box 1).
- ***For many countries where there have been large increases in FLP over time—for example, Ireland, Netherlands, and Spain—our equation does not do a good job of explaining these changes.*** Demographics and some policies explain these changes to a certain extent, but something else that this equation does not quite capture is transforming these economies.

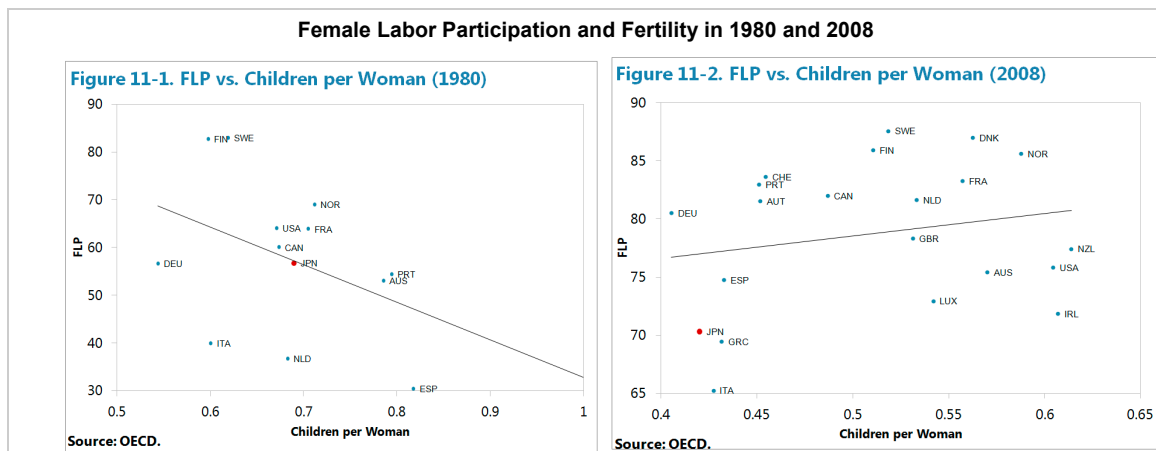
31. The demographic variables also do a good job of explaining changes over time within countries, which we interpret to mean that the coefficients are large enough to be economically significant. For Japan, for example, the decline in the number of children per woman from 4.2 to 3.7 from 1980 to 2008 is associated with a predicted increase in FLP of 8 percentage points, which is more than half of the full change in FLP over those years. Adding the effect of all the demographic variables together, in fact, overexplains changes in Japan. The importance of demographics is evident in other countries as well. For the United States, where fertility rates have remained favorable, the smaller decline in the number of children per woman from 4.2 to 4.1 from 1980 to 2008 explains 15 percent of the change in

FLP, with all demographic variables added together explaining close to 20 percent of the change.

Explaining Differences across Countries

32. Next we looked at the explanatory power of our equation for differences across countries (Figures 32 and 33 in Appendix I). Figure 32 decomposes the percentage deviation for each country's female participation rate from the OECD average using again the estimates in column 13 of Table 8 in Appendix I.¹⁵ The impact of the interactive and squared terms is evaluated at each country's current value. Figure 33 decomposes the percentage deviations using the less robust cross-sectional regressions in Table 9, using the estimates in column 13.

- Policies are more important in explaining differences across countries than in explaining differences over time within countries.*** The key policy variables are the availability of part-time work, the wage gap in manufacturing, and public expenditure on child care. Child care expenditure helps explain to some extent why the Scandinavian countries have higher participation rates and perhaps why the United States is now below the OECD average. Part-time work seems to be very important for the Netherlands in the cross section as well.
- Analogously, demographic factors are relatively less important in the cross section than in the time series.*** This is noticeable in the relationship between the number of children per woman and FLP (Figures 11-1 and 11-2). In 1980 a cross section of countries shows a somewhat negative correlation, consistent with our regression estimates. But in 2008, the correlation turns seemingly positive. What this possibly highlights is that the importance of demographics diminishes or changes as countries' demographics converge.



- Very little of the difference in participation rates between Japan and the OECD is explained.*** A somewhat lower than average level of support for child care and a higher

¹⁵ Assuming the estimated coefficients in Table 8 of the difference equation (3) are also the unbiased estimates of the coefficients in equation (1), these estimates can be used to explain differences across countries.

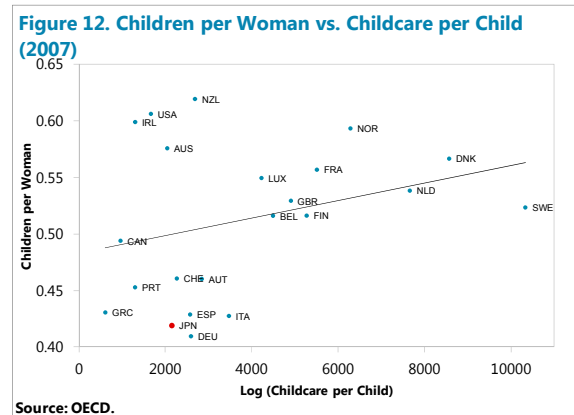
wage gap are small negatives for female participation rates, while demographics tend to be positives. The net effect is that the resulting unexplained residual using either equation differs little from the starting percentage deviation from the OECD average.

Explaining the Residuals

33. The large unexplained residuals or country fixed effects in both within- and across-country decompositions suggest the need for some complementary qualitative analysis to help explain many of the observed differences across countries.

- *In the United States and Canada, for example, FLP rates tend to be relatively higher despite low policy support.* This in part reflects high education levels but also likely reflects the availability of market-based child care and other child support services, which are not captured in our policy variables.

- *In the Scandinavian countries, where FLP rates are the highest among the OECD, a family-friendly set of government policies seems to have positively affected not only labor force participation but also overall fertility rates.* If countries with high immigration are excluded in Figure 12, there is a clear positive correlation between family-friendly policies and higher fertility. The Scandinavian countries appear to have reached a threshold at which family-friendly policies and labor force participation are part of their culture, something that cannot be easily captured by regression analysis (Box 2).



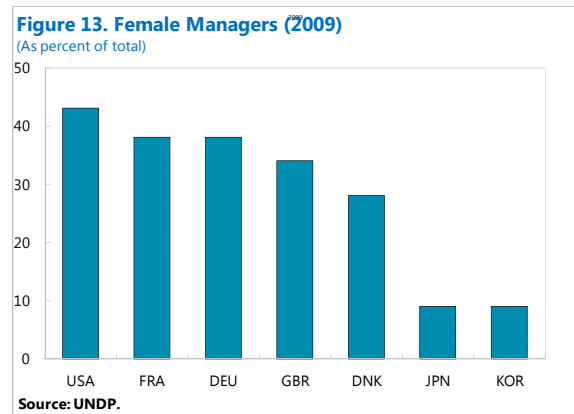
- In the case of Japan, there is also a large residual when the comparison is made on a cross-country basis. This relates in part to Japan's unique job market, which is discussed in more detail below.

34. To summarize, our findings suggest that demographic changes are strongly associated with changes in aggregate participation rates within countries over time and that policies increasingly explain differences across countries. For Japan, the model helps explain the recent rise in participation rates, but the model does not convincingly capture the characteristics of Japan's economy that set it apart in cross-country comparisons. We think this is perhaps related to elements of the labor market that are not captured by the model, including decisions both at initial entry in the labor market and when women take leave to bear children. We believe that these effects are unlikely to have been fully captured by the regression analysis. In the next section we will look at policies to change this environment.

IV. WOMEN TO THE RESCUE: POLICIES TO RAISE FLP IN JAPAN

35. One of the more striking characteristics of Japan’s labor force is the paucity of female managers, with the ratio of female managers at just 9 percent in 2009 compared with 43 percent in the United States

(Figure 13). The trend is a result not only of low female participation rates, but also of current hiring practices, promotion policies, and lack of public and private sector policies that promote work-family balance. Korea—with similar hiring practices—is the only country that shares a similar disparity. This problem, of course, is intimately related to low FLP rates. In this section we review the current system and discuss possible changes to Japan’s policy framework, with the aim of raising not only FLP rates but also the share of female managers.



A. Hurdle 1: Employment and Promotion Policies

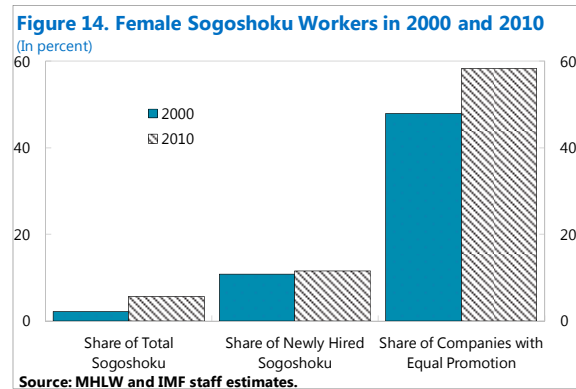
36. A potential challenge to higher FLP is limited opportunity to enter career positions (*sogoshoku*). The most important individual labor market decision in Japan is typically made following graduation from postsecondary school, when jobs with implicit lifetime employment guarantees are filled. As a result, most employees do not make substantial job shifts during their prime working years, and therefore decisions made at this early juncture lead to the many inequities that exist in the current employment system. This includes not only the low level of female career employees but also the increasing number of nonregular workers among the young.

37. For women, the key decision at this juncture is often between noncareer positions and career positions at large corporations.¹⁶ Career positions pay more and usually include significant investment in human capital over a lifetime of employment at a corporation. Noncareer positions, in contrast, are filled predominantly by women, pay less, and usually include less demanding tasks, with little investment in human capital development. Corporations begin their selection processes for long-term career advancement soon after this initial hiring decision and give long-term binding employment contracts. Potential employees also use this occasion to signal their long-term intentions about employment with the corporation. From the corporation’s perspective, the aim of the system is to minimize the risk of early retirement of women (Yamaguchi, 2008).

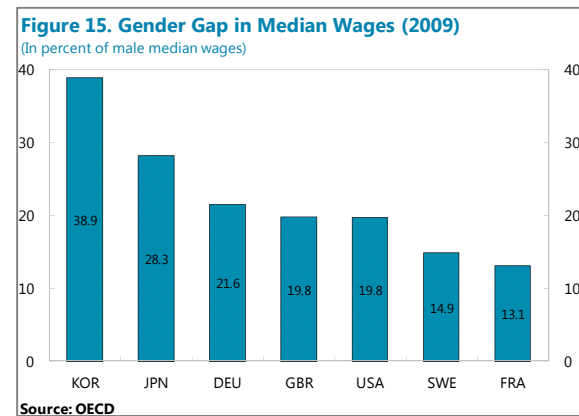
¹⁶ We use the terms “career position” and “noncareer position” to describe the difference between *sogoshoku* (総合職) and *ippansyoku* (一般職) positions, respectively.

