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Influence of Parents' Unemployment on the Health of Newborn Babies

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【Abstract】Recent research has shown that low-income households have a higher probability of babies being born underweight, which is an indicator of poor health. The causes and effects of the weights of newborn babies need to be analyzed in Japan, where the proportion of low-weight babies is extremely high relative to the other OECD countries. In this paper, we use panel data by prefecture to analyze the influence of market labor conditions on the weights of newborn babies in Japan. Controlling for heterogeneity among prefectures and years as random effects, we first show that high unemployment rates among parents do reduce the weights of newborn babies. However, our analysis does not confirm the influence of poverty and low income on the weights of newborn babies. Unemployment of parents may hamper the health of a baby for reasons other than financial difficulties.

【Key Words】unemployment, low birth-weight, panel data, Japan

【JEL Classification Number】I1, J1, J2

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1. Introduction

Genetic factors are not the only elements that decide health conditions when a child is born. As Grossman (2000, 2006) point out, the individual's health is formed through an accumulation of income status or budget restriction, the ability to develop good health, and preference for healthy behavior. Because newborn babies cannot accumulate health on their own, the parents' behavior and their surroundings determine the health of newborn babies.

This paper examines the determinants of the health of newborn babies in Japan. Specifically, we examine the effects on the weight of newborn babies of parents' economic conditions due to unemployment. We use regional panel data, because of the lack of sufficient microdata on infant birthweight and parents' economic conditions in Japan. The use of regional panel data has several advantages, although it does not allow us to examine a direct relationship between parents' unemployment and their babies' health condition. First, individual microdata usually have short time spans, and only a few parents are unemployed at any one point in time. It is hard to examine the effect of changes in unemployment status, and the results may be seriously affected by outliers. Prefectural data, in contrast, are available over longer time periods, so we can follow the changes in tendencies of unemployment and babies' health condition. This is important in Japan where these two tendencies have changed a lot during the past 30 years. Further, the problem raised by the presence of outliers could be smaller since the situation is averaged over individuals in a prefecture.[1]

Note that using regional (prefectural) data may raise the possibility of a spurious correlation between unemployment and weight. As is often pointed out in empirical researches using microdata, unobserved heterogeneity can cause a problem of endogeneity. For example, cultural factors, customs, parents' tastes, preferences, and/or hereditary factors may be related to both low-weight babies and high unemployment rates. In these cases, it is not unemployment but unobserved heterogeneity that causes low birthweight. The endogeneity problem is often solved using the instrumental variable method. However, even when using microdata, it is difficult to find sufficient instruments strongly related to the parents' employment status but not related to the weight of the fetus or health conditions during pregnancy.[2] We use panel analysis, removing prefectural and time-designated characteristics as two random components in an error term.

The objective of this paper is to supplement the existing literature on the determinants of health condition at birth, using regional data. The second objective is to add Japanese findings to the existing literature. No economic investigation on this topic has been conducted in Japan so far, although an increasing volume of economic research has been accumulated in many other developed countries. According to OECD Health Data 2003, the percentage of low-weight babies among newborn babies has been increased dramatically in Japan since 1977. The figures since 1990 show a higher rate of increase, and by 2002 the

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1 Averaging the conditions, however, could raise an aggregation bias. An analysis using individual microdata would be required in the future.

2 Unobserved heterogeneity can be solved by utilizing samples of twins or siblings, although collecting these samples is more difficult than collecting general samples.

percentage of low-weight babies is exceptionally high in Japan compared to the other developed countries. In industrialized countries, generally, 2500g is a threshold of poor health at birth, and newborn babies weighing 2500g or less are called low-weight babies. The determinants of infant birthweight must therefore be clarified, especially for Japan.[3]

