Female labour supply in Australia and Japan: An analysis based on longitudinal data

Tomoko Kishi

Department of Economics, Nanzan University
18 Yamazato-cho Showa-ku Nagoya, Japan
kisi@nanzan-u.ac.jp

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1. Introduction

The objective of this study is to compare female labour supply in Australia with that in Japan using longitudinal data. In particular, we focus on the relationships between education, vocational qualifications, and employment statuses of women in both countries. This comparison enables us to isolate problems concerning skills formation and job creation in the Japanese labour market because the two countries have different types of job skills formation and employment systems.

The Japanese labour market has been characterised by low mobility of employees and highly organised internal labour markets. Firms provide intense on-the-job training to newly hired regular employees to develop skills to perform a wide variety of jobs. There is systematic job rotation within firms in which employees gradually accumulate knowledge and skills and are promoted to ranks with higher responsibilities. These employment practices are closely related to the seniority-based wage system. Job training within firms is regarded as more important than training outside firms (Koike, 1991; Koike and Inoki, 2003).

However, since the beginning of the 1990s, the labour market of Japan has undergone fundamental changes amid a period of prolonged stagnation. The changes include increases in female employees and non-regular employees, growing competitiveness, and an emerging performance-based pay system. The proportion of people who continue to work for the same firm throughout their careers is declining. This means that the customs of skills formation peculiar to Japanese firms are no longer available to the majority of working people. Under such circumstances, it is necessary to establish a system of evaluating vocational skills acquired outside firms in order to provide a wide range of workers with opportunities for career formation (JILPT, 2008).

For researchers, studies to establish how vocational skills affect individual job careers are becoming increasingly more important. This study analyses the effects of formal education and vocational licences on female employment in contemporary Japan. We perform an international comparison to evaluate the estimated results objectively. Australia is considered to be a useful comparison objective as it has a well-established qualification system, known as the Australian Qualifications Framework (AQF) and the Australian Apprenticeship.

The rest of the paper is devoted to comparing linkages between education and female labour supply in Australia and Japan. Section 2 provides an overview of female labour force participation and education in both countries. Section 3 reviews the literature. Section 4 explains both the econometric model and the longitudinal data used in the comparative analysis and Section 5 interprets the estimated results. Section 6 concludes.

2. Female labour supply and education in both countries

Figure 1 shows the trends of both male and female labour force participation rates in Australia and

Japan since 1980. The trends of the male labour force participation rate are largely similar between the two countries; the rates have been declining consistently since the early 1980s. In contrast, the female labour force participation trends are quite different. In Australia, female labour force participation increased from less than 50% in 1980 to nearly 60% in 2010, while in Japan, it has remained nearly constant at 50%, with a slight declining trend in recent years.

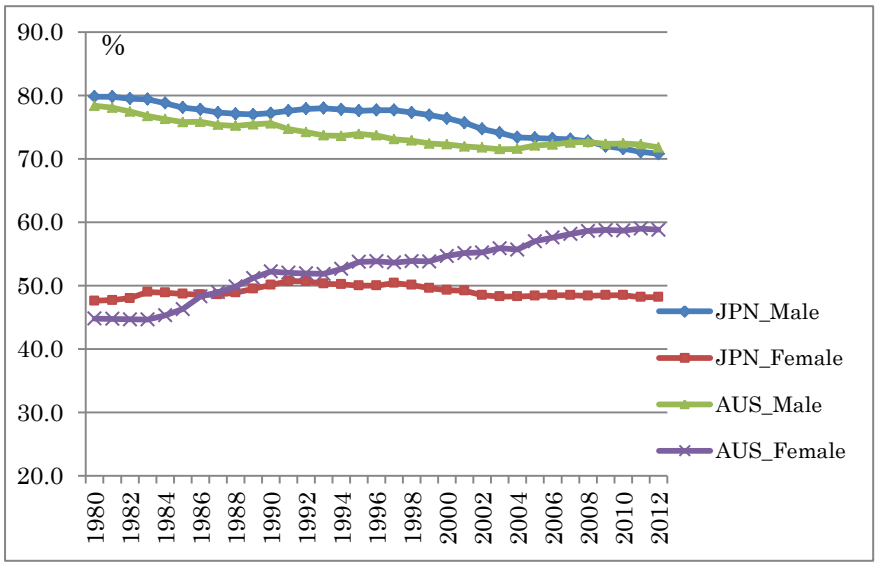

Figure 1 Australian and Japanese labour force participation rates for men and women
Sources: Australian Bureau of Statistics (2014); Statistics Bureau of Japan (2011)

A direct comparison of trends in educational attainment between the two countries is not possible because the educational systems of the two countries are so different. Australia's national system, the AQF, incorporates the qualifications from each education and training sector into a single national qualifications framework. Among the AQF's 10 levels of qualifications, Certificates I–IV, Diplomas, and Advanced Diplomas are issued upon completion of Vocational Education and Training (VET) courses, which are provided mainly by vocational education institutions named Technical and Further Education colleges (TAFEs).

