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Author	岸, 智子(Kishi, Tomoko) 鹿野, 繁樹(Kano, Shigeki)
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The Employment Outcomes of Vocational Education and Training in Australia and Japan

By

Tomoko Kishi[†]

Shigeki Kano[‡]

Abstract

This study compares the effects of vocational education and training (VET) on employment, employment status, and wages in Japan and Australia, by applying a difference-in-differences analysis to the data obtained from the Keio Household Panel Survey (KHPS) in Japan and the Household, Income and Labour Dynamics in Australia (HILDA) Survey. Vocational education effects were observed mainly for men in the KHPS and women in the HILDA Survey. For the HILDA respondents, the VET effects on employment and wages were more significant for those with a low academic background, while for the KHPS respondents, the reverse applied.

Keywords

Program evaluation, Difference-in-differences, Average treatment effect, Panel data analysis, Vocational education and training (VET), Qualifications, Specialised training college, Diploma, Advanced diploma, Employment, Full-time employment, Ongoing employment

1. Introduction

This paper presents a report of the study analysing the effects of vocational education and training (VET) offered by educational institutions on employment and wages in Japan, comparing them with the empirical results for Australia, and clarifying the future challenges of vocational education and training in Japan.

In Japan, human capital development has been an important function of individual firms since the period of rapid economic growth in the 1960s. It has become customary for firms

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†Nanzan University
‡Osaka Prefecture University

Table 1 Commitment of government and individual firms in the VET system

	Low involvement of firms	High involvement of firms
High public expenditure	Group 1 countries Finland, Norway, France, Sweden	Group 2 countries Germany, Denmark, Netherlands
Low public expenditure	Group 3 countries U.S.A., U.K., Australia	Group 4 country Japan

Source: Sato (2019)
Note: The group names in Table 1 are different from those used in Sato's (2019) classification.

to hire newly graduated young employees and train them extensively through on-the-job training and off-the-job training to develop their skills. However, since the beginning of the 1990s, the Japanese labour market has seen substantial changes, including the casualisation of the labour force and workforce diversification. Correspondingly, there has been an increase in the proportion of unprivileged employees in corporate-based VET. Therefore, the vocational education system in Japan requires reforms to address the challenges of this new era. Australia is a useful reference to draw a vision of human capital development in Japan, as there is a similarity in the vocational education system of both countries, and Australia has been able to develop this system more comprehensively than Japan.

The remainder of this paper is structured as follows. Section 2 discusses the similarities and differences in the vocational education systems in Japan and Australia against the background of labour market differences. Section 3 reviews the preceding research that forms the basis for our hypothesis, and Section 4 describes the methodology used. Section 5 describes the variables and data sources, and Section 6 presents and discusses the estimation results. Section 7 concludes.

2. Vocational education and training systems in Japan and Australia

2.1 Comparison between Japan and Australia

Nowadays, most countries attempt to reform VET systems to cope with the rapid technological developments and structural changes of the economy. Different countries have different VET systems, and the reforms should take various forms accordingly. Table 1 is based on Sato's (2019) classification of the VET system into four patterns according to the degrees of involvement of government sectors and individual enterprises.

As can be seen from Table 1, if individual firms in Japan are forced to have less commitment to VET in the future, a potential solution would be to move into Group 3, where the government expenditure on VET is low, as in Japan. Hence, the experiences of this group could serve as useful references in taking steps towards VET system reform in Japan. This study represents the first step in the direction by presenting comparative analyses between Japan and the country walking in front of Japan.

2.2 Labour markets in Japan and Australia

Labour markets in Japan and Australia differ in terms of recruitment by firms and the attachment of the labour force to the firms, as evidenced by job tenure and job separation in

Table 2 Distribution of tenure for the employed in Japan and Australia

	Japan, men	Australia, men	Japan, women	Australia, women
Fewer than 12 months	6.7	19.0	10.1	19.5
Between 1 and 3 years	12.9	21.1	18.1	21.8
Between 3 and 5 years	10.0	14.3	13.3	14.4
Between 5 and 10 years	17.9	17.7	20.8	18.4
Between 10 and 20 years	24.4	16.2	23.2	17.3
20 years and over	28.1	11.7	14.5	8.6
	100.0	100.0	100.0	100.0

Source: Ministry of Health, Labour and Welfare, Basic Survey on Wage Structure 2018; Australian Bureau of Statistics, Participation, Job Search and Mobility, Australia, February 2018.

the two countries. These differences are clearly reflected by various statistics. In terms of the firms' recruitment, hiring new graduates is more common in Japan than in Australia. The Recruit Works Institute (2012) found that the proportion of employees who received job offers from firms before graduation was 83.3% for Japanese men, 79.5% for Japanese women, 52.2% for Australian men, and 45.5% for Australian women. As for job tenure, Table 2 shows that the proportion of employees with a tenure of 10 years or more is higher for Japanese men and women than for their Australian counterparts.

2.3 Historical development of the VET system in Japan

In Japan, the 1880 Education Order and the 1899 Vocational School Order led to the establishment of vocational education institutions. Rapid industrialisation in the beginning of the 20th century also stimulated the increase in vocational schools. However, vocational education in the pre-war period was complicated and not systematised (Miyazawa, 2011). After World War II, institutes of technology, offering five-year courses and focusing on engineering or mercantile marine studies, were established for junior high school graduates. Additionally, miscellaneous vocational schools, open to both senior high school graduates and employed people who seek continued education, were established.