Birthweight has an important implication for future productivity.[4] Almond and Mazumder (2005) use influenza infection of the mother during pregnancy as an exogenous shock that causes a deterioration of the nutritional status of the fetus, and show that low weight has adverse effects on health in adulthood. Examining U.K. microdata, Currie and Hyson (1999) show that babies under 2500g at birth scored lower in math tests at school, and had lower wage rates among men and lower full-time employment rates among women. Case, Fertig, and Paxson (2005) also use data from the U.K. and show that having parents who smoked during the prenatal period or being born underweight adversely affect health status at the age of 42 and lower social class at that point in time. Black, Devereux, and Salvanes (2007) use data of individuals born in Norway between the late 1960s and the mid-1980s, and show that birthweight had a positive impact on height, IQ level, and wage income at 18 to 20 years of age. Behrman and Rosenzweig (2004) use a sample of twins born in the U.S. between 1936 and 1955, and indicate a positive correlation between birthweight and years of education or wage rate. Oreopoulos, Stabile, Walld, and Roos (2008) use a different sample of twins, mainly of those born between the late 1970s and the

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[3] The Science Council of Japan (2008) introduced a study on the relationship between low birthweight babies in Japan and their health in later years.

[4] See Currie and Madrian (1999), Grossman (2006), Cutler and Lleras-Muney (2006), Royer (2009), Currie (2009), and Almond and Currie (2010) for a conventional survey on this topic.

mid-1980s, and show that those born healthier have higher high school graduation rates and higher rates of not receiving income support after graduation. Currie, Stabile, Manivong, and Roos (2008) use a follow-up survey for more than 20 years on the health status of sample babies born in Canada between 1979 and 1987. They indicate that low-birthweight babies suffer from poor health also when they are grown up, which led to lower educational outcomes such as mathematical competence and reading comprehension ability at school age, and a higher possibility of receiving income support during adulthood.[5]

Note that these findings are not for developing countries suffering from food insecurity and malnutrition, but for industrialized countries, including Japan. Examining the Japanese case to find how an adverse economic condition in a society affects health at birth for the next generation might have an important policy implication for Japan.

In Section 2, we summarize specific literature that examine the relationship between parents' employment or income and newborn babies' birthweight. We then explain our estimation model. Section 3 introduces data by prefecture used in the study and reviews the trend of birthweight in Japan through descriptive statistics. Section 4 reports the results of the analysis, and Section 5 summarizes the findings of this study.

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[5] However, studies by Behrman and Rosenzweig (2004) and Almond, Chay, and Lee (2005) using twins and siblings indicate that negative effects of health on growth can be greatly reduced by controlling family components such as heredity. Royer (2009) uses a large-scale sample of twins in the U.S. and shows that low birthweight has a minor negative influence on educational outcomes in adulthood. Although the sample size is small, Miller, Mulvey, and Martin (2005) use Australian twins data and show that if the family fixed effect is removed, birthweight would not affect academic record or annual income. The cause-and-effect relationship needs to be further verified.

2. The Empirical Model

Case, Lubotsky, and Paxson (2002) point out that higher income lead to children with better health. The study uses U.S. data collected between the late 1980s and the mid-1990s to show that the proportion of children with chronic diseases is higher and their recovery is slower among lower income households. Currie and Lin (2007) show that U.S. children from poor households have relatively poor health conditions, including mental diseases. Almond, Hoynes, and Schanzenbach (2008) indicate that a baby's birthweight would increase among low-income households if they were given income support during the prenatal period. Currie and Moretti (2007) show that the rate of low-weight babies is lower among wealthy households, and that its gap between the wealthy and the poor increased in the 1990s.

We regress birthweight on parents' employment status, using prefectural panel data between 1975 and 2000, but for a five-year interval. In order to control for heterogeneities among prefectures, we first take the first difference from the previous time period for each variable (5-year difference because data are taken every 5 years). The estimated model can be written as follows:

$$\Delta y_{it} = \beta \Delta X_{it} + u_{it}, \tag{1}$$

where i denotes a prefecture ($i = 1, \ldots, 47$), and t is a point of time ($t = 1980, 1985, 1990, 1995, 2000$). In order to take the non-linear effect into account, the logarithm of birthweight and percentage of low-birth babies are used for y in the estimation. We focus on the effect of labor indicators in X. We include unemployment rate, employment rate, income level, and poverty indicators. The poverty indicator is calculated on the basis of income, as described in detail in the next section. Due to high correlation between income level and unemployment rate (non-employment rate), including both of them in the explanatory variable at the same time would cause multi-colinearity. Thus, we estimate them separately as different specifications and compare the results.

