Family Leave Policy and Fertility Rates in OECD Countries including East Asia

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Abstract

This study examines the effects of family leave policy on fertility rates across 19 Organisation for Economic Co-operation and Development (OECD) countries including two East Asian countries – Japan and South Korea - from 1969 to 2010. This research contributes to the existing literature (e.g. Luci & Thevenon, 2012) by including an additional East Asian country, South Korea ("Korea"), and incorporating more recent years.

I use data on family leave policy from Ruhm (2000) and Tanaka (2005) and extend it using data from the Max Planck Institute for Demographic Research (MPIDR), Organization for Economic Co-operation and Development (OECD), World Health Organization (WHO), International Labour Organization (ILO), and World Bank. Additional data sources include the United States Social Security Administration (SSA), International Social Security Association (ISSA), and various government sources.

I estimate the effects of family leave policy (specially, number of weeks provided) – considering both job protected paid leave and other leave (unpaid or non-job protected leave) – on fertility rates using ordinary leave squares (OLS) models. I control for relevant variables including gross domestic product (GDP) per capita, health expenditures, healthcare coverage, dialysis patients, child mortality, female employment, and immunization rates for measles. Following Luci and Thevenon (2012), I additionally control for social expenditures on families (cash allowances, maternity and parental leave, and family services) and childcare enrollment of children under three (as % of the total number of children of this age group). I also include in all models: (1) country fixed effects; (2) year fixed effects; and (3) country-time trend interactions. All missing values are imputed 20 times using the predictive mean matching method (PMM).

The results suggest job protected paid leave significantly increases fertility rates – a 2.27% increase ($p=0.000$). The effects are robust throughout all model specifications. Comparing the effects of other leave (unpaid or non-job protected) and job protected paid leave, other leave has no significant effects on fertility rates. This suggests that parents do not respond to leave provided without adequate payment benefits or job protection. As a result, other leave does not have any significant effects on parents' reproductive decisions.

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Chapter One: Background

Introduction

In the midst of these rapid changes in society, many governments in the Organisation for Economic Co-operation and Development (OECD) countries recognized families in more diverse forms and made great efforts to address their unique needs and demands by introducing various types of family policies. The ways in which family policy objectives become developed and implemented across countries may vary, depending on the country's specific needs; more explicitly, family policy may be designed to: (1) promote conditions that can help adults have the number of children that they desire at the time of their choice; (2) help parents to reconcile work and family decisions and responsibilities; (3) mobilize female labor supply and promote gender equality to foster economic growth and financial sustainability; (4) combat child and family poverty; and finally (5) enhance child well-being and promote child development (Adema, 2012; Kamerman & Moss, 2009).

As helping (or encouraging) parents have the desired number of children is one of the most important objectives of family policy, especially due to the dramatically falling fertility rates, most OECD countries have implemented and extended the provision of family policy. While there are various factors that may influence fertility rates both at the micro (e.g., working hours) and macro (e.g., labor market condition) levels, this study examines whether family policy, specifically family leave policy, has any effects on fertility rates across 19 OECD countries over the last four decades, from 1969 to 2010. The 19 countries[1] are as follows: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Republic of Korea (South Korea or "Korea"), the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, the

[1] *I sincerely thank Dr. Ruhm and Dr. Tanaka for kindly sharing the dataset they have developed for studies on family leave policy and. child health. Their sources include the OECD, International Labor Organization, World Health Organization, United States Social Security Administration, and Work Life Research Centre.*

United Kingdom, and the United States. Family leave policy includes: (1) maternity leave; (2) parental leave; and (3) childcare leave[2]. Further definitions and details about family leave policy are discussed in the "*Terminology"* section below.

My study contributes to the existing literature as follows:

(1) There are no comparative studies that include Korea. In Luci and Thevenon (2012), the most recent study on the similar topic, Korea is not included in quantitative analyses. By adding Korea, another representative country in East Asia (which has been traditionally understudied) along with Japan, my research provides a more diverse and balanced view on how family leave policy impacts fertility rates across various regions.

(2) In addition to maternity and parental leave, I also incorporate childcare leave in my research. This helps me look into not only paid leave but also unpaid and non-job protected leave. In the process of developing the dataset created by Ruhm (2000) and Tanaka (2005), I use the most updated version three of the Comparative Family Policy data from the Max Planck Institute for Demographic Research (Gauthier, 2011a) and PF 2.5. Annex: Detail of Change in Parental Leave by Country (OECD, 2012b), in addition to data from various international and governmental sources.

Therefore, my main research question is:
Does family leave policy have any effects on fertility rates?

Over the last four decades, 19 OECD countries have witnessed a dramatic decline in fertility rates. For instance, Figure1-1 presents the change in fertility rates in 19 OECD countries from 1970 to 2009. In addition, Table 1-1 summaries the current status of fertility rates in 19 OECD countries. While there are many factors that have contributed to the change in fertility rates within a relatively short period of time, this research aims to look into the effects of family leave policy specifically.

Terminology: Family Leave Policy and Current Status

[2] *I first describe the three types of leave policy; for quantitative analyses, they are categorized into job protected paid leave and other leave (unpaid or non-job protected leave). Details are provided in the sections below.*

Family policy is generally measured with three indicators: (1) family leave policy; (2) financial supports; and (3) public childcare services (Kamerman, 2009; Gauthier, 1999). In this paper, while the latter two are briefly discussed, my main focus is on family leave policy: (1) weeks of maternity leave; (2) weeks of parental leave; and (3) weeks of childcare leave. Leave benefits have existed since the 1880s in Europe: first in Germany in 1883 with health insurance, paid sick leave, and paid maternity leave (Kamerman, 2000b). Family leave policy has developed very differently across countries, as I discuss in the following chapter, and underlying policy objectives and dimensions of family leave policy can be emphasized in different ways, including: (1) economic,[3] as leave policy affects labor force behaviors and market regulation; (2) social,[4] as leave policy may affect the welfare of working mothers, as well as the emotional, cognitive, and physical health and development of children; and (3) demographic,[5] because parents' reproductive decisions (i.e., whether to have children, how many, and when to have them, etc.) can be influenced by leave policy (Thevenon & Solaz, 2013).