Unlike Australia, Japan has not established a national system of vocational education and, in fact, there is no concept of 'vocational qualification'. Technical colleges, which aim to train technicians, provide five years of formal education for those who have finished junior high school. On the other hand, vocational schools, which aim to provide practical skills, seek to meet demand for various skills. Some but not all people attend vocational schools to prepare for the national examinations for vocational licences. The linkages between vocational schools and academic education are weak.

Official data show that the enrolment rates for higher education have been increasing in both countries. However, the patterns of changes in enrolment differ between the two countries. The Japanese government publishes data on the proportions of newly enrolled students to total high school graduates, as Figure 2-1 shows. On the other hand, the Australian government publishes data

for students enrolled in higher education as a proportion of the population by age range, as Figure 2-2 shows. For Japan, the proportion of enrolment in universities shows an increasing trend from 2001 to 2009 but has remained largely stable since 2009. For Australia, the proportion of enrolment in bachelor's or higher degrees is increasing rapidly and that of vocational education is largely stable.

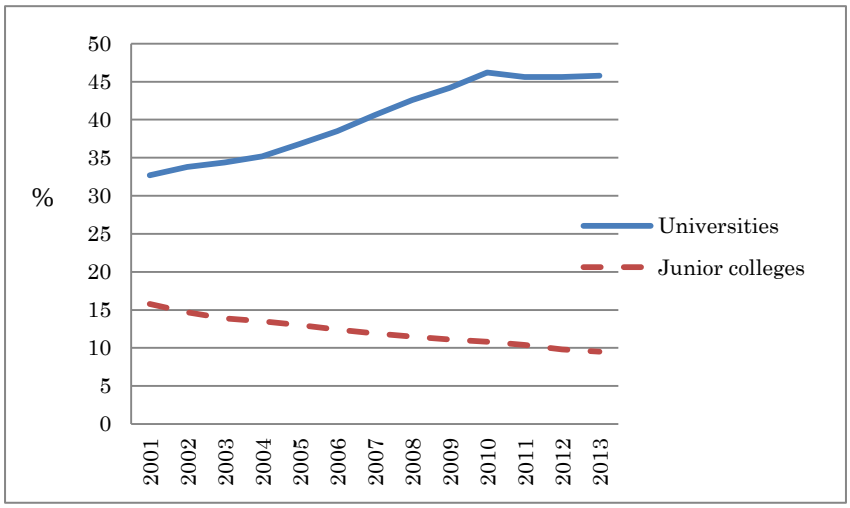

Figure 2-1 Proportion of newly enrolled students to high school graduates, 2001–2013, Japan
Source: Ministry of Education, Culture, Sports, Science and Technology in Japan (2013)