38. The result of this hiring system is that there are very few women in career path positions within large corporations (Figure 14). A survey in 2010 found that women make up just 6 percent of career employees, which is consistent with the low level of female managers overall.¹⁷ The share of women in these categories has been on the rise (up from 2.2 percent in 2000), because a higher share of women are being recruited into these positions at the start of their careers (12 percent in 2010), but the level remains very low by international standards.

Moreover, for women who do enter career-track positions, the path to promotion is not always easy. The same survey found that at more than half the firms in the sample, top-performing male employees were one or more steps ahead of top-performing female employees in the promotion cycle.



39. This two-track system has also led to a significant wage gap between men and women (Figure 15).¹⁸ Although the size of the gap has declined over time, from 42 percent in 1980 to 28 percent in 2009—as measured by the difference in median wages between men and women—it is still significant by international standards. Japan’s gap is nearly twice that of Sweden but still smaller than that of Korea. Researchers using micro panel data sets have also found that the wage gap between men and women cannot be explained by differences in productivity levels, and that the gap remains unreasonably large (Abe, 2005; Kawaguchi, 2007).¹⁹



40. Clearly, increasing both women’s wages and the number of women in career positions would increase women’s attachment to market work. Achieving this, however, will likely require efforts on multiple fronts.

¹⁷ The sample size of this Ministry of Health, Labor, and Welfare (MHLW) survey is both small and non-random. In 2000 the survey was conducted with 215 firms, and in 2010 there were 129 firms in the sample. An even smaller number of firms were able to answer the question on promotion: either the firm had not hired career female employees in the past or the female employees who were hired had already left the firm. The sample size for this question was thus 75 firms in 2000 and 24 firms in 2010.

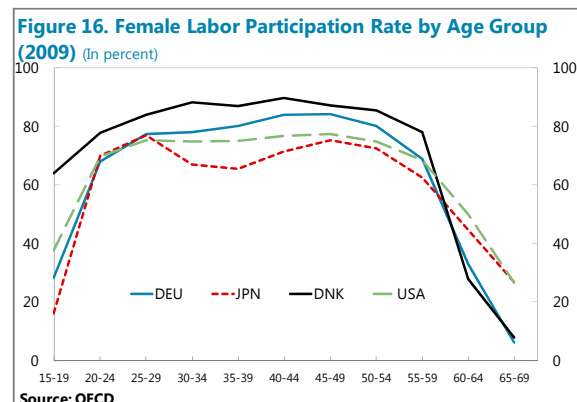
¹⁸ The higher share of women in nonregular positions has also likely contributed to the gap, with 52 percent of women holding nonregular positions relative to 17 percent of men.

¹⁹ The Institute for Research on Household Economics has conducted an annual longitudinal household survey of women since 1993. The survey has gathered data on a wide range of factors, including income, expenditures, savings, work patterns, and family relationships. The Japanese studies referenced in this section largely draw their evidence from this data set.

- *Corporations' employment and promotion policies must be more equitable.* The government first became actively involved in the resolution of discrimination against women at work in the 1980s, with the passage of the Equal Employment Opportunity Act in 1986, which banned gender discrimination in vocational training, welfare, retirement, and dismissal. A 1999 revision added hiring and promotion, and a 2007 revision added further protections for pregnant women. Penalties were introduced in 1999, including the disclosure of noncompliant companies, and these were further elaborated in 2007. The reality, however, is that for similar work, Japanese women typically get paid significantly less, and the government needs to better enforce these laws in terms of wages, employment, and promotion discrimination (Matsui, 2010).
- *Corporations need more flexible employment contracts to reduce hiring risks.* Introducing a new more flexible labor contract could increase incentives for hiring regular workers and allow a greater number of young and female workers to enter mainstream career paths with established firms. One possible option is to modify regular work contracts to include phased-in employment protection. Such a new regular work contract would gradually increase the dismissal costs to employers over the course of a worker's tenure. This would help reduce the hiring risks attendant to uncertainty about new workers' skills (or, more important, the length of their tenure) while maintaining employment protection for tenured employees.
- *Promoting diversity: women need more role models.* In part, the reason so few women are in career positions is that few of them opt for this career path in the first place. This self-selection process appears to begin early, with top universities continuing to show gender bias. At the University of Tokyo, for example, where entrance is based on test outcomes, less than 20 percent of the student body is female. Raising the number of women in high-profile career positions would encourage more women to choose career positions. There are some signs that this is beginning to take hold, with the Bank of Japan appointing its first female branch manager, Daiwa Securities placing four women on its board in 2009, and Shiseido setting a goal of raising the number of female managers to 30 percent by 2013 (Matsui, 2010). Further progress perhaps could be made by establishing new rules for the minimum number of female directors on company boards, following the lead of countries in Europe such as Norway, Spain, and France.

B. Hurdle 2: Balancing Family Responsibilities with Work

41. The second hurdle to a woman's career is usually the return to work after childbirth. Japan has FLP rates similar to comparator countries for women in their early twenties, but the participation rate drops off sharply for women in their late twenties and thirties, Japan's so-called M-curve (Figure 16). The unfortunate reality is that even today, roughly 60 percent of Japanese women quit working after giving birth to their first child. This partly reflects women's

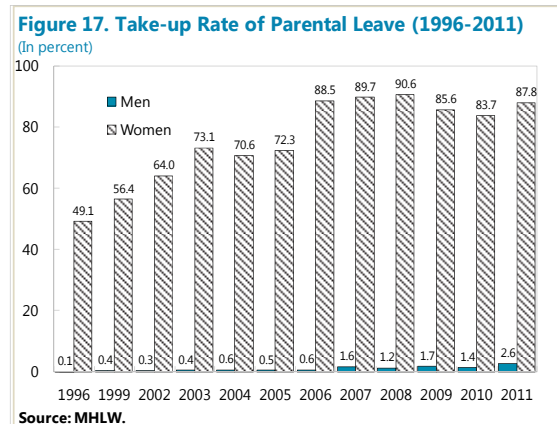


weaker attachment to the labor market due to the issues discussed above, including lower wages and fewer opportunities for career advancement, but it also reflects a weak support system for working mothers. In this subsection we concentrate on three policies that can change this environment: (1) leave policy to allow women to retain their current positions, (2) child care policies to reduce the time burden of family responsibilities, and (3) flexible work arrangements to allow women to better balance market work with family responsibilities.

Parental Leave Policy

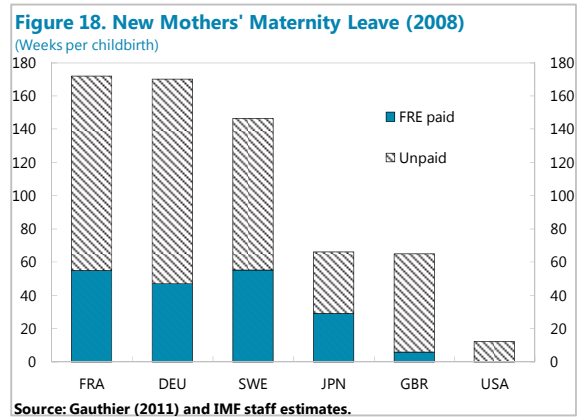
42. Japan's leave provisions are near OECD averages but generally less than the major European countries (see the figure in Box 2). Japan's system includes both maternity leave, which was established in 1947, and child care leave for children under one year old. The latter provision was established in 1991 and raised child-related leave from 14 to 58 weeks, bringing Japan broadly in line with the OECD averages. Working parents are also entitled to 50 percent of their previous income up to an income ceiling of 52 weeks. The Act on Parental Leave was further revised in 2005 to extend to some nonregular workers, but their share in the total remains low, at 4.3 percent in 2007 (Oishi, 2011).

43. Usage of leave policy has increased following the introduction of childcare leave, but few males make use of it (Figure 17). The proportion of eligible female workers taking child care leave increased from 49 percent in 1996 to 88 percent in 2011; however, the impact of the policy change may have been dampened by the increase in the share of ineligible nonregular workers. Meanwhile, fewer than 3 percent of fathers make use of child care leave (relative to 70 percent in Sweden) despite a system that allows both parents parental leave.



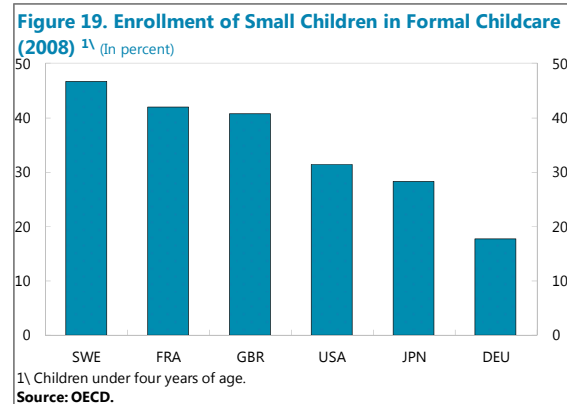
44. Evidence using micro data sets in Japan tends to confirm that the length of leave policy has a beneficial impact on women returning to work following childbirth. Waldfogel, Higuchi, and Abe (1999), for example, examine the impact of family leave on women's employment in the United Kingdom, the United States, and Japan. They confirm that longer parental leave increases the probability that mothers will return to their jobs after childbirth in all three countries and that the effect is particularly strong in Japan. Shigeno and Ohkusa (1998) and Suruga and Cho (2003) also confirm that women working at companies that support parental leave are more likely to have a baby and return to their jobs (22 percent, according to Suruga and Cho, 2003).

45. Our own cross-country results tend to confirm that for leave policy to be effective it needs to be longer. This is particularly true for Japan, where the probability of finding full-time work after a career interruption is very low: 18 percent for university educated women and 12 to 13 percent for less educated women (Ueda, 2007). *Thus, consideration should be given to extending the duration of leave policy to levels similar to those in France, Germany, and the Scandinavian countries (Figure 18).* At the same time, efforts could be made to encourage more males to share in parental leave.

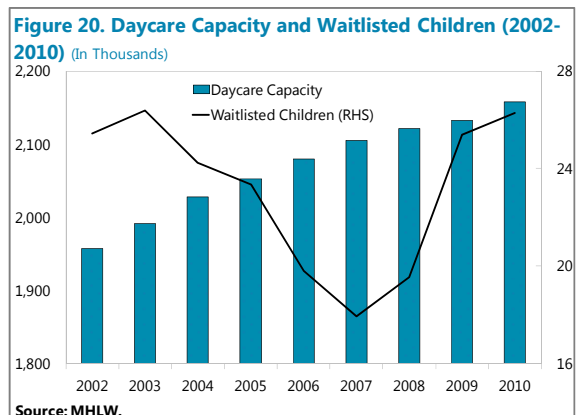


Child Care

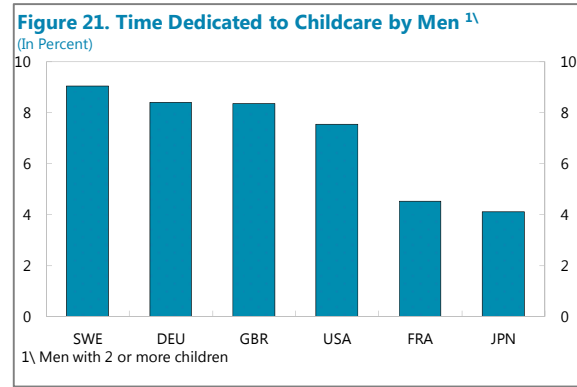
46. Usage of child care and early educational services in Japan is still low by international standards (Figure 19). The system is also fragmented between day care centers and kindergartens. Day care centers provide full-day child care for working mothers with children between the ages of zero and 6 and are regulated and funded by the Ministry of Health, Labor, and Welfare. Kindergartens, in contrast, usually provide child care for only part of the day for children ages 3 to 6 and are largely intended for traditional single-earner households. They are regulated and subsidized by the Ministry of Education.