Here I provide a brief introduction to the three main types of family leave. Maternity leave includes a leave arrangement granting employed mothers a designated job-protected period of absence before and after childbirth, and it is usually paid (Kamerman, 2000a). In 1919, the

[3] *There is rich literature on the impact of parental leave on the labor market outcomes of women. See Thevenon & Solaz (2013) for the latest analysis; this cross-national study on the 30 OECD countries from 1970 to 2010 reports that the extension of paid leave has positive, though small, effects on female employment and the gender ratio of employment within two years of leave. On the other hand, leave longer than two years has negative effects on female employment and the gender employment gap.*

[4] *There is also rich literature on maternal employment and child development both on cross-national and specific country levels; for instance, Huerta et al. (2011) examines five OECD countries and suggests that a return to paid work by mothers within six months after childbirth may have negative effects on child outcomes, particularly on cognitive development, though the effects are small and not universally observed. Other studies looked into individual countries to understand the relationship between parental employment and child developmental outcomes (e.g., Brooks-Gunn et al., 2002; Ruhm, 2004). In addition, Ruhm (2000) and Tanaka (2005) looked into the effects of family leave policy on child health and found that paid leave significantly improves health outcomes.*

[5] *Many studies examined the effects of family policy on fertility rates—both at cross-national and specific country levels. Though it varies, the literature overall reports the positive effects of leave policy in increasing fertility rates. More details will be discussed in the "Previous Studies" section below.*

first Convention on Maternity Protection of the International Labour Organization (ILO)[6] recommended 12 weeks with a compulsory six-week post-birth period. In 2000, the Convention was revised to stipulate 14 weeks of recommended leave with six weeks of compulsory leave after childbirth at the minimum payment of 2/3 of earnings during that time (Kamerman, 2000b; Tanaka, 20005). Almost all OECD countries—except the US (no federal mandate) and Korea (13 weeks)—have ratified the minimum duration of 14 weeks of paid leave recommended by ILO and provided specific public income supports tied to the duration of maternity leave (OECD, 2012a). Countries do vary in the time period in which they adopted the ILO recommendations on maternity leave. For instance, Portugal, Spain, and Finland established employment reinstatement provisions that meet the ILO standards between the late 1960s and early 1970s, and similar legislations were passed in France and the Netherlands in the mid-1970s, followed by Denmark, Ireland, and Greece in the early 1980s (Ruhm, 1998). In Asia, Japan was the first country that enacted the maternity leave legislation as part of the Labor Standard Law in 1947 (Tanaka, 20005). Almost all OECD and European Union (EU) countries now have standards that exceed the ILO recommendation of 14 weeks of leave (ILO, 2010). However, while most OECD countries currently have family leave policies in place, there are many differences and disparities in the detailed components of the policies, such as duration, payment availability and rate, take-up flexibility, and whether the leave is given as a family or individual right (i.e., whether the entitlement can be transferrable between the two parents or not) (Moss & Kamerman, 2009).

[6]*Ratified by 33 countries, the Convention specified that women working in both public and private sectors: (a) shall not be permitted to work during the six weeks following her confinement; (b) shall have the right to leave her work if she produces a medical certificate stating that her confinement will probably take place within six weeks; (c) shall, while she is absent from her work, in pursuance of paragraphs (a) and (b), be paid benefits sufficient for the full and healthy maintenance of herself and her child, provided either out of public funds or by means of a system of insurance; and (d) shall in any case, if she is nursing her child, be allowed half an hour twice a day during her working hours for this purpose (ILO, 1919, Article 3; Moss & Kamerman, 2009).*

Parental leave is a gender-neutral leave from employment that is usually taken after maternity leave (Kamerman, 2000a). Parental leave is designed to offer parents additional opportunities for more time to take care of their newborn; as of 2010, all countries, except countries, such as Switzerland and the US, provide at least some type of payment benefits during parental leave, either earning-related or based on a flat rate. The way in which parental leave is provided varies, since it can be granted as: (1) family rights that parents can divide between themselves as they choose; (2) individual rights, which are transferrable to the other parent; and (3) non-transferable individual rights, whereby both parents are given an entitlement to a specified amount of leave, i.e. mommy or daddy quotas on a "use it or lose it" basis (Thevenon & Solaz, 2013). Some countries, such as Sweden and Norway, do not have a legal framework of distinction between maternity and parental leave, though they usually set aside a certain period of weeks for the specific use of each parent (Gauthier, 2011b).

Childcare leave (sometimes called homecare leave) is a leave entitlement to care for children until they are up to three years old as a variation or extension of parental leave, and payments are not necessarily restricted to parents with prior work requirements (OECD, 2012a). Countries, including Belgium and all of the Nordic/Scandinavian countries (e.g., Finland, Norway, and Sweden) provide paid childcare leave ranging from 13 to 128 weeks (Gauthier, 2011a; 2011b). Payments vary across countries; for instance, Finland makes homecare-related income supports contingent on not using public day care facilities, and payment rates in Norway vary with the number of hours that publicly provided day care is used (Thevenon & Solaz, 2013). Though not discussed in depth in this study, other types of leave, such as paternity leave (usually a much shorter job protected leave of absence for employed fathers exclusively), as well as other additional leave entitlements (e.g., holidays or sick leave), are available to attend to family and

child matters. I note that the 12 weeks of job protected leave entitlement in the US under the Family and Medical Leave Act (FMLA) are counted as unpaid childcare leave for this research (Gauthier, 2011a).

Terminology: Fertility Rates

There are two terminologies that are more used compared to others – completed fertility rates (CFR) and total fertility rates (TFR). The latter is the most widely used measure for numerous studies as well as throughout my paper. TFR in a specific year is the average number of children who *would be born* to a synthetic cohort of women whose age-specific birth rates were the same as those actually observed in the year in question (Hotz & Miller, 1988). TFR reflects the interplay of two components, namely *quantum tempo effects*: the level (number of children) and timing (time of birth) of fertility. Therefore, it is affected by changes in the timing of childbearing; for instance, in years when timing of childbearing is advanced, TFR is inflated relate to the level that would have been observed without such timing changes, and vice versa (Bongaarts and Feeney, 1998, 2000). In addressing this issue, many scholars have studied how this measure can be better used and adjusted (e.g. Bongaarts & Feeney, 1998, 2000; Kohler & Ortega, 2002; Philipov et al, 2006; Sobotka, 2004).