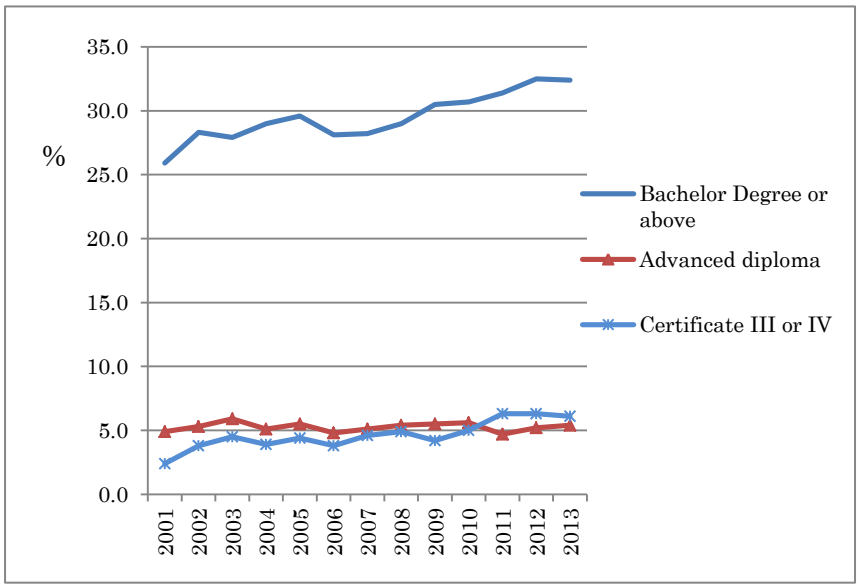

Figure 2-2 Enrolment in higher education for females aged 18–24, 2001–2013, Australia
Source: Australian Bureau of Statistics, Data Catalogue 4125.0 (2014)
Note: The data show females enrolled in Advanced Diplomas, Diplomas, and Certificates III and IV, as a proportion of all females aged 18–24.

3. Previous research

3-1. Previous research in Japan

In Japan, a number or researchers have estimated female labour supply functions. Most pay special attention to the effects of childbirth on employment. Research that focuses on the relationship between education for women and employment outcomes is rare. However, the effects of education on employment outcomes of women have been estimated incidentally in the literature. Matsuura and Shigeno (2001) employ static estimation to find a positive relationship between levels of education and employment. On the other hand, Nawata and Ii (2004) conclude that the effects of higher education on female employment in Japan are negative[1]. Waldfogel et al. (1999), in an analysis of the effects of childcare leave, find that the effects of higher education on job retention of female employees after childbirth are weaker for Japan than for the United States and Britain. Kohara (2010) uses a dynamic model to estimate labour supply for women whose husbands face job losses and finds that the dummy variable for higher education compared to senior high schools is not significant. Okamura and Islam (2011) estimate inter-temporal participation decisions of women using linear probability models that assume state dependence and unobserved heterogeneity; they find that highly educated women are less likely to re-enter labour markets after childbirth than less educated women.

The effects of vocational licences on employment are rarely estimated in panel data analyses. Uenishi (1999) and Agata (2010), while not employing panel data analysis, find that vocational licences do not always raise either the probability of obtaining full-time employment or the probability of being employed in large firms.

3-2. Previous research in Australia

Australia also has rich literature on female labour supply. A number of researchers have focused on spousal incomes or own wages of female labour supply, as reviewed in Birch (2005), or on the effects of childcare on labour supply (Breunig et al., 2010; Moschion, 2011). Recent analyses using panel data indicate that educational attainment, including vocational education, raises the probability of obtaining jobs. Among the research, Cai (2010) shows that education of more than 11 years, that is, 12 years, certificates, diplomas, and degrees, have significant positive effects on female labour supply. The estimation of Buddelmeyer et al. (2006) also indicates that degrees and diplomas have significant positive effects on female employment, even after controlling for state dependence. Mitchell and Welters (2008), in a Cox hazard analysis on labour market transitions, find that the hazard rates out of casual employment and into permanent employment are higher for those with bachelor's degrees or higher. On the other hand, some recent research, such as that of Mavromaras et al. (2010), notes the existence of over-education and over-skills in Australia.

4. The data

[1] Aside from the analyses of the effects of education, some researchers, including Edwards and Pasquale (2003), point out that in Japan, higher education for women is not career-oriented.

4-1. Two longitudinal datasets

We use the following panel data: the Household Income and Labour Dynamics in Australia (HILDA) Survey for Australia and the Japanese Panel Survey on Consumers (JPSC) for Japan. HILDA is a household-based panel dataset collected by the Melbourne Institute of Applied Economic and Social Research, which has been gathering information on economic and subjective well-being, labour market dynamics, and family dynamics since 2001 by following respondents over time[2]. The JPSC has been conducted by the Institute on Household Economics in Japan since 1993, and also accumulates data on economic and subjective well-being, labour market dynamics, and family dynamics. The features of both HILDA and the JPSC are described in Appendix A.

The HILDA Survey covers both men and women aged 15 years and higher. However, we use data for women only in order to compare the results of the HILDA Survey with those of the JPSC, which collects only female data. The period of our study is 2005–2009. For the HILDA Survey, this corresponds to waves 5–9, while for the JPSC, this corresponds to waves 13–17. We confine our analysis to respondents who fulfil the following conditions:

(1) Female respondents aged 25–40 years,

(2) Respondents who gave answers for each year from 2005 through 2009, and

(3) Respondents whose employment statuses are clear.

The second condition is imposed because the econometric model explained in Subsection 5-1 requires the panel data to have no attrition and the same number of time periods for all respondents. That is, the number of observations for the balanced data we use is $1{,}045 \times 5 = 5{,}225$ for the HILDA Survey and $746 \times 5 = 3{,}820$ for the JPSC.

