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Female Labor Force Participation in Japan:
An epidemiological approach using native and immigrant data*

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Abstract

This is the first study to examine Japanese female labor force participation (LFP) applying the epidemiological approach in economics (EAE), which identifies the roles of cultural and economic factors in determining economic outcomes using native and immigrant data. Although certain economic and social factors discourage women from working, we find that the probability of married female LFP of long-term immigrants is significantly *higher* than that of natives, controlling for human capital, family, and region of residence. The estimation results indicate that the LFP decision is significantly affected by both economic and cultural factors, that is, the social attitude toward being a housewife in the country of origin. Finally, the decomposition results show that our estimation model successfully explains 93.6% of female LFP difference between natives and long-term immigrants, with culture having the largest contribution, greater than that of the women's own education and that of their husbands.

Keywords: female labor force participation, natives, immigrants, culture, education

JEL classification: J16 J22 J24 J61 Z13

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1. Introduction

For decades, Japan has been known to have a large gender gap in the labor market. According to the Global Gender Gap Report 2022, Japan ranks the 121st out of 146 countries on women's "economic participation and opportunity," with a LFP rate much lower than the global average (World Economic Forum 2022). It is widely believed that women are discouraged from working outside of economic and institutional environments in Japan, due to long working hours, limited childcare services and nurseries, and an income tax system that benefits full-time homemakers.

However, some studies have found that improvements in the economic and social environments contribute little to women's performance in the Japanese labor market (Abe 2011; Asai et al. 2015; Asai 2015). Furthermore, the mystery of female labor supply in Japan has escaped the attention of scholars. Living and working in the same social and economic environment as natives, the group of long-term female immigrants residing in Japan for five years or more has a significantly higher average LFP rate than natives, with human capital, family, and region of residence factors controlled. This was determined by using large scale census data. Further, this result could not be caused by migrant selection of working women because the female LFP rate of immigrants who have lived in Japan for 0-4 years is much lower than that of long-term immigrants.

Thus, the economic and institutional environment is not the sole reason for low LFP rates among Japanese women. Another key determinant could be culture, which differs between natives and immigrants. Culture is described as "the ideas, customs, and social behavior of a particular people or society" (Oxford Languages). This study follows Fernández and Fogli (2009), which considers culture as "systematic differences in preferences and beliefs across either socially or geographically differentiated groups." Culture differs between natives and immigrants from various countries; immigrants inherit it from the first generation and passes it on to future generations (Fernández and Fogli 2009; Fernandez et al. 2004).

The cross-country analysis in econometrics to distinguish between the effects of culture and that of economic and institutional environments on economic outcomes is difficult due to unquantifiable institutional factors and other problems. As discussed by Fernández (2010), "standard approaches to this question, such as the use of cross-country regressions on a large variety of variables that are meant to capture economic and institutional differences across countries, identify culture with the regression residual. This approach, however is fraught with problems of omitted variables and endogeneity, compounded by mismeasurement."

To solve this problem, economists have recently developed an epidemiological approach to identify the role of culture in economic outcomes using data on immigrants and natives. They are inspired by epidemiologists who distinguish the genetic contribution to disease from that of the physical environmental through the study of immigrants and natives (Fernández 2008, 2010;

Marmot et. al. 1975). Similarly, in economic analysis, immigrants and natives, although living in the same country, have different cultures but share the same economic and institutional environment. Thus, their data helps to avoid bias caused by unquantifiable factors in different environments when examining their contributions to economic outcomes. This approach has been applied to various topics, such as son preference and the persistence of culture (Almond et.al. 2013), inherited trust and growth (Algan and Cahuc 2010), and female LFP and culture (Blau et.al. 2013; Fernandez and Fogli 2009). Particularly, Fernandez and Fogli (2009) examine the effects of culture on the work and fertility behavior of second-generation American women. Furthermore, Antecol (2000) found that culture affects the gender gap of both first and second generations of immigrant women in the U.S.

In Japan, a culture that highly respects full-time housewives has existed for a long time. As opposed to most other countries where housewives are undervalued in families and by society at large, rarely would you hear a Japanese woman say “I’m just a housewife.” Japanese women perceive their work as wives and mothers as important because it is socially valued (White 1987). This culture may affect women’s preference in participating in the labor market (Nakamura 2021). Hayama et al. (2014) focusing on the employment attitudes of female university students in Japan and China, found that the Japanese are less likely than the Chinese to want to continue working after marriage and childbirth. This is consistent with the results reported in the World Values Survey (Wave 5), which shows that only 8% of the Japanese disagree or strongly disagree with the question “being a housewife is just as fulfilling as working for pay,” which is much lower than that of the Chinese (28.2%). The data of this question has been used as a proxy for culture in U.S studies (Fernandez 2007, 2011) that examines the contribution of culture to female LFP in the country. Following this literature review, we used the same proxy for culture in this study.

