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Income and Fertility
Analyzing the Relationship Using Administrative Tax Records from a Japanese City

Yusuke Masaki

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from a Japanese City

Yusuke Masaki

December 2024

Graduate School of Public Policy
The University of Tokyo
7-3-1, Hongo, Bunkyo-ku, Tokyo, 113-0033, Japan
Phone:+81-3-5841-1349

Income and Fertility

Analyzing the Relationship Using Administrative Tax Records from a Japanese City*

December 19, 2024

Yusuke Masaki
University of Tokyo

Abstract

Recently, a positive relationship between income and fertility has been observed in the highest-income countries. Many studies using microdata have analyzed this relationship, but they face challenges due to their reliance on survey data, such as small sample sizes and inaccuracies. This study analyzes the relationship between men's and women's incomes and fertility using administrative tax records from a Japanese municipality with a population exceeding one million. For men, the study finds a monotonic positive relationship between income and fertility, driven by higher marriage rates and higher marital fertility among high-income men, with marriage rates having a greater impact. For women, while the relationship between income and fertility is not monotonic, a relatively monotonic positive relationship is observed when excluding women with incomes below 2 million yen, who are more likely to be married and adjust their work hours due to tax and social insurance benefits. Unlike for men, this relationship is driven by higher marital fertility among high-income women rather than higher marriage rates. This study also highlights the potential of using municipal administrative records for research, as the clear graphical and regression analyses conducted in this study would not be feasible without large and accurate administrative panel data.

I. Introduction

Over the centuries, many countries have experienced rising incomes alongside declining birth rates. This negative relationship has often been taken for granted. Becker and Lewis (1973) theorized this phenomenon, formalizing it into the quantity-

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quality tradeoff model for children. According to this model, while higher incomes could positively influence the number of children through the income effect, the substitution effect of potential income increases leads to a reduction in fertility rates. However, recent observations among the highest-income countries show a positive relationship between income and fertility (e.g., Doepke et al. 2023). Theoretically, as per Becker and Lewis (1973), either the income effect or the substitution effect could dominate, prompting numerous studies to explore this phenomenon. Many studies have explored various factors affecting fertility, such as education and employment status, which are related to income, while others have directly analyzed the relationship between income and fertility.

Research on the relationship between income and fertility can be broadly categorized into studies using macrodata and those using microdata. Macrodata studies analyze aggregated data at levels larger than the individual, such as cross-national or cross-county data. For instance, Herzer, Strulik, and Vollmer (2012) demonstrate that growth in income per capita leads to fertility reduction based on country-level birth rates and GDP, while Brueckner and Schwandt (2014) find a positive association between income growth and population growth. Hailemariam (2024) uses oil price shocks to show a negative impact of national per capita income on fertility, concluding that this effect is heterogeneous.

On the other hand, microdata studies include works by Chung and Lee (2022), Black et al. (2013), Jones and Tertilt (2008), and Bar et al. (2018). Among these, Jones and Tertilt (2008) find a negative relationship between income and fertility, while the others find a positive relationship.

Despite their significance, these studies face challenges due to their reliance on survey data. As previously mentioned, the relationship between income and fertility can theoretically be either positive or negative, depending on whether the income effect or the substitution effect is stronger. It is not appropriate to assume a priori that this relationship is either monotonically linearly positive or monotonically linearly negative. Conducting linear regression without graphical confirmation implicitly assumes a monotonic linear relationship. Even using other functions, such as quadratic or cubic functions, logarithms, or probit or logit models, involves making assumptions about the functional form. This is not suitable for examining the nuanced relationship between income and fertility, where the income effect and substitution effect intersect. Given that the probability of childbirth is only a few percent even among those of childbearing age, and that the impact on fertility rates might not be too large, weak statistical power accompanied by the small sample sizes of survey data forces these assumptions. In addition, survey data often suffer from issues such as nonresponse, inaccuracies, and respondents' lack of precise income knowledge, raising questions about their reliability.

For example, Chung and Lee (2022), constrained by a dataset with only about 2,000 observations, analyze a broad period from 1999 to 2016, during which the relationship between income and fertility could vary significantly. They also use a wide age range of 20 to 45 years. Although they visualize income quartiles, they do not capture changes in fertility rates corresponding to subtle income changes. Black et al. (2013) analyze approximately 100,000 cross-sectional observations from US Census data, but since it is not panel data, they can only analyze children ever born, not fertility itself, and have to examine postbirth income rather than prebirth income, making it difficult to assess the impact of income on fertility due to the influence of childbirth on income. Moreover, as a survey, the accuracy of income data cannot be guaranteed. Jones and Tertilt (2008) analyze data from 1826 to 1960, using Census occupation and education as proxies for income, not income itself. Bar et al. (2018) create a model calibrated to the 1980 Census and the American Community Survey, which is not data driven.

In contrast, this paper analyzes the relationship between individual men's and women's incomes and fertility using municipal tax data. This study accesses accurate administrative records from a Japanese municipality with a population exceeding one million, without relying on assumptions discussed above. Since the relationship between income and fertility is not monotonic, examining average trends is not sufficient.

In Japan, Kondo (2024) confirms that the relationship between women's income at age 25 and the number of children at ages 35 and 40 was negative for those born in the late 1960s but became positive (though not statistically significant) for those born in the 1970s. Kondo (2024) also finds that the decline in fertility rates among high school-educated women and the increase among college-educated women were driven by a decrease in marriage rates among the former and an increase in marital fertility among the latter. In addition, although not directly examining the relationship between income and fertility, Raymo and Shibata (2017) and Hashimoto and Kondo (2012) find a positive association between early-career economic uncertainty and fertility for women who already had one child or more.

This paper first introduces the data used in the next section, presents the model used for analysis in Section III, and then provides the results for men and women separately in Section IV. After conducting a graphical analysis, the regression analysis results applying the model from Section III are presented. Section V discusses the results, and Section VI concludes.

II. Data

This study uses administrative records from municipalities participating in the Project for Utilizing Local Tax Data to Promote Evidence-Based Policymaking, led by the Center for Research and Education in Program Evaluation at the University of Tokyo. In particular, I use resident registration and tax records provided by a Japanese municipality with a population exceeding one million. The dataset comprises panel data of all residents (including those without taxable income) from 2018 to 2022,[1] maintained for resident management and taxation purposes. The data has been anonymized through methods such as 1/2 random sampling, top-coding the top 1 percent of incomes, and 3-anonymization.[2] The dataset includes 871,900 unique individuals, 475,770 unique households, and a total of 3,822,828 observations.