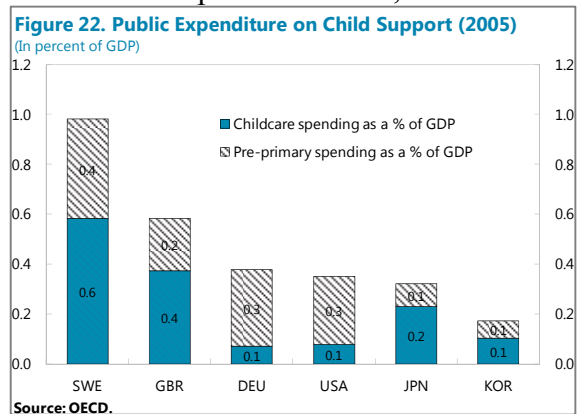
47. The demand for day care centers has increased with the rising number of two-earner households, with demand largely outstripping supply (Figure 20). The number of wait-listed children emerged as a defining social issue in the early 2000s, with the Koizumi government eventually targeting an increase in capacity from 203,000 to 215,000 children by 2009. This goal was met, but due to steady increases in female employment the number of children on day care waiting lists has largely remained unchanged at about 25,000 children. Informal reports suggest that potential unmet demand could be as high as one-third of current child care capacity (Nikkei, 2011). Kindergartens, meanwhile, remain underutilized (approximately 70 percent of capacity) because the population has aged and an increasing number of families require full-day child care.



48. Evidence using micro data sets in Japan also confirms that women’s participation decisions are indeed dependent on the time they must devote to child care. Waldfogel, Higuchi, and Masahiro (1999) estimate that having an infant child reduces participation rates by about 30 percent. Meanwhile, Sasaki (2002) finds that mothers living in the same house as their parents or in-laws are more likely to participate in market work, because these women can reduce their child-rearing responsibilities with support from the older generation. In contrast, women often report receiving little support from men in the household even after returning to work, likely reducing participation rates overall. Recent studies by Murakami (2007) and Sakamoto (2008) find that the time men spend on child care is the same regardless of a woman’s work decision. Thus, market work represents an additional burden for women. This is also borne out in cross-country comparisons (Figure 21).



49. Thus, increasing the supply of child care facilities should help reduce women’s child care burdens and support an increase in participation. *Increasing the supply of child care, however, will require focus on a variety of policy options, including deregulation and merging the two child care systems.* “One of the stumbling blocks continues to be excessive regulation of the daycare industry. Currently, a myriad of regulations—ranging from the floor space of the facility to the stringent licensing process—means that the supply of facilities remains limited relative to demand. Given constrained public finances, it is necessary to deregulate in order to encourage more private sector entrants into the sector” (Matsui, 2010, p.15). The government has also started the process of unifying the two systems, but progress is likely to be slow given different ministerial oversight responsibilities. Finally, some consideration could be given to a small reallocation of spending toward child care: Japan’s spending (as a percent of GDP) is still somewhat lower than in comparator countries (Figure 22).



Flexible Work Arrangements

50. Finally, there is a growing need for a more flexible work environment. Inflexible working hours and a lack of support for women in the workplace are often cited by women who drop out of the workforce after having their first child. In a more recent survey, working hours was the second-highest reason given for not participating in the workforce, behind only the additional burden of housework (Table 4). As Japan ages, this will become increasingly

Table 4. Reasons for Stay Out of Labor Market among Female Labor Force, 2010

Reason	Percent
Housework	33.9
Working hours	14.2
Health	12.1
Location	7.9
Job Characteristics	3.6
Others	28.2

Source: MIC

important, because more time will need to be devoted to the care of elderly parents at home. Employers have recently responded to some of these concerns by creating a new career position that does not require relocation,²⁰ but more needs to be done.

51. Adopting elements of the Dutch model, with its emphasis on part-time but equal work could be appropriate for Japan. (This could include, for example, equal hourly wages and other full-time benefits, such as parental leave and employment protection.) Japan already has a large number of nonregular (or part-time) workers and a high share of female workers in these positions. In the same survey mentioned earlier, 87 percent of the respondents indicated that if they were to participate in the labor force they would be interested mainly in part-time work. This is also largely consistent with our earlier findings that suggest the availability of part-time work is significantly correlated with higher female participation rates.

52. Achieving this, however, will require either closing the benefit gap between nonregular and regular work or by making regular work more flexible. The government is already making efforts to increase protection of nonregular workers, but over the long term it may be very difficult to equalize benefits between these two streams of work. Efforts instead could be made to make regular work more flexible. In both the Netherlands and Sweden laws were passed that give employees the right to request more flexible working hours. In the Netherlands, employees who have worked for more than one year can change their working hours, while in Sweden the regulations are more closely tied to child rearing, with parents eligible to work shorter hours until their child's eighth birthday.

C. Special Issues for Low-Income Households

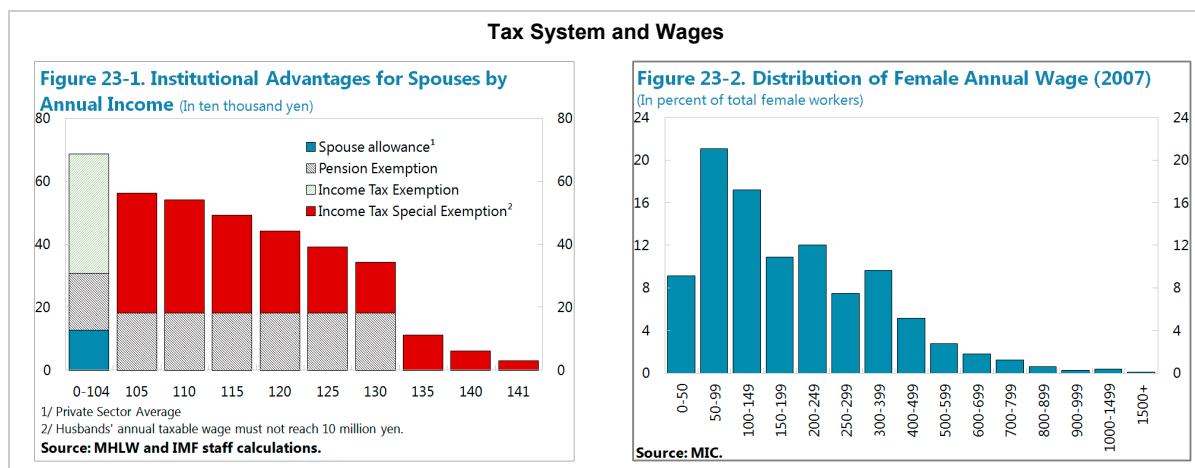
53. In this last section we explore the importance of monetary incentives for lower-income households. In the previous empirical section we found that both the tax system and family allowances could play a role in determining labor market participation, but the benefits decreased as the average education level of women improved. Thus, for Japan with its high level of educational attainment, these monetary incentives—including Japan's child-rearing allowance—may not be effective at raising overall rates of FLP. Nonetheless, they could be quite important for low-income households. Our discussions here focus on the tax system and Japan's child-rearing allowances.

Tax System

54. Japan's tax system, like that of many other advanced economies, has implicitly compensated women for not fully participating in the workforce. This is because tax systems were originally designed to treat families, rather than individuals, equally. In Japan, for example, prior to 2004 a head of household was able to claim both a dependent exemption and a special dependent exemption of ¥380,000 each, as long as the spouse's annual income was less than ¥1.03 million. This is also the income level that many private companies set for benefits on pensions and spouse allowances. As such, ¥1.03 million is often referred to as the "barrier to full-time female employment," so that at pay levels above this level many

²⁰ Career employees are usually expected to relocate at the company's request, with relocation occurring as often as every few years.

housewives prefer part-time to full-time work. A histogram of annual wages of female workers indeed indicates that just under one-third of workers earn less than the ¥1.03 million threshold (Figures 23-1 and 23-2).



55. In 2004, one of the special dependent exemptions was eliminated as part of a package of reforms implemented following the passage of the Basic Law for a Gender-Equal Society in 1999. (This law provides general guidelines for the promotion of gender equality in society but does not stipulate penalties.) In addition, eliminating both the pension exemption and the other dependent exemption is currently under review. *Reducing these tax distortions could encourage more married women to seek full-time employment.* This would have the additional benefit of reducing tax expenditures.

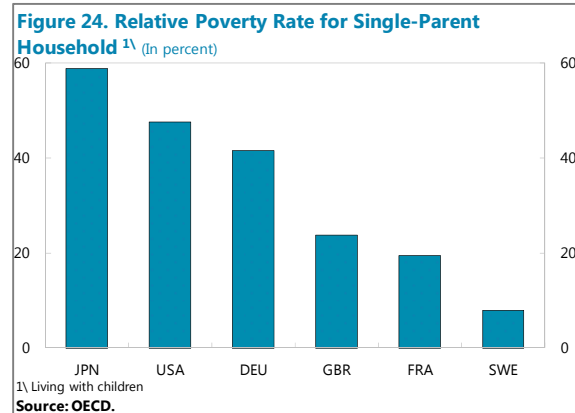
56. The short-term impact of removing tax disincentives on the female labor supply may not be large if implemented as a stand-alone measure. Analyses of micro data sets largely find a minimal impact from these distortions. Ishizuka (2003) finds that eliminating the distortions would lead to a small increase in regular full-time employment, but at the same time lead to a decrease in overall labor force participation. Murakami (2008), meanwhile, finds that the 2004 reforms had no discernible impact on participation choices in the short term. Given other constraints to female labor force participation, this outcome does not seem surprising.

Child and Child-Rearing Allowances

57. Japan started providing child allowances in the early 1970s to help pay for child-rearing costs as the number of working mothers increased and the number of multiple-generation households declined. Until 2010, monthly ¥5,000 or ¥10,000 child allowances were paid for children in elementary school or below and were conditional on income levels. In 2010, the Democratic Party of Japan renamed this allowance the “child-rearing allowance” and increased the overall benefits. The amount was increased to ¥13,000 per month, eligibility was raised to include junior high school students, and the new system was no longer conditional on income levels. Benefits, however, were recently reduced for a majority of households.