Following the EAE, this study examines the effects of both economic and cultural factors on female LFP in Japan using data on natives and immigrants who have been living in Japan for five years or more. The major variables in the estimation are selected based on our extended version of the standard model of labor supply in economics, which introduces culture into the utility maximization of the individual. In section 2, we conduct a review of the existing literature, in sections 3, 4, and 5 we discuss the methods of the study and we draw conclusions in section 6.

2. Previous studies

In Japan, women are widely believed to be discouraged from working due to the economic and social environment. However, studies have provided critical opinions which contribute to the improvement of the economic and social environment to women’s work. Abe (2011) shows that the Equal Employment Opportunity Law for men and women in Japan does not contribute to

regular employment among women. Asai et al. (2015) found that childcare centers provided by the Japanese government did not increase maternal employment. Another study of Asai (2015) also suggests that the labor supply pattern of new mothers did not change in response to the increased cash benefits provided by the government during parental leave. These results motivated us to consider other factors that determine female LFP in Japan, apart from the economic and social environment.

Few studies have qualitatively analyzed the gap in female LFP between immigrants and natives in Japan. Previous studies on immigrants focused on disadvantages in the Japanese labor market. Machikita (2015) shows that foreign females are more likely to be fully unemployed than Japanese women. Osanami and Holbrow (2017) also state that Japan's inflexible labor market and its poor work-life balance and gender inequality have discouraged skilled workers from settling in the country. Suzuki (2017) interviewing highly educated female, career-oriented employees from Asia, employed by Japanese companies, indicates that even if they are capable and highly motivated to work in Japan, they face many difficulties in terms of balancing life events and career progression, abandonment of identity, values, and customs as a foreigner, and pressure from family members in the home country based on the norms and values regarding marriage and childbearing. The study also found that support from family members living abroad is essential for foreign women to continue working, such as in the case of female immigrants from China who continue to work using the support of their mothers and mothers-in-law after birth or during pregnancy. However, Japanese immigration policies provide only three-month visas for most of their parents, which leads to difficulties for most immigrants who receive childcare support from their parents.

Despite the disadvantages faced by immigrants in the Japanese labor market, we find a higher female LFP probability for long-term immigrants than for natives, controlling human capital, family, and residence factors. This suggests that beyond these traditional economic factors, there is a considerable impact from other factors that contribute to female LFP. Culture, which differs between natives and immigrants, could be a factor. Thus, this study examines not only traditional economic, but also cultural factors, in determining female LFP.

3. Estimation strategy

The estimation strategy is based on the standard economic theory of labor supply. A female makes a choice between consuming more goods and consuming more leisure, given a certain level of non-wage income (Cahuc and Zylberberg 2004). The labor supply decision is determined by maximizing utility from goods and leisure, subject to budget constraints, as follows.

$$\text{Max}_{(C,L)} U = C^\alpha L^\beta \text{ s.t. } C \leq wh + R \quad (1)$$

In Equation (1), U is an individual's utility, which is determined by C , the consumption of goods, and L , the leisure time. In the budget constraint, w is the wage rate, h is working hours, and R is non-wage income. The working time h satisfies that $h = T_0 - L$, where T_0 is the total time for work and leisure.

The reservation wage w_R is obtained by solving the above maximization problem. It is equal to the marginal rate of substitution, $(dU/dL)/(dU/dC)$, taken at points $C = R$ and $L = T_0$ (Cahuc and Zylberberg 2004). The calculated result is as follows.

$$w_R = \frac{\beta R}{\alpha T_0} \quad (2)$$

In this study, because a married woman's non-wage income usually comes from the husband's income, we assume that non-wage income equals to the individual's share from her spouse's wage. This share is determined by the bargaining power of the individual, which is higher in cultures with a greater respect for housewives, denoted by c , in the following equation.

$$R = s(c)w_s, 0 < s(c) < 1 \quad (3)$$

In the above equation, $s(c)$ is an increasing equation of culture. In addition, a culture that respects housewives may also increase women's utility from leisure. Thus, we also include the role of culture in the utility function, as $\beta = \beta(c)$, in which β is an increasing function with c .

Further, the individual may have to spend time caring for children and the elderly. Thus, the total time spent on work and leisure, T_0 , is as follows.

$$T_0 = T - H \quad (4)$$

In this equation, T is the total time spent by an individual. H is the time taken to care for children and the elderly, which is determined by the number of young kids, H_k , and the number of older family members, H_o . In addition, time spent on housework is assumed to be exogenous in our study. This is because in Japan, not only housewives but also working women engage in most of the housework (SMBC 2020); housework is rarely reduced by homemaker services because over 97% of families in Japan have never used these services (LINE Corporation 2021).