As for the third condition, we delete samples of respondents who did not provide answers for their employment statuses. We also delete samples of self-employed people and family of JPSC employees.

4-2. State dependence

We check the sequences for employment statuses for the two longitudinal datasets. The five most frequent patterns of sequences are listed in Tables 1-1 and 1-2. For the HILDA Survey, 40% of respondents retain their respective employment statuses for the five consecutive years of the sample period while the proportion is more than 60% for the JPSC. This suggests that Japanese people do not frequently change their employment statuses. That is, there could be a strong state of dependence in employment status, particularly in Japan.

[2] Detailed information on HILDA is available from http://www.melbourneinstitute.com/hilda/.

Table 1-1 Sequence patterns for the HILDA Survey, waves 5–9

Sequence pattern	Number of observations	Percentage	Cumulative percentage
FFFFF	197	18.85	18.85
NNNN	125	11.96	30.81
PPPPP	95	9.09	39.90
FFFFP	31	2.97	42.87
PNNNN	21	2.01	44.88
NPPPP	20	1.91	46.79
PFFFF	18	1.72	48.52
FPPPP	17	1.63	50.14
NNPPP	16	1.53	51.67
NNNPP	15	1.44	53.11
Others	490	46.89	100.00
Total	1,045	100.00	

Note: Author's calculation based on the HILDA Survey, waves 5–9.

F, P, and N denote full-time employment, part-time employment, and not in the labour force, respectively.

Table 1-2 Sequence patterns for the JPSC, waves 5–9

Sequence pattern	Number of observations	Percentage	Cumulative percentage
FFFFF	185	24.21	24.21
NNNNN	162	21.2	45.42
PPPPP	98	12.83	58.25
NPPPP	17	2.23	60.47
NNNNP	16	2.09	62.57
PNNNN	15	1.96	64.53
FFFFN	15	1.96	66.49
NNNPP	10	1.31	67.8
PPPNN	10	1.31	69.11
PPFFF	10	1.31	70.42
Others	226	29.59	100.00
Total	764	100.00	

Note: Author's calculation based on the JPSC, waves 13–17.

F, P, and N denote full-time employment, part-time employment, and not in the labour force, respectively.

5. The model, the variables, and the estimation method

5-1. The model

A basic assumption underlying this research is that female labour supply is characterised by state dependence, as detailed in Heckman (1981). That is, we assume that work experience raises the probability that a woman will work in the future, even if initial entry into the workforce is determined by a random process. As for previous research based on this assumption, Hyslop (1999) investigates labour force participation for married women using a panel study of income dynamics to find that state dependence and unobserved heterogeneity have significant effects on the determination to work. On the other hand, Okamura and Islam (2011) apply a model similar to that of Hyslop and find that state dependence has no significant effect.

We use a random-effect dynamic probit model with first-order auto-regressive errors, whose basic framework is introduced by Stewart (2006).

Suppose that the employment status for the i^{th} person in the t^{th} period is y_{it}. We estimate two models, where the latent variable for y_{it} is y^*_{it}.

Model 1

y_{it} = 1 (employed) if $y_{it}^* \geqq 0$

0 (not employed) if $y_{it}^* < 0$

Model 2

y_{it} = 1 (employed full-time) if $y_{it}^* \geqq 0$

0 (employed part-time or not employed) if $y_{it}^* < 0$

For these two models, employment status in the t^{th} period is assumed to be dependent on that in the $(t\text{-}1)^{th}$ period as in Equation (1).

$$y_{it}^* = \gamma y_{it-1} + x'_{it}\beta + \alpha_i + u_{it} \qquad (1)$$

where x_{it} is a vector of exogenous explanatory variables; α_i is an individual-specific error term; u_{it} is an error term; and $u_{it} \sim N(0, \sigma_u^2)$.

The composite error term $\upsilon_{it} = \alpha_i + u_{it}$ is considered to be correlated over time due to the individual-specific term α_i.

$$\lambda = corr(\upsilon_{it}, \upsilon_{is}) = \frac{\sigma_\alpha^2}{\sigma_\alpha^2 + \sigma_u^2} \qquad (2)$$

Estimation of this model requires an assumption about the initial observation y_{i1} as follows.

$$y_{i1}^{*} = z_{i1}'\pi + \eta_i \quad (3)$$

where Z_{i1} is a vector of exogenous instruments and η_i is an error term correlated with α_i but uncorrelated with u_{it} for $t \geqq 2$.

$$\eta_i = \theta\alpha_i + u_{i1} \quad (4)$$

Substituting η_i in Equation (3) in Equation (4), we obtain Equation (5).

$$y_{i1}^{*} = z_{i1}'\pi + \theta\alpha_i + u_{i1} \quad (5)$$

We assume that the error term follows an auto-regressive process, such as Equation (6).

$$u_{it} = \rho u_{it-1} + \varepsilon_{it} \quad (6)$$

5-2. The variables

We use the following explanatory variables in common for both countries.