If unemployment or non-employment status hampered the health of a newborn baby, the unemployment coefficient would be expected to be negative in the estimate for weight and positive in the estimate for the percentage of low-weight babies. The opposite sign would be expected if looking at employment. If financial difficulty hampered the health of a newborn baby, the poverty coefficient would be expected to be negative in the estimate for weight and positive in the estimate for the percentage of low-weight babies. The opposite sign would be expected if looking at income level. Note that the coefficients on labor indicator and poverty indicator would not necessarily have the same sign. Although non-employment would be expected to have a strong correlation with low income, the two elements may have different meanings. Rather, if the two coefficients have different signs, it suggests that the influence of financial problems due to unemployment should be different from the influences of the other shocks resulting from unemployment.

In equation (1), other factors such as mother's age when she gave her first baby and the ratio of three-generation households are included as control variables in X.[6] The error term is expressed as $u_{it} = \mu_i + \lambda_t + \nu_{it}$. The effects by prefecture are expressed as μ_i, and the

[6] Although mother's education may also be an important control variable, we cannot include that because data for educational level are available for each prefecture only every other decade.

effects by year as λ_t; ν_{it} is the random variable: $\nu_{it} \sim iid(0, \sigma_\nu^2)$ that is orthogonal to μ_i, λ_t, X. By taking the 5-year difference, the effects, by prefecture, that are captured as non-stochastic variables are removed. However, there may be effects by prefecture that are captured as random variables. Further, in the case of data by prefecture that are collected over a long period, it will be important to consider the influence of effects by year, in addition to effects by prefecture[7]. In the following analysis, the estimation is first done with a mixed model in which year effects are captured as a non-stochastic variable and prefecture effects are captured as a random variable: $\mu_i \sim iid(0, \sigma_\mu^2)$. In addition, an estimation is done with a model that captures year effects also as a random variable—a two-way random effect model, assuming that $\mu_i \sim iid(0, \sigma_\mu^2)$ and $\lambda_t \sim iid(0, \sigma_\lambda^2)$ are not correlated to X.

3. The Data

This paper uses prefectural data on "average weight of newborn babies" and "percentage of newborn babies weighing 2500g or less," both of which are reported annually in the National Vital Statistics (Ministry of Health, Labour and Welfare). We take their logarithms for the estimation.

[7] By taking the first difference, we can remove the problem of a spurious correlation that appears on long-term time-series data of birthweight and unemployment if they are both integrated of order 1. Auto-correlation may not be a serious problem since our data has 5-year intervals. The analysis covers a long-term trend of 20 years, but the time periods used for the estimation are limited to 6 sequential years due to the few time points of only every 5 years. Therefore, we do not consider time-series components in error terms.

The main explanatory variables are the unemployment rate and the employment rate of 25- to 39-year-old males as indicators of the parents' employment status. The employment rate is calculated by dividing the number in employment by the population of those aged 25 to 39 years. Both data are from the National Census compiled by the Statistics Bureau, Ministry of Internal Affairs and Communications. The reason for limiting the age to 25 to 39 years is to capture the probable age group of parents with newborn babies.

Instead of these employment variables, we use the variables reflecting parents' poverty due to unemployment for comparison. The following two variables are created from income data. First, we calculate the income level of the bottom 10% group for each prefecture, utilizing the data from the Employment Status Survey (Statistics Bureau, Ministry of Internal Affairs and Communications). Since the timing of the survey is different from that of the National Census, we pick up the 1982, 1987, 1992, 1997, and 2002 waves of the survey, which are closest to the National Census years (1980, 1985, 1990, 1995, and 2000). The survey reports the number of households by income class in each prefecture, and the minimum and maximum points of each income class. Using this, we calculate the level of income at the lowest 10% for each prefecture.[8] For the estimation, we deflate the income level by consumer price level in each prefecture.