Further, this study focuses on individuals whose spouses are employed. According to the human capital theory, a spouse's wage is determined as follows:

$$w_s = w_s(educ_s, tenu_s) \quad (5)$$

where $educ_s$ is the education level of the spouse, $tenu_s$ is the potential tenure.

Similarly, if women work, the potential wage they receive is determined by their education level and tenure, as follows.

$$w = w(educ, tenu) \quad (6)$$

The woman participates in the labor market if the wage (w) is higher than the reservation wage (w_R) otherwise, she leaves the labor market as follows.

$$\begin{aligned} LFP &= 1, \text{ if } w > w_R \\ LFP &= 0, \text{ if } w \leq w_R \end{aligned} \quad (7)$$

In the above equations, $LFP = 1$ if the individual participates in the labor market and $LFP = 0$ if the individual does not participate.

Substituting equations (2) to (6) into equation (7), we obtain the following conditions for labor force participation.

$$\begin{aligned} LFP &= 1, \text{ if } w(educ, tenu) - \frac{\beta(c) s(c) w_s(educ_s, tenu_s)}{\alpha [T - H(H_k, H_o)]} > 0 \\ LFP &= 0, \text{ if } w(educ, tenu) - \frac{\beta(c) s(c) w_s(educ_s, tenu_s)}{\alpha [T - H(H_k, H_o)]} \leq 0 \end{aligned} \quad (8)$$

Thus, the logit model for LFP is as follows (Greene 2008).

$$Prob[LFP = 1] = F(educ, tenu, H_k, H_o, educ_s, tenu_s, c, constant) \quad (9)$$

In Equation (9), the probability of LFP is increased by a higher level of education, $educ$, and a longer tenure, $tenu$; whereas it is reduced when living with young children, H_k , or older family members, H_o . Spouse's higher level of education, $educ_s$, and longer tenure, $tenu_s$, reduces the probability of LFP. Moreover, the probability of LFP is reduced by a culture that respects housewives, c .

Additionally, we introduce the variable of *living in public houses* to control the economic condition because public housing is provided for low-income families and individuals. Other

control variables include *spouse's job type*, *house owner*, *municipality-level (ShiKuChoSon in Japanese) population*, and *prefecture dummies*.

4. Data

The individual data used in this study were the total responses from the Japanese 2010 Population Census. The census aims to provide a complete and accurate count of the population and essential information on individuals and households. In 2010, the number of responses to the census was 128.1 million, which was reported as the official statistic of the Japanese population in 2010. This census is conducted every five years. As the 2015 census was a simplified one that omitted information such as education, and individual-level data for academic studies was not provided in the 2020 census, we used the 2010 census data for this study.

Immigrants in Japan are defined as foreign nationals who live in Japan but do not have Japanese nationality (Immigration Services Agency of Japan, Ministry of Justice). This definition is similar to European countries but differs from the U.S and certain other countries where the definition is based on birthplace (OECD 2003). As the 2010 census was conducted in Japanese and 27 foreign languages with the cooperation of major immigrant support organizations in Japan, the immigrant responses in the census are believed to have high reliability (Ministry of Internal Affairs and Communications 2010). The total responses by immigrants were 1.63 million, which covers over 70% of registered immigrants in this year.

Our estimation analysis uses the total responses of immigrants and a 10% random sample of natives. Among the data for each variable, LFP = 1 if the individual is employed or unemployed, and LFP = 0 if the individual does not participate in the labor market. Education level is measured as dummy variables for four categories: *primary school or junior high school* = 1 if applicable and 0 otherwise, *senior high school* = 1 if applicable and 0 otherwise, *junior college or technical college* = 1 if applicable and 0 otherwise, *university (undergraduate or higher)* = 1 if applicable and 0 otherwise. *Job type* refers to whether an individual is a *seishain* (a worker who has acquired lifetime employment, job type = 1) or not (job type = 0). Furthermore, *living in public house* = 1 if the individual lives in a public house, and is 0 otherwise. *Local population* is ranked from the largest population in a residential area (on city/town levels) and is classified into 19 levels.

Moreover, the proxy for culture comes from the World Values Survey (Wave 5, 2005-2009), following Fernandez (2007, 2011). In this survey, the respondents were asked to express their attitude toward the statement “being a housewife is just as fulfilling as working for pay,” using a four level scale of “strongly agree” (response = 4), “agree” (response = 3), “disagree” (response = 2), and “strongly disagree” (response = 1). To obtain the social level of the attitudes, this study calculated the country average of those responses and matched them with the

individuals' country of origin in the census. A total of 55 countries were matched, and the country average of this data was 2.75, with a standard deviation of 0.34. Among these countries, the cultural data for Japan was 3.12, which is higher than that of most countries of origin for immigrants living in Japan. Another proxy for culture, female LFP rates in immigrants' countries of origin, has been used in previous studies (Fernandez and Fogli 2009 and Antecol 2000). Unfortunately, this proxy is not applicable to our study because our culture variable includes both immigrants and natives.

