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Female Labour Supply in Australia and Japan: The Effects of Education and Qualifications

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Abstract

This paper compares the effects of educational attainment on women's employment status in Australia and Japan from 2005 to 2009. Our data are from the Household Income and Labour Dynamics in Australia Survey and the Japanese Panel Survey on Consumers. Using both static and dynamic models to estimate female labour supply, we find robust positive effects of education on employment in Australia, but not in Japan, where the effects of higher education on permanent employment are weaker. The results of the dynamic estimation suggest that the effect of previous employment status is more significant than that of education in Japan, unlike in Australia. This suggests that Japanese firms value previous experience more than educational attainment. Vocational education has a significant effect in Australia, but not in Japan. This result suggests that the skill acquired from education, in particular, vocational education, is not fully utilised in Japan.

Keywords: Female labour force participation, Vocational education, Longitudinal data

JEL Classification: J210, J220, J240

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 status of women in both countries. As the two countries differ in vocational training and employment systems, the comparison enables us to identify problems concerning skill formation and job creation in the Japanese labour market.

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Japan's labour market has been characterised by low employee mobility and highly organised internal labour markets, and employment practices are closely related to the seniority-based wage system. Firms provide intense on-the-job training to newly-hired employees, enabling them to develop the skills needed to perform a wide variety of jobs. There are systematic job rotations within firms, allowing employees to gradually accumulate knowledge and skills and be promoted to roles involving higher responsibility. Job training within firms is regarded as more important than training outside firms (Koike, 1991; Koike and Inoki, 2003).

However, since the early 1990s, the Japanese labour market has undergone fundamental changes amid a period of prolonged economic stagnation. The changes include increased numbers of female employees and part-time or contract employees, growing competitiveness, and the emergence of a performance-based pay system. The portion of people who spend their entire career working for a single firm is declining. As a result, the majority of working people no longer experience the traditional processes of skill formation operating within Japanese firms. Under such circumstances, providing the full range of workers with opportunities for career advancement requires establishing a system for evaluating vocational skills acquired outside firms (JILPT, 2008).

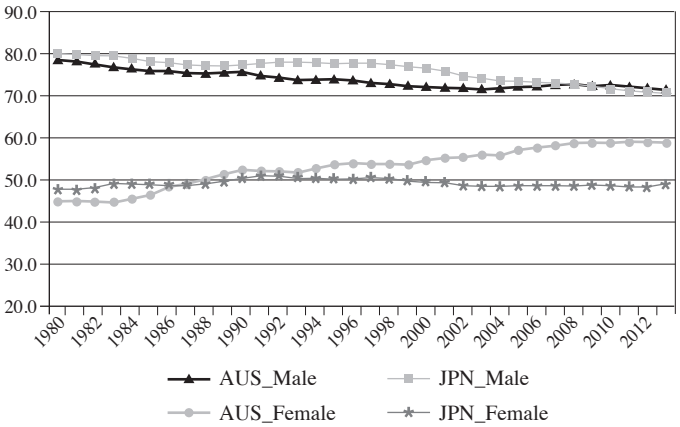
The effect of vocational skills on individuals' careers is becoming an increasingly important research question. As such, this study analyses the effects of formal vocational education on female employment in contemporary Japan. We perform an international comparison to evaluate our results objectively. Australia is considered to be a useful comparative case, as it has a well-established qualification system, including the Australian Qualifications Framework (AQF) and the Australian Apprenticeship.

The rest of the paper compares 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 explains the current situation of vocational education in Japan and compares it with that of Australia. Section 4 reviews the relevant literature. Section 5 explains the longitudinal data, the econometric model, and the variables used in the comparative analysis. Sections 6 and 7 interpret the estimated results and conclude the paper.

2. An overview of labour force and education in Australia and Japan

Figure 1 shows the trends in both male and female labour force participation rates in Australia and Japan since 1980. The trends in male labour force participation are largely similar between the two countries, showing consistent declines since the early 1980s. In contrast, the female labour force participation trends are markedly different. In Australia, female labour force participation increased from less than 50 per cent in 1980 to nearly 60 per cent in 2010, while in Japan, it has remained nearly constant at 50 per cent, with a slight decline 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 (2014).

3. Vocational education in Japan

The outline of the education system of Japan as of 2014 is as shown in figure 2. Six years of elementary schooling are followed by three years of lower secondary and three years of upper secondary education. Both elementary and lower secondary education are compulsory. Post-secondary academic education is offered by junior colleges, which provide two-year education, and universities, which provide four-year education. Junior colleges, usually female-dominated, teach both liberal arts and practical education based on liberal arts within a shorter period than do universities. Institutions for vocational education are shown by the shaded areas in figure 2. It suggests that the vocational education system is not well coordinated as multiple institutions coexist, instead of forming a hierarchy.

The vocational education system of Japan has developed in a way quite different from that of Australia. Before World War II, education in Japan was based on a 'double track' system consisting of the vocational track and the academic track, which were not linked at all. After World War II, the system was changed to a 'single track' system, where academic education had a higher status than vocational education (Goodman, Hatakenaka and Kim, 2009). A number of vocational schools were 'promoted' to universities with multiple disciplines soon after the war. The government laid much stress on the development of university education, while reducing subsidies for vocational schools. At the same time, the demand for higher academic education increased with the rise in per capita incomes. As a result, the number of junior colleges and universities went up significantly.

The post-war educational policy was closely related with the Japanese management system. The expansion of heavy industries has been accompanied by the development of internal labour markets. Japanese firms gave intensive OJTs to newly hired employees so that they would be able to perform a wide range of jobs within a firm. As the employees' average years of service were long and wage determination was left

to wage negotiations in individual firms, firms valued the experience that employees gained within the firm more than the employees' experience prior to recruitment. Firms believed that 'qualifications themselves are not significant signals of the quality of labour for white-collar employees' in Japan (Koike and Inoki, 2003, Chapter 3).