58. The effectiveness of these allowances on participation rates, however, is ambiguous. Our results suggest that they are effective only for low-income households; thus, if households' liquidity is constrained, an increase in income could lead to higher FLP. However, in-kind benefits, such as child care, are likely to be more effective. Moreover, Jaumotte (2003) finds a negative effect from tax benefits and argued that this is likely due to income effects.

59. Thus, perhaps a better rationale for child-rearing allowances is equity concerns and this benefit's impact on lowering child poverty. In fact, the relative poverty rate for single-parent household with children in Japan was the highest among OECD countries, and its proportion is 10 percent higher than in the United States (Figure 24). *As such, consideration should also be given to better targeting these allowances by conditioning the allowances on income.*



V. CONCLUSIONS

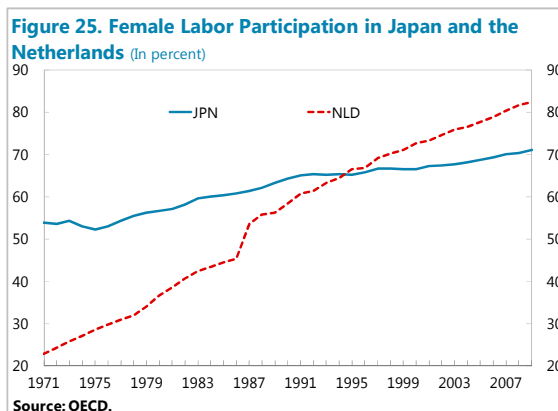
60. Japan is growing older faster than any other country in the world, and the consequence of this rapidly aging society is the sharpest labor force decline among advanced economies. To keep the potential growth rate from steadily declining Japan must find new ways to increase labor force participation. In this paper we explore the possibility of raising female labor participation rates.

61. Our findings suggest that demographic changes explain many of the changes in aggregate participation rates within countries over time. But more recently, policies have become increasingly important in explaining differences across countries.

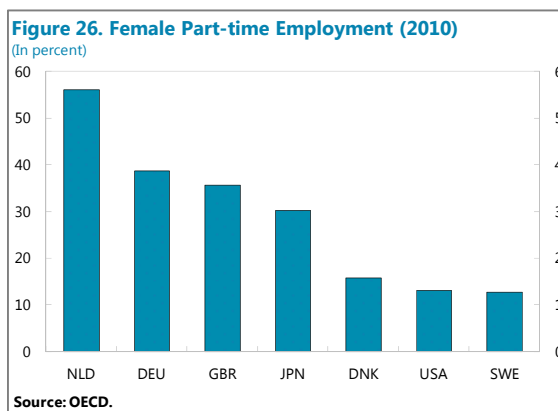
62. We argue that Japan must make two changes to achieve higher FLP rates. First, Japan should consider policies to increase the number of career-track female employees: it has by far the lowest rate of female managers among advanced economies. Increasing the number of women role models would help steer women toward market work. Second, Japan should provide better support for working mothers. A more flexible work environment combined with better child care facilities and longer leave policies would help reduce the number of women who exit the workforce after childbirth.

Box 1. The Netherlands' Part-Time Economy¹

The Netherlands has succeeded in dramatically improving the female labor participation (FLP) rate. In the 1970s, the FLP in the Netherlands was much lower than in Japan but it increased rapidly over the past four decades. In 1995, the FLP in the Netherlands surpassed that in Japan and is now almost at the same level as in Scandinavia. One of the main drivers is the high incidence of part-time jobs among female workers coupled with high education levels and well-compensated parental leave. Kenjoh (2005) points out that easy access to part-time jobs has especially improved the labor participation of new mothers in the Netherlands.



Female part-time employment in the Netherlands is the highest among OECD countries. The share of part-time work has historically been high for female workers (55 percent in 1983) and socially acceptable (OECD, 2004). However, the rapid increase in FLP is also a result of part-time working conditions that are equal to those of full-time employment. Negotiated adjustments among the government, employers, and unions reduced the barriers between full-time and part-time workers since the early 1980s (Rasmussen, Lind, and Visser, 2004). As a result, for example, the median hourly wage of part-time workers is now equal to that of full-time employees. In addition, part-time workers have the same social security coverage, employment protection, and rules as full-time workers. Switching from full-time to part-time employment is also relatively easy and happens frequently (OECD, 2004).



Moreover, the Netherlands enacted the Working Hours Adjustment Act in 2000. Under this law, all employees who have completed one year of continuous employment with their present employer have the right to change their working hours (Groenendijk, 2005). This law enables people to work more flexibly and spend more time working in the home, which is expected to further encourage women to join the labor market.

¹ The annual data correspond to January 1 for the population and labor force until 1986 and to annual or semestrial estimates from 1987.

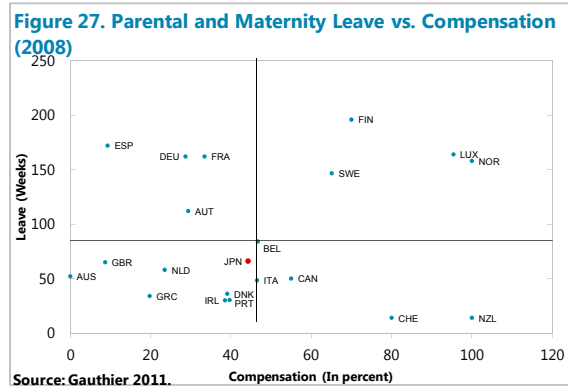
Box 2. Family-Friendly Sweden

Sweden's high female labor participation rate has been achieved mainly by improving the working environment for women with children. Sweden has well-developed parental leave, a highly subsidized child care system, and a strict shorter-working-hour policy. These systems result in high rates—over 90 percent—of women returning to employment after childbirth (Pylkkänen, 2003).

In Sweden, leave provisions are generous in terms of duration and compensation rates. Sweden established long and well-compensated maternity leave in the 1960s, and maternity leave was replaced by parental leave in 1974 (Gauthier, 2011; Gustafsson, Kenjoh, and Wetzels, 2002). Today, all parents are entitled to up to 450 days of compensated leave per child. Working parents are entitled to 80 percent of their previous income, up to an income ceiling of 360 days; for an additional 90 days they are assured a guaranteed level of compensation. The leave can be taken flexibly until children are 8 years old. In addition, the system allows both parents to share the leave, and about 70 percent of fathers make use of the parental leave and participate in child care at home.

Child care service is offered mainly by the government, and the coverage rates are high. The public child care system started to expand in Sweden during the 1960s, and coverage has continued to grow steadily (OECD, 2001). In 2000, 76 percent of children ages 1 to 5, and 67 percent of children ages 6 to 9 received public child care. Child care services are highly subsidized, but the fees have increased since the 1990s. In most cases, the cost depends on the number of children, time used, and parents' income.

In addition to those family policies, the law guarantees job security, with the assurance of the same or a comparable position once parents return from leave. In Sweden, there is a job-protection period of 18 months for parents of a newborn, and parents are also legally eligible to work shorter hours until their child's eighth birthday, with a corresponding reduction in wages.



APPENDIX I. ADDITIONAL TABLES AND FIGURES

Table 5. Number of Observations in the Dataset (1960-2008)

Country	FLP	Marriage rate	Number of children per woman	Education	Wage gap	Family allowance	Leave	Child benefits	Part-time incidence	Childcare per child	Taxwedge
AUS	44	7	50	51	49	49	51	37	9	28	22
AUT	16	38	50	51	49	49	51	37	15	20	9
BEL	27	38	48	51	49	49	51	37	27	28	15
CAN	34	38	50	51	49	49	51	37	34	10	22
CHE	19	38	50	51	49	49	51	37	19	18	9
DEU	40	38	50	51	49	49	50	37	27	28	22
DNK	27	38	50	51	49	49	51	37	27	28	22
ESP	38	37	50	51	49	49	51	37	23	28	22
FIN	47	38	50	51	49	49	51	37	21	28	22
FRA	42	38	49	51	49	49	51	37	27	28	22
FRA	42	38	49	51	49	49	51	37	27	28	22
GBR	26	36	50	51	49	49	51	37	27	12	22
GRC	27	38	49	51	49	49	51	37	27	18	0
IRL	34	36	50	51	49	49	51	37	27	28	9
ITA	40	38	45	51	49	49	51	37	27	28	15
JPN	48	37	50	51	49	49	51	37	8	28	9
LUX	27	38	50	51	49	49	51	37	27	28	0
NLD	39	38	50	51	49	49	51	37	25	28	22
NOR	38	38	50	51	49	49	51	37	21	22	16
NZL	24	37	50	51	49	49	51	37	24	28	9
PRT	36	38	50	51	49	49	51	37	24	28	9
SWE	47	37	50	51	49	49	51	37	12	28	22
USA	50	38	50	51	49	49	51	37	31	16	22
Total	770	797	1091	1122	1078	1078	1121	814	509	536	342

Sources: OECD and Gauthier (2010 and 2011).

Table 6. Latest Data Available

Country	FLP (%)	Marriage rate (%)	Number of children per woman	Education (Year)	Wage gap (%)	Family Allowance (PPP-USD)	Leave (Week)	Child benefits (PPP-USD)	Part-time incidence (%)	Childcare per child (PPP-USD)	Tax wedge
AUS	75.41	5.40	0.57	12.30	5.10	3.70	52	47.07	18.28	2047	1.43
AUT	81.53	4.33	0.45	8.72	23.97	3.43	112	49.82	16.80	2844	0.82
BEL	78.99	4.28	0.52	10.45	14.86	2.71	84	81.17	17.43	4494	1.16
CAN	81.97	4.60	0.49	11.40	34.28	1.59	50	40.92	11.69	964	1.29
CHE	83.59	5.34	0.45	9.50	23.44	2.47	14	63.98	24.41	2267	1.08
DEU	80.51	4.48	0.41	11.84	23.70	3.40	162	90.30	20.97	2596	1.46
DNK	86.98	6.70	0.56	9.97	14.14	1.77	36	45.48	9.49	8572	1.61
ESP	74.73	4.61	0.43	9.90	22.98	0.59	172	21.50	9.87	2575	0.86
FIN	85.89	5.58	0.51	10.24	16.03	1.98	196	23.79	6.35	5274	0.44
FRA	83.25	4.21	0.56	9.91	14.79	1.59	162	34.36	11.67	5511	0.52
GBR	78.29	5.23	0.53	9.31	19.94	1.90	65	30.47	18.60	4910	1.26
GRC	69.45	5.16	0.43	9.90	18.03	0.30	34	45.70	7.45	613	3.07
IRL	71.83	5.13	0.61	11.60	15.97	2.99	30	60.05	18.70	1304	3.07
ITA	65.24	4.21	0.43	8.78	18.02	3.54	48	39.73	15.12	3474	0.78
JPN	70.30	5.80	0.42	11.02	23.15	4.64	66	26.20	15.20	2151	0.88
LUX	72.93	4.10	0.54	9.67	27.10	4.80	164	115.52	13.62	4228	0.88
NLD	81.61	4.49	0.53	10.81	17.83	1.86	58	37.01	28.92	7662	1.00
NOR	85.59	4.98	0.59	12.69	-6.93	1.98	158	34.90	13.28	6287	0.98
NZL	77.42	5.13	0.61	12.30	18.64	4.12	14	47.53	17.06	2689	1.01
PRT	82.95	4.37	0.45	7.27	30.91	0.92	30	29.44	5.53	1301	0.46
SWE	87.55	5.24	0.52	11.84	10.13	2.13	147	26.84	9.25	10334	0.60
USA	75.81	7.30	0.60	12.46	20.03	0.00	12	49.71	7.31	1668	1.94
OECD 22 Mean	78.72	5.03	0.51	10.54	18.46	2.38	84.82	47.34	14.41	3807.58	1.13
JPN / OECD 22 Mean ¹	-0.11	0.95	-1.34	0.34	0.54	1.69	-0.31	-0.91	0.13	-0.64	-0.42
G5 ² Mean	79.96	5.16	0.52	10.99	22.55	1.70	90.20	49.15	14.05	3129.95	1.29
JPN / G5 Mean ³	-3.26	0.51	-1.28	0.03	0.08	2.44	-0.35	-0.95	0.21	-0.49	-0.80

Sources: OECD and Gauthier.