Employed (t-1): dummy variable is 1 if the respondent was employed in the (t-1)th period, and 0 otherwise

Full-time (t-1): dummy variable is 1 if the respondent was employed full-time[3] in the (t-1)th period, and 0 otherwise

Children0_4: number of children aged 0–4 years

Children5_14: number of children aged 5–14 years

Spouse incomes (AUD1,000 for the HILDA Survey and JPY1,000 for the JPSC)

As the systems of education and qualification differ between the two countries, we cannot use the same explanatory variables for education. For the HILDA Survey, we use dummy variables pertaining to the highest education achieved as follows.

Postgraduate degrees

Graduate certificates

Bachelor's or honours degrees

Advanced diplomas, diplomas

Certificates III or IV

Certificates I or II

12 Years or less (reference group)

[3] The definition for full-time and part-time employment in Japan is explained in JILPT (2008). The corresponding definitions for Australia are found in the Australian Fair Work Ombudsman website.

As for the JPSC, we use dummy variables for the highest education as follows.
Bachelor's or postgraduate degrees
Technical or junior college
Vocational school
Vocational licences
Senior high school, no vocational licences (reference group)

Some explanations are required pertaining to the dummy variable 'vocational licences' for the JPSC. As explained in Section 2, the linkages between vocational licences or qualifications and educational achievement tend to be weak in Japan. Licences for some professionals, including medical doctors, nurses, lawyers and teachers, require years of enrolment in certain educational institutions. However, licences for other professionals, such as tax accountants and information technology engineers, do not require graduation from specific educational institutions. Some people obtain licences for such professions through self-study and passing examinations conducted by the state. For this reason, we use the dummy variable for 'vocational licences' in addition to the three dummies for educational achievement. The descriptive statistics for the explanatory variable for the HILDA Survey and the JPSC are listed in Tables 2-1 and 2-2, respectively. The vocational licences surveyed by the JPSC are listed in Appendix B[4].
(Table 2-1 is inserted here).
(Table 2-2 is inserted here).

5-3. Econometric methods and results

We use Stewart's method and written programme (Stewart, 2006) to simultaneously estimate the equations for the t^{th} period and the initial condition, that is, Equations (1) and (5)[5]. As for Equation (5), the equation for the employment status in the initial stage, we use dummy variables for educational achievements for each country as instrumental variables. We perform estimations with no assumption of auto-correlated errors as well as for those with auto-correlated errors.

The estimated results are presented in Tables 3–6. The upper parts of the tables report the estimated results for Equation (1) while the lower parts of the tables report those for Equation (5).

(Table 3 is inserted here)
(Table 4 is inserted here)
(Table 5 is inserted here)
(Table 6 is inserted here)

[4] Among the licences in the JPSC, there are grades for English proficiency tests, bookkeeping, and private licences, such as interior coordinators. We do not include these in vocational licences in this study.
[5] We apply a 'random effects dynamic probit models with auto-correlated errors' (Redpace) command in Stata.

Table 3 shows the estimated results for employment using the HILDA Survey. Among the variables pertaining to qualifications, both graduate certificates and bachelor's or honours degrees have significant positive effects on the probability of a respondent working either full-time or part-time On the other hand, postgraduate degrees, advanced diplomas or diplomas, and certificates have no significant effects on the probability of being employed. As for the initial stage, postgraduate degrees as well as graduate certificates and diplomas raise the probability that a respondent works. The estimated coefficients for AR (1) are not significant, indicating that there is no auto-correlation between errors.

Table 4 shows the estimated results for full-time employment based on the HILDA Survey. According to this table, postgraduate degrees, graduate certificates, and bachelor's or honours degrees have significant positive effects on full-time employment. Other degrees are not significant. As for the initial stage, advanced diplomas or diplomas as well as higher qualifications have significant positive effects on full-time employment. The estimated coefficients for AR (1) are not significant, indicating that there is no autocorrelation between errors.