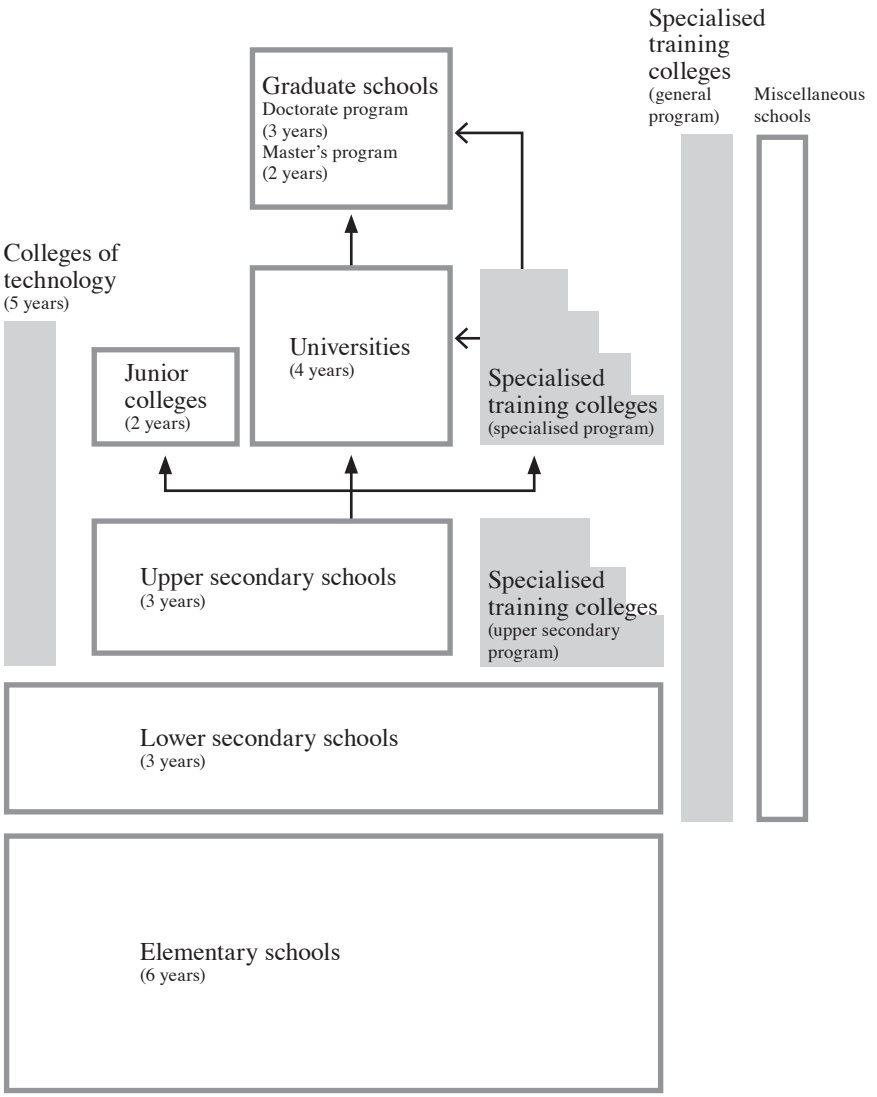
That government stressed academic education does not mean that it made light of vocational education; it established colleges of technology in 1962 to nurture engineers to meet demand from industries. These colleges have provided students who finished lower secondary education with five-year education on specialised subjects such as mechanical engineering, electrical engineering, information technology, and architecture, as well as general subjects. However, the number of colleges of technology has been much smaller than that of universities.

The 'vacuum' in vocational education led to an emergence of a number of miscellaneous vocational schools, most of which were private and not regulated by the government. In 1975, after the revision of the Basic Education Law, miscellaneous schools which fulfilled certain conditions were promoted to specialised training colleges. In addition, from 1994 onwards, students who completed courses of two years or more or 1,700 hours or more were awarded a 'Diploma', and from 2006 onwards, those finished four years of specialised courses with certain conditions were granted an 'Advanced Diploma'. The government also created a linkage between the specialised training colleges and universities. This enabled graduates of specialised training colleges to transfer to universities, subject to fulfilling certain conditions. Nowadays, specialised training colleges can be categorised into three types by programs – those associated with general programs, upper secondary programs, and specialised programs. General programs do not have any pre-requisites. On the other hand, upper secondary programs require graduation from lower secondary education, and specialised programs require graduation from upper secondary education.[1] The main areas of education include engineering, agriculture, healthcare, hygiene such as hairdressing, cooking and nutritional management, social welfare, commercial business, home economics, and culture/general education. The curriculum within specialised training colleges emphasizes practical education.[2] Some of them grant candidacy for the state examinations for professions such as nurses, physical therapists, occupational therapists, medical technologists, architects, registered surveyors, tax accountants, and so on.

The education system of Australia is quite different from that of Japan. Australia's national system, the AQF, incorporates the qualifications from each educational and training sector into a single national qualification framework with 10 qualification levels. TAFE (Technical and Further Education) colleges award AQF qualifications aligned as Certificate 1-IV, Diploma, Graduate Certificate, and Graduate Diploma qualifications. On the other hand, universities grant bachelors and honours, masters, and doctoral degrees following completion of academic education. Each qualification attests that the individual has a certain level of skill or knowledge, be it academic or vocational.

[1] In 2014, there were 3,205 specialised training colleges in Japan, among which 2,812 offered specialised courses, 438 had upper secondary courses, and 178 offered general courses.
[2] Practical education is usually offered within the colleges. Usually, this is different from OJT.