For this study, we focused on individuals who are married, aged 15-64, have lived in Japan for five years or more, and whose spouses are employed. We excluded individuals who are currently at school, foreign workers involved in the Japan Technical Intern Training Program, and special households such as those in the army or nursing homes. Furthermore, this study concentrates on individuals whose spouses have the same nationality as them because international marriages usually cause different culture assimilations, which has been left for future research. A summary of statistics in this study is presented in Table A1 in the Appendix.

5. Major estimation results

5.1 Differences in female LFP between natives and immigrants

We first examined whether there were female LFP differences between natives and immigrants by controlling factors related to human capital, spouse, family conditions, and residential regions. This study focuses on immigrants who have lived in Japan for five years or more. For comparison, immigrants who have lived in Japan for fewer than five years are also included in this subsection. In the first few years after migrating to the host country, immigrants' LFP behavior may be affected by their initial purpose for immigration, lack of local language skills, and limited information on the local labor market. After a certain period of assimilation, these initial effects decrease sharply, and the economic and social environment in the host country may become one of the major determinants of LFP behaviors, similar to natives.

Table 1 reports the results of LFP differences between natives and the two immigrant groups.

(Table 1)

The results indicate that female LFP rates are significantly higher for long-term immigrants than natives, whereas the rates are significantly lower for most short-term immigrants than natives. As expected, the lower female LFP rate could be caused by the effects of the initial purpose for immigration and the lack of language skills and information. However, these effects would be minute for long-term immigrants, indicated by the significantly *positive* estimates of long-term

immigrants in the results. Additionally, our results were not affected by the work limitations of visas, because all immigrants in this study were allowed to work in Japan, and temporary visitors and students were excluded from our samples. For instance, for immigrants who have fixed-term working visas, their spouses who have spouse visas (*Kazoku taizai*) are allowed to work under 28 hours per week by applying for “permission to engage in activities other than permitted under the status of residence,” which is approved for almost all applicants; for immigrants with green cards, their spouses do not have any work limitations.

Overall, as we have controlled human capital, spouses, family conditions, and residential regions factors, this higher level of LFP for long-term immigrants than natives could be caused by culture, which we carefully examine in the subsequent section.

5.2 The roles of culture and personal economic factors in female LFP determination

Table 2 shows the estimated effects of cultural and economic factors on female LFP. For comparison, the results for men are also included. This table reports the average marginal effect of each factor. First, the model results for females, show that with a one-degree increase in the culture indicator, that is., positive social attitudes toward housewives, the probability of female LFP decreases by 14.3 percentage points. In other words, as the standard deviation of culture among all sample countries is 0.34, one standard deviation increase in culture reduces the probability of female LFP by 4.9 percentage points, which is as large as having a university degree, thereby increasing the probability of female LFP by 5.1 percentage points. The results indicated that positive social attitudes toward housewives could reduce female LFP. Furthermore, this result can be confirmed by the results for males, in which the same proxy of culture, that is, positive social attitudes toward housewives, increases male LFP. One standard deviation increase in the culture of positive attitudes toward housewives increased the probability of male LFP by 1.6 percentage points. This could be because the positive social attitude toward housewives increases men’s preference for housewives than working wives therefore, LFP to support their families increases.

Second, as a culture that highly respects full-time housewives and has existed for many years among the Japanese, the large gender gap in the labor market may not be solely due to discrimination against females and the economic and social environment, but also due to women’s preferences. This may be a reason for the limited contributions of policies that improve the social and economic environment for females’ labor participation (Abe 2011; Asai et al. 2015).

The rest of the results indicate that having a university degree increases the probability of female LFP by 5.1 percentage points, while having a junior college or technical college degree only leads to an increase of 1.1 percentage points for LFP probability. In contrast, husbands with university degrees reduce the probability of women’s LFP by 16.8 percentage points, if the

husband's degree was from a junior college or technical college and is a high school graduate, the probability was reduced by 9.7 and 7.9 percentage points, respectively. Moreover, husbands being older in age, which indicates a potential longer tenure, also has a significantly negative estimate.

Based on the theoretical background of this study, the explanations are as follows: First, a higher level of woman's education leads to a higher wage if they work, which increases the probability that the expected wage is higher than their reservation wage thus, probability of LFP grows. Second, husbands with more years of education and longer tenure leads to a higher wage, which increases the non-wage income of the spouse. Thus, the reservation wage, which is determined by the maximization of women's utility from work and leisure subject to budget constraints, increases, leading to a lower probability of LFP for women.