Table 5 shows the estimated results for employment using the JPSC. This table demonstrates that none of the dummy variables denoting educational levels promote employment. The dummy variable for having vocational licences also has no significant effect on employment. However, in the initial stage, the dummy variable for having vocational licences has a significant positive effect on employment, while that for educational attainment does not. The estimated coefficients for AR (1) are significant, indicating that there is significant auto-correlation between errors.

Table 6 shows the estimated results for full-time employment using the JPSC. None of the dummy variables pertaining to educational levels or vocational licences have positive effects on full-time employment. However, at the initial stage, both university or higher degrees and vocational licences have significant positive effects on the probability of full-time employment.

The coefficients for both Employed (t-1) and Full-time (t-1) are higher for the JPSC results than for the HILDA results. This suggests that in Japan, employment status in the present period has stronger dependence on that in the previous period compared with Australia. This could be interpreted as follows: the effects of higher education and vocational licences, which have positive effects on employment status in the initial periods, fades in the subsequent five years in Japan.

The effects of graduation from vocational schools on employment are limited for women of both countries. Thus, there are similarities pertaining to the estimated coefficients for vocational education of lower classes. However, there is a major difference between the estimated results for Australia and Japan in that the effects of bachelor's degrees or higher qualifications on female employment and full-time employment are significant in Australia but not in Japan. Our results, that higher education has only a limited effect on female labour supply, confirm the results of

previous research. Vocational licences are found to have positive effects on both employment and full-time employment at the initial stage. However, they cannot be observed in the final results of the estimation controlled for state dependence, unobserved heterogeneity, and auto-correlation.

6. Concluding remarks

This study estimated female labour supply functions with state dependency, with special attention on the effects of education on employment outcomes and the effects of education on labour market outcomes. We adopted an econometric method that enabled us to control for both state dependence and unobserved heterogeneity. The major findings are as follows. First, the percentages of the respondents who held their respective employment statuses for the five consecutive years of the study period are significantly higher in Japan than in Australia. Second, the effects of education higher than bachelor's degrees are significant for Australian women but not so for Japanese women. Third, the effects of vocational education on employment, in particular, for the lower levels, are weaker than the effects of higher education on employment in Australia. Fourth, the effects of vocational licences in Japan are significant at the beginning of the period of our research, although they are not significant in the final estimation.

The finding that vocational licences in Japan have positive effects on female labour supply, even if only in the initial stage, is original. Future studies should examine how vocational licences affect women obtaining their first jobs, changing jobs, and re-entering the labour market. If vocational licences are useful for women's career paths, it may be necessary to establish a system that links vocational licences with the formal education system because it is inefficient to undertake both vocational training and university study.

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Appendix A Characteristics of the Household Income and Labour Dynamics in Australia survey (HILDA) and the Japanese Panel Survey on Consumers (JPSC)

	HILDA	JPSC
Starting year	2001	1993
Gender of respondents	Both men and women	Only women
Age group for the first year	14–92 years	24–34 years
Number of participants at the beginning	19,114	1,500
Interviews	Conducted each year	Not conducted
Continuity	Panel members are followed over time	Panel members are followed over time
Topping of the data	5,477 new members were added in wave 11	500 new members were added in wave 5. 836 new members were added in wave 11
Information	Family dynamics, labour market dynamics, household incomes, savings, and expenditure	Economic and subjective well-being, labour market dynamics, and family dynamics

Appendix B Occupational licences covered by the Japanese Panel Survey on Consumers

Medical doctors	Pharmacists	Nurses
Dentists	Dental technicians	Medical technologists
Physical therapists	Dieticians	Teachers, lecturers, or professors
Lawyers	Judicial scriveners	Notary publics
Social insurance and labour consultants	Small and medium firm consultants	Social workers
Public accountants	Licensed tax accountants	Architects
Information processing technicians	Commercial drivers	Childcare workers

Table 2-1 Descriptive statistics for the balanced data from the HILDA Survey, waves 5–9

Variable	Mean	Standard deviation	Minimum	Maximum
Employed	0.724	0.447	0	1
Employed (t-1)	0.721	0.448	0	1
Employed full-time	0.369	0.483	0	1
Employed full-time (t-1)	0.391	0.488	0	1
Children0_4	0.706	0.800	0	4
Children5_14	0.765	1.013	0	5
Spouse income (AUD1,000)	68.304	42.500	0.013	450
Postgraduate	0.050	0.218	0	1
Graduate certificate	0.088	0.284	0	1
Bachelor's or honours degree	0.282	0.450	0	1
Advanced diploma, diploma	0.098	0.297	0	1
Certificate III or IV	0.129	0.335	0	1
Certificate I or II	0.008	0.090	0	1

Note: Author's estimation based on the HILDA Survey, waves 5–9. There are 5,225 observations.