A significant issue in examining the relationship between income and fertility is how to account for the effects of maternity and parental leave. Many individuals, especially women, take these leaves around childbirth, leading to a substantial reduction in taxable income. Consequently, analyzing income in the years close to childbirth could introduce a bias, making income and fertility appear negatively associated. To address this, I exclude data from the year of childbirth (year n), the year before (year $n-1$), and the two years following (year $n+1$ and year $n+2$).[3]

Although this dataset includes many different cohorts, analyzing cohorts that are too far apart is not appropriate. Changes in childcare availability and socioeconomic conditions could alter the relationship between income and fertility. For both men and women, the highest fertility rates occur between ages 27 and 36 (fig. 1). Therefore, this paper examines the relationship between income in the previous year and fertility in the following year for individuals aged 26 through 35 as of January 1.

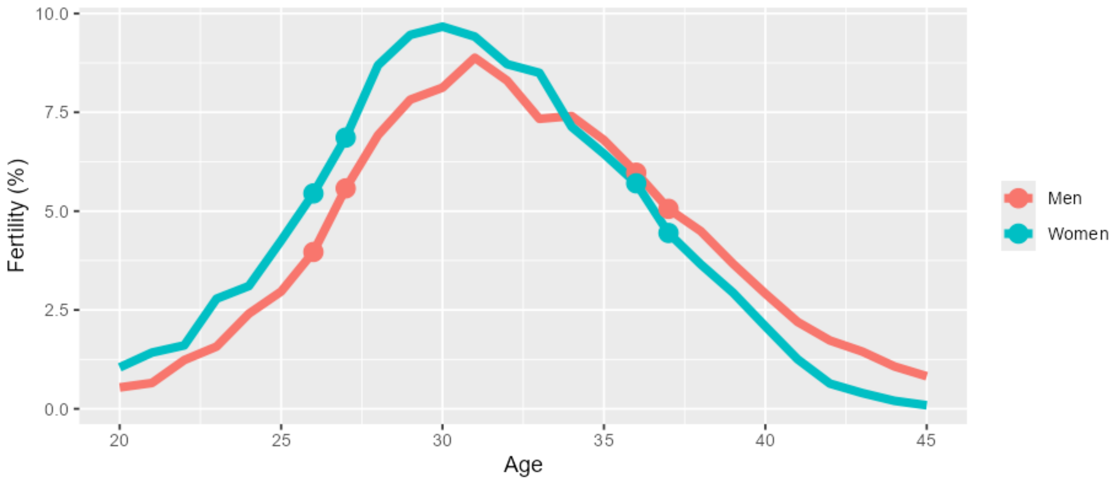

Figure 1. Fertility by age

Note: Age is as of January 1. *Fertility* is the proportion of childbirths in that year.

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[1] Although the dataset includes data from 2017, it is clearly irregular and thus excluded.

[2] For detailed information on the anonymization process, refer to Masaki (2022).

[3] Due to the nature of municipal household data, some individuals dropped out of the record, presumably because they moved out or passed away. I exclude these individuals from the denominator. I also exclude individuals who are not the household head or their spouse (e.g., "child of the household head") because, even if they have children (e.g., "child of a child of the household head"), parent-child relationships between them cannot be confirmed.

III. Model

In this paper, I analyze the relationship between income and fertility for both men and women. While child-rearing in married households is typically a joint effort, making household income potentially more relevant than individual income, household income can only be properly defined for married households. Therefore, I conduct my analysis at the individual level and, to complement this, include the spouse's income and their age fixed effects as control variables in the regression analysis. To be specific, I use the following linear probability model to examine the relationship between fertility and income. To understand the magnitude of the effects rather than just the direction, I use OLS instead of probit or logit models. OLS allows for straightforward coefficient interpretation.

$$Childbirth_{it} = \beta_0 + \beta_1 Income_{it} + \delta_t + c_{age_{it}} + u_{it} \tag{1}$$

Here, $Childbirth_{it}$ indicates whether individual i had a child in year $t + 1$ (i.e., whether there is a child born to individual i between January 1 and December 31 of year $t + 1$, as of January 1 of year $t + 2$). $Income_{it}$ represents the income of individual i in year $t - 1$ (i.e., from January 1 to December 31 of year $t - 1$).[4] I examine births in the year after next rather than the following year because, as discussed in the previous section, individuals may take maternity leave in the year before childbirth, reducing their income and potentially biasing the relationship between income and fertility. In addition, there is a time lag between deciding to have a child and the actual birth, making it reasonable to consider births in the year after next. δ_t and $c_{age_{it}}$ represent year fixed effects and age fixed effects, respectively.

One reason for not using the logarithm of income is that approximately 10–20 percent of both men and women have no income, which would require their exclusion from the sample. While it is possible to use $\log(Income + 1)$ instead of $\log(Income)$, there is no substantial basis for adding 1, and the results are highly sensitive to the choice of the constant c in $\log(Income + c)$. In addition, in the analysis of women, many have incomes below 1 million yen, and many of these women are not the primary earners. Therefore, it is not appropriate to treat the difference between an income of 100,000 yen and 200,000 yen the same as the difference between 3 million yen and 6 million yen.

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[4] *Income* refers to pretax and prededuction salary income (*kyūyo-shūnyū*). It does not include other types of income, such as business income or dividend income. Although the dataset includes total income before deductions including business and dividend income (*sōshotoku-kingaku-tō*), I use prededuction salary income because, even if total income before deductions is zero due to various deductions, differences in prededuction salary income result in different net incomes. I exclude individuals with no salary income but positive total income from the sample, as they are clearly different from those with no income at all, which would skew the analysis of the relationship between income and fertility.

As mentioned in the introduction, the relationship between income and fertility is not necessarily linear. Therefore, I first conduct a graphical analysis to confirm that applying this model is appropriate before proceeding with the regression analysis.

IV. Results

1. Men

First, I analyze the relationship between men's income and fertility. I divide the sample into five groups: those with no income and those with income divided into quartile classes.[5] Panel A of figure 2 shows the quartile values by age, indicating a monotonically increasing trend. The proportion of men with no income is shown in panel B.