Furthermore, for women, the effect of her husband having a university degree (16.8 percentage points) is much higher than the effect of the woman holding a university degree herself (5.1 percentage points). This indicates that the LFP decision of women is largely affected by her husband's income. As a developed country, the high level of husbands' wages could be one of the reasons for the low female LFP rate in Japan.

Moreover, the results show that having an additional child under six years of age is associated with a 14.5 percentage points decrease in women's probability of LFP. This could be caused by the effect that having young children in the family reduces women's LFP, or the opposite effect that working women may give fewer births. Moreover, living with one or more older family members aged 65-75 reduces women's LFP probability by 3.2 percentage points, indicating that women may reduce their LFP to take care of older members of the family. However, this effect is very small for those living with family members who are aged 85 and older. The reason for this could be that in Japan, many older people receive home care services, which reduces the time spent to care for these family members. Additionally, these estimates are very small in the results for men, indicating that men's LFP are rarely affected if they have by young children or are living with older family members.

(Table 2)

6. Additional analysis: the decomposition result

This section examines the extent to which our model explains the female LFP differences between natives and long-term immigrants. This analysis uses a nonlinear decomposition of binary outcome differentials (Fairlie 2003, 2005; Jann 2006).

The results are presented in Table 3. Approximately 93.6% of the female LFP gap between natives and long-term immigrants is explained by our model. Particularly, cultural differences between natives and long-term immigrants explains 25.8% ($0.0172/0.0667$) of the gap,

the contribution of which is larger than the education difference, which explains 21.1% $((0.00482+0.00809+0.00118)/0.0667)$ of the gap. Furthermore, differences in husbands' education levels explain 23.6% of the LFP gap for females.

For comparison, we further examined factors contributing to the male LFP gap between natives and long-term immigrants and found that only 31.2% $(0.005/0.016)$ of the gap is explained by the observed factors. The reason for this could be that males' labor force participation behavior is usually different from those of women's. Furthermore, the results reported factors contributing to the LFP gaps between natives and short-term immigrants for males and females indicating that the total factor contributions do not explain either gap. This could have been caused by limited language skills and lack of information in the first few years after migration, as discussed in Section 4.1. In summary, the comparison results suggest that a good explanation of our model on female LFP differences between natives and long-term immigrants could not be simply caused by technical skills, but really reflects the characteristics of those individuals.

(Table 3)

7. Concluding remarks

This study provides novel evidence for female LFP in Japan using native and immigrant data. It follows the EAE method, which identifies the roles of culture and economic factors in determining economic outcomes.

Although the economic and social environment in Japan has been considered to discourage women from working, we found that the probability of married female LFP of long-term immigrants is significantly higher than that of natives, controlling human capital, family, and region of residence factors. This suggests that there is a permanent factor that contributes to a higher level of LFP among immigrants, and the most likely factor could be culture. To examine the role of culture in determining female LFP in Japan, we introduced a proxy for culture, following a previous study conducted in the U.S. The estimation results indicate that females' LFP decision is significantly affected by both economic and cultural factors, that is, social attitude toward being a housewife in the country of origin. The effect of one standard deviation increase in culture is as large as that of having a university degree. Finally, the decomposition results show that our model successfully explains 93.6% of the female LFP difference between natives and long-term immigrants; particularly, culture contributes 25.8% of the difference, which is larger than the contribution from women's own education (21.1%) and her husband's education (23.6%).

Note that we do not claim that the negative effect of culture on Japanese women's LFP is a disadvantage in Japanese society. Instead, housewives' hard work must be fully respected. Our implication is that the gender gap in Japan is not solely caused by women facing

discrimination or other factors, but is also partly a result of women's voluntary and optimal preferences that maximize their utilities.

By contrast, Japan saw a gradual increase in the female LFP rate in the late 2010s. Policies that aim at increasing women's labor force participation in the backdrop of a lack of labor in Japan seem to have contributed to female LFP during this period. Unlike previous major policies that have been considered to contribute little to women's LFP, the policies in the late 2010s have a new slogan, which suggests that working is an excellent choice for women (*kyosei katsuyaku*), and has been promoted on television, the streets and throughout Japan. This could have challenged the traditional attitudes toward being a housewife and may have contributed to the increase in female LFP in the late 2010s.