Second, we calculate the percentage of poor households. Using the same income class data as described above, we calculate the number of households belonging to the income

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[8] Suppose that F_j is the number of households, and x_j is a middle point of income class *j* where the bottom 10% households belong to. The bottom 10% income point is $\tilde{x} = x_{j-1}^{max} + (x_j^{max} - x_{j-1}^{max}) \times \frac{0.1 - F_{j-1}/n}{F_j/n - F_{j-1}/n}$. Likewise, the median is calculated by changing 0.1 to 0.5 for *j*-th class where the household from the bottom 50% points belong to.

classes with less than half the national median. We calculate the percentage of this "half-the-median" group to the total number of the households for each prefecture.

The explanatory variables are as follows. First, the average age at which a mother gave the first birth in each prefecture. The National Vital Statistics (Ministry of Health, Labour and Welfare) report the number of women who give birth by age group. The data are broken down into increments of 5 years between 15 and 50 years of age. The weighted average is calculated using each class mark and frequency for each prefecture.[9] The rate of living together with parents, which is a unique characteristic of Japanese households, is controlled for. Specifically, the percentage of three-generation households in each prefecture is used. Whether or not a family lives with parents has various influences on household behavior. It may change the mother's employment status and the affluence of the household. The attitude of the couple's parents to childbearing may influence lifestyle or nutritional intake during the prenatal period (during pregnancy), which may affect the weights of the newborn babies.

Because the National Census is taken every five years, the sample size for our estimation is 235 (47 times 5 years). Table 1 shows the definitions of the variables and their descriptive statistics. We take the first difference, which is the 5-year difference, for the estimation.

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9 This paper does not use the education level of the age group to which the mother belongs. This is because the education level by age and by prefecture reported by the National Census is taken only every 10 years. The other data on female educational level in each prefecture are not available in Japan. In addition, academic background is strongly correlated with labor index and child-birth age, and including these variables as explanatory variables in the same equation anyway raises a problem of multi-colinearity making the estimates unstable.

<Table 1>

4. The Results

Table 2 shows the results of the effect of unemployment or employment on the average weight of newborn babies (Panel A) and on the ratio of low-weight babies (Panel B). Column (1a) shows the result of the mixed model where the prefectural effects are taken as a random variable and year effects as a non-stochastic variable. Column (1b) shows the result of the two-way random effect model where both prefecture and years are taken as random variables. As for a model specification, the LM test indicates the necessity of capturing individual and time effects at the same time. The result of the Hausman test shows that the null hypothesis that assumptions of the two-way random effect model are applicable is not rejected even at the 10% level of significance, and thus supports the specifications of (1b). The same applies to (2a), (2b), and Panel B.[10]

The results in column (1) show that an increase in unemployment decreases the weight of newborn babies. The coefficients of the unemployment rate of 25- to 39-year-old males are all negative, and the coefficient in (1b) is significant at the 5% level of significance, while the coefficient in (1a) is not significant at the 10% level. In column (2), an increase in employment raises the weight of newborn babies: the coefficients of the employment rate are positive and significant at the 5% and 1% levels of significance in (2a) and (2b), respectively.

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[10] The estimates would be biased if we used the mixed model when the two-way random effect model is correct (Baltagi, 2001).

At least with (1b) and (2b), in which specifications are statistically supported, we can say that higher unemployment rate or lower employment rate disturbs the health of newborn babies in terms of their weights.

The same implication is shown in Panel B where we use the percentage of low-weight babies, instead of average weight. If the unemployment rate (employment rate) for the male aged between 25 and 39 are higher (lower), the percentage of low-weight babies becomes lower. The positive (negative) coefficients of the unemployment (employment) rate are significant in both (1b) and (2b).