1/ (Japan-OECD 20 Mean) / SD.

2/ G5: Canada, France, Germany, United Kingdom, United States.

3/ (Japan-G5 Mean) / SD.

Table 7. Correlation among All Variables

Level	FLP	Marriage rate	Log (Number of children per woman)	Log (Education)	Wage gap	Log (Family allowance)	Log (Leave)	Log (Child benefits)	Part-time incidence	Log (Childcare per child)	Log (Tax wedge)
FLP	1.00										
Marriage rate	-0.28	1.00									
Log (Number of children per woman)	0.41	0.41	1.00								
Log (Education)	0.44	-0.03	-0.02	1.00							
Wage gap	-0.34	0.39	0.17	-0.20	1.00						
Log (Family allowance)	0.26	-0.47	-0.38	0.16	-0.25	1.00					
Log (Leave)	0.35	-0.53	-0.36	-0.04	-0.34	0.35	1.00				
Log (Child benefits)	0.05	-0.21	-0.19	0.12	-0.11	0.51	0.18	1.00			
Part-time incidence	0.19	-0.23	-0.01	0.32	-0.05	0.42	-0.18	0.20	1.00		
Log (Childcare per child)	0.65	-0.28	-0.18	0.27	-0.50	0.28	0.39	0.17	0.09	1.00	
Log (Tax wedge)	0.08	0.32	0.22	0.56	0.16	0.00	-0.57	0.45	0.27	-0.03	1.00
Three-year Chnange	FLP-DLP	Marriage rate	Log (Number of children per woman)	Log (Education)	Wage gap	Log (Family allowance)	Log (Leave)	Log (Child benefits)	Part-time incidence	Log (Childcare per child)	Log (Tax wedge)
FLP-DLP	1.00										
Marriage rate	-0.12	1.00									
Log (Number of children per woman)	-0.27	-0.07	1.00								
Log (Education)	0.23	0.03	-0.08	1.00							
Wage gap	0.11	-0.10	-0.10	-0.05	1.00						
Log (Family allowance)	-0.05	0.01	0.05	-0.09	0.04	1.00					
Log (Leave)	-0.02	-0.11	-0.03	0.00	-0.02	-0.03	1.00				
Log (Child benefits)	-0.10	0.05	0.08	-0.02	0.04	0.37	-0.09	1.00			
Part-time incidence	0.42	-0.17	-0.03	0.22	0.25	0.07	-0.03	0.02	1.00		
Log (Childcare per child)	0.00	0.02	-0.02	-0.01	0.03	0.05	0.09	0.17	0.01	1.00	
Log (Tax wedge)	0.11	0.08	-0.13	0.10	-0.02	0.19	-0.14	0.70	0.07	0.13	1.00
Ten-year Average	FLP-DLP	Marriage rate	Log (Number of children per woman)	Log (Education)	Wage gap	Log (Family allowance)	Log (Leave)	Log (Child benefits)	Part-time incidence	Log (Childcare per child)	Log (Tax wedge)
FLP-DLP	1.00										
Marriage rate	-0.39	1.00									
Log (Number of children per woman)	-0.58	0.53	1.00								
Log (Education)	0.46	-0.23	-0.22	1.00							
Wage gap	-0.44	0.45	0.35	-0.18	1.00						
Log (Family allowance)	0.24	-0.35	-0.12	-0.20	-0.25	1.00					
Log (Leave)	0.37	-0.69	-0.64	0.03	-0.35	0.27	1.00				
Log (Child benefits)	-0.03	-0.08	-0.02	0.00	-0.10	0.42	0.18	1.00			
Part-time incidence	0.22	-0.21	-0.09	0.37	-0.08	0.47	-0.07	0.15	1.00		
Log (Childcare per child)	0.58	-0.53	-0.45	0.34	-0.36	0.52	0.51	0.36	0.26	1.00	
Log (Tax wedge)	0.12	0.31	0.18	0.56	0.12	0.07	-0.51	0.43	0.43	0.05	1.00

Source: Fund staff calculations

Table 8. Gap between FLP and MLP, and Demographic and Policy Variables

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
	Thre-year Change of the Gap between FLP and MLP														
Log (Number of children per woman)	-16.345*** [6.017]	-16.533*** [6.197]	-15.625*** [5.748]	-16.103*** [6.106]	-21.012*** [5.896]	-26.522*** [6.458]	-19.142* [10.527]	-20.356** [8.365]	-38.652*** [7.457]	-15.345*** [5.787]	-19.491*** [5.856]	-23.826*** [5.980]	-16.048 [9.896]	-16.738 [10.865]	-22.404** [10.067]
Log (Education)	10.765*** [3.428]	10.826*** [3.523]	13.568*** [3.407]	10.076*** [3.489]	9.015*** [2.665]	1.325 [3.049]	10.224** [4.131]	7.828* [4.031]	-33.559** [13.270]	13.014*** [3.443]	11.850*** [2.906]	4.590* [2.550]	12.291*** [4.112]	10.420** [4.581]	-6.162 [28.014]
Wage gap		-0.027 [0.049]													
Log (Family allowance)			3.995 [2.617]							4.240 [2.591]	5.061** [2.438]	10.134*** [3.417]	9.715*** [3.435]	10.889*** [3.778]	5.440 [9.612]
Log (Family allowance) * Log (Education)			-1.829 [1.180]							-1.974* [1.159]	-2.314** [1.100]	-4.348*** [1.635]	-3.980** [1.699]	-4.437** [1.806]	-2.511 [4.748]
Log (Leave)				-0.934*** [0.360]						-0.948*** [0.335]	-0.726** [0.357]	-1.016** [0.405]	-1.096** [0.431]	-1.726*** [0.616]	-1.682* [0.989]
Squared Log (Leave)				0.158** [0.073]						0.162** [0.068]	0.137* [0.070]	0.228*** [0.078]	0.245*** [0.085]	0.320*** [0.111]	0.318* [0.163]
Log (Child benefits)					-0.224 [0.399]						-0.534 [0.406]	-0.573* [0.329]	-0.424 [0.293]	-0.410 [0.607]	-2.390 [2.233]
Part-time Incidence						0.649*** [0.107]	-0.034 [0.291]					0.643*** [0.106]	0.006 [0.284]	-0.013 [0.391]	-0.145 [0.284]
Log (Childcare per child)								-0.020 [0.192]						-0.110 [0.189]	-0.161 [0.221]
Log (Tax wedge)									-20.821*** [7.127]						-9.340 [16.605]
Log (Tax wedge) * Log (Education)									9.056*** [2.998]						5.416 [7.390]
Observations	229	229	229	229	214	146	124	141	90	229	214	146	124	90	52
F-test (Number of children per woman)	217.76	215.64	176.45	223.38	230.31	40.49	12.61	105.87	16.19	186.84	217.80	51.14	18.40	17.97	7.57
F-test (Part-time incidence)							24.64						26.86	13.24	6.16

Clustered standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

Note: We introduced structural break terms for Germany (1991), Ireland (1985), Japan (1968), Netherlands (1987), and Portugal (1978) due to structural breaks. Number of children per woman is instrumented in all columns, and part-time incidence is instrumented in column 7, 13, 14, and 15.

Source: Fund staff calculations

Table 9. Gap between FLP and MLP, and Demographic and Policy Variables including Marriage Rate

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
	Three-year Change of the Gap between FLP and MLP												
Marriage rate	-0.594*	-0.598*	-0.604*	-0.574*	-0.596*	-1.025*	-0.940**	-1.817***	-0.583*	-0.573*	-1.262**	-1.211**	-2.097***
	[0.338]	[0.337]	[0.345]	[0.328]	[0.339]	[0.554]	[0.421]	[0.459]	[0.335]	[0.338]	[0.540]	[0.571]	[0.639]
Log (Number of children per woman)	-24.070***	-24.004***	-23.321***	-23.574***	-24.084***	-24.939**	-21.625***	-43.245***	-22.765***	-22.554***	-20.993**	-18.265*	-27.323**
	[6.409]	[6.443]	[6.222]	[6.506]	[6.393]	[10.967]	[8.347]	[7.894]	[6.283]	[6.327]	[10.059]	[10.885]	[11.801]
Log (Education)	6.549**	6.484**	9.340***	6.165**	6.573**	7.307*	9.344**	-50.175***	9.108***	9.251***	10.891**	11.443**	-11.774
	[3.032]	[3.085]	[2.959]	[3.009]	[2.936]	[3.734]	[3.857]	[15.709]	[2.868]	[2.961]	[4.731]	[5.169]	[34.676]
Wage gap		0.012											
		[0.044]											
Log (Family allowance)			3.925*						4.197*	4.582*	12.753***	11.912***	1.056
			[2.355]						[2.351]	[2.434]	[4.306]	[4.527]	[11.812]
Log (Family allowance)			-1.819*						-1.964*	-2.108*	-5.508***	-4.996**	-0.212
* Log (Education)			[1.066]						[1.066]	[1.085]	[2.126]	[2.256]	[5.875]
Log (Leave)				-0.596					-0.629	-0.718*	-1.620***	-1.913***	-1.971**
				[0.402]					[0.401]	[0.425]	[0.464]	[0.648]	[0.936]
Squared Log (Leave)									0.121	0.132*	0.355***	0.386***	0.344*
									[0.079]	[0.076]	[0.096]	[0.122]	[0.196]
Log (Child benefits)					0.057					-0.312	-0.264	-0.245	-2.345
					[0.544]					[0.611]	[0.446]	[0.538]	[2.052]
Part-time Incidence						-0.083					-0.012	0.001	-0.139
						[0.281]					[0.264]	[0.266]	[0.335]
Log (Childcare per child)							0.007					-0.149	-0.077
							[0.165]					[0.147]	[0.179]
Log (Tax wedge)								-29.967***					-11.301
								[8.174]					[19.274]
Log (Tax wedge) * Log (Education)								13.276***					5.762
								[3.507]					[8.845]
Observations	184	184	184	184	184	103	135	85	184	184	103	90	52
F-test (Number of children per woman)	193.26	190.69	156.75	198.18	184.53	10.11	93.08	12.54	165.06	172.98	15.44	18.09	7.12
F-test (Part-time incidence)						14.94					14.75	12.14	7.08

Clustered standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

Note: We introduced structural break terms for Germany (1991), Ireland (1985), Japan (1968), Netherlands (1987), and Portugal (1978) due to structural breaks. Number of children per woman is instrumented in all columns, and part-time incidence is instrumented in column 6, 11, 12, and 13.