Figure 2 - The Japanese educational system



Source: Ministry of Education, Culture, Sports, Science, and Technology in Japan website for specialised training colleges. http://www.mext.go.jp/component/a_menu/education/detail/__icsFiles/afieldfile/2013/10/11/1322361_2_1.pdf

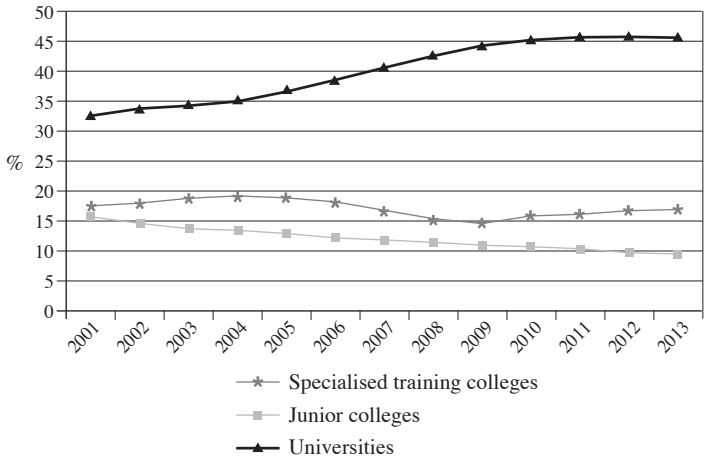
The absence of the fixed concept of a 'qualification' in Japan makes it hard to make precise comparisons with the Australian context. However, there are some similarities between the vocational education systems of Australia and Japan. For both countries, universities grant bachelor's degrees, master's degrees, and doctoral degrees. Both countries have post-secondary vocational education systems. In the following section, we compare the effects of higher education and qualifications on labour market outcomes in both countries.

Statistics on post-secondary education in Australia and Japan

Official data show that higher education enrolment rates have been increasing in both Australia and Japan. However, the data published pertaining to the indicators for education differ. The Japanese government publishes data on the ratio of newly enrolled university, junior college, or specialised training college students to total high school graduates, as shown in figure 3.1. On the other hand, the Australian government publishes data for students enrolled in higher education as a portion of the population by age range, as figure 3.2 shows. For Japan, the university enrolment rate increased from 2001 to 2009 but has remained relatively stable since 2009. The enrolment rate for junior colleges has been declining, while that for specialised training colleges has been increasing after reaching a nadir in 2009.

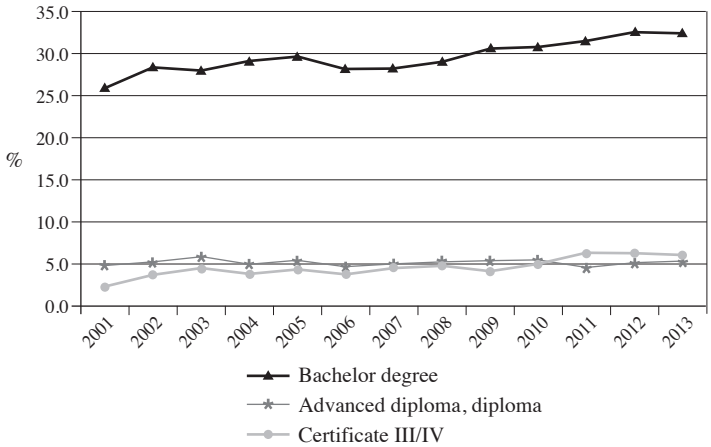
For Australia, the enrolment rate for bachelor's or higher degrees has been increasing rapidly, whereas that for advanced diplomas or diplomas has been fairly stable. The enrolment for Certificate III or IV has increased from 2.4 per cent to 6.1 per cent in the period 2001-2013 (figure 3.2)

Figure 3.1 Ratio of female students enrolled in higher education to female high school graduates, 2001-2013, Japan



Source: Ministry of Education, Culture, Sports, Science, and Technology of Japan, School Basic Survey 2001-2013.

Figure 3.2 - 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 portion of all females aged 18-24.

4. Previous research

Previous research in Japan

In Japan, a number of researchers have estimated female labour supply functions, usually focusing on the effects of childbirth on employment. Research that focuses on the relationship between women's education and employment outcomes is rare. However, some researchers have estimated the effect of education on women's employment outcomes, even where this was not the primary consideration. Matsuura and Shigeno (2001) employ static estimation to find a positive relationship between education levels and employment. In contrast, Nawata and Ii (2004) conclude that higher education has a negative effect on female employment in Japan.[3] Waldfogel *et al*. (1999), analysing the impact of childcare leave, find that the effect of higher education on post-childbirth job retention of female employees is weaker in Japan than in the United States or Britain. Kohara (2010) uses a dynamic model to estimate labour supply for women whose husbands face job loss and finds that higher education has no significant impact compared to senior high school education. 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 than less-educated women to re-enter the labour market after childbirth.

[3] 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.

Previous research in Australia

Australia also has a rich literature on female labour supply. A number of researchers have focused on spousal incomes or women's own wages and female labour supply, as reviewed in Birch (2005), or on the effects of childcare on labour supply (Breunig *et al*., 2012; and Moschion, 2013). Recent analyses using panel data indicate that higher educational attainment, including vocational education, raises the probability of obtaining a job. Cai (2010) shows that completing more than 11 years of education has a significant positive effect on female labour supply. The results of Buddelmeyer *et al*. (2006) also indicate that degrees and diplomas have significant positive effects on female employment, even after controlling for state dependence. Mitchell and Welters (2008), using a Cox proportional hazard analysis of 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 post-bachelor's education. On the other hand, some researchers, such as Mavromaras *et al*. (2009), have recently noted the existence of overly educated and overly skilled job-seekers in Australia.

Previous comparative research on Australia and Japan

Comparisons of female labour supply between Australia and Japan are still rare. Daly, Meng, Kawaguchi, and Munford (2006) estimated the gender wage gap in four countries including Australia and Japan. They found that secondary education as well as tertiary education had significant positive effects on female wages in both Australia and Japan. Kishi (2014) found that part-time employment in Japan was different from that in Australia both in terms of the relationship with education and in terms of job duration.