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Table 1. Female LFP differences between natives and the two immigrant groups: country dummies

	Model	Comparison	Comparison	Comparison
	Immigrants (5 years and more) and natives	Immigrants (5 years and more) and natives	Immigrants (0-4 years) and natives	Immigrants (0-4 years) and natives
Country of origin (reference: Japanese natives)				
Korea	0.00558** (0.00259)	0.00173 (0.00263)	-0.347*** (0.0116)	-0.341*** (0.0118)
China	0.0387*** (0.00263)	0.0619*** (0.00266)	-0.121*** (0.00490)	-0.0610*** (0.00497)
Philippines	0.189*** (0.00756)	0.206*** (0.00763)	0.146*** (0.0143)	0.196*** (0.0144)
Thailand	0.0781*** (0.0216)	0.0937*** (0.0219)	-0.189*** (0.0406)	-0.146*** (0.0414)
Indonesia	0.101*** (0.0207)	0.109*** (0.0208)	-0.141*** (0.0295)	-0.120*** (0.0296)
Vietnam	0.128*** (0.0106)	0.135*** (0.0106)	-0.0104 (0.0214)	0.0456** (0.0216)
UK	0.0239 (0.0402)	0.0249 (0.0408)	-0.0265 (0.0398)	-0.00380 (0.0404)
US	0.0731*** (0.0178)	0.0695*** (0.0180)	-0.0639*** (0.0171)	-0.0507*** (0.0172)
Brazil	0.119*** (0.00352)	0.140*** (0.00357)	0.173*** (0.00828)	0.221*** (0.00840)
Peru	0.122*** (0.00698)	0.125*** (0.00705)	0.0431** (0.0208)	0.0581*** (0.0210)
Immigrants from other countries	0.152*** (0.00437)	0.167*** (0.00440)	-0.143*** (0.00765)	-0.123*** (0.00771)
Education (reference: primary school or junior high school)				
Senior high school	-0.0104*** (0.00122)	-0.0101*** (0.00124)	-0.00691*** (0.00126)	-0.00638*** (0.00128)
Junior college or technical college	0.0106*** (0.00141)	0.00579*** (0.00143)	0.0145*** (0.00145)	0.00993*** (0.00147)

Table 1 (continued)

	Model	Comparison	Comparison	Comparison
	Immigrants (5 years and more) and natives	Immigrants (5 years and more) and natives	Immigrants (0-4 years) and natives	Immigrants (0-4 years) and natives
University (undergraduate or higher)	0.0483*** (0.00164)	0.0433*** (0.00166)	0.0534*** (0.00169)	0.0493*** (0.00171)
Age (reference: 15-24)				
25-35	0.123*** (0.00306)	0.110*** (0.00306)	0.127*** (0.00317)	0.115*** (0.00318)
36-45	0.165*** (0.00322)	0.216*** (0.00321)	0.171*** (0.00334)	0.225*** (0.00333)
46-55	0.225*** (0.00359)	0.311*** (0.00355)	0.233*** (0.00373)	0.322*** (0.00369)
56-64	0.0557*** (0.00392)	0.117*** (0.00390)	0.0610*** (0.00406)	0.124*** (0.00405)
Spouse's Education (reference: primary school or junior high school)				
Senior high school	-0.0792*** (0.00119)	-0.0774*** (0.00120)	-0.0786*** (0.00122)	-0.0763*** (0.00124)
Junior college or technical college	-0.0973*** (0.00165)	-0.0974*** (0.00167)	-0.0971*** (0.00169)	-0.0967*** (0.00171)
University (undergraduate or higher)	-0.167*** (0.00134)	-0.166*** (0.00136)	-0.168*** (0.00138)	-0.166*** (0.00140)
Spouse's age	-0.00530*** (7.41e-05)	-0.00401*** (7.14e-05)	-0.00535*** (7.69e-05)	-0.00398*** (7.41e-05)
Spouse's job type	0.0146*** (0.000886)	0.0187*** (0.000891)	0.0205*** (0.000917)	0.0256*** (0.000922)
Living in public houses	0.0112*** (0.00172)	-0.000863 (0.00174)	0.0249*** (0.00188)	0.0138*** (0.00190)
Local population	-0.00426*** (9.36e-05)	-0.00394*** (9.47e-05)	-0.00432*** (9.57e-05)	-0.00398*** (9.69e-05)

Table 1 (continued)

	Model	Comparison	Comparison	Comparison
	Long-term immigrants and natives	Long-term immigrants and natives	Short-term immigrants and natives	Short-term immigrants and natives
House owner	0.0633*** (0.000876)	0.0546*** (0.000885)	0.0656*** (0.000908)	0.0568*** (0.000917)
Number of children under the age of six	-0.145*** (0.000646)		-0.147*** (0.000669)	
Number of families aged 65-75	-0.0317*** (0.00108)		-0.0312*** (0.00111)	
Number of families aged 85 and older	0.00773*** (0.00164)		0.00776*** (0.00166)	
Residential prefecture dummies	Yes	Yes	Yes	Yes
Observations	2,038,488	2,038,488	1,934,177	1,934,177
Pseudo R2	0.0619	0.0439	0.0626	0.0442
Log-likelihood	-1.284e+06	-1.309e+06	-1.223e+06	-1.247e+06

Note: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 2. Effects of economic factors and culture on LFP