Source: Fund staff calculations

Table 10. Regression of FLP on Demographic and Policy Variables

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
							FLP						
Log (Number of children per woman)	-16.740*** [5.794]	-16.734*** [5.822]	-16.346*** [5.717]	-16.940*** [5.821]	-20.372*** [6.156]	-18.738*** [6.697]	-20.017** [8.681]	-36.446*** [7.715]	-16.536*** [5.736]	-19.758*** [6.131]	-17.515*** [6.613]	-17.081** [7.264]	-22.533** [11.490]
Log (Education)	7.728* [4.280]	7.725* [4.315]	9.664** [4.123]	7.079* [4.245]	6.123 [3.753]	-0.940 [4.381]	4.842 [5.006]	-27.679** [12.367]	9.082** [4.074]	8.047** [3.680]	2.616 [3.991]	1.063 [4.776]	22.419 [22.504]
Wage gap		0.001 [0.049]											
Log (Family allowance)			2.903 [2.702]						3.068 [2.683]	4.064 [2.628]	10.073*** [2.814]	10.664*** [3.302]	-0.531 [6.361]
Log (Family allowance) * Log (Education)			-1.450 [1.218]						-1.549 [1.200]	-1.969* [1.167]	-4.573*** [1.416]	-4.543*** [1.572]	0.782 [3.204]
Log (Leave)				-0.774*** [0.289]					-0.802*** [0.273]	-0.819*** [0.305]	-0.581 [0.354]	-0.083 [0.513]	-0.764 [0.743]
Squared Log (Leave)				0.126* [0.072]					0.136* [0.070]	0.136* [0.072]	0.088 [0.081]	0.039 [0.090]	0.113 [0.089]
Log (Child benefits)					-0.330 [0.383]					-0.550 [0.422]	-0.234 [0.376]	0.604 [0.558]	-0.889 [2.036]
Part-time incidence						0.576*** [0.162]					0.594*** [0.159]	0.632*** [0.146]	0.537*** [0.120]
Log (Childcare per child)							-0.035 [0.176]					-0.107 [0.134]	-0.039 [0.129]
Log (Taxwedge)								-16.028** [7.149]					13.847 [13.247]
Log (Taxwedge) * Log (Education)								6.778** [3.059]					-5.867 [5.756]
Observations	225	225	225	225	211	141	138	88	225	211	141	103	58

Clustered standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

Source: Fund staff calculations

Table 11. Effects on FLP by One S.D. Change of Ten-year Average Variables

	Marginal Effect	Mean	S.D.	Effect by one S.D. Change (In percentage point)
Marriage rate	-4.55	6.08	1.33	-6.06
Log (Number of children per woman)	-43.85	4.16	0.23	-10.11
Log (Education)	27.86	2.12	0.32	8.83
Wage gap	-0.79	27.03	9.59	-7.57
Log (Family allowance)	7.28	1.20	0.60	4.40
Log (Leave)	3.90	3.86	1.54	6.01
Log (Child benefits)	-1.04	4.20	0.52	-0.54
Part-time incidence	0.52	13.00	5.54	2.87
Log (Childcare per child)	4.90	6.93	1.56	7.62
Log (Tax wedge)	4.03	4.68	0.35	1.40