<Table 2 Panel A>

<Table 2 Panel B>

As for the other variables, Panel A shows that birthweight increases as the mother's age at first birth increases. Older mothers may be more conscious of their health during pregnancy. In addition, smoking rates are higher among younger women in Japan.[11] The higher rate of smokers among young women may impair fetal growth. Panel B shows that high three-generation household rates reduce the percentage of low-weight babies. Living together with the parent generation (grandparent generation) may lead to better care for health such as higher nutritional intake during pregnancy for the mother, which results in

[11] According to the National Health and Nutrition Survey Report (Project for National Health and Nutrition Survey, Ministry of Health, Labour and Welfare), the female smoking rate as of 2000 was 20.9% in the 20s, 18.8% in the 30s, 13.6% in the 40s, 10.4% in the 50s, 6.6% in the 60s, and 4.0% in the 70s or older.

the lower number of low-weight babies.

As described above, parents' unemployment or non-employment leads to lower health status among newborn babies. Is this caused by lowered income due to unemployment? Table 3 summarizes the results of the influence of low income or poverty on birthweight. As for the specification, Panels A and B both accept the assumptions of the two-way random effect model, supporting the specifications of (1b) and (2b).

Panel A in Table 3 shows the positive sign of the coefficients of income level for the bottom 10% group. However, they are not significant at the 10% level of significance. The coefficients of the percentage of poor households show a negative sign, although they are not significant at the 10% level. There are no statistically significant effects of low income or income-measured poverty on reducing the average weight of newborn babies.

Panel B in Table 3 shows that the coefficients of the income level for the bottom 10% group basically are negative, and the coefficients of the percentage of poor households are positive. However, these coefficients are not significant at the 10% level of significance.

<Table 3 Panel A>

<Table 3 Panel B>

In sum, the influence of parents' non-employment on reducing birthweight is statistically significant, while the influence of income-measured poverty on birthweight is not significant at least at the 10% level. Parents' non-employment may reflect a low-income state for a long period, while low annual income may reflect temporary income loss. Alternatively, parents' non-employment affects the health of newborn babies negatively not because of the lowered income from being jobless. For a male in his late 20s through 30s, the burden of not having a job is not limited to financial difficulties. A mental burden such as uncertainty about the future may damage his health and that of his family. The true burden of non-employment may not come from low income. This might be true especially in a society where people have a stereotyped perception that the husband as the head of the household has to support the household finances even if the other household members have income.

5. Conclusion

This paper examines whether parents' unemployment deteriorates the health of newborn babies in Japan, focusing on their weight at birth. Because sufficient individual data are not available to control for unobserved heterogeneity, causing a problem of endogeneity, we use regional data instead. Using prefectural data for 20 years, we examine a longer trend between unemployment and birthweight. We conduct panel estimation dealing with both prefecture and year components in error terms as random variables, since both regional and time effects cannot be fixed in an error term.

We found that high unemployment rate or low employment rate leads to lower average weight of newborn babies, and raises the proportion of low-weight babies among newborns. In contrast, the influences of low income or income-measured poverty on reducing the weights of newborn babies were not confirmed at least at the conventional level of statistical significance. Parents' non-employment may hinder the health of newborn babies due to reasons other than financial difficulties.

Previous studies conducted in other countries show that low birthweight depresses various post-growth outcomes. Low birthweight negatively impacts not only physical health but also mental health, as well as cognitive performance such as test scores at school and non-cognitive performance. It may also lower productivity and health status during working years. Non-employment of parents creates an income disparity within that generation. At the same time, it leads to deteriorating health of the newborn child, which then may result in a health disparity and thus an economic disparity in the next generation. Measures against unemployment probably need to be discussed with a much longer-term view than previously thought.