Panel A. Income quartile values

Panel B. Proportion of men with no income

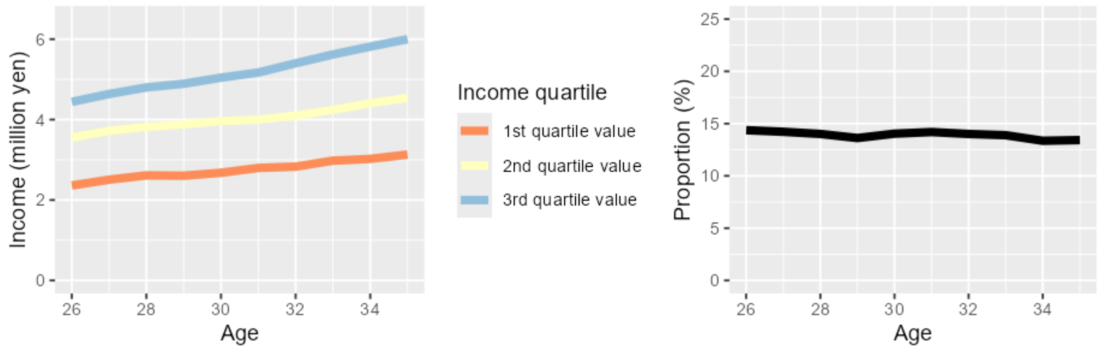

Figure 2. Men's income distribution by age
Note: Age is as of January 1. *Income* refers to the previous year's income.

Figure 3 illustrates the fertility rates for each group. Although there are slight variations, it is evident that higher income levels are associated with higher fertility rates for all ages from 26 through 35. This trend is also confirmed in panel A of figure 4, showing a monotonous positive relationship between income and fertility.

[5] The term *quartile* can refer to either "any of the three values that divide the items of a frequency distribution into four classes, each containing one-fourth of the total population" or "any one of the four classes" (*Merriam-Webster*). To avoid ambiguity, I use *quartile value* for the first meaning and *quartile class* for the second.

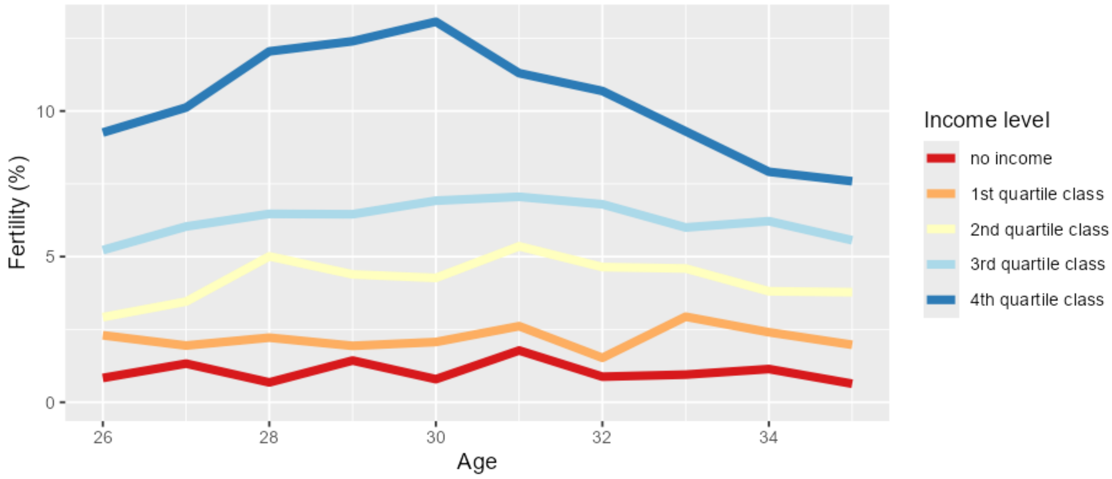

Figure 3. Men's age and fertility by income level
Note: Age is as of January 1. *Fertility* refers to the proportion of childbirths in the following year. *Income* refers to the previous year's income.

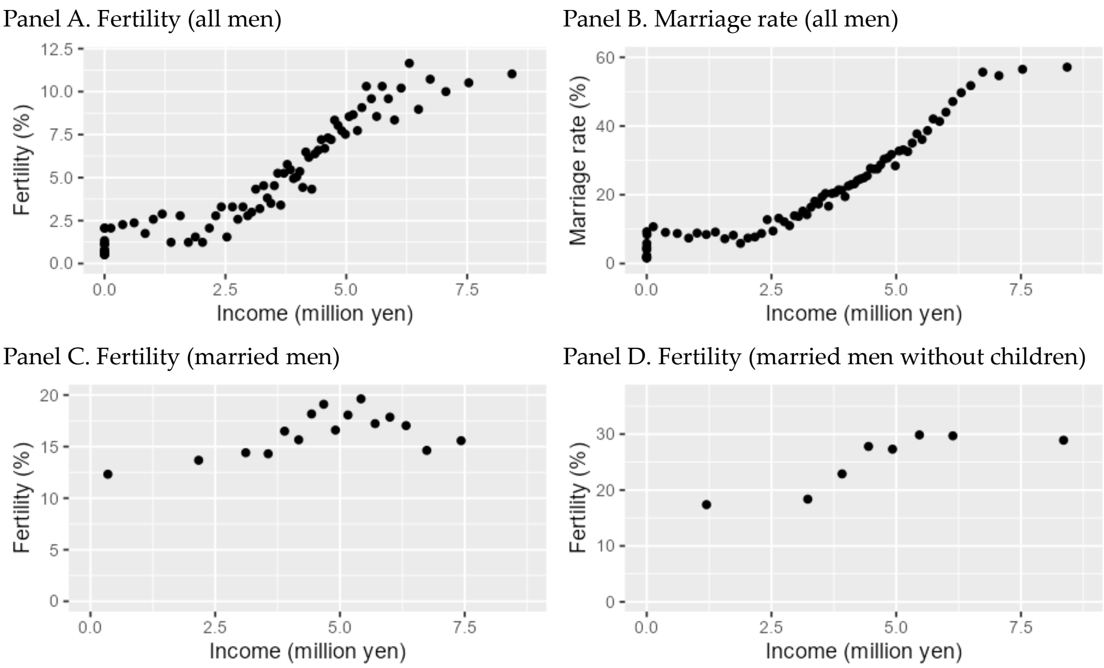

Figure 4. Men's income and fertility
Note: Income refers to the previous year's income. *Fertility* refers to the proportion of childbirths in the following year. *Marriage rate* is as of January 1 of that year. Each bin contains 1,000 observations.