Theory: Family Policy and Fertility Rates

There is no one single factor that entirely shapes women's fertility behaviors. The conventional explanation is based on the *economic rational choice approach*; for example, it would argue that individual's choice to have a child is the result of a utility maximization process that depends on the economic costs and benefits of children, subject to income constraints and

individual's preferences (Becker, 1981; Cigno, 1991; Joshi, 1998). Therefore, according to the economic theoretical approach, any "reduction" in the cost of children (e.g. through various subsidies for child care, education, and health, as well as through cash benefits during maternity or parental leave) or any "increase" in income (e.g. through direct cash transfers or allowances as well as indirect benefits through the tax system) would be expected to increase the demand for children (Becker, 1981; Bjorklund, 2006; Castles 2003; Chesnais 1996; Del Boca et al, 2007; Englehard et al, 2004; Gauthier, 2007; McDonald 2000) [7]. Such economic framework, therefore, can lead to the rationale in which generous family policies and benefits can positively influence fertility rates.

Hakim (2003) proposed a notable alternative approach which has gotten much attention – preference theory. She focuses on how three "qualitatively" different types of women make different fertility and work choices. They are namely (1) "the home-centered" who would choose a home-career over a work in labor market; (2) "the work-centered" who would more likely to choose a childless life due to the strongest commitment for their work in labor market; and (3) "the adaptive" who are somewhat in between the previous two types and want to have a career in both labor market and their home. However, the preference theory is based on the assumption that women in our modern time are able to make unconstrained decisions between work and family depending on their preferences, which becomes a controversial argument and needs to be further examined (Vitali et al, 2009).

Lastly, there also have been some scholars who called for the need of incorporating studies focusing on more macro-level and non-quantifiable factors. For instance, some noted that

[7] *As Becker (1960) and scholars after him mentioned, it is important to distinguish between the quantity and quality impact of an increase utility (due to the increased family policies and benefits). For instance, while a higher income (from higher benefits) can lead to higher demand for children in number, it may also lead to an increased demand for child's quality (Gauthier & Hatzius, 1997).*

changing attitudes, values, and ideologies in a society and culture can play a significant role in changes in fertility trend and family and work structure (Sleebos, 2003). While many agreed with the importance of such factors, there are still many methodological as well as theoretical discussions to be made.

Previous Studies

There have been a number of empirical cross-national studies that compared multiple countries together though none of those studies focused on any of the East Asian countries (for more details, see Luci and Thevenon, 2012). Ekert (1986), using pooled data of 8 Western European countries from 1971 to 1983, found positive effects of family policy on fertility based on OLS regressions. A similar study was conducted later where Blanchet and Ekert-Jaffe (1994), with pooled data from 11 Western European countries from 1969 to 1983, also concluded that there are positive effects of family policy on fertility. Winegarden and Bracy (1995), based on macro-data of 17 OECD countries from 1959 to 1989, suggested that maternity leave benefits have positive effects on fertility rates. Gauthier and Hatzius (1997) used times-series regressions with data of 22 OECD countries from 1970 to 1990 and focused only on the effects of cash benefits on fertility; the authors found small but positive effects. Castles (2003), based on the data of 21 OECD countries from 1960 to 1998 and using OLS models, concluded that the average level of formal childcare has positive effects on fertility; in this study, Japan was the only East Asian country included. Del Boca et al (2003) compared four European countries to examine the impact of childcare availability using fixed effect and random effect models; the study found that childcare availability has positive effects on fertility overall. Also, D'Addio and Mira d'Ercole (2005), in their analyses on 19 OECD, showed that family benefits and services

have small but positive effects on fertility. Most recently, Luci and Thevenon (2012) looked at the effects of family policy package (paid leave, financial benefits, and family services) on fertility trends in 18 OECD countries with data from 1982 to 2007. This study also concluded that family policy package overall positively impacts fertility rates. However, some countries including Korea are excluded in a number of empirical analyses.

Chapter Two: Data and Method

Data and Measures

Table 1-2 provides the descriptive statistics for all of the variables used in my study. The data were all retrieved from publicly available sources, such as the OECD (Stat Extracts), WHO (European Health for All Database), ILO (Maternity at Work), and World Bank (World Development Indicators). Additionally, I relied on the United States Social Security Administration (SSA) and International Social Security Association (ISSA). For Korea and Japan, I also used data from the National Office of Statistics and the Statistics Bureau of the Ministry of Internal Affairs and Communications, respectively.[8]

For my outcome variable, I use total fertility rates; all values are continuous and in the natural log (non-zero positively skewed). Data for my independent variables—family leave policy in weeks—were obtained from the dataset developed by Ruhm (2000) and Tanaka (2005). To extend the dataset, in addition to the sources I mentioned above, I used PF 2.5. Annex: Detail of Change in Parental Leave by Country (OECD, 2012b), as well as the latest version (3) of the Comparative Family Policy dataset from the Max Planck Institute for Demographic Research (MPIDR),[9] which was organized by Gauthier (2011a). Table 1-3 provides an overview of family leave policy in the 19 OECD countries in 2010. In addition, Table 1-4 provides the change/increase in weeks of leave over the last four decades.

Family leave policy is discussed in the following measures.

[8] *www.index.go.kr (Korea); and http://www.stat.go.jp/english/index.htm (Japan)*

[9] *One of the most recent OECD reports using the Dataset Version 2 was "Labour Market Effects of Parental Leave Policies in OECD Countries" by Thevenon and Solaz (2013). The dataset has been updated, and I am using the most recent version (Version 3) for this research. Original sources include the OECD, International Labor Organization, United States Social Security Administration, World Health Organization, Council of Europe, and Missoc, among others.*

Independent Variables:

1) Job-protected paid leave: Weeks of job protected paid leave
2) Other leave: Weeks of unpaid leave and non-job protected paid leave
3) Total leave: Sum of all leave (not included in the analysis)