Table 2-2 Descriptive statistics for the balanced data from the JPSC, waves 13–17

Variable	Mean	Standard deviation	Minimum	Maximum
Employed	0.640	0.480	0	1
Employed (t-1)	0.640	0.480	0	1
Full	0.359	0.480	0	1
Full (t-1)	0.366	0.482	0	1
Children0_4	0.407	0.638	0	3
Children5_14	0.588	0.867	0	4
Spouse income (JPY1,000)	0.503	0.255	0	4.405
University	0.204	0.403	0	1
Technical or junior college	0.420	0.494	0	1
Vocational school	0.329	0.470	0	1
Vocational licences	0.281	0.450	0	1

Note: Author's estimation based on the JPSC, waves 13–17. There are 3,820 observations.

Table 3 Estimated results for employment, the HILDA Survey

	Random-effect Dynamic Model with AR(1) Errors			Random-effect Dynamic Model with no AR(1) Errors		
	Estimated coefficient	z-value	P>z	Estimated coefficient	z-value	P>z
Employed (t-1)	0.626	1.45	0.146	0.805	6.26	0.000
Children0_4	-0.651	-7.09	0.000	-0.626	-7.85	0.000
Children5_14	-0.073	-1.00	0.319	-0.059	-0.93	0.354
Spouse income (AUD1,000)	-0.002	-1.88	0.060	-0.002	-1.89	0.059
Postgraduate	0.388	1.22	0.224	0.345	1.18	0.237
Graduate certificate	0.903	3.18	0.001	0.852	3.33	0.001
Bachelor's or honours degree	0.900	4.27	0.000	0.848	4.80	0.000
Advanced diploma, diploma	0.205	0.88	0.381	0.180	0.83	0.408
Certificate III or IV	-0.018	-0.09	0.926	-0.031	-0.17	0.868
Certificate I or II	0.228	0.41	0.681	0.211	0.39	0.693
Intercept	0.829	2.22	0.026	0.686	3.33	0.001
Initial stage						
Postgraduate	0.657	1.89	0.058	0.660	1.90	0.058
Graduate certificate	1.036	3.29	0.001	1.038	3.27	0.001
Bachelor's or honours degree	1.061	5.45	0.000	1.059	5.43	0.000
Advanced diploma, diploma	0.888	3.14	0.002	0.912	3.29	0.001
Certificate III or IV	0.130	0.59	0.552	0.132	0.60	0.546
Certificate I or II	0.671	0.82	0.410	0.645	0.79	0.430
Intercept	0.249	2.21	0.027	0.242	2.17	0.030
lambda	0.496	5.90	0.000	0.465	7.11	0.000
AR(1)	0.100	0.42	0.674			
theta	0.537	3.58	0.000	0.574	4.16	0.000
Log likelihood	-1037.918			-1038.018		
No. of observations	5225			5225		

Note: Author's estimation based on the HILDA Survey, waves 5–9.

Table 4 Estimated results for full-time employment, the HILDA Survey.

	Random-effect Dynamic Model with AR(1) Errors			Random-effect Dynamic Model with no AR(1) Errors		
	Estimated coefficient	z-value	P>z	Estimated coefficient	z-value	P>z
Full-time (t-1)	0.970	3.41	0.001	0.948	6.97	0.000
Children0_4	-0.984	-8.47	0.000	-0.988	-9.33	0.000
Children5_14	-0.226	-3.12	0.002	-0.227	-3.24	0.001
Spouse income (AUD1,000)	-0.005	-3.83	0.000	-0.005	-3.83	0.000
Postgraduate	1.202	3.90	0.000	1.212	4.19	0.000
Graduate certificate	0.688	2.76	0.006	0.695	2.90	0.004
Bachelor's or honours degree	0.911	4.73	0.000	0.919	5.26	0.000
Advanced diploma, diploma	0.359	1.61	0.107	0.364	1.69	0.092
Certificate III or IV	0.150	0.80	0.423	0.152	0.82	0.414
Certificate I or II	0.479	0.83	0.407	0.482	0.83	0.406
Intercept	-0.290	-1.47	0.142	-0.282	-1.60	0.110
Initial stage						
Postgraduate	1.138	3.66	0.000	1.139	3.66	0.000
Graduate certificate	0.855	3.33	0.001	0.857	3.36	0.001
Bachelor's or honours degree	0.859	5.12	0.000	0.860	5.16	0.000
Advanced diploma, diploma	0.845	3.64	0.000	0.845	3.63	0.000
Certificate III or IV	0.244	1.13	0.258	0.243	1.13	0.260
Certificate I or II	-0.137	-0.18	0.860	-0.145	-0.19	0.852
Intercept	-0.708	-5.94	0.000	-0.709	-5.97	0.000
lambda	0.413	4.84	0.000	0.417	5.67	0.000
AR(1)	-0.012	-0.09	0.929			
theta	0.505	3.47	0.001	0.506	3.5	0.000
Log likelihood	-1024.083			-1024.0867		
No. of observations	5225			5225		