In Japan, where most children are born within marriage, the fact that higher income levels are associated with higher fertility rates suggests that either higher-income men are more likely to be married, or among married men, those with higher incomes are more likely to have children. Examining marital status by age (panel B) clearly shows that higher-income men have higher marriage rates.

On the other hand, while there is a positive relationship between income and fertility among married men, this relationship is much weaker compared to the relationship between income and marriage (panel C).[6] Therefore, the higher fertility rates among higher-income men can be mostly attributed to higher marriage rates among higher-income men, rather than higher fertility rates among higher-income married men.

The positive associations observed in the graphical analysis are also confirmed by regression analysis (table 1). Controlling for year fixed effects, age fixed effects, and parity fixed effects (only for model 2), a 1-million-yen increase in men's income is associated with a 1.192 percentage-point increase in fertility (model 2) and a 4.960 percentage-point increase in marriage rate (model 3).

In addition, among married men, a 1-million-yen increase in income is associated with a 0.977 percentage-point increase in fertility when controlling for these fixed effects (model 5), and a 0.811 percentage-point increase when also controlling for wife's income and wife's age fixed effects (model 6).

Among married men without children, a 1-million-yen increase in income is associated with a 1.786 percentage-point increase in fertility when controlling for these fixed effects (model 7), and a 1.349 percentage-point increase when also controlling for wife's income and wife's age fixed effects (model 8).

In conclusion, there is a monotonic positive relationship between men's income and fertility. This relationship is driven by both the relationship between income and marriage rates and the relationship between income and marital fertility rates, with the former having a greater impact.

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[6] For married men, the apparent negative relationship between income and fertility for those with incomes above 5 million yen is due to higher incomes being associated with older ages, which have lower fertility rates. When controlling for age fixed effects in regression analysis (as shown in model 4 of table 1), a positive relationship is observed. Panels A and B of figure 9 show that while there is a positive relationship between income and children ever born by age 35, this relationship is much weaker among married men compared to all men aged 35, indicating that the higher fertility rates among higher-income men are primarily due to higher marriage rates.

Table 1. Relationship between men's income and fertility / marriage rates

	All men			Married men			Married men without children	
Dep. var. (%):	Childbirth		Married	Childbirth			Childbirth	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Income	1.185 ***	1.192 ***	4.960 ***	0.761 ***	0.977 ***	0.811 ***	1.786 ***	1.349 ***
(million yen)	(0.037)	(0.039)	(0.076)	(0.113)	(0.113)	(0.114)	(0.219)	(0.218)
Wife's income						1.779 ***		2.513 ***
(million yen)						(0.159)		(0.242)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Age FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Parity FE	No	Yes	No	No	Yes	Yes	No	No
Wife's age FE	No	No	No	No	No	Yes	No	Yes
Adj. R^2	0.018	0.022	0.144	0.035	0.078	0.098	0.021	0.050
Observations	74,750	74,750	74,750	16,282	16,282	16,026	8,142	8,041

*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.

Note: Childbirth refers to the following year's childbirth. *Married* refers to marital status as of January 1 of that year. *Income* and *wife's income* refer to the previous year's income. *Age* and *wife's age* refer to age as of January 1 of that year. *Parity* refers to the number of children born by January 1 of that year. The sample includes individuals aged 26 through 35.

2. Women

Next, I analyze the relationship between women's income and fertility. Similar to the analysis for men, I divide women into five groups: those with no income and those with income divided into quartiles. Panel A of figure 5 shows the quartile values by age, and panel B shows the proportion of women with no income.

Panel A. Income quartile values

Panel B. Proportion of women with no income

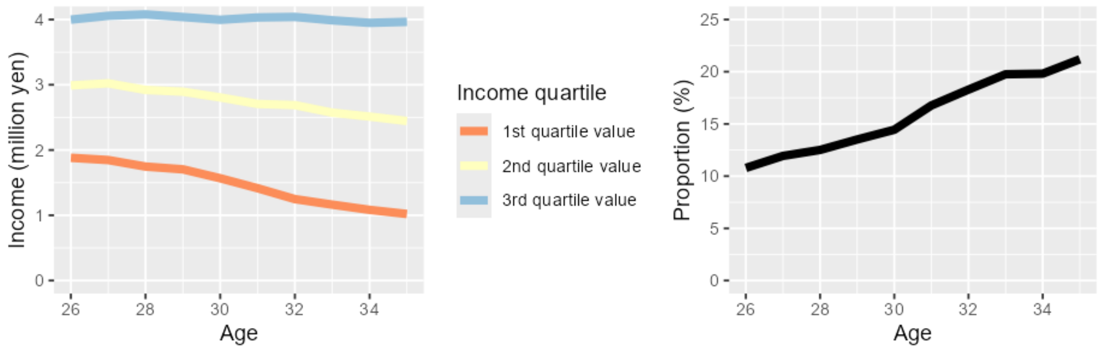

Figure 5. Women's income distribution by age

Note: Age is as of January 1. *Income* refers to the previous year's income.

Figure 6 illustrates the fertility rates for each group. The relationship between income and fertility is not monotonic. To be specific, it appears that the fourth quartile has higher fertility rates throughout the period, but while the third quartile has higher fertility than the second, and the first quartile has higher fertility than those without income, the second quartile has lower fertility than the first. Panel A of figure 7 shows the relationship between income and fertility, depicting a sideways S-shape, further indicating a nonmonotonic relationship.