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Table 1. Definition of Variables and Descriptive Statistics

Variable Name	Definition, etc.	Mean	Standard Dev	Minimum	Maximum
Birthweight	Average weight of newborn babies. Logarithmic values used for the analysis. (log of gram)	1.1372	0.0191	1.0986	1.1756
Percentage of low-weight babies	Percentage of babies among newborn babies who are 2500 gram or under. Logarithmic values used for the analysis. (log of %)	1.8912	0.1800	1.5261	2.3321
Unemployment rate of 25-39 year-old males	Average unemployment rate of males aged 25-29 years, 30-34 years old, and 35-39 years. (%)	3.1336	1.3985	1.2000	9.9333
Employment rate of 25-39 year-old males	Average percentage of employed males aged 25-29 years, 30-34 years old, and 35-39 years. (%)	0.8735	0.0431	0.7322	0.9457
Income level of the bottom 10% group	The annual income level of the bottom 10% group is calculated from income class data for general households having an employed head of a household. This income level is deflated by consumer price level for each year. (1000yen)	2439.646	505.283	1225.966	3756.979
Proportion of poor households	Using the same data as used in Income level of the bottom 10% group, the ratio of the households with income of less than half the national median value to total households in each prefecture in each year. (%)	0.1584	0.0793	0.0400	0.4500
Mother's age of giving the first baby	Weighted average of the mother's age at the time of giving the first birth is calculated from classified data for each 5 years of age weighted by the number of persons in each age group. (years old)	28.4951	0.6294	25.5505	30.3438
Percentage of three-generation households	The percentage of three-generation households among all households. (%)	15.5317	6.6900	2.8675	33.5724

Notes.

1. All the data are taken as prefectural average.
2. Birthweight, Percentage of low-birth weight babies, and Mother's age of giving the first baby are from 1975, 80, 85, 90, 95, 2000 National Vital Statistics (Ministry of Health, Labour and Welfare), Unemployment rate, Employment rate, and Pecentage of three generation households are from 1975, 80, 85, 90, 95, 2000 National Census (Statistics Bureau, Ministry of Internal Affairs and Communications), and Income level of the bottom 10% group and Proportion of poor households are calculated from the data reported by 1977, 82, 87, 92, 97, 2002 Employment Status Survey (Statistics Bureau, Ministry of Internal Affairs and Communications).
3. All the variables are taken as the first difference (5-year differences) for estimations.

Table 2. Unemployment and Birthweight

Panel A. Explained Variable: Logarithmic values of average weight reflecting 5-year difference

	(1a)	(1b)	(2a)	(2b)
Unemployment rate of 25-39 year-old male	-0.0005	-0.0009 **		
	(0.0005)	(0.0004)		
Employment rate of 25-39 year-old male			0.0640 **	0.0739 ***
			(0.0278)	(0.0259)
Mother's age of giving her first child	0.0011	0.0040 ***	0.0014 *	0.0017 **
	(0.0008)	(0.0009)	(0.0008)	(0.0008)
Rate of three-generation households	0.0003	0.0000	0.0005	0.0000
	(0.0004)	(0.0003)	(0.0004)	(0.0003)
Constant term	-0.0110 ***	-0.0141 ***	-0.0092 ***	-0.0070 ***
	(0.0011)	(0.0010)	(0.0014)	(0.0007)
Effects by prefecture	random	random	random	random
Effects by year	fixed	random	fixed	random
F test: $\lambda t=0$	313.16	---	326.69	---
LM statistics				
for a test: $\sigma_{\mu}^{2} = 0$	12.14		12.35	
for a test: $\sigma_{\lambda}^{2} = 0$	1254.03		1229.79	
Wald Statistics				
Hausman Test: (a) vs (b)	0.0000		0.0000	

Notes

1. The number of the observations is 235 (47 prefectures×5 periods).

2. (a) represents a mixed model of fixed effect and random effect that caputures an effect by prefecture as a random variable, and an effect by year as a non-stochastic variable.

(b) represents random effect model that captures effects by prefecture and by year as random variables.

3. As for the definition of the variables, see Table 2 and the description in the paper.

4. *, **, *** represent the estimates at 10%, 5%, and 1% level of significance, respectively.