Job-protected paid leave refers to weeks of job protected paid maternity and parental leave, which includes family and adoptive leave, but not paternity leave.[10] In addition, I control separately for weeks of other leave as my second independent variable. Other leave refers to weeks of unpaid leave and non-job protected paid leave, which includes parental leave provided at a very low flat rate and not clearly job protected (e.g., Austria and Germany). In addition, I add childcare leave that is also either unpaid or paid at a very low flat rate and not clearly job-protected. In addition, I adhere the following rules as extending the dataset[11]: (1) When there is no distinction between maternity leave and parental or childcare leave with the same job protection and payment, the leave is under "job-protected paid leave," which was usually the case for the Nordic/Scandinavian countries, including Denmark, Finland, Norway, and Sweden; (2) Parental leave and childcare leave in the dataset are usually the additional leave entitlements taken after maternity leave; therefore, in this case, total leave can be obtained simply by adding all weeks of leave. However, in some countries, parental or childcare leave is given *until* the child reaches a certain age, in which case maternity leave is already included in parental or childcare leave, as noted by Gauthier (2011a); thus, in this case, I deduct post-birth maternity leave from parental or childcare leave in order to avoid overestimation and correlation. For instance: (i) in Finland, childcare leave lasts until the child's third birthday; (ii) in France, Germany, and Spain, parental leave lasts until the child's third birthday; and (iii) in Sweden,

[10] Fathers' take-up rates are known to be still very low in most OECD countries, and as illustrated above, daddy's quota ("take it or lose it") has been enacted in a few countries of the Scandinavian countries.
[11] I carefully follow notes provided by Gauthier (2011a, 2011b), Ruhm (2000), and Tanaka (2005).

childcare leave lasts until the 18 months of age; and (3) when no differentiation between pre-birth and post-birth maternity leave is noted, I assume them to be equal except for: (i) Japan (from 2000 and 2010), where 14 total weeks of maternity leave are assumed to be six pre-birth and eight post-birth as previous years; (ii) the UK (from 1998 to 2003), where 18 total weeks of maternity leave are assumed to be 11 pre-birth and seven post-birth, as in previous years; and (iii) Portugal (from 1996 to 1998), where 14 total weeks of maternity leave are assumed to be 5.4 pre-birth and 8.6 post-birth, as in previous years.

Furthermore, I analyze the effects of family leave policy on fertility rates with a number of important control variables: (1) real GDP per capita in thousands of purchasing power parity (PPP)-adjusted in the 2005 US dollars; (2) the total expenditures on health care as a percentage of GDP; (3) the share of the population covered by health insurance[12] (public and primary private coverage); (4) the number of kidney dialysis patients per 100,000 population; (5) the female employment-to-population ratios; (6) child deaths between ages 1 and 5 per 1,000 live births; and (7) immunization rates for measles under 1 year of age. First, GDP per capita is a universally used economic indicator for a country's wealth; therefore, it is likely to influence the overall economic and social condition, which may contribute to parents' reproductive decisions (Luci & Thevenon, 2012). In the same light, the total health expenditures and health insurance coverage are also important variables to control for because they are specifically allocated for healthcare (both in terms of access and affordability), and therefore, they may influence parents' fertility behaviors (Luci & Thevenon, 2012). The number of dialysis patients is included as a proxy for technology advancement and medical infrastructure available in a country (Ruhm, 2000; Tanaka, 2005). Female employment rates are included to take into consideration the

[12] *In all countries, more than 99% of the population is covered by public health insurance, except Germany (89.2% public and 10.8% primary private) and the United States (26.4% public and 54.9% primary private).*

effects of family leave policy on fertility risks being biased if the policy itself affects female employment, which is closely related to fertility (Luci & Thevenon, 2012). I also control for child mortality as a proxy variable for the general child wellbeing in a country; I include this indicator because I suspect that child deaths may influence how parents view the society in general (i.e. how much they can trust the society in which they live), which may contribute to their reproductive decisions. In the same light, I control for immunization rates for measles since the indicator is directly related to care access and health coverage for very young children.

In addition, following Luci and Thevenon (2012), I control for three types of social welfare expenditures on families and children: (1) the public expenditures on family cash allowances; (2) the public expenditures on maternity and parental leave; and (3) the public expenditures on family services. I include the expenditures spent on families and children because they may contribute to the reduction in the cost of having children or increase in income, which can affects parents' fertility decisions. All of my expenditure variables have been USD PPP-adjusted and defined by expenditures per child. The public expenditures on family cash allowances and the expenditures on family services are divided by the number of children ages 0-14; further, the public expenditures on maternity and parental leave are divided by the number of children ages 0-4. The summary on the welfare expenditures is provided in Table 1-5. The data on childcare enrollment for children under age three (additional control variable) for 19 OECD countries from 1969 to 2010 are currently being collected.

Method of Analysis

I estimate the effects of leave policy—job-protected paid leave and other leave (unpaid or non-job protected)—on total fertility rates (continuous) in 19 OECD countries from 1969 to

2010 using OLS models, including country fixed effects, year fixed effects, and country-time trend interactions to control for unobserved factors across countries and time periods.

(1) Country fixed effects are incorporated in order to control for the specific fixed effects of each country over a time period. These country dummies are defined by dichotomous variables.

(2) Year fixed effects in order to control for the specific fixed effects of each year for all countries. This set of year dummies is also defined by dichotomous variables for all years from 1969 to 2010.

(3) Country-time (linear) trend interactions, which I create using the country dummies and a time trend (linear) variable.[13] The interactions are incorporated to control for country-specific time varying effects—i.e., whether the effects of the country on the outcome depend on time, as well as whether the change of outcome with time also depends on the particular country.

I have a number of missing values in my dataset; the results from the missing data analysis are presented in Table 1-6. Instead of simply dropping all missing values, I conduct multiple imputations. First, I conduct the Little's Test[14] to test whether missing data are missing completely at random (MCAR), which can be ignorable because the "missing-ness" does not depend on the observed data. However, I had to reject the null hypothesis, as the Little's Test results came out highly significant (p=0.000). Therefore, I assume that my missing data are missing at random (MAR) instead of missing completely at random (MCAR), which suggests that it is appropriate to replace the missing data by conducting multiple imputations.

All variables with missing numbers are imputed; for multiple imputations, I use the predictive mean matching (PMM) method to incorporate the appropriate restrictions for the

[13]The country-specific time trend dummy variables are assumed to be linear in both Ruhm (2000) and Tanaka (2005). I tested for both linear and curvilinear models, whether they contribute to the effects of policy on outcome variables; no change in policy effects was found in all analyses, and, therefore, I also use linear trends.
[14] Ha: Data are not missing completely at random; Ho: Data are missing completely at random.

variables I impute[15]. For instance, values should not exceed 100 for variables in a percent measure, such as health expenditures and health insurance coverage. Female employment ranges from 0 to 1. I also do not expect to have any negative values in my variables. After running multiple imputations 20 times, I could confirm that all of the imputed values are within my restrictions. The summary of the non-imputed original data and imputed data is presented in Table 1-7. I note that, as a robustness check, I repeat all analyses with both non-imputed and imputed data and confirm that the results are similar.