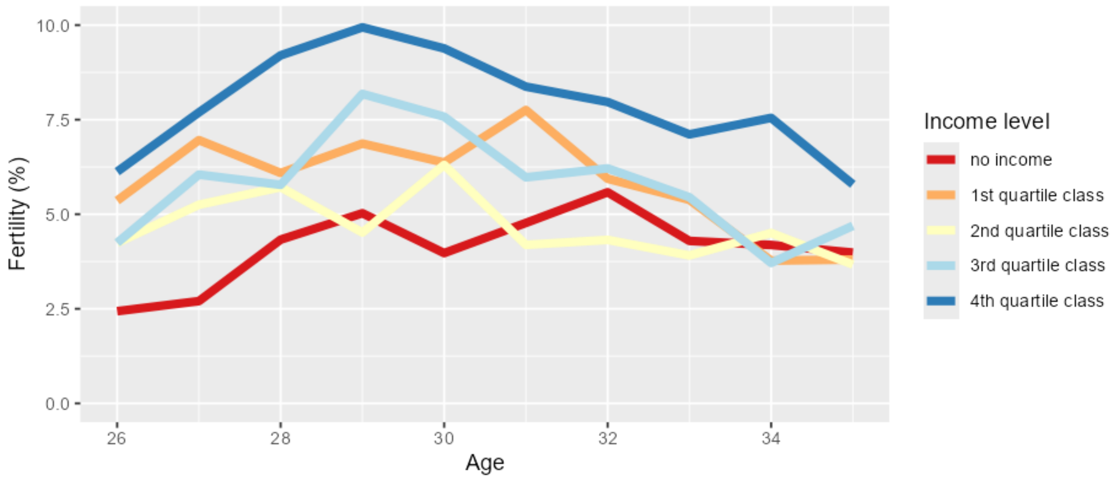

Figure 6. Women's age and fertility by income level

Note: Age is as of January 1. *Fertility* refers to the proportion of childbirths in the following year. *Income* refers to the previous year's income.

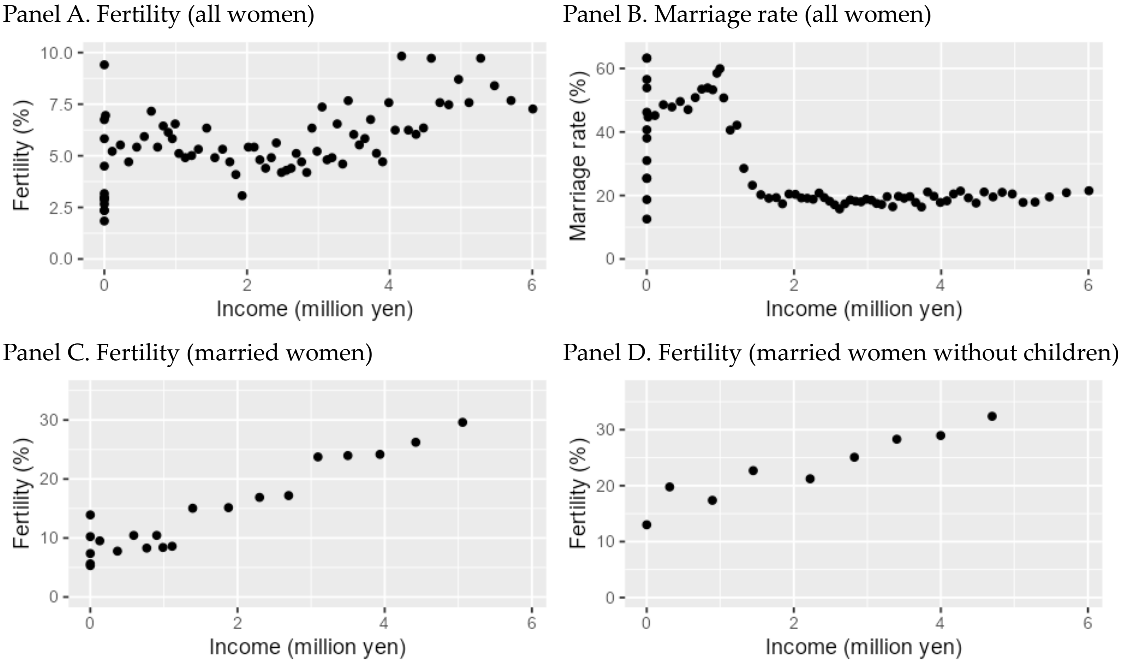

Figure 7. Women's income and fertility

Note: Income refers to the previous year's income. *Fertility* refers to the proportion of childbirths in the following year. *Marriage rate* is as of January 1 of that year. Each bin contains 1,000 observations.

This nonmonotonic relationship is primarily due to the high marriage rates among low-income women. In Japan, spouses with incomes below certain thresholds can benefit from tax and social insurance advantages by being classified as dependents. Consequently, many married women adjust their work hours to stay below the income thresholds of 1.03 million yen for income tax and 1.3 million yen for social insurance (Kondo and Fukai 2023). Panel B shows the relationship between income and marriage rates, indicating high marriage rates up to the early 1-million-yen range, followed by a sharp decline, and then a relatively constant marriage rate beyond that. Revisiting panel A, it is evident that for incomes above 2 million yen, where marriage rates are relatively constant, higher income is associated with higher fertility rates. Panel C, which focuses on married women, confirms a monotonic increase in fertility with income.

For women, it is observed that even four years after childbirth, their income remains less than half of their prebirth income (Fukai and Kondo 2024), a phenomenon known as the "child penalty." Therefore, even if there is a positive relationship between high income and fertility, it might simply reflect that high-income women are less likely to have had children, and women who have not had children are more likely to have them. To remove the impact of the child penalty, panel D shows the fertility rates for married women without children. Even here, a monotonic positive relationship between income and fertility is observed.

Similar to the analysis for men, I examine whether the positive association between income and fertility for women with incomes above 2 million yen is due to higher marriage rates or higher fertility rates within marriage. While there is little difference in marriage rates for incomes above 2 million yen (panel B), there is a monotonic positive relationship between income and fertility among married women (panel C). Therefore, the positive association between income and fertility is due to higher fertility rates within marriage.

The results of these graphical analyses are confirmed by regression analysis in table 2. For women with incomes above 2 million yen, controlling for year fixed effects, age fixed effects, and parity fixed effects (only for model 2), a 1-million-yen increase in women's income is associated with a 0.855 percentage-point increase in fertility (model 2) and a 0.430 percentage-point increase in marriage rate (model 3),[7] which is much smaller than the 4.960 percentage points observed for men.

In addition, among married women, a 1-million-yen increase in income is associated with a 1.919 percentage-point increase in fertility when controlling for these fixed effects (model 5), and a 1.700 percentage-point increase when also controlling for husband's income and husband's age fixed effects (model 6).[8] These coefficients are much larger than the 0.977 and 0.811 percentage points observed for men.

Among married women without children, a 1-million-yen increase in income is associated with a 2.655 percentage-point increase in fertility when controlling for these fixed effects (model 7), and a 2.209 percentage-point increase when also controlling for husband's income and husband's age fixed effects (model 8). These coefficients are also larger than the 1.786 and 1.349 percentage points observed for men.