5. Data

Two longitudinal datasets

We use panel data from the Household Income and Labour Dynamics in Australia (HILDA) Survey and the Japanese Panel Survey on Consumers (JPSC). HILDA Survey 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 structures since 2001 by following respondents over time.[4] The JPSC collects data on the similar topics and has been conducted by the Institute on Household Economics in Japan since 1993. The features of both the HILDA Survey and the JPSC are described in Appendix A2. There are some differences between the two longitudinal datasets; for the HILDA Survey, interviews are conducted annually, while for the JPSC, no interviews are conducted; questionnaires are sent to respondents and returned to the institute by post. The HILDA Survey covers both men and women of 15 years of age or older, while the JPSC covers only women of 24 years of age or older.

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

For the HILDA Survey, we use only data for women in order to maintain comparability with the JPSC. The study period is 2005-2009. For the HILDA Survey, this corresponds to waves 5-9, while for the JPSC, it 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 provided answers to all questions pertaining to education, qualifications, employment status, and incomes for each year from 2005 through 2009, and
(3) Respondents whose employment status is clear.

The second condition is imposed because the econometric model (explained in Subsection 5.1) requires that the panel data have no attrition and that the data cover the same number of time periods for all respondents. To meet the third condition, we exclude respondents who did not provide answers to questions regarding their employment status. We also exclude self-employed people and family members of JPSC employees. After making these exclusions, the number of observations we use in the dynamic estimation is 912 x 5 = 4,560 for the HILDA Survey and 764 x 5 = 3,820 for the JPSC. The number of observations used in the static estimations is lower still, because observations with missing values on family variables are deleted.

The effects of past employment status

We classify employment status into three types. Within the HILDA sample, we distinguish three categories of employment status: permanent (on-going) employment, casual employment, and not working. Casual employment means employment without paid leave (Fair Work Ombudsman, 2012) and is characterised by a lack of job security. For the JPSC, we also classify observations into three categories for employment status: employment on a permanent or on-going basis[5], other types of employment, and not working. Among the employment sequences, the ten most frequent patterns for the two samples are listed in Appendix B. In the HILDA Survey, 40 per cent of respondents retain the same employment status for all five consecutive years, while the corresponding proportion is over 60 per cent for the JPSC. This suggests that Japanese people change their employment status only infrequently. This indicates potentially strong state dependence of employment status, particularly in Japan.

The model

We use two kinds of models for our econometric analysis; one is static and the other is dynamic. The reason why we use the latter model is that previous research has found 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. In order to capture state dependence, we use a random-effects dynamic probit model; the basic framework for this model is given by Stewart (2006).

[5] In Japan, employees are classified into regular and non-regular employees in the official statistics. Regular employees roughly correspond to employees who work on a permanent or ongoing basis. On the other hand, non-regular employees do not correspond to casual employees in Australia. For this reason, we confined our analysis to the estimations of employment and employment on a permanent basis. The meaning of 'non-regular employees' is detailed in Kambayashi (2013).

Model 1

Suppose that the employment status for person i in period t is y_{it} and that the latent variable for y_{it} is y^*_{it}.

$$y_{it} = \begin{cases} 1 & \text{if } y_{it}^* \geqq 0 \\ 0 & \text{if } y_{it}^* < 0 \end{cases} \tag{1}$$

$$y_{it}^* = x'_{it} b + a_i + \varepsilon_{it}$$

In equation (1), x_{it} is a vector of exogenous explanatory variables; a_i denotes an individual specific (time-invariant) error term; ε_{it} is the error term; and

$$\varepsilon_{it} \sim N(0, \sigma_\varepsilon^2)$$

Equation (1) is estimated using both a random-effect probit model and a probit model clustered for individuals.

Model 2

$$y_{it} = \begin{cases} 1 & \text{if } y_{it}^* \geqq 0 \\ 0 & \text{if } y_{it}^* < 0 \end{cases} \tag{2}$$

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

In equation (2), x_{it} is a vector of exogenous explanatory variables; α_i is an individual-specific (time invariant) error term; u_{it} is an error term; and

$$u_{it} \sim N(0, \sigma_u^2)$$

Equation (2) is estimated using the random-effect dynamic probit model based on the Stewart method (Stewart, 2006). This method assumes that the initial condition for the employment status is specified as in equation (3).

$$y_{i1}^* = z_{i1}'\pi + \eta_i \tag{3}$$

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 $t \geqq 2$.

$$\eta_i = \theta\alpha_i + u_{i1} \tag{4}$$

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

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

We assume that the error term follows an auto-regressive process, as shown in equation (6).

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

Equations (3) and (5) are estimated simultaneously.[6] When estimating equation (5), we use data for the year 2005. These models are estimated using variables drawn from the two datasets, as detailed in the next subsection.

Using both model 1 and model 2, we perform two kinds of estimations. In the first estimation, $y_{it} = 1$ if the respondent works on a permanent basis and $y_{it} = 0$ otherwise; in the second estimation, $y_{it} = 1$ if the respondent works on any basis, and $y_{it} = 0$ otherwise.

The variables

The variables used for the analyses of the HILDA Survey and the JPSC are as shown in table 1.