[15]*The predictive mean matching (PMM) method is a tool that calculates the predicted values of target variables according to the specified imputation model and proves to be robust against model misspecification; imputations are based on values observed elsewhere, so they are realistic, and imputations outside of the observed data range will not occur, which prevents problems with meaningless imputations, such as negative fertility rates (Van Buuren, 2012).*

Chapter Three: Findings and Conclusion

Question: Family Leave Policy and Fertility Rates

Effects of Family Leave Policy on Fertility Rates

Table 2-1 shows the results from three models estimating the effects of both job-protected paid leave and other leave (unpaid or non-job protected leave) on fertility rates (the natural log of fertility rates). Model 1 includes the effects of weeks of job protected paid leave only. Model 2 takes into consideration seven control variables described above: GDP per capita, expenditures on healthcare, health insurance coverage, dialysis, child mortality, female employment, and immunization for measles. Finally, Model 3 incorporates other leave (unpaid or non-job protected leave). Other leave is a crucial indicator that needs to be added due to the fact that most of the 19 OECD countries have extended both job-protected paid leave and other leave over the last four decades. All three models include country fixed effects, year fixed effects, and country-time trend interactions. The results overall indicate that job protected paid leave has significant effects in increasing fertility rates.

In Model 1, without any control variable, a 10-week extension of job protected paid leave increases fertility rates by 1.98% (p=0.000). In Model 2, when controlling for seven variables, the results indicate that a 10-week extension of job-protected paid leave increases fertility rates by 2.27%, and the effects are highly significant (p=0.000). Model 3, when adding other leave, shows that the results are quite consistent; a 10-week extension of job-protected paid leave significantly increases fertility rates by 2.27% (p=0.000). This suggests that the effects of job protected paid leave are robust throughout all model specifications. Comparing other leave and job protected paid leave, no effects of other leave are found.

Effects of Leave on Fertility Rates, including Social Expenditures

Table 2-2 shows the results from models that estimate the effects of both job-protected paid leave and other leave on fertility rates controlling for three types of social welfare expenditures on families: (1) the expenditures on family cash allowances; (2) the expenditures on maternity and parental leave; and (3) the expenditures on family services. For all models, I include country and year fixed effects, as well as country-time trend interactions. I also include seven control variables (GDP per capita, expenditures on healthcare, health insurance coverage, dialysis, child mortality, female employment, and immunization) in all models. The overall results throughout all of the models show that even when controlling for social expenditures, both individually and concurrently, job-protected paid leave significantly increases fertility rates, whereas other leave has no significant effects in all cases.

In Model A, with controlling for the expenditures on cash allowances, the results indicate that a 10-week extension of job-protected paid leave significantly increases fertility rates by 2.28% (p=0.000), suggesting that the effects are slightly amplified but consistently robust. In Model B, when controlling for the expenditures on maternity and parental leave, job-protected paid leave still significantly increases fertility rates by 2.15% (p=0.000). In addition, I note that the expenditures on maternity and parental leave have small but significant effects in increasing fertility rates – by 0.01% (p=0.026). In Model C, when controlling for the expenditures on family services, a 10-week extension of job-protected paid leave again significantly increases fertility rates by 2.32% (p=0.000). Furthermore, in Model D, when controlling for all expenditure variables concurrently (cash allowances, maternity and prenatal leave, and family services), a 10-week extension of job-protected paid leave significantly increases fertility rates by 1.93%

(p=0.000). Therefore, the results are robust throughout all of the model specifications, controlling for all three social expenditures, both individually and concurrently.

Conclusion and Discussions

Consistent with previous studies, this paper found that an extension of job-protected paid leave has significant effects in increasing fertility rates (Table 2-1). Compared to the effects of job-protected paid leave, other leave (unpaid or non-job protected leave) does not show any significant effects on fertility rates. This suggests that when family leave policy is provided without sufficient payment benefits or job protection, parents do not respond to the policy. As a result, other leave does not affect parents' fertility decisions or behaviors.

The effects of job protected paid leave on fertility rates are robust with different model specifications (Table 2-2). In particular, when controlling for the additional social policy variables—including public welfare expenditures on family cash allowances, the expenditures on maternity and parental leave, and the expenditures on family services—I found that the effects of job protected paid leave on fertility rates are not eliminated. Also, when controlling for all three expenditure variables concurrently, the effects of job protected paid leave are still robust. Therefore, the results indicate that job protected paid leave has positive effects in increasing fertility rates, even after taking into consideration the generosity of social expenditure components. Other leave has no significant effects in all cases, which again suggests that parents do not respond to leave when it is provided without sufficient income replacement or job protection.

In sum, with more years of data and with data on one additional country (Korea), this research confirms and extends the findings from previous studies (e.g. Luci & Thevenon, 2012), especially regarding the effects of job protected paid leave on fertility rates.

Policy Implications

When leave is provided without sufficient payment benefits or job protection, parents do not seem to respond to the policy. This implies that if leave policy is to promote fertility rates, it must be provided with proper payment benefits that would support parents to maintain their income. Moreover, job protection is an important part of leave policy because it guarantees continuous and stable employment for parents who return to the workforce after attending to family responsibilities, including pregnancy as well as childbirth and care.

In addition, if leave policy is to increase fertility rates, it should perhaps be more generous/longer than the current provision. The results from this study as well as previous studies on the same topic consistently indicate that the extension of job-protected paid leave is closely related to an increase in fertility rates. Moreover, family-friendly work cultures and environments in which men can take their leave entitlement may contribute to the increase in fertility rates. For this, the government must plan and implement family policy in collaboration with multiple sectors and industries.