Table 2. Continued

Panel B. Explained Variable: Logarithmic values of percentage of low-weight babies reflecting 5-year difference

	(1a)		(1b)		(2a)		(2b)	
Unemployment rate of 25-39 year-old male	0.0112		0.0201	***				
	(0.0089)		(0.0074)					
Employment rate of 25-39 year-old male					-0.9479	*	-1.1204	***
					(0.5072)		(0.4477)	
Mother's age of giving her first child	-0.0088		-0.0169		-0.0118		-0.0145	
	(0.0138)		(0.0131)		(0.0139)		(0.0132)	
Rate of three-generation households	-0.0138	**	-0.0094	**	-0.0157	**	-0.0094	*
	(0.0065)		(0.0047)		(0.0066)		(0.0052)	
Constant term	0.1048	***	0.0956	***	0.0809	***	0.0526	***
	(0.0199)		(0.0153)		(0.0258)		(0.0132)	
Effects by prefecture	random		random		random		random	
Effects by year	fixed		random		fixed		random	
F test: $\lambda t=0$	121.85		---		119.58		---	
LM statistics								
for a test: $\sigma^2_\mu = 0$	7.68				8.47			
for a test: $\sigma^2_\lambda = 0$	390.81				396.86			
Wald Statistics								
Hausman Test: (a) vs (b)	0.0000				0.0017			

Table 3. Poverty and Birthweight

Panel A. Explained Variable: Logarithmic values of average weight reflecting 5-year difference

	(1a)	(1b)	(2a)	(2b)
Income level of the bottom 10% class	0.00006	0.00006		
	(0.00014)	(0.00013)		
Proportion of poor households			-0.0068	-0.0033
			(0.0078)	(0.0076)
Mother's age of giving her first child	0.0011	0.0011	0.0011	0.0012
	(0.0008)	(0.0008)	(0.0008)	(0.0008)
Rate of 3-generation households	0.0003	-0.0001	0.0003	-0.0001
	(0.0004)	(0.0003)	(0.0004)	(0.0003)
Constant term	-0.0110 ***	-0.0051 ***	-0.0107 ***	-0.0055 ***
	(0.0017)	(0.0004)	(0.0013)	(0.0004)
Effects by prefecture	random	random	random	random
Effects by year	fixed	random	fixed	random
F test: $\lambda t=0$	315.84	---	246.18	---
LM statistics				
for a test: $\sigma_{\mu}^{2} = 0$	11.38		10.39	
for a test: $\sigma_{\lambda}^{2} = 0$	1134.27		661.31	
Wald Statistics				
Hausman Test: (a) vs (b)	0.0000		0.0000	

Note

1. See footnotes in Table 2.

Table 3. Continued

Panel B. Explained Variable: Logarithmic values of percentage of low-birthweight babies reflecting 5-year difference

	(1a)	(1b)	(2a)	(2b)
Income level of the bottom 10% class	-0.0013	-0.0026		
	(0.0025)	(0.0022)		
Percentage of poor households			0.1153	0.0737
			(0.1414)	(0.1293)
Mother's age of giving her first child	-0.0086	-0.0104	-0.0083	-0.0095
	(0.0139)	(0.0133)	(0.0138)	(0.0133)
Rate of 3-generation households	-0.0135 **	-0.0066	-0.0134 **	-0.0063
	(0.0065)	(0.0051)	(0.0065)	(0.0051)
Constant term	0.1028 ***	0.0657 ***	0.1022 ***	0.0646 ***
	(0.0301)	(0.0100)	(0.0243)	(0.0102)
Effects by prefecture	random	random	random	random
Effects by year	fixed	random	fixed	random
F test: $\lambda t=0$	118.72	---	122.45	---
LM statistics				
for a test: $\sigma_{\mu}^{2} = 0$	7.72		7.61	
for a test: $\sigma_{\lambda}^{2} = 0$	340.62		329.44	
Wald Statistics				
Hausman Test: (a) vs (b)	0.0000		0.0000	