Table 1 - Variables used in the estimations

	HILDA Survey	*JPSC*
Dependent variable	1) Dummy =1 if the respondent is employed in the t^{th} period.	1) Dummy =1 if the respondent is employed in the t^{th} period.
	2) Dummy =1 if the respondent is employed on a permanent basis in the t^{th} period	2) Dummy =1 if the respondent is employed on a permanent basis in the t^{th} period
Independent variables		
Age	Respondent's age as of June30	Respondent's age as of October1
Children0_4	Number of children aged 0-4 years	Number of children aged 0-4 years
Children 5_14	Number of children aged 5-14 years	Number of children aged 5-14 years
Spousal income	Spousal income in AUD 1,000	Spousal income in JPY million
Dummy variables for education		
Reference group	Respondents whose highest education is year 12 or less, or certificates I/ II	Respondents whose highest education is secondary school or specialised training college with lower secondary programs or general programs
Postgraduate	Dummy =1 if the respondent has a postgraduate degree	Dummy =1 if the respondent has finished a postgraduate course
Bachelor	Dummy = 1 if the respondent has a bachelor's or honours degree	Dummy =1 if the respondent has a bachelor's degree
Advanced diploma/ diploma (HILDA Survey) Junior college/ college of technology (JPSC)	Dummy =1 if the respondent has a diploma or advanced diploma	Dummy = 1 if the respondent has finished a junior college or a college of technology

[6] We apply a 'random effects dynamic probit model with auto-correlated errors' (redpace) command in Stata.

Table 1 - Variables used in the estimations (continued)

	HILDA Survey	*JPSC*
Certificate III/IV (HILDA Survey) Specialised technical college (JPSC)	Dummy = 1 if the respondent has a certificate III or IV	Dummy = 1 if the respondent has finished a specialised course of specialised technical college
lag1(Employed)	Dummy =1 if the respondent is employed in the t^{th} period.	Dummy =1 if the respondent is employed in the t^{th} period.
lag1(Permanent)	Dummy =1 if the respondent is employed on a permanent basis in the t^{th} period	Dummy =1 if the respondent is employed on a permanent basis in the t^{th} period

Some explanation is required pertaining to the dummy variable for education. The variable 'postgraduate' represents postgraduate degrees for both the HILDA Survey and the JPSC. It represents a graduate certificate, a graduate diploma, a master's degree, or a doctoral degree for the HILDA Survey, while it covers only master's degrees and doctoral degrees for the JPSC, as graduate certificates and graduate diplomas are not awarded in Japan. The variable 'bachelor' pertains to a bachelor's degree or honours for the HILDA Survey and only to a bachelor's degree for the JPSC, as an honours degree is not a distinct formal qualification in Japan. The education dummies for the qualifications other than 'postgraduate' and 'bachelors' differ between the two countries. For the HILDA Survey, we use the dummy variable 'Advanced diploma/diploma' and 'Certificate III/IV'. The reference group consists of the respondents whose highest education is Certificate I/II or Year 12 or less. For the JPSC, we use the dummy variables 'Junior college/college of technology' and 'specialised training college'.[7] As explained in the previous section, there are several types of specialised training colleges in Japan. We distinguish specialised courses offered by specialised training colleges from other courses. The dummy variable 'specialised training college' is 1 if the respondent's highest education is a specialised course offered by a specialised training college. The reference group consists of respondents whose highest education is senior high school, or a general course offered by a specialised training college, or a miscellaneous school. The descriptive statistics for the explanatory variables for the HILDA Survey and the JPSC are listed in table 2.

We calculated the proportion of employment and employment on a permanent basis for each level of education or qualification, for both the HILDA Survey and the JPSC samples (table 3). This suggests that the proportion employed increases with education or qualification for the HILDA Survey but not for the JPSC. On the other hand, the proportion of those employed on a permanent basis has a positive relationship with education for both samples.

[7] In the JPSC, junior college graduates are not separated from those who graduated from colleges of technology. This makes it difficult to estimate the effect of colleges of technology.

Table 2 - Descriptive statistics

HILDA Survey			*JPSC*		
Variable	*Mean*	*Standard deviation*	*Variable*	*Mean*	*Standard deviation*
Employed	0.718	0.45	Employed	0.495	0.5
Employed (*t*-1)	0.719	0.45	Employed (*t*-1)	0.493	0.5
Permanent employment	0.485	0.5	Permanent employment	0.212	0.409
Permanent employment (*t*-1)	0.491	0.5	Permanent employment (*t*-1)	0.226	0.419
Children0_4	0.719	0.801	Children0_4	0.623	0.698
Children5_14	0.765	1.03	Children5_14	0.848	0.848
Spousal income (AUD1,000)	59.694	46.554	Spousal income (JPY1,000 thousand)	503.31	255.16
Postgraduate	0.131	0.337	Postgraduate	0.011	0.104
Bachelor	0.273	0.446	Bachelor	0.164	0.37
Advanced diploma, diploma	0.105	0.306	Junior college or college of technology	0.264	0.441
Certificate III or IV	0.11	0.312	Specialised training college	0.171	0.376
N of observations	3,247			2,359	

Note: Author's calculations based on the HILDA Survey, waves 5-9 and the JPSC, waves 13-17.

Table 3 - Labour market outcomes by education/qualifications, HILDA Survey and the JPSC

HILDA Survey	*Proportion employed (%)*	*Proportion employed on a permanent basis (%)*	*JPSC*	*Proportion employed (%)*	*Proportion employed on a permanent basis (%)*
Postgraduate	83.29	62.35	Postgraduate	57.69	53.85
Bachelor	80.59	64.79	Bachelor	48.32	33.59
Advanced diploma, diploma	76.97	52.25	Junior college or college of technology	45.10	21.03
Certificate III/IV	63.95	36.05	Specialised training college	56.82	25.56
Certificate I/II or lower (reference)	62.04	34.30	Senior high school, specialised training college (not specialised courses)	49.57	13.26

Note: Author's calculations based on the HILDA Survey, waves 5-9 and the JPSC, waves 13-17.

6. Econometric results

As explained in the previous subsection, our analyses are mainly composed of four kinds of estimations, as shown in the following table.

Model	*Type*	*Description of the type*	*Data*
Model (Static)	1	y = 1 if employed on a permanent basis; y = 0 otherwise	HILDA
			JSPC
	2	y = 1 if employed on any basis; y = 0 otherwise	HILDA
			JSPC
Model (Dynamic)	1	y = 1 if employed on a permanent basis; y = 0 otherwise	HILDA
			JSPC
	2	y = 1 if employed on any basis; y = 0 otherwise	HILDA
			JSPC

The estimated results are presented in tables 4.1 through 6.2.