Research Challenges and Future Implications

As a number of researchers have already pointed out, policy variations and definitions across countries make it challenging to conduct cross-national research, as this study does. For instance, in countries like Sweden and Norway, there is no official maternity leave because it

was replaced by parental leave in the 1970s (Gauthier, 2011b; OECD, 2012a). Even when it comes to defining the same leave that allows parents to take leave until the child becomes 3 years old, it is sometimes under childcare leave (e.g., Finland) and in other cases, parental leave (e.g., Germany and Spain). Furthermore, while this research looks into two types of policy measure—job-protected paid leave and other leave (unpaid or non-job protected)—payment benefits during leave are provided in complex and unique channels and methods country by country; therefore, it is difficult to compare the true generosity of family leave policy, and this remains an important topic for future research.

Finally, policymakers and researchers must consider other emerging market countries. As more emerging market countries around the world recognize the importance of families in diverse forms and their unique needs and demands in balancing family and work responsibilities, it is crucial to collect comparable data using universally agreed-upon methods. It is important to conduct cross-national research to investigate the effects of family policy on various crucial social, health, and economic outcomes in newly added countries; while the policy may look similar on the surface, the effects may vary across countries as well as time periods.

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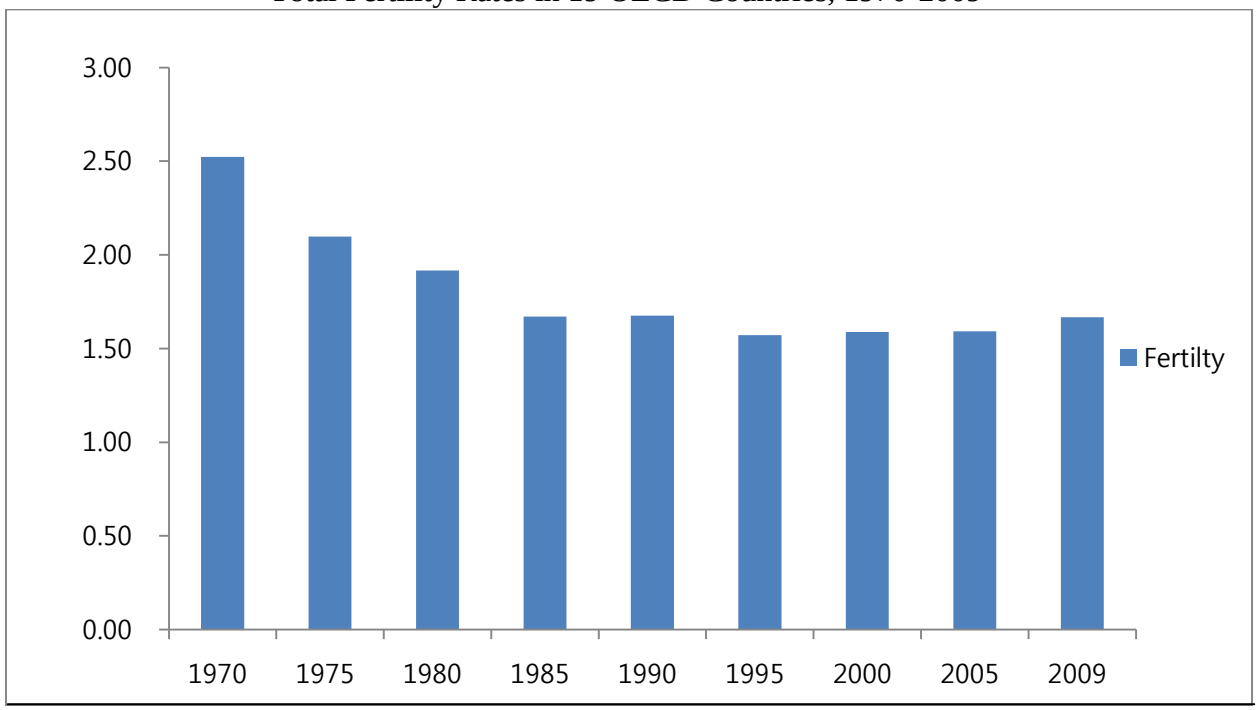
Figure 1-1

Total Fertility Rates in 19 OECD Countries, 1970-2009



Data Source: OECD.

Table 1-1

Total Fertility Rates in 19 OECD Countries, 2010

Country	Total Fertility Rates
Mean	**1.68**
Austria	1.44
Belgium	1.84
Denmark	1.87
Finland	1.87
France	2.00
Germany	1.39
Greece	1.44
Ireland	2.07
Italy	1.40
Japan	1.39
Korea	1.22
Netherlands	1.79
Norway	1.95
Portugal	1.32
Spain	1.39
Sweden	1.98
Switzerland	1.50
UK	1.94
US	2.10

Data Source: OECD.

Table 1-2

Summary of Variables Used in the Analysis

	N	Mean	S.D.
Outcome Variable			
Fertility Rates	798	1.8	0.5
Independent Variables*			
Weeks of job protected paid leave	798	21.9	18.7
Weeks of other leave	798	32.8	47.2
Weeks of all leave (sum of all leave)	798	54.8	51.8
Control Variables			
Female Employment	742	0.5	0.1
GDP per capita**	782	23.9	8.2
Health insurance coverage***	781	93.2	15.1
Number of Dialysis patients per 100,000 population	662	30.4	35.0
Child mortality****			
Immunization rates for measles	566	81.8%	18.6
Total Expenditures on healthcare as % of GDP	771	7.8	2.1
Public expenditures on family cash allowances per child*****	549	5.1	10.7
Public expenditures on maternity and parental leave per child*****	498	10.7	22.9
Public expenditures on family services per child*****	501	15.7	72.0

**Job protected paid leave refers to weeks of job protected paid maternity and parental leave, which includes family leave and adoptive but not paternity leave. Other leave refers to weeks of unpaid leave and non-job protected paid leave, which includes parental leave provided at a very low flat rate and not clearly job protected e.g. Austria and Germany. In addition, I added childcare leave that is also either unpaid or provided at a very low flat rate.*

***In thousands of PPP-adjusted constant US dollars, base year 2005.*

****In all countries, more than 99% of the population is covered by the public health insurance, except Germany (89.2% public and 10.8% primary private) and the United States (26.4% public and 54.9% primary private) in 2010.*

***** Deaths between ages 1 and 5 per 1,000 live births.*

******In thousands of PPP-adjusted constant US dollars. For the expenditures per child, the public expenditures on family cash allowances and family services are divided by the number of children ages 0-14. The public expenditures on maternity and parental leave are divided by the number of children ages 0-4. Similar method was applied in previous studies. Expenditures on family cash allowances, maternity and parental leave, and family services are sub-categories of the total public expenditures on family.*