Source: Fund staff calculations

Figure 28. Scatter Plots of Each Variable in Levels

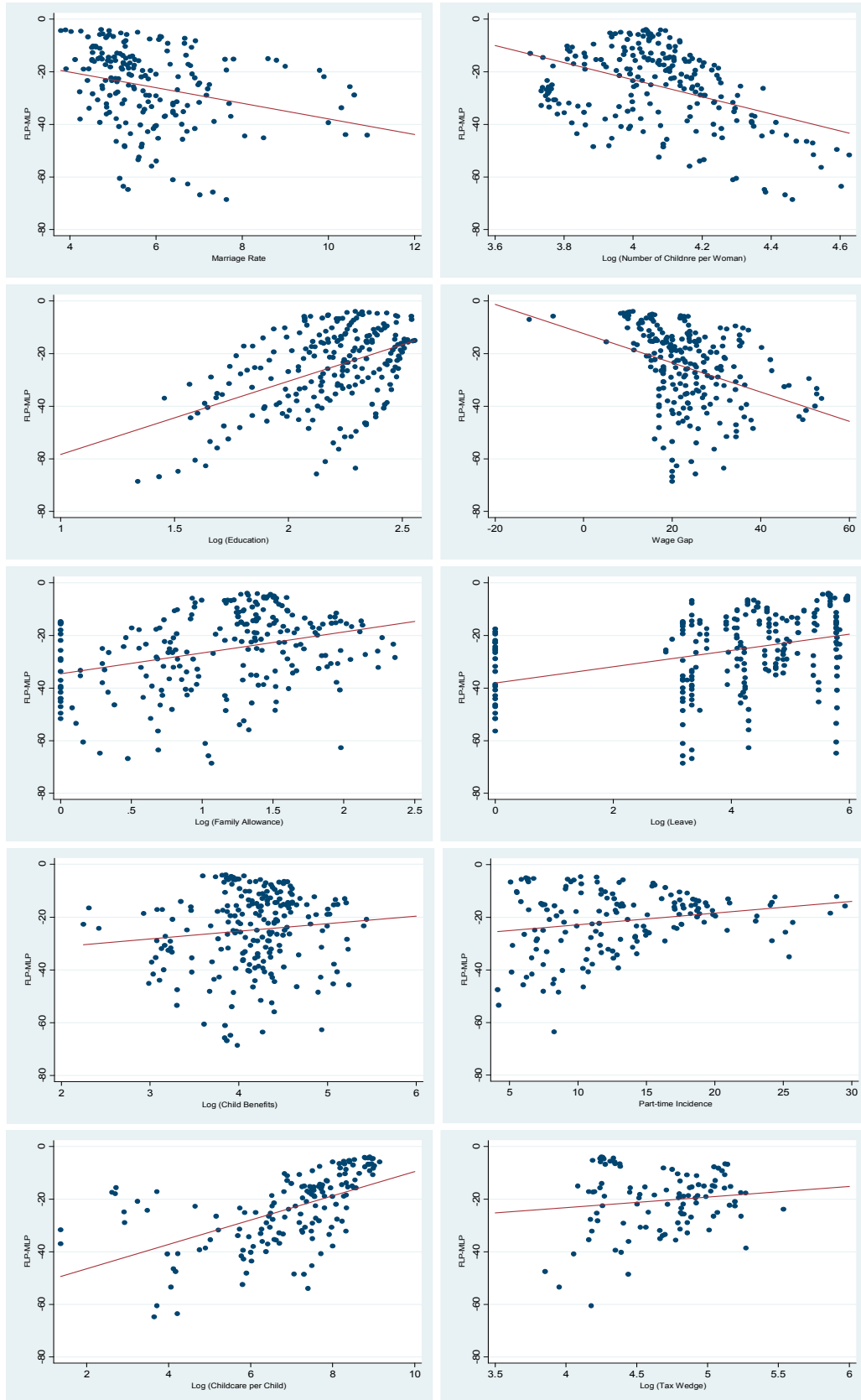


Figure 29. Scatter Plots of Each Variable in Changes

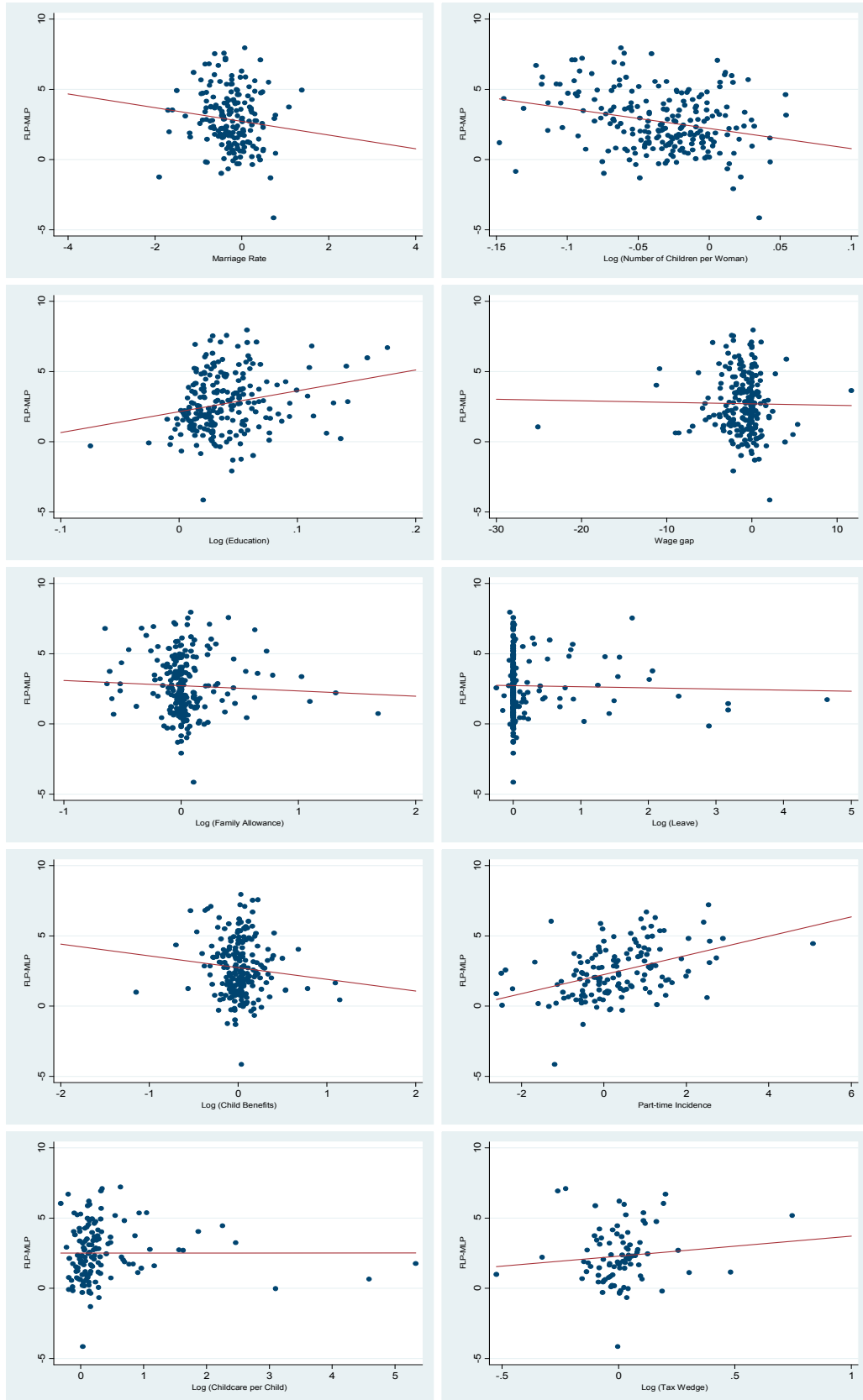


Figure 31. Within Variable Explanation

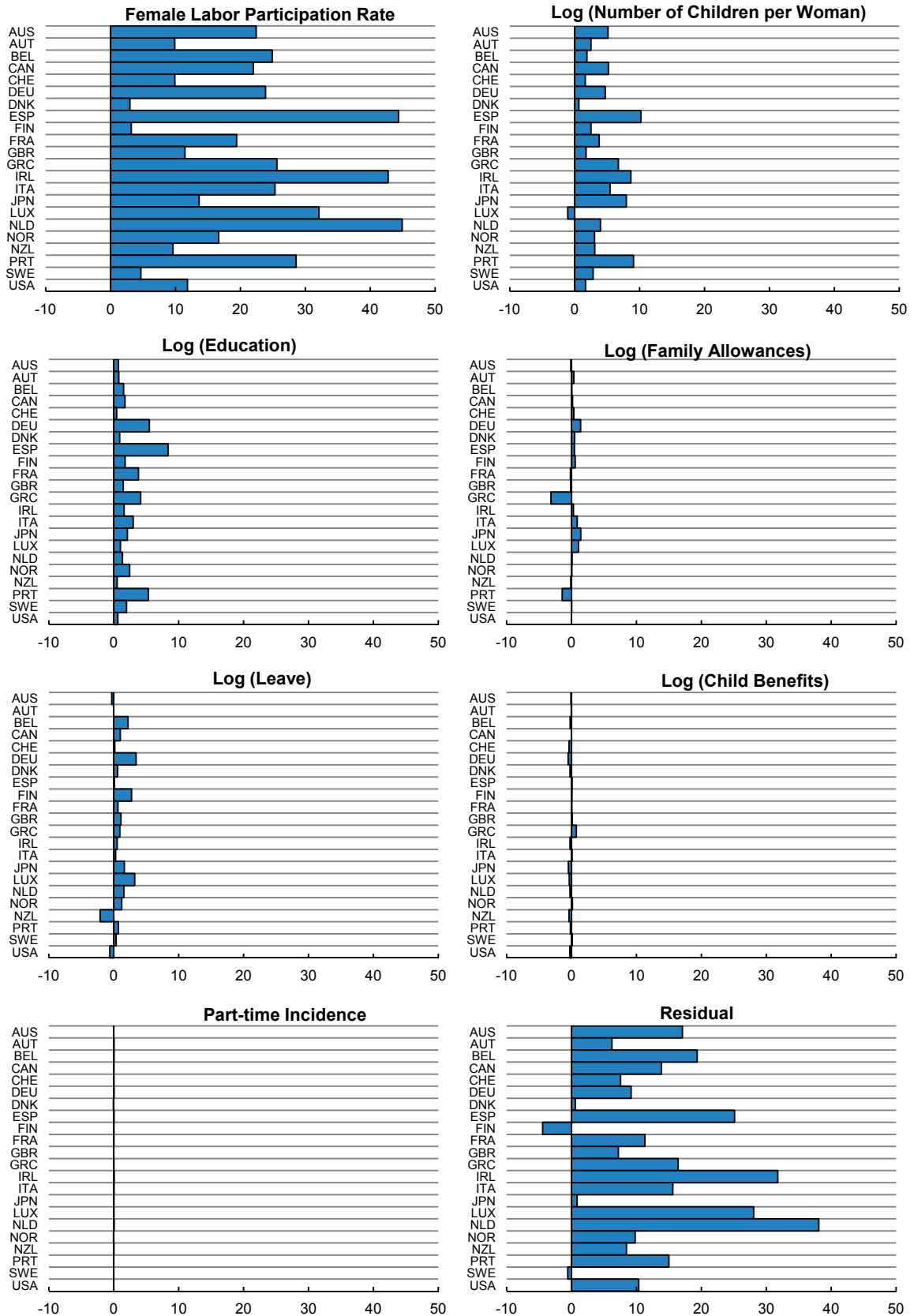


Figure 32. Cross Section Explanation

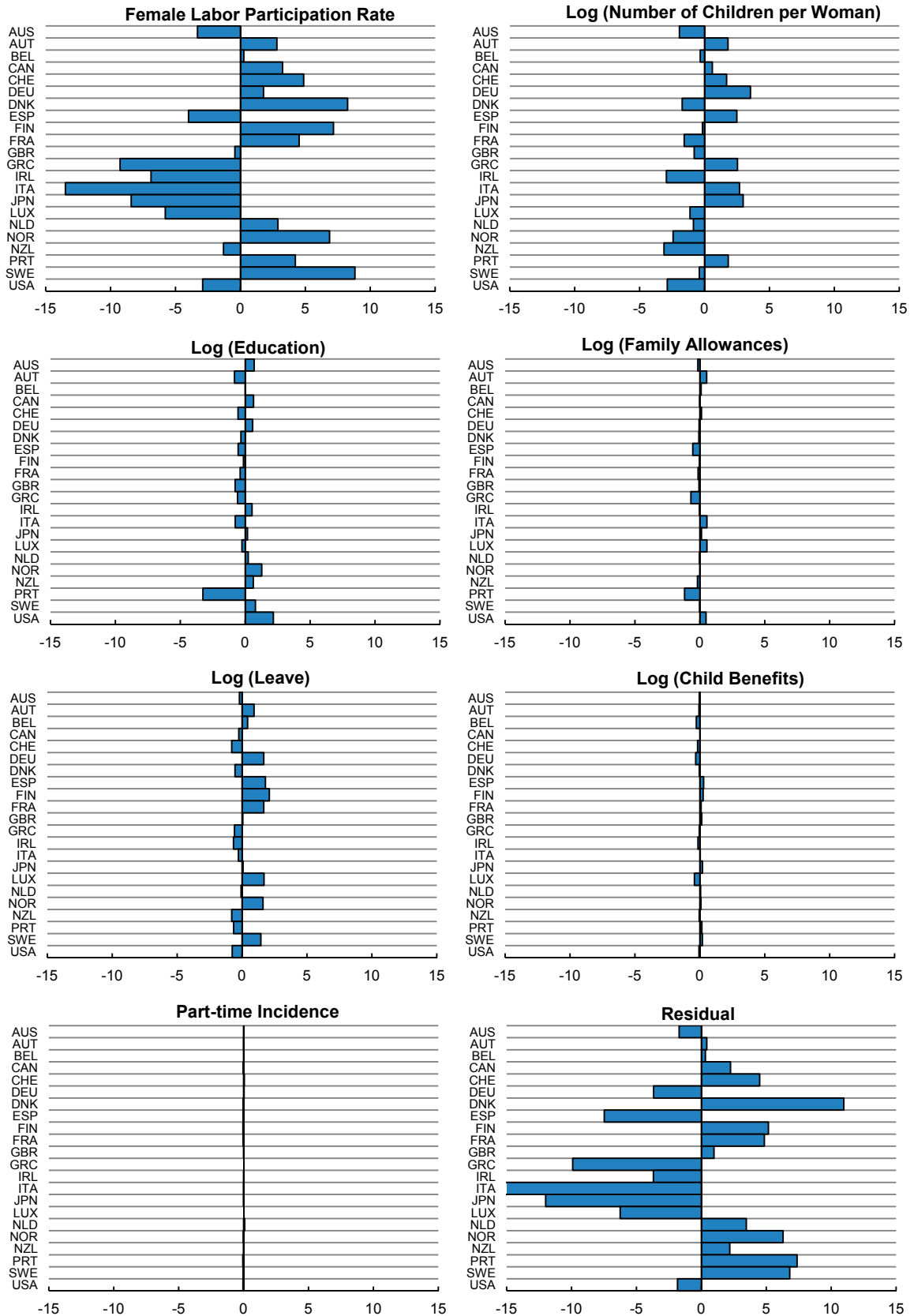
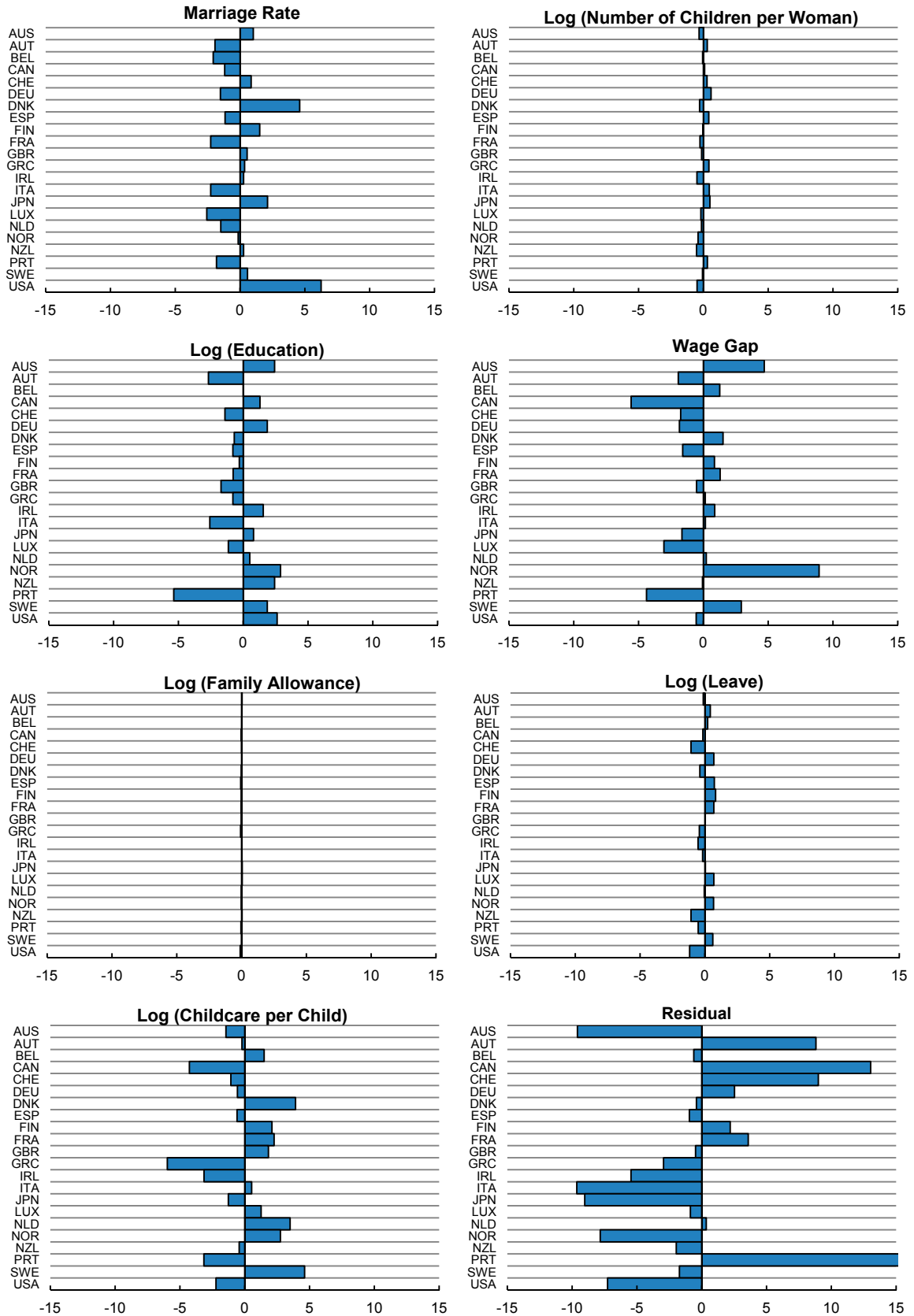


Figure 33. Cross-Section Explanation Using Ten-Year Average



APPENDIX II. DEFINITION AND SOURCES OF DATA

1. Dependent Variable

Total female prime-age labor force participation rates:

- Definition: Sum of unemployed and employed female workers as a share of the female labor force ages 25–54, in percent (0–100).