Note: Author's estimation based on the HILDA Survey, waves 5–9.

Table 5 Estimated results for employment, the JPSC, waves 13–17

	Random-effect Dynamic Model with AR(1) Errors			Random-effect Dynamic Model with no AR(1) Errors		
	Estimated coefficient	z-value	P>z	Estimated coefficient	z-value	P>z
Employed (t-1)	1.920	7.14	0.000	1.490	7.79	0.000
Children0_4	-0.244	-2.32	0.020	-0.332	-2.98	0.003
Children5_14	0.150	2.32	0.020	0.142	1.84	0.066
Spouse income (JPY1,000)	-0.377	-1.81	0.070	-0.425	-1.83	0.067
Bachelor's or postgraduate degree	0.241	0.77	0.440	0.308	0.78	0.435
Technical or junior college	0.167	0.58	0.565	0.250	0.69	0.492
Vocational schools	0.137	0.47	0.638	0.242	0.66	0.506
Vocational licences	0.087	0.59	0.557	0.161	0.88	0.377
Intercept	-0.976	-3.14	0.002	-0.787	-2.08	0.038
Initial stage						
Bachelor's or postgraduate degree	0.104	0.23	0.821	0.115	0.24	0.812
Technical or junior college	0.288	0.66	0.507	0.297	0.65	0.513
Vocational schools	0.495	1.14	0.255	0.516	1.14	0.255
Vocational licenses	0.454	2.16	0.031	0.454	2.05	0.041
Intercept	-0.482	-1.18	0.238	-0.507	-1.19	0.233
lambda	0.372	2.07	0.039	0.553	4.91	0.000
AR(1)	-0.198	-2.20	0.027			
theta	1.284	2.73	0.006	0.988	4.07	0.000
Log likelihood	-859.012			-860.540		
No. of observations	3820			3820		

Note: Author's estimation based on the JPSC, waves 13–17.

Table 6 Estimated results for full-time employment, the JPSC, waves 13–17

	Random-effect Dynamic Model with AR(1) Errors			Random-effect Dynamic Model with no AR(1) Errors		
	Estimated coefficient	z-value	P>z	Estimated coefficient	z-value	P>z
Full-time (t-1)	2.192	4.46	0.000	1.779	6.00	0.000
Children0_4	-0.281	-1.76	0.078	-0.358	-2.30	0.022
Children5_14	0.066	0.67	0.501	0.039	0.36	0.722
Spouse income (JPY1,000)	-0.850	-1.83	0.067	-0.924	-1.77	0.076
Bachelor's or postgraduate degree	1.057	1.5	0.134	1.353	1.76	0.078
Technical or junior college	0.591	1.04	0.300	0.719	1.07	0.284
Vocational schools	0.157	0.29	0.768	0.211	0.32	0.748
Vocational licenses	0.239	0.91	0.363	0.374	1.27	0.204
Intercept	-2.301	-3.39	0.001	-2.552	-3.29	0.001
Initial stage						
Bachelor's or postgraduate degree	2.211	1.92	0.055	2.404	2.02	0.043
Technical or junior college	1.549	1.44	0.151	1.677	1.49	0.137
Vocational schools	1.289	1.22	0.224	1.409	1.26	0.207
Vocational licenses	0.795	2.22	0.026	0.835	2.24	0.025
Intercept	-3.420	-2.78	0.005	-3.677	-3.01	0.003
lambda	0.559	2.02	0.043	0.717	5.50	0.000
AR(1)	-0.146	-1.06	0.289			
theta	1.596	1.96	0.050	1.242	3.00	0.003
Log likelihood	-477.13449			-477.557		
No. of observations	3820			3820		

Note: Author's estimation based on the JPSC, waves 13–17.