Table 1-3

Weeks of Leave in 19 OECD Countries, 2010

Country	JOB PROTECTED PAID LEAVE	OTHER LEAVE	TOTAL LEAVE
Austria	16.0	104.0	120.0
Belgium	41.0	13.0	54.0
Denmark	50.0	0.0	50.0
Finland	57.4	127.3	184.7
France	16.0	146.0	162.0
Germany	14.0	148.0	162.0
Greece	43.0	30.5	73.5
Ireland	26.0	44.0	70.0
Italy	65.2	0.0	65.2
Japan	14.0	44.0	58.0
Korea	13.0	44.0	57.0
Netherlands	16.0	52.0	68.0
Norway	104.0	0.0	104.0
Portugal	43.1	26.0	69.1
Spain	16.0	148.0	164.0
Sweden	68.6	43.7	112.3
Switzerland	14.0	0.0	14.0
UK	39.0	26.0	65.0
US	0.0	12.0	12.0

Data Source: Data gathered by Ruhm (2000) and Tanaka (2005) as well as the Comparative Family Policy data from the Max Planck Institute for Demographic Research (Gauthier, 2011a) and PF 2.5. Annex: Detail of Change in Parental Leave by Country (OECD, 2012b).

Note: Job-protected paid leave refers to weeks of job protected paid maternity and parental leave, which includes family and adoptive leave, but not paternity leave. In addition, I control separately for weeks of other leave as my second independent variable. Other leave refers to weeks of unpaid leave and non-job protected paid leave, which includes parental leave provided at a very low flat rate and not clearly job protected (e.g., Austria and Germany). In addition, I add childcare leave that is also either unpaid or paid at a very low flat rate and not clearly job-protected. In the effort to follow previous studies (Ruhm, 2000; Tanaka, 2005), I adhere the following rules: (1) When there is no distinction between maternity leave and parental or childcare leave with the same job protection and payment, the leave is under "job-protected paid leave," which was usually the case for the Nordic/Scandinavian countries, including Denmark, Finland, Norway, and Sweden; (2) Parental leave and childcare leave in the dataset are usually the additional leave entitlements taken after maternity leave; therefore, in this case, total leave can be obtained simply by adding all weeks of leave. However, in some countries, parental or childcare leave is given until the child reaches a certain age, in which case maternity leave is already included in parental or childcare leave, as noted by Gauthier (2011a); thus, in this case, I deduct post-birth maternity leave from parental or childcare leave in order to avoid overestimation and correlation. For instance: (i) in Finland, childcare leave lasts until the child's third birthday; (ii) in France, Germany, and Spain, parental leave lasts until the child's third birthday; and (iii) in Sweden, childcare leave lasts until the 18 months of age; and (3) when no differentiation between pre-birth and post-birth maternity leave is noted, I assume them to be equal except for: (i) Japan (from 2000 and 2010), where 14 total weeks of maternity leave are assumed to be six pre-birth and eight post-birth as previous years; (ii) the UK (from 1998 to 2003), where 18 total weeks of maternity leave are assumed to be 11 pre-birth and seven post-birth, as in previous years; and (iii) Portugal (from 1996 to 1998), where 14 total weeks of maternity leave are assumed to be 5.4 pre-birth and 8.6 post-birth, as in previous years.

Table 1-4

Weeks of Leave in 19 OECD Countries, 1970-2010

`YEAR	Job Protected Paid Leave	Other Leave	Total Leave
1970	12.7	4.2	16.9
1980	17.5	20.5	37.9
1990	20.6	40.0	60.6
2000	28.5	52.2	80.7
2010	34.5	53.1	87.6

Data Source: Data gathered by Ruhm (2000) and Tanaka (2005) as well as the Comparative Family Policy data from the Max Planck Institute for Demographic Research (Gauthier, 2011a) and PF 2.5. Annex: Detail of Change in Parental Leave by Country (OECD, 2012b).

Note: Job-protected paid leave refers to weeks of job protected paid maternity and parental leave, which includes family and adoptive leave, but not paternity leave. In addition, I control separately for weeks of other leave as my second independent variable. Other leave refers to weeks of unpaid leave and non-job protected paid leave, which includes parental leave provided at a very low flat rate and not clearly job protected (e.g., Austria and Germany). In addition, I add childcare leave that is also either unpaid or paid at a very low flat rate and not clearly job-protected. In the effort to follow previous studies (Ruhm, 2000; Tanaka, 2005), I adhere the following rules: (1) When there is no distinction between maternity leave and parental or childcare leave with the same job protection and payment, the leave is under "job-protected paid leave," which was usually the case for the Nordic/Scandinavian countries, including Denmark, Finland, Norway, and Sweden; (2) Parental leave and childcare leave in the dataset are usually the additional leave entitlements taken after maternity leave; therefore, in this case, total leave can be obtained simply by adding all weeks of leave. However, in some countries, parental or childcare leave is given until the child reaches a certain age, in which case maternity leave is already included in parental or childcare leave, as noted by Gauthier (2011a); thus, in this case, I deduct post-birth maternity leave from parental or childcare leave in order to avoid overestimation and correlation. For instance: (i) in Finland, childcare leave lasts until the child's third birthday; (ii) in France, Germany, and Spain, parental leave lasts until the child's third birthday; and (iii) in Sweden, childcare leave lasts until the 18 months of age; and (3) when no differentiation between pre-birth and post-birth maternity leave is noted, I assume them to be equal except for: (i) Japan (from 2000 and 2010), where 14 total weeks of maternity leave are assumed to be six pre-birth and eight post-birth as previous years; (ii) the UK (from 1998 to 2003), where 18 total weeks of maternity leave are assumed to be 11 pre-birth and seven post-birth, as in previous years; and (iii) Portugal (from 1996 to 1998), where 14 total weeks of maternity leave are assumed to be 5.4 pre-birth and 8.6 post-birth, as in previous years.