Table 4.1 - Estimated results for permanent or ongoing employment, 2005-2009 (1)

Dependent variable: employed on a permanent or ongoing basis in wave *t*

	Random-effect probit estimation			*Random-effect probit estimation*	
HILDA Survey	*Marginal effects*	*z-value*	*JPSC*	*Marginal effects*	*z-value*
Age	0.0041	1.08	Age	0.0012	0.04
Children0_4	-0.2265	-16.31 ***	Children0_4	-0.0822	-6.81 ***
Children5_14	-0.1132	-7.84 ***	Children5_14	-0.0452	-3.46 ***
Spousal income	0.0002	0.89	Spousal income	-0.1311	-2.63 ***
Postgraduate	0.2470	5.41 ***	Postgraduate	0.3690	2.22 **
Bachelor	0.2586	6.94 ***	Bachelor	0.2450	4.27 ***
Advanced diploma, diploma	0.1607	3.23 ***	Junior college, college of technology	0.0979	2.15 **
Certificate III/IV	0.0068	0.15	Specialised training college	0.1318	2.41 **
N of observations	3247		N of observations	2359	
N of groups	749		N of groups	546	
Wald chi^2	336.730		Wald chi^2	84.54	
	Prob > chi2 = 0.0000			Prob > chi2 = 0.0000	

Note: Author's estimation based on the HILDA Survey, waves 5-9 and the JPSC, waves 13-17.
***, ** and* denote significance at the 1%, 5%, and 10% levels, respectively.

Table 4.2 - Estimated results for permanent or ongoing employment, 2005-2009 (2)

Dependent variable: employed on a permanent or ongoing basis in wave *t*

	Pooled probit estimation, clustered with individuals			*Pooled probit estimation, clustered with individuals*	
HILDA Survey	*Marginal effects*	*z-value*	*JPSC*	*Marginal effects*	*z-value*
Age	0.0027	0.56	Age	0.0003	0.06
Children0_4	-0.2168	-11.64 ***	Children0_4	-0.0962	-4.44 ***
Children5_14	-0.1075	-5.90 ***	Children5_14	-0.0631	-3.31 ***
Spousal income	0.0004	1.09	Spousal income	-0.2945	-3.73 ***
Postgraduate	0.2280	4.61 ***	Postgraduate	0.4065	2.51 **
Bachelor	0.2721	6.96 ***	Bachelor's degree	0.2405	4.02 ***
Advanced diploma, diploma	0.1425	2.57 **	Junior college, college of technology	0.0996	2.11 **
Certificate III/IV	-0.0049	-0.09	Specialised training college	0.1453	2.56 **
N of observations	3247		N of observations	2359	
N of groups	749		N of groups	546	
Wald chi^2	247.25		Wald chi^2	82.50	
Log pseudo-likelihood	-1927.305		Log pseudo-likelihood	-1104.57	

Note: Author's estimation based on the HILDA Survey, waves 5-9 and the JPSC, waves 13-17.
***, ** and* denote significance at the 1%, 5%, and 10% levels, respectively.

Table 5.1 - Estimated results for employment on any basis, 2005-2009 (1)

Dependent variable: employed in wave *t*

	Random-effect probit estimation			*Random-effect probit estimation*	
HILDA Survey	*Marginal effects*	*z-value*	*JPSC*	*Marginal effects*	*z-value*
Age	0.0121	3.57 ***	Age	-0.0023	-0.62
Children0_4	-0.2005	-16.44 ***	Children0_4	-0.2461	-13.97 ***
Children5_14	-0.0916	-7.81 ***	Children_514	-0.0128	-0.96
Spousal income	-0.0001	-0.44	Spousal income	-0.5820	-9.49 ***
Postgraduate	0.1474	4.81 ***	Postgraduate	0.1075	1.06
Bachelor	0.1479	5.45 ***	Bachelor	0.0775	2.32 **
Advanced diploma, diploma	0.1009	2.92 ***	Junior college or college of technology	0.0005	0.02
Certificate III/IV	0.0101	0.29	Specialised training college	0.0871	2.76 ***
N of observations	3247		N of observations	2359	
N of groups	749		N of groups	546	
Wald chi^2	318.02		Wald chi^2	303.78	

Note: Author's estimation based on the HILDA Survey, waves 5-9 and the JPSC, waves 13-17.
***, ** and* denote significance at the 1%, 5%, and 10% levels, respectively.

Table 5.2 - Estimated results for employment on any basis, 2005-2009 (2)
Dependent variable: employed on a permanent or ongoing basis in wave *t*

	Pooled probit estimation, clustered with individuals			*Pooled probit estimation, clustered with individuals*	
HILDA Survey	*Marginal effects*	*z-value*	*JPSC*	*Marginal effects*	*z-value*
Age	0.0107	2.75 ***	Age	-0.0025	-0.39
Children0_4	-0.1985	-13.49 ***	Children0_4	-0.2468	-9.33 ***
Children5_14	-0.0773	-5.84 ***	Children_514	-0.0127	-0.56
Spousal income	-0.0002	-0.67	Spousal income	-0.5768	-4.09 ***
Postgraduate	0.1579	5.32 ***	Postgraduate	0.1065	0.64
Bachelor or honours	0.1528	5.50 ***	Bachelor's degree	0.0775	1.32
Advanced diploma, diploma	0.0897	2.37 ***	Junior college or college of technology	0.0004	0.01
Certificate III/IV	-0.0059	-0.14	Specialised training college	0.0872	1.55
N of observations	3247		N of observations	2359	
N of groups	749		N of groups	546	
Wald chi^2	275.23		Wald chi^2	121.20	
log pseudo-likelihood	-1650.014		log pseudo-likelihood	-1451.8503	

Note: Author's estimation based on the HILDA Survey, waves 5-9 and the JPSC, waves 13-17.
***, ** and* denote significance at the 1%, 5%, and 10% levels, respectively.