FLP

$$= \frac{\text{Unemployed Female Workers Ages 25 to 54} + \text{Employed Female Workers Ages 25 to 54}}{\text{Female Labor Force Ages 25 to 54}} \times 100$$

- Available Period: 1960–2008.
- Source: Organization for Economic Cooperation and Development, *Database on Labour Force Statistics*.

2. Demographic Variables

Crude marriage rate:

- Definition: Annual number of new marriages divided by population, in thousands.

$$\text{Marriage Rate} = \frac{\text{Newly Married Population}}{\text{Total Population}} \times 1,000$$

- Available Period: 1970–2007.
- Source: Organization for Economic Cooperation and Development, *Society at a Glance, 2009*.

Number of Children per Woman:

- Definition: Total population ages 0–14 divided by female population ages 15–64.

$$\text{Log (Number of Children per Woman)} = \text{Log} \left(\frac{\text{Child Population Ages 0 to 14}}{\text{Female Population Ages 15 to 64}} \right)$$

- Available Period: 1960–2008.
- Source: Organization for Economic Cooperation and Development, *Annual Labour Force Statistics*.
- Data adjustments: Some countries have a value of less than 1, so when transformed to a logarithmic scale, each value is multiplied by 100.

Female education:

- Definition: Average years of education of female population over age 25.

- Available Period: 1960–2008.
- Source: Barro and Lee (2010), *Educational Attainment Dataset*.
- Data adjustments: Missing observations are obtained by linear interpolation when possible.

3. Policy Variables

Gender wage gap:

- Definition: Hourly wage gap in manufacturing between male and female workers in percentage of male wage.

$$\text{Gender Wage Gap} = \frac{\text{Male Hourly Wage} - \text{Female Hourly Wage}}{\text{Male Hourly Wage}} \times 100$$

- Available Period: 1960–2008.
- Source: Gauthier (2010), *Comparative Family Benefits Database, 1960–2008*.

Family allowances:

- Definition: Monthly family allowances for children (assuming a two-child family) in purchasing-power-parity-adjusted U.S. dollars.
- Available Period: 1960–2008.
- Source: Gauthier (2010), *Comparative Family Benefits Database, 1960–2008*.
- Data adjustments: Some countries have a value of zero, so when changed into a logarithmic scale, each value is transformed as follows:

$$\text{Log (Family Allowance)} = \text{Log (Family Allowance} + (\text{Family Allowance}^2 + 1)^{0.5})$$

Number of parental leave weeks:

- Definition: Maximum number of weeks a mother may take after the birth of a first child as maternity leave, parental leave, and child care leave.

$$\text{Leave} = \text{Maternity Leave} + \text{Parental Leave} + \text{Child Care Leave}$$

- Available Period: 1960–2008.
- Source: Gauthier (2011), *Comparative Family Benefits Database, 1960–2008*.
- Data adjustments: Some countries have a value of zero, so when changed into a logarithmic scale, each value is transformed as follows:

$$\text{Log (Leave)} = \text{Log (Leave} + (\text{Leave}^2 + 1)^{0.5})$$

Child benefits:

- Definition: Child benefits were calculated by subtracting the disposable income (after taxes and transfers) of a one-earner, two-parent, two-child family from that of a comparable childless single earner, converted to purchasing-power-parity-adjusted U.S. dollars.
- Available Period: 1972–2008.
- Source: Gauthier (2010), *Comparative Family Benefits Database, 1960–2008*.
- Data adjustments: Some countries have a value of zero, so when changed into a logarithmic scale, each value is transformed as follows:

$$\text{Log (Child Benefits)} = \text{Log (Child Benefits} + (\text{Child Benefit}^2 + 1)^{0.5})$$

Part-time incidence:

- Definition: Part-time employment as a share of prime-age employment (25–54), in percent (0–100). Part-time employment is based on the Organization for Economic Cooperation and Development typical 30-hour minimum for full-time work.

$$\text{Part-Time Incidence} = \frac{\text{Part-Time Employment}}{\text{Total Employment}} \times 100$$

- Available Period: 1976–2008.
- Source: Organization for Economic Cooperation and Development, *Database on Labour Force Statistics*.

Public expenditures on child care:

- Definition: Public spending on formal child care in purchasing-power-parity-adjusted U.S. dollars is divided by the child population ages 0 to 4.

$$\text{Log (Child Care per Child)} = \text{Log} \left(\frac{\text{Total Public Spending on Formal Child Care}}{\text{Population Ages 0 to 4}} \right)$$

- Available Period: 1980–2007.
- Source: The main data sources for formal child care spending are the Organization for Economic Cooperation and Development, *Social Expenditures Database*. The population of children ages 0–4 is from the OECD *Statistical Profiles 2010*.

Relative marginal tax rates on second earners:

- Definition: Ratio of the marginal tax rate on the second earner to the tax wedge for a single-earner couple with two children earning 100 percent of average production worker (APW)

earnings. The marginal tax rate on the second earner is in turn defined as the share of the wife's earnings that goes into paying additional household taxes.

Log (Tax second earner)

$$= \text{Log} \left(1 - \frac{(\text{Household Net Income})_B - (\text{Household Net Income})_A}{(\text{Household Gross Income})_B - (\text{Household Gross Income})_A} \right)$$

where *A* denotes a situation in which the wife does not earn any income and *B* denotes a situation in which the wife's gross earnings are *X*% of APW earnings. Two different tax rates are calculated, depending on whether the wife is assumed to work full-time (*X* = 67 percent) or part-time (*X* = 33 percent). In all cases it is assumed that the husband earns 100 percent of APW earnings and that the couple has two children. The difference between gross and net income includes income taxes, an employee's social security contribution, and universal cash benefits.

- Available Period: 1982–2003.
- Source: *Bassanini and Duval (2006)*.
- Data adjustments: Some countries have a value of less than 1, so when transformed to a logarithmic scale, each value is multiplied by 100.

**APPENDIX III. CALCULATION OF CONTRIBUTIONS OF THE EXPLANATORY
VARIABLES TO FEMALE LABOR PARTICIPATION**

1. Within-Variable Explanation

The contribution of the explanatory variables to female labor force participation in the case of within-variable comparison is calculated as the difference between the values at two time periods in the country (Table 4) multiplied by the marginal effect of the variable as follows:

First, marginal effects are obtained by

$$\text{Marginal Effect} = \frac{\partial(\Delta flp_{it} - \Delta mlp_{it})}{\partial x_i^j}$$

Next, one of three types of formulas is used, depending on the function of the variable:

(a) Variable has a solo term

$$\text{Contribution of Variable } j = \beta^j (x_{it}^j - x_{it-h}^j)$$

(b) Variable has an interaction term

$$\text{Contribution of Variable } j = (\beta^j + \beta^{jk} \bar{x}_i^k) (x_{it}^j - x_{it-h}^j)$$

(c) Variable has a square term

$$\text{Contribution of Variable } j = (\beta^j + 2\beta^{jj} \bar{x}_i^j) (x_{it}^j - x_{it-h}^j)$$

where

$$\beta^j = \text{Coefficient of Variable } j$$

$$\beta^{jk} = \text{Coefficient of the Interaction of Variables } j \text{ and } k$$

$$\beta^{jj} = \text{Coefficient of the square term of Variable } j$$

$$x_{it}^j, x_{it-h}^j = \text{Values of Variable } j \text{ of Country } i \text{ at Times } t \text{ and } t - h$$

$$\bar{x}_i^j, \bar{x}_i^k = \text{Mean of Variables } j \text{ and } k \text{ of Country } i$$

Time Range for Within Variable Explanation											
Country	AUS	AUT	BEL	CAN	CHE	DEU	DNK	ESP	FIN	FRA	GBR
Year	80-08	94-08	83-07	80-08	91-08	80-08	83-08	80-08	80-08	80-08	84-08
Country	GRC	IRL	ITA	JPN	LUX	NLD	NOR	NZL	PRT	SWE	USA
Year	83-08	81-08	80-08	80-08	83-08	80-08	80-08	86-08	80-08	80-08	80-08

2. Cross-Section Explanation

Contribution of the explanatory variables to female labor force participation in the case of cross-section comparison is calculated as the difference between the value of the mean and of each country at one period multiplied by the marginal effect of the variable as follows:

First, marginal effects are obtained by

$$\text{Marginal Effect} = \frac{\partial(\Delta flp_{it} - \Delta mlp_{it})}{\partial x_{it}^j}$$

Next, one of three types of formulas is used, depending on the function of the variable:

(a) Variable has a solo term

$$\text{Contribution of Variable } j = \beta^j (x_{it}^j - \bar{x}_t^j)$$

(b) Variable has an interaction term

$$\text{Contribution of Variable } j = (\beta^j + \beta^{jk} x_{it}^k) (x_{it}^j - \bar{x}_t^j)$$

(c) Variable has a square term

$$\text{Contribution of Variable } j = (\beta^j + 2\beta^{jj} x_{it}^j) (x_{it}^j - \bar{x}_t^j)$$

where

$$\beta^j = \text{Coefficient of Variable } j$$

$$\beta^{jk} = \text{Coefficient of the Interaction of Variables } j \text{ and } k$$

$$\beta^{jj} = \text{Coefficient of the square term of Variable } j$$

$$x_{it}^j, x_{it}^k = \text{Variables } j \text{ and } k \text{ of Country } i \text{ at Time } t$$

$$\bar{x}_t^j = \text{Mean of Variables } j \text{ and } k \text{ at time } t$$

Female and male labor participation rates are from 2008, and the values of the explanatory variables are from the latest data available for each country.

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