In conclusion, while the relationship between income and fertility is nonmonotonic for women due to tax and social insurance incentives that encourage many married women to limit their income, a clear positive relationship is observed for women with incomes above 2 million yen. This positive relationship is also observed among married women and married women without children. Unlike men, the positive relationship between women's income and fertility is driven by the relationship between income and marital fertility rates rather than marriage rates.

[7] Though not strong, there is a positive association between income and marriage rate. This finding aligns with Fukuda (2013), who finds that women's earnings now positively influence marriage.

[8] The main reason model 6 in table 2 is not symmetrical with model 6 in table 1 is that there is no age restriction for spouses.

Table 2. Relationship between women's income and fertility / marriage rates

Dep. var. (%):	Women with income of 2 million yen or more			Married women			Married women without children	
	Childbirth		Married	Childbirth			Childbirth	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Income	0.814 ***	0.855 ***	0.430 **	2.920 ***	1.919 ***	1.700 ***	2.655 ***	2.209 ***
(million yen)	(0.090)	(0.091)	(0.142)	(0.140)	(0.143)	(0.147)	(0.220)	(0.226)
Husband's income						0.547 ***		0.982 ***
(million yen)						(0.075)		(0.158)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Age FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Parity FE	No	Yes	No	No	Yes	Yes	No	No
Husband's age FE	No	No	No	No	No	Yes	No	Yes
Adj. R^2	0.004	0.006	0.030	0.061	0.085	0.097	0.031	0.048
Observations	41,773	41,773	41,773	21,489	21,489	20,340	9,607	9,232

*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.

Note: Childbirth refers to the following year's childbirth. *Married* refers to marital status as of January 1 of that year. *Income* and *husband's income* refer to the previous year's income. *Age* and *husband's age* refer to age as of January 1 of that year. *Parity* refers to the number of children born by January 1 of that year. The sample includes individuals aged 26 through 35.

V. Discussion

In the previous section, I have established a positive association between income and fertility for men and for women either with incomes above 2 million yen or who are married. However, the nature of the data does not allow for completely ruling out endogeneity, and thus, one must be cautious in interpreting this as a causal relationship. Here, I explore potential noncausal explanations for this association.

One possibility is bias due to migration. The data used in this study comes from a city with significant central urban functions, where land prices tend to be higher than in surrounding municipalities. If higher-income households remain in the city to have children while lower-income households move to less expensive surrounding areas, a positive association between income and fertility might be observed in the city's data, even if no such relationship exists. Conversely, the city also has nearby affluent residential areas and an even larger, more expensive city further away, suggesting that higher-income individuals might move out when having children. Therefore, income and migration are not independent, and this bias could create an apparent positive association between income and fertility.

To address this, I conduct similar analyses in other municipalities where I have access to tax data. Figure 8 plots the coefficients on income and their 95 percent confidence intervals from the analyses of these municipalities, based on model 2 from tables 1 and 2. I use the ratio of daytime to nighttime population as an indicator of whether the municipality is a central urban area or a suburban area. The municipalities analyzed include a bedroom city in the Tokyo metropolitan area and municipalities near larger cities in rural areas with low daytime populations, as well as central cities in rural regions, prefectural capitals, rural regional centers, and industrial cities with high daytime populations.

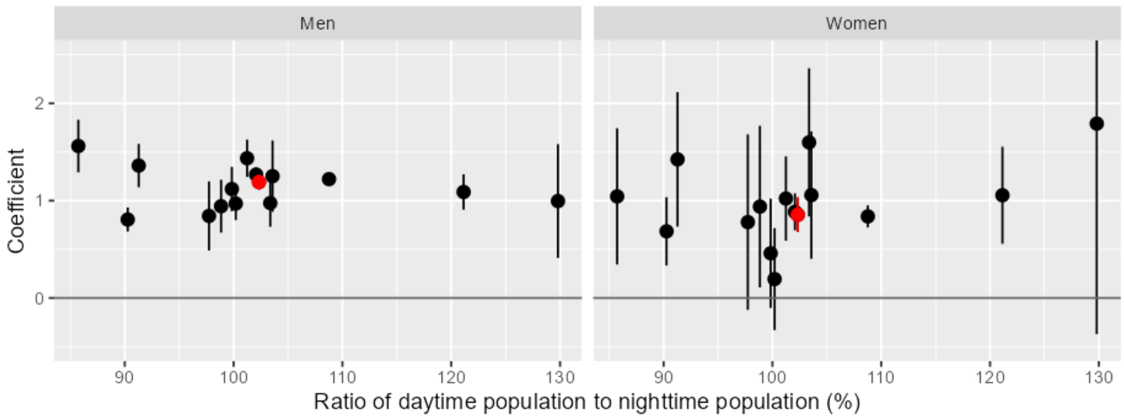

Figure 8. Coefficients on income by municipality

Note: This figure plots the coefficients on income and their 95 percent confidence intervals from the analyses of other municipalities, based on model 2 from tables 1 and 2. The red dot represents the city discussed in this paper. The ratio of daytime to nighttime population is based on the 2020 Census.

The results show that while the estimated coefficients and confidence intervals vary somewhat by municipality, the positive association between income and fertility remains consistent. Therefore, even if there is some bias due to migration, it is unlikely to significantly alter the observed positive association between income and fertility.

Another potential issue is the timing of births. It is generally known that women from lower-income households tend to have children earlier (Caucutt, Guner, and Knowles 2002). If lower-income individuals have already reached their desired number of children before the ages of 26–35, the period analyzed in this study, a positive association between income and fertility might be observed even if there is no relationship between lifetime fertility and income.

To address this, this study includes regression models with parity fixed effects and analyses limited to individuals without children, considering past birth histories. If low-income women who want children have already had them and are excluded from the denominator while high-income women who want children have not yet had them, then even if high-income women do not ultimately have a higher probability of having children than low-income women, the fertility rate conditioned on having no children would be higher for high-income women.

I examine this issue separately for men and women. For men, there is a clear positive relationship between income and children ever born by age 35 (panels A and B of fig. 9). Therefore, even if there are issues with the timing of births, there is a positive relationship between lifetime fertility and income.