Table 6.1 - Estimated results for permanent or ongoing employment, 2005-2009 (3)
Dependent variable: employment on a permanent or ongoing basis in wave *t*

	Random-effect dynamic probit estimation with auto-correlated errors			*Random-effect dynamic probit estimation with auto-correlated errors*	
HILDA Survey	*Estimated coefficients*	*z-value*	*JPSC*	*Estimated coefficients*	*z-value*
lag1(permanent)	0.8401	2.74 ***	lag1(permanent)	2.2230	4.99 ***
Children0_4	-0.5164	-6.19 ***	Children0_4	-0.2719	-1.82 *
Children5_14	0.0017	0.03	Children5_14	0.0731	0.77
Spousal incomes	0.0001	0.10	Spousal incomes	-0.8398	-1.85 *
Postgraduate	1.0905	4.18 ***	Postgraduate	1.4015	1.41
Bachelor or honours	1.3390	5.66 ***	Bachelor	0.9580	2.20 **
Advanced diploma, diploma	0.7852	3.08 ***	Junior college, college of technology	0.4658	1.74 *
Certificate III/IV	0.1860	0.88	Specialised training college	0.6309	1.70
Intercept	-0.7392	-3.83 ***	Intercept	-2.1401	-5.40 ***
N of observations	4560		N of observations	3820	
Log likelihood	-1264.8608		Log likelihood	-476.574	
Wald chi^2	161.95		Wald chi^2	137.76	
lambda	0.608	8.08 ***	lambda	0.5436	2.09 **
AR(1)	0.011	0.07	AR(1)	-0.1609	-1.26
theta	0.959	5.51 ***	theta	1.6829	2.01 **

Note: Author's estimation based on the HILDA Survey, waves 5-9 and the JPSC, waves 13-17.
***, ** and* denote significance at the 1%, 5%, and 10% levels, respectively.

Table 6.2 - Estimated results for employment on any employment basis, 2005-2009 (3) Dependent variable: employment in wave *t*

	Random-effect dynamic probit estimation with auto-correlated errors			*Random-effect dynamic probit estimation with auto-correlated errors*	
HILDA Survey	*Estimated coefficients*	*z-value*	*JPSC*	*Estimated coefficients*	*z-value*
employed					
lag1(employed)	0.7781	2.65 ***	lag1(employed)	1.8440	6.34 ***
Children0_4	-0.6279	-7.20 ***	Children0_4	-0.2600	-2.36 **
Children5_14	-0.0540	-0.88	Children5_14	0.1515	2.25 **
Spousal incomes	-0.0011	-1.17	Spousal incomes	-0.3882	-1.82 *
Postgraduate	0.7725	3.62 ***	Postgraduate	0.2144	0.32
Bachelor	0.7314	4.13 ***	Bachelor	0.1480	0.79
Advanced diploma, diploma	0.4238	1.97 *	Junior college, college of technology	0.0174	0.11
Certificate III/IV	0.0454	0.26	specialised training college	0.1807	0.93
Intercept	0.6366	2.18 **	Intercept	-0.7989	-3.15
N of observations	4560		N of observations	3820	
Log likelihood	-1193.756		Log likelihood	-855.1954	
Wald chi^2	174.56		Wald chi^2	148.75	
lambda	0.4743	5.97 ***	lambda	0.4155	2.29
AR(1)	-0.0222	-0.15	AR(1)	-0.1713	-1.7
theta	0.6674	4.48 ***	theta	1.2302	2.88

Note: Author's estimation based on the HILDA Survey, waves 5-9 and the JPSC, waves 13-17.
***, ** and* denote significance at the 1%, 5%, and 10% levels, respectively.

Tables 4.1 and 4.2 are obtained from the static estimation based on model1, type1. They indicate that most of the variables pertaining to education or qualifications have significant positive effects on the probability that a respondent works on a permanent or ongoing basis. For the HILDA Survey, three categories of qualifications – postgraduate degrees, bachelors or honours, and advanced diplomas or diplomas – have significant positive effects. For the JPSC, four categories of post-secondary education have significant positive effects on permanent employment. The comparison between the HILDA and JPSC results reveals that the marginal effects of the bachelor's degrees are almost the same for both samples, while those for the advanced diplomas or diplomas in the HILDA Survey are higher than those for junior college or colleges of technology in the JPSC.

Tables 5.1 and 5.2 display the estimated results for model1, type2. Table 5-1, which is based on random-effects estimation, indicates that for the HILDA Survey, the three dummy variables for qualifications – postgraduate degrees, bachelor or honours, and advanced diplomas/diplomas – have significant effects on the probability that the respondent works. On the other hand, for the JPSC, only bachelor's degrees have significant positive effects. However, the marginal effect of the bachelor's degree for the JPSC, 0.078, is lower than that for its HILDA counterpart, 0.148. Table 5.2, based on a pooled probit estimation with clusters, shows that for the JPSC, none of the variables pertaining to educational attainment have significant effects to employment.

A comparison between table 4.1 and 5.1 reveals that for both surveys, marginal effects of all dummy variables for higher education or qualifications are higher for employment on a permanent/ongoing basis than for other employment statuses. However, the differences in the marginal effects of education/qualifications dummies between the two tables are greater for the JPSC than for the HILDA survey. For example, the differences in the marginal effects of bachelor's degrees are larger for the JPSC (0.2450 in table 4.1 and 0.0775 in table 5.1) than that for the HILDA Survey (0.2586 in table 4.1 and 0.1479 in table 5.1). Similarly, the differences in the marginal effects of junior colleges or colleges of technology for the JPSC (0.0979 in table 4.1 and 0 in table 5.1) are also larger than the differences in the marginal effects of advanced diploma/diploma for the HILDA Survey (0.1607 in table 4.1 and 0.1009 in table 5.1). Similar observations are obtained from a comparison between table 4.2 and 5.2. This suggests that for the JPSCs, the return to higher education or qualification is more dependent on whether the employment is on a permanent or ongoing basis than it is for the HILDA Survey.