	Female		Male	
	Model	Comparison	Comparison	Comparison
Culture	-0.143*** (0.00421)	-0.180*** (0.00426)	0.0469*** (0.00212)	0.0473*** (0.00213)
Education (reference: primary school or junior high school)				
Senior high school	-0.00932*** (0.00123)	-0.00914*** (0.00125)	0.00130*** (0.000412)	0.00125*** (0.000412)
Junior college or technical college	0.0110*** (0.00142)	0.00602*** (0.00144)	0.00804*** (0.000793)	0.00799*** (0.000793)
University (undergraduate or higher)	0.0505*** (0.00165)	0.0458*** (0.00167)	0.00253*** (0.000527)	0.00233*** (0.000526)
Age (reference: 15-24)				
25-35	0.126*** (0.00313)	0.114*** (0.00313)	0.0356*** (0.00490)	0.0340*** (0.00489)
36-45	0.168*** (0.00329)	0.221*** (0.00328)	0.0629*** (0.00487)	0.0575*** (0.00485)
46-55	0.229*** (0.00367)	0.317*** (0.00362)	0.0769*** (0.00490)	0.0674*** (0.00486)
56-64	0.0582*** (0.00399)	0.121*** (0.00398)	0.0154*** (0.00493)	0.00339 (0.00489)
Spouse's Education (reference: primary school or junior high school)				
Senior high school	-0.0789*** (0.00119)	-0.0771*** (0.00121)	-0.00301*** (0.000429)	-0.00332*** (0.000429)
Junior college or technical college	-0.0974*** (0.00166)	-0.0974*** (0.00168)	-0.00494*** (0.000567)	-0.00524*** (0.000567)
University (undergraduate or higher)	-0.168*** (0.00135)	-0.166*** (0.00137)	-0.00956*** (0.000715)	-0.00986*** (0.000714)
Spouse's age	-0.00528*** (7.50e-05)	-0.00397*** (7.23e-05)	-0.00420*** (3.75e-05)	-0.00391*** (3.38e-05)
Spouse's job type	0.0150*** (0.000891)	0.0193*** (0.000896)	0.0127*** (0.000390)	0.0127*** (0.000390)

Table 2. (continued)

	Female Model	Comparison	Male Comparison	Comparison
Living in public houses	0.0160*** (0.00174)	0.00508*** (0.00176)	-0.0193*** (0.000784)	-0.0193*** (0.000785)
Population	-0.00416*** (9.39e-05)	-0.00379*** (9.51e-05)	0.000471*** (3.90e-05)	0.000470*** (3.89e-05)
House owner	0.0625*** (0.000882)	0.0537*** (0.000891)	-0.00698*** (0.000494)	-0.00743*** (0.000493)
Number of children under the age of six	-0.145*** (0.000654)		0.00439*** (0.000484)	
Number of families aged 65-75	-0.0320*** (0.00109)		0.0143*** (0.000706)	
Number of families aged 85 and older	0.00729*** (0.00165)		-0.00234*** -0.000451	
Residential prefecture dummies	Yes	Yes	Yes	Yes
Observations	2,009,755	2,009,755	1,933,182	1,933,182
Pseudo R2	0.0608	0.0427	0.223	0.223
Log-likelihood	-1.270e+06	-1.294e+06	-264204	-264482

Note: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 3. Contribution of economic factors and culture to the LFP differential between natives and immigrants

	Females Immigrants (5 years and more) and natives	Females Immigrants (0-4 years) and natives	Males Immigrants (5 years and more) and natives	Males Immigrants (0-4 years) and natives
Total explained	0.0624	0.0879	0.00509	0.0905
Difference	0.0667	-0.0869	0.0161	-0.000350
Pr(Y!=0 G=immigrant)	0.664	0.511	0.973	0.956
Pr(Y!=0 G=native)	0.598	0.598	0.957	0.957
Culture	0.0172*** (0.000984)	0.0762*** (0.00497)	-0.000803*** (0.000212)	0.00771*** (0.00176)
Education (reference: primary school or junior high school)				
Senior high school	0.00482*** (0.000877)	0.00837*** (0.00298)	-0.000149 (0.000213)	-0.00121 (0.00193)
Junior college or technical college	0.00809*** (0.00120)	0.0122*** (0.00183)	0.000200** (0.000102)	0.00129* (0.000680)
University (undergraduate or higher)	0.00118* (0.000662)	-0.00932** (0.00376)	0.000677*** (0.000166)	0.00124 (0.00267)
Age (reference: 15-24)				
25-35	0.00437*** (0.00134)	0.0123** (0.00489)	0.000819 (0.000730)	0.0283*** (0.00842)
36-45	0.00182*** (0.000551)	-0.000277 (0.000214)	0.00258*** (0.000945)	0.00751*** (0.00266)
46-55	-0.000850*** (0.000265)	-0.00150 (0.00382)	0.00219*** (0.000800)	-0.00714*** (0.00244)
56-64	0.00459* (0.00241)	0.0150* (0.00899)	0.000960 (0.00260)	-0.00900 (0.0139)
Spouse's Education (reference: primary school or junior high school)				
Senior high school	0.00911*** (0.000856)	0.00416 (0.00291)	-0.000493 (0.000368)	8.87e-05 (0.00368)
Junior college or technical college	0.00195*** (0.000274)	0.000568*** (0.000143)	-0.000302 (0.000275)	0.00545* (0.00304)
University (undergraduate or higher)	0.00469*** (0.000192)	-0.0382*** (0.00269)	-0.000962*** (0.000322)	-0.0176*** (0.00669)