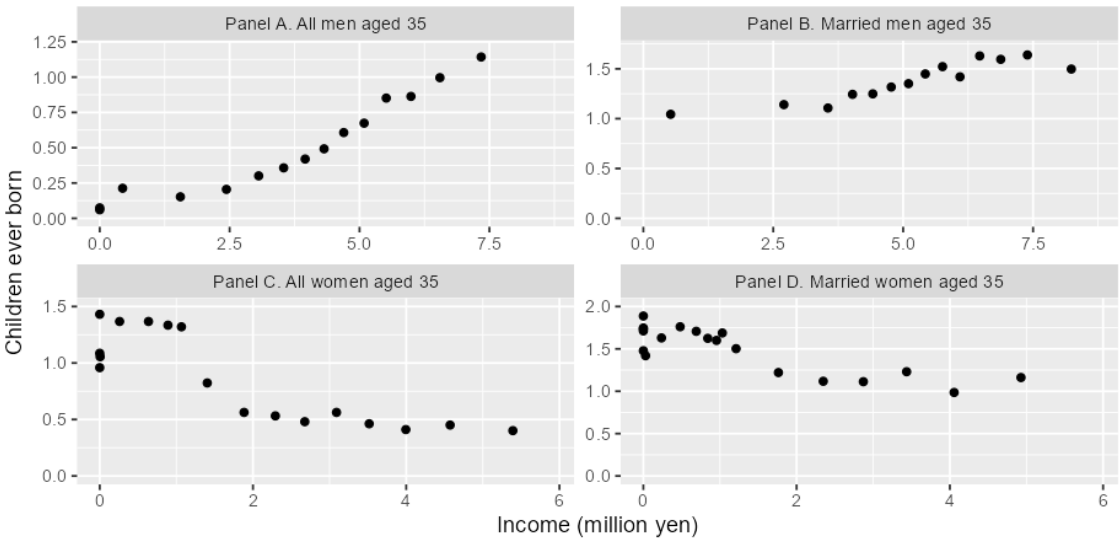

Figure 9. Income and children ever born

Note: Income refers to the previous year's income. *Children ever born* refers to the number of children born by January 1 of that year. Each bin in panels A and C contains 500 observations, and each bin in panels B and D contains 200 observations.

For women, as shown in panels C and D, there is a negative relationship between income and children ever born by age 35. However, this negative relationship is likely influenced by the "child penalty," where childbirth significantly impacts women's employment and income, with effects lasting at least four years (Fukai and Kondo 2024).

Figure 10 plots the relationship between income at age 25 and the number of children ever born and children born by age 29 (four years later). This analysis focuses on individuals aged 25, just before the 26–35 age range, analyzed in this study. College education has usually been completed by age 25, so their actual income can reasonably reflect their potential earning capacity. In addition, since few women have children by age 25, the impact of childbirth on income is minimal.

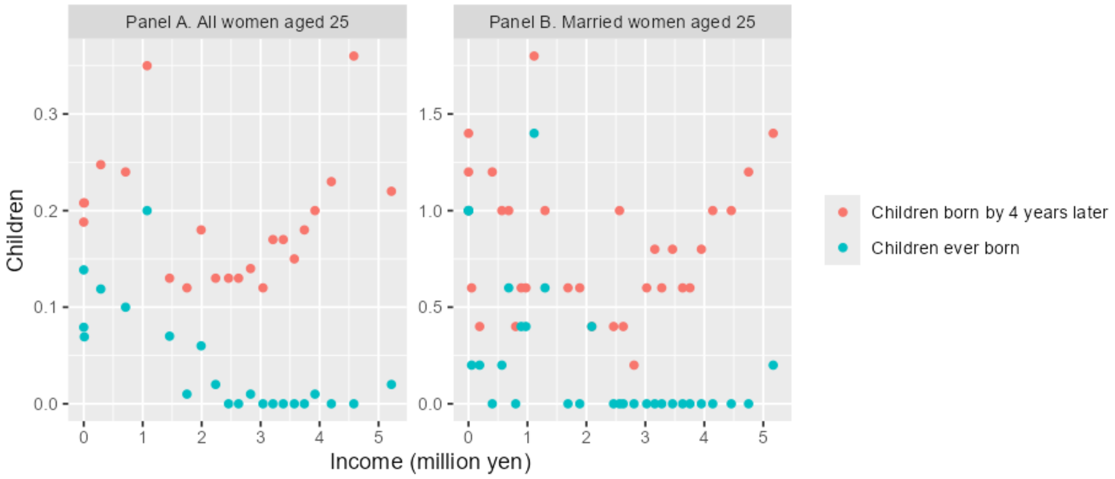

Figure 10. Women's income and children

Note: Income refers to the previous year's income. *Children ever born* refers to the number of children born by January 1 of that year. *Children born by 4 years later* refers to the number of children born by January 1 four years later. Each bin in panel A contains 100 observations, and each bin in panel B contains 5 observations.

Even at age 25, some women have children, particularly those with incomes below 2 million yen, where the number of children ever born is around 0.1 (panel A). However, for women with incomes above 2 million yen, there is a positive association between income and the number of children born by four years later. Regression analysis shows that for women with incomes above 2 million yen at age 25, a one-million-yen increase in income is associated with a 0.057 increase in the number of children born by four years later (statistically significant at the 0.1 percent level).

If lower-income individuals tend to have children earlier, this positive relationship would be subject to downward bias, potentially underestimating the positive relationship rather than creating a nonexistent one.

In summary, while the results of this study should not be immediately interpreted as causal, the potential biases due to migration and timing of births do not appear to be strong enough to create a nonexistent positive relationship between income and fertility. Therefore, the positive association between income and fertility observed in this study is robust.

VI. Conclusion

This study has shown that for men, there is a monotonic positive relationship between income and fertility, driven by higher marriage rates and higher marital fertility among high-income men, with marriage rates having a greater impact. For women, while the relationship between income and fertility is not monotonic, a relatively monotonic positive relationship is observed when excluding women with incomes below 2 million yen, who are more likely to be married and adjust their work hours due to tax and social insurance benefits. Unlike for men, this relationship is driven by higher marital fertility among high-income women rather than higher marriage rates. Regression analysis shows that controlling for year fixed effects, age fixed effects, and parity fixed effects, a 1-million-yen increase in men's income is associated with a 1.192 percentage-point increase in fertility, and for women with incomes above 2 million yen, a 1-million-yen increase in women's income is associated with a 0.855 percentage-point increase in fertility.