Tables 6.1 and 6.2 depict the dynamic estimation results based on model2, types 1 and 2, respectively. Table 6.1 demonstrates that, for the HILDA Survey, postgraduate degrees, bachelor's degrees, advanced diplomas or diplomas have significant positive effects on permanent or ongoing employment. On the other hand, for the JPSC, only bachelor's degrees significantly raise the probability of working on a permanent basis. Table 6.2 shows that, for the HILDA Survey, postgraduate degrees, bachelor's degrees, and advanced diploma/ diploma have significant positive effects on employment on any basis. For the JPSC, none of the education dummies has significant effects on employment in the dynamic estimation results.

Comparing the HILDA and JPSC results leads to several observations. Firstly, the effects of education on employment (for all types of employment status) are significant and positive in the estimations using HILDA data but not for those using JPSC data. The effects of higher education on permanent employment are observed for the JPSC but the results are not robust. Secondly, for the JPSC results, the effects of postgraduate degrees, bachelor's degrees, and junior college/colleges of technology on permanent employment are less significant statistically for the dynamic model (table 6.1) than for the static model (tables 4.1 and 5.1). This suggests that the effects of education are cancelled by the effects of the previous period's employment status. This in turn suggests that, in Japan, the previous period's employment status is more important for employment than educational attainment or qualifications in the present period. Thirdly, for the HILDA Survey, the effects of degrees or diplomas are significant in the dynamic estimation results as well as in the static results. Fourthly, the marginal effects of bachelor's degrees on employment are weaker for the JPSC than for the HILDA Survey. One possible explanation is that university education in Japan is not necessarily career-oriented, as pointed out by Edwards and Pasquale (2003). Another explanation is that the labour demand for women with bachelor's degrees is so weak in some industries (Hori, 2009; and Sano, 2009) that labour supply of women with bachelor's degrees tends to be excessive. However, the interpretation of this result needs further research.

7. Concluding remarks

We estimated female labour supply functions, paying special attention to the effects of education and qualifications on labour market and employment outcomes in Australia and Japan. We adopted a dynamic model as well as static models to obtain robust results for the two countries.

As the qualification systems for the two countries differ, it was not possible to compare the effects of education or qualifications on employment in a symmetric manner. However, we were able to find some differences between the econometric results for the two countries.

One of the major dissimilarities is that postsecondary education does not lead to a higher probability of employment (for any employment status) in the JPSC results, unlike for the HILDA results. Another important dissimilarity is that, for the JPSC, the effects of education are weaker for the dynamic estimation with lagged employment variables than for the static estimation. In contrast, for the HILDA Survey, the effects of education are not significantly different between the dynamic and static estimation results. This result could be interpreted in the following way. For the JPSC, the effects of previous employment status were so strong that they cancelled the effects of education. However, this is a hypothesis; future econometric study will be required to isolate the effects of previous employment from those of education.

The marginal effects of bachelor's degrees on permanent employment were weaker for the JPSC than for the HILDA Survey. The interpretations for this finding also need to be investigated further.

For Japan, specialised training colleges appear to have no effects on employment in the dynamic estimation results. In contrast, for Australia, qualifications such as advanced diplomas or diplomas did have an effect. This suggests that skills acquired from vocational education have not yet been fully utilized in Japan.

The need for certain types of education, skill formation, and skill evaluation varies on the basis of the labour market type. In the past, the Japanese labour market was characterised by low labour mobility and well-developed internal labour markets. For this reason, experiences acquired within firms have been weighed higher than the skills acquired outside firms. However, the labour market in Japan has been changing since the beginning of the 1990s in terms of labour mobility and diversifications in the types of employment, thus raising the importance of skills acquired outside firms. Currently, the systems of education, qualifications, and labour market institutions are undergoing reform so that human capital developed both outside and inside the firms can be fully utilized to bear returns. The Australian experiences could be useful as an example of advanced cases for this reform.

Appendices

Appendix A1 - Characteristics of the Household Income and Labour Dynamics in Australia (HILDA) Survey and the Japanese Panel Survey on Consumers (JPSC)

	HILDA Survey	*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 respondents in first wave	13,969	1,500
Interviews	Conducted annually	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	Economic and subjective well-being, labour market dynamics, and family dynamics	Family dynamics, labour market dynamics, household incomes, savings, and expenditure

Appendix A2 - Sequence patterns for the HILDA Survey, waves 5-9

Sequence pattern	*Number of observations*	*Percentage*	*Cumulative percentage*
22222	158	17.32	17.32
00000	108	11.84	29.17
11111	91	9.98	39.14
22221	25	2.74	41.89
10000	19	2.08	43.97
01111	18	1.97	45.94
12222	16	1.75	47.70
21111	16	1.54	49.45
00111	14	1.54	50.00
10111	13	1.43	52.52
Others	433	47.48	100.00
Total	912	100.00	

Notes: Author's calculations based on the HILDA Survey, waves 5-9. 2, 1, and 0 denote employment on a permanent basis, other types of employment, and not working, respectively.

Appendix A3 - Sequence patterns for the JPSC, waves 13-17

Sequence pattern	*Number of observations*	*Percentage*	*Cumulative percentage*
22222	185	24.21	24.21
00000	162	21.20	45.42
11111	98	12.83	58.25
01111	17	2.23	60.47
00001	16	2.09	62.57
10000	15	1.96	64.53
22220	15	1.96	66.49
00011	10	1.31	67.80
11100	10	1.31	69.11
11222	10	1.31	70.42
Others	226	29.59	100.00
Total	764	100.00	

Note: Author's calculations based on the JPSC, waves 13-17. 2, 1, and 0 denote employment on a permanent basis, other types of employment, and not working, respectively.

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