Table 1-5

Total Public Expenditures on Families in 19 OECD Countries, 2009*

Country	Total Public Expenditures on Family*		Expenditures on Family Cash allowances	Expenditures on Maternity and Parental Leave	Expenditures on Family Services
MEAN	**2.3**		**0.8**	**0.3**	**0.8**
Austria	2.9		2.2	0.2	0.5
Belgium	2.8		1.6	0.2	0.9
Denmark	3.9		1.0	0.6	2.0
Finland	3.3		0.8	0.7	1.1
France	3.2		1.1	0.3	1.3
Germany	2.1		0.8	0.3	0.5
Greece	1.4		0.5	0.2	0.1
Ireland	4.1		1.8	0.2	0.8
Italy	1.6		0.4	0.2	0.7
Japan	1.0		0.3	0.2	0.4
Korea	0.8		0.01	0.03	0.7
Netherlands	1.7		0.8	-	0.9
Norway	3.2		0.6	0.7	1.2
Portugal	1.5		0.6	0.3	0.4
Spain	1.5		0.2	0.3	0.6
Sweden	3.7		0.8	0.8	2.0
Switzerland**	1.3		0.9	-	0.3
UK	3.8		0.8	0.4	1.1
US	0.7		0.1	0.0	0.3

Data Source: OECD.
-Data not available.
All figures are in % of GDP, USD PPP-adjusted.
** Expenditures on family cash allowances, maternity and parental leave, and family services are sub-categories of the total expenditures on families. This also includes other family-related cash benefits and services such as housing and residential care help, which may impact parents' reproductive decisions.*
***Switzerland: data from 2008.*

Table 1-6

Missing Values in Original Data

	N	Mean	S.D.	Missing Values	
				Count	Percent
Fertility rates	798	1.80	0.48	0	0
Child	798	1.87	1.42	0	0
Immunization	566	81.83	18.62	232	29.1
Health expenditures	771	7.83	2.12	27	3.4
Insurance coverage	781	93.19	15.13	17	2.1
Dialysis patients	662	30.43	35.00	136	17.0
Female employment	742	0.54	0.13	56	7.0
GDP per capita	782	23.86	8.17	16	2.0
Expenditures on family cash benefit	549	5.11	10.72	249	31.2
Expenditures on leave provision	498	10.68	22.91	300	37.6
Expenditures on family services	501	15.73	71.96	297	37.2
Job protected paid leave	798	21.93	18.72	0	0
Other leave	798	32.82	47.17	0	0
Total leave	798	54.75	51.78	0	0

Note: Job protected paid leave refers to weeks of job protected paid maternity and parental leave, which includes family leave and adoptive but not paternity leave. Other leave refers to weeks of unpaid leave and non-job protected paid leave.

Table 1-7

Summary of Variables after Multiple Imputations

	Original Data*		**Imputed Data****	
Variables	N	Mean	N	Mean
Fertility rates	798	1.80	798	1.80
Child Imunization	798 566	1.87 81.83	798 798	1.87 70.82
Health expenditures	771	7.83	798	7.77
Insurance coverage	781	93.19	798	92.71
Dialysis patients	662	30.43	798	32.50
Female employment	742	0.54	798	0.53
GDP per capita	782	23.86	798	23.67
Expenditures on family cash benefit	549	5.11	798	4.64
Expenditures on leave provision	498	10.68	798	8.60
Expenditures on family services	501	15.73	798	16.37
Job protected paid leave	798	21.93	798	21.93
Other leave	798	32.82	798	32.82
Total leave	798	54.75	798	54.75

Note: Job protected paid leave refers to weeks of job protected paid maternity and parental leave, which includes family leave and adoptive but not paternity leave.

**Table 1-2 provides details of the original data.*

*** In the process of MIs, I applied appropriate restrictions for the selected variables; for instance, values should not exceed 100 for variables in % such as health expenditures and health insurance coverage. Female employment ranges from 0 to 1. For all variables, including outcome variables, I should have no negative values. To meet this standard, I used the predictive mean matching method (PMM).*

Table 2-1
Effects of Family Leave Policy on Log of Fertility Rates
Estimates from OLS Models for 19 OECD Countries, 1969-2010

	Fertility Rates		
Regressor	Model 1	Model 2	Model 3
Job Protected Paid Leave	0.198**	0.227**	0.227**
	(0.044)	(0.044)	(0.044)
Other Leave			-0.027
			(0.014)
GDP per Capita		0.001	0.001
		(0.000)	(0.003)
Healthcare Expenditures		-0.013*	-0.012*
		(0.005)	(0.005)
Healthcare Coverage		-0.001	-0.001
		(0.000)	(0.000)
Dialysis Patients		0.000	0.000
		(0.000)	(0.000)
Child Mortality		-0.008	-0.008
		(0.007)	(0.007)
Female Employment		0.473**	0.472**
		(0.093)	(0.093)
Immunization		0.000	0.000
		(0.000)	(0.000)
Country fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Country*Time trends	Yes	Yes	Yes
R2	0.90	0.91	0.91
N	798	798	798

**p<0.05, **p<0.01*
Note: Numbers shown are coefficients (with standard errors in parentheses). All leave refers to weeks divided by 100.

Table 2-2

Effects of Family Leave Policy on Log of Fertility Rates, including Social Expenditures

Estimates from OLS Models for 19 OECD Countries, 1969-2010

	Fertility Rates			
Regressor	Model A	Model B	Model C	Model D
Job Protected Paid Leave	0.228**	0.215**	0.232**	0.193**
	(0.045)	(0.043)	(0.044)	(0.052)
Other Leave	-0.027	-0.028	-0.029	-0.027
	(0.014)	(0.015)	(0.014)	(0.015)
Expenditures on family cash allowances	0.000			-0.001
	(0.001)			(0.001)
Expenditures on leave benefits		0.001*		0.002
		(0.001)		(0.001)
Expenditures on family services			0.000	0.000
			(0.000)	(0.000)
Country fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Country*Time trends	Yes	Yes	Yes	Yes
R2	0.91	0.91	0.91	0.91
N	798	798	798	798

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

Note: Numbers shown are coefficients (with standard errors in parentheses). All leave refers to weeks divided by 100. For the expenditures per child, the public expenditures on family cash allowances and family services are divided by the number of children ages 0-14. The public expenditures on maternity and parental leave are divided by the number of children ages 0-4. Expenditures on family cash allowances, maternity and parental leave, and family services are sub-categories of the total public expenditures on family (all expenditures are in thousands of PPP-adjusted constant US dollars).Controls include GDP per capita, expenditures on healthcare, health insurance coverage, dialysis, child mortality, female employment, and immunization.