The relationship between income and fertility is not fixed and can vary depending on factors such as the availability of childcare. Therefore, the results of this study should be interpreted as reflecting the relationship observed in this specific cohort in Japan. Nonetheless, the significant positive relationship between income and fertility observed in Japanese administrative data is noteworthy. It complements Kondo (2024), who finds a shift from a negative to a positive relationship between income and the number of children at ages 35 and 40, despite large standard errors due to sample size limitations.

This study also highlights the potential of using Japanese administrative records, particularly municipal tax data, for research. Studying fertility rates is challenging due to the low birth rates even among those of childbearing age and the significant bias introduced by attrition in survey panel data. Participants often drop out due to the demands of childbirth itself. Therefore, using accurate and large administrative data is beneficial. Small sample sizes would not allow for the clear graphical and regression analyses conducted in this study (see figs. A1 and A2).

However, there are challenges in using administrative records. These records only include information necessary for administrative purposes, lacking data on education, ease of taking parental leave, household division of labor, values, and other factors that could influence fertility. Future research should combine administrative records with surveys to address these gaps. In addition, administrative records are typically only available for the years needed for administrative purposes. The tax data from the city analyzed in this study was only available from 2018 to 2022. The University of Tokyo's Local Tax Data Utilization Project, which collects administrative records from multiple municipalities, has just started. Longer-term administrative panel data will be accumulated in the future, allowing for the observation of longer-term impacts, such as the relationship between early income and lifetime fertility.

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Appendix: Results from 1/20 Subsamples

For the dataset used in this study, I conduct multiple random samplings, each with a size of 1/20 of the full dataset. Figures A1 and A2 present the results from these subsamples. Figure A1 replicates panel C of figure 7, showing the relationship between married women's income and fertility for each subsample. Figure A2 shows the results of the analysis based on model 2 from table 2, plotting the coefficients on income for each subsample. Both figures show that small sample sizes would not allow for the clear graphical and regression analyses conducted in this study.

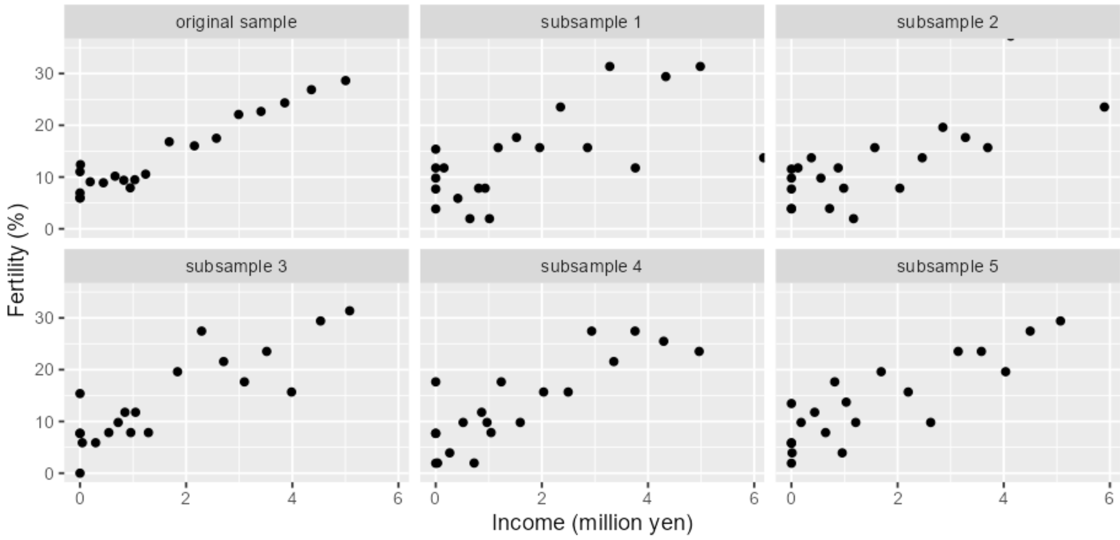

Figure A1. Married women's income and fertility by subsample
Note: Each plot represents a subsample randomly drawn five times, each with a size of 1/20 of the full dataset. *Income* refers to the previous year's income. *Fertility* refers to the proportion of childbirths in the following year. Each bin contains 1,000 observations.

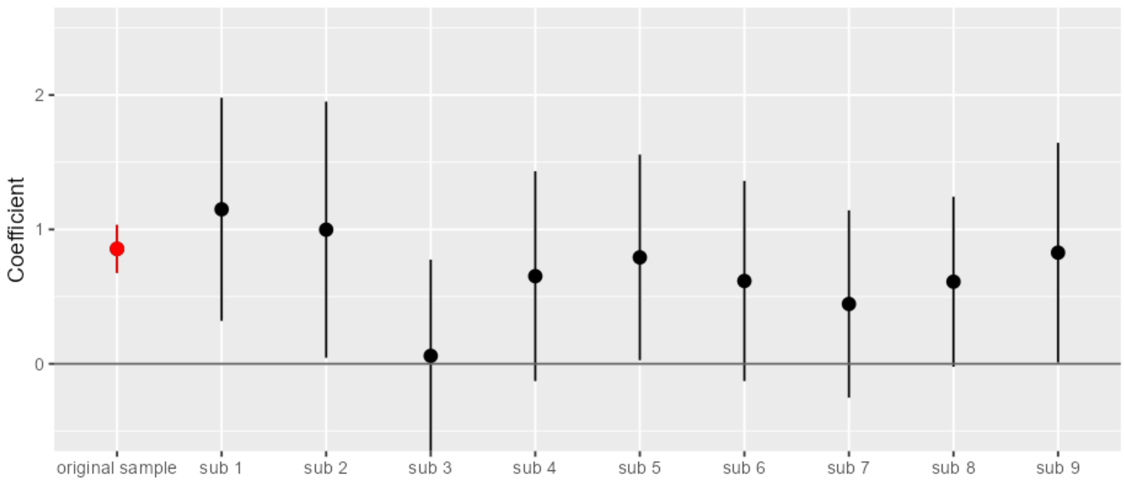

Figure A2. Coefficients on income by subsample
Note: Each plot represents a subsample randomly drawn nine times, each with a size of 1/20 of the full dataset. The analysis is based on model 2 from table 2, with the coefficients on income plotted as points and the 95 percent confidence intervals shown as lines.