Table 3 (continued)

	Females	Females	Males	Males
	Immigrants (5 years and more) and natives	Immigrants (0-4 years) and natives	Immigrants (5 years and more) and natives	Immigrants (0-4 years) and natives
Spouse's age	0.0130*** (0.00143)	0.0333*** (0.00924)	0.0136*** (0.000808)	0.0351*** (0.00761)
Spouse's job type	0.0266*** (0.00102)	0.0265*** (0.00143)	0.000756*** (0.000137)	0.00693*** (0.000976)
Living in public houses	-0.00879*** (0.000652)	-0.00260*** (0.000706)	-0.00943*** (0.000655)	-0.00573*** (0.00116)
Local population	-0.00255 (0.00161)	-0.00772** (0.00332)	-0.00166** (0.000825)	0.000780 (0.00336)
House owner	-0.0196*** (0.00157)	-0.0197* (0.0106)	-0.00532*** (0.000743)	0.00895 (0.0106)
Number of children under the age of six	-0.00380*** (0.000106)	-0.00660*** (0.000560)	0.000442** (0.000200)	0.000224 (0.000982)
Number of families aged 65-75	0.00211*** (0.000508)	-0.00369 (0.00477)	9.33e-05 (0.000218)	-0.00147 (0.00130)
Number of families aged 85 and older	-0.00146** (0.000714)	-0.00202 (0.00648)	-0.000530 (0.000545)	0 (0)
Residential prefecture dummies	Yes	Yes	Yes	Yes
Number of obs	2,009,755	1,929,398	1,933,182	1,846,435
N of obs G=native	1.911e+06	1.911e+06	1.832e+06	1.832e+06
N of obs G=immigrant	98638	18281	101649	14902

Note: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Appendix

Table A1. Summary statistics

(1) Females

	Obs	Mean	Std. Dev.	Min	Max
Labor force participation (LFP)	2038488	0.60	0.49	0	1
Senior high school	2038488	0.46	0.50	0	1
Junior college or technical college	2038488	0.24	0.42	0	1
University (undergraduate or higher)	2038488	0.12	0.32	0	1
Age 25-35	2038488	0.19	0.39	0	1
Age 36-45	2038488	0.26	0.44	0	1
Age 46-55	2038488	0.25	0.43	0	1
Age 56-64	2038488	0.29	0.45	0	1
Senior high school(Spouse)	2038488	0.42	0.49	0	1
Junior college or technical college(Spouse)	2038488	0.08	0.27	0	1
University (undergraduate or higher, Spouse)	2038488	0.30	0.46	0	1
Spouse's age	2038488	49.12	12.01	15	100
Spouse's job type (seishain)	2038488	0.72	0.45	0	1
Local population	2038488	9.21	4.09	1	19
Number of children under the age of six	2038488	0.27	0.58	0	8
Number of families aged 65-75	2038488	0.12	0.34	0	3
Number of families aged 85 and older	2038488	0.04	0.20	0	4

(2) Males

	Obs	Mean	Std. Dev.	Min	Max
Labor force participation (LFP)	1962680	0.96	0.20	0	1
Senior high school	1962680	0.43	0.49	0	1
Junior college or technical college	1962680	0.09	0.28	0	1
University (undergraduate or higher)	1962680	0.30	0.46	0	1
Age 25-35	1962680	0.17	0.37	0	1
Age 36-45	1962680	0.26	0.44	0	1
Age 46-55	1962680	0.26	0.44	0	1
Age 56-64	1962680	0.31	0.46	0	1
Senior high school(Spouse)	1962680	0.46	0.50	0	1
Junior college or technical college(Spouse)	1962680	0.24	0.43	0	1
University (undergraduate or higher, Spouse)	1962680	0.12	0.33	0	1
Spouse's age	1962680	45.45	10.79	16	107
Spouse's job type (seishain)	1962680	0.22	0.41	0	1
Local population	1962680	9.22	4.10	1	19
Number of children under the age of six	1962680	0.29	0.60	0	8
Number of families aged 65-75	1962680	0.04	0.22	0	3
Number of families aged 85 and older	1962680	0.04	0.20	0	4