During the period of economic growth in the 1960s, industrial expansion led to technological development and the consequent need for new skills. However, this change did not lead to an increased demand for VET outside corporations. Major companies implemented systematic on-the-job training methods, and it became customary for such companies to hire and train new graduates with almost no vocational skills (Moriguchi and Ono, 2004). With general education being considered as the basis for trainability of young people, universities became more mainstream within higher education.

Aside from this trend, the number of VET institutions, mainly private, gradually increased. In 1976, under the revision of the School Education Law, a new type of educational institution, called a specialised training college, was established, and many miscellaneous vocational schools upgraded or integrated into these institutions.

Since the beginning of the 1990s, Japanese enterprises have faced significant changes, including a lower productivity growth than before, rise in offshore production, and an increased need to reduce costs. Hence, it has become harder for companies to afford intensive human capital development as in the past (Hara, 2007). In addition, the proportion of part-time, casual, or fixed-term employees with limited access to corporate-based training has increased substantially. Consequently, vocational education institutions have come to

Table 3 The Australian Qualifications Framework

Level	Qualification	Sector of accreditation
Level 1	Certificate I	VET sector
Level 2	Certificate II	VET
Level 3	Certificate III	VET
Level 4	Certificate IV	VET
Level 5	Diploma	Both VET and higher education institution
Level 6	Advanced diploma	Both VET and higher education institution
	Associate degree	Both VET and higher education institution
Level 7	Bachelor's degree	Higher education institution
Level 8	Bachelor honours degree	Higher education institution
	Graduate certificate	Both VET and higher education institution
	Graduate diploma	Both VET and higher education institution
Level 9	Master's degree	Higher education institution
Level 10	Doctoral degree	Higher education institution

Source: Australian Qualifications Framework Council (2013)

attract a wide variety of people, including full-time university students and employed people.[1]

2.4 Historical development of the VET system in Australia

According to Bowman and McKenna (2016), the early stages of the establishment of vocational education institutions across Australia began in the 1870s, at the latest. In the 1930s, technical colleges were established to assist high school graduates who were unemployed due to the Great Depression. World War II encouraged the development of vocational education schemes to train workers during wartime and improve civilian job opportunities for former service persons (Goozee, 2001). After World War II, industrial expansion, diversification of the labour force, and social movements towards equality stimulated a greater demand for technical education.

In 1974, the Australian Committee on Technical and Further Education submitted the Kangan Report, which provided a blueprint for the development of 'technical and further education (TAFE)' colleges as major institutions of vocational education in subsequent years (Bowman and McKenna, 2016; Goozee, 2001).

2.5 Vocational qualifications and recognition by firms

The Australian Qualifications Framework integrates ten levels of school, vocational, and academic education qualifications into one national system. It specifies the purpose of each qualification, and the knowledge, skills, and volume of learning required to achieve it. This ensures that established qualifications are consistent across the country and represent the same standards of education. Table 3 summarises the ten qualification levels. Among them, vocational education qualifications are available at the following levels: Certificate I, II, III, and IV; Diploma; and Advanced diploma (Australian Qualifications Framework Council, 2013).

[1] According to the Basic School Survey conducted by the Japanese Ministry of Education, Culture, Sports, Science, and Technology (2019), approximately 4.6% of newly enrolled students in specialised training colleges in 2019 had already graduated from higher education institutions, be it universities, junior colleges, or technical colleges.

In contrast, Japan has no system to integrate academic and vocational education. The 1994 educational reforms enabled specialised training colleges to grant diplomas equivalent to the associate degrees offered by junior colleges, and advanced diplomas equivalent to the bachelor's degrees.[2] However, these qualifications are neither well known nor internationally applicable.

Regarding the recognition of VET qualifications, Keating et al. (2005) interviewed 359 employers in Australia and found that 50% of employers required qualifications for recruitment. In Japan, the Japan Institute for Labour Policy and Training's survey (JILPT, 2014) questioned employers about the importance of vocational licences in recruitment, although it did not ask about vocational qualifications such as diplomas or advanced diplomas, indicating that the qualifications are still not familiar among enterprises in Japan.

3. Preceding research and hypothesis development

3.1 Preceding research in Japan

In Japan, researchers focused on VET within, rather than outside, firms, as seen in Koike's (1981, 1991, 1994) pioneering works in this field. Recently, Morikawa (2019) found a significant impact of corporate-based off-the-job training on labour productivity.

Studies on the effects of VET provided by vocational schools or colleges on individual career formation are only recent. Yokoyama et al. (2019) estimated the effects of voluntary human capital investments using the KHPS and showed that vocational education without schooling significantly raises trainees' wage incomes.

3.2 Preceding research in Australia

In Australia, researchers have investigated the impact of vocational education and qualifications on employment outcomes and wages, mainly using the Household, Income and Labour Dynamics in Australia (HILDA) Survey. Leigh (2008) analysed data from the first five waves of the HILDA Survey, and found that vocational qualifications have significant positive effects on hourly wages and annual incomes. Forbes et al. (2010) applied the Heckman correction to the data from the same waves and found that the acquisition of diplomas or certificates through vocational education led to higher-than-normal wages. Mavromaras et al. (2015) used data from waves 1–10 and demonstrated that academic qualifications protect against unemployment more than vocational qualifications do. Polidano and Ryan (2016) applied a fixed-effects estimation to data from waves 1–11. They showed that women with VET qualifications often had greater estimated outcome improvements than men with the same qualifications. Perales and Chesters (2017) used a fixed-effects model to study data from waves 1–15 and found that transitions from 12 years of education to vocational qualifications had modest but significant effects on wages for both men and women. Coelli and Tabasso (2019), in their analysis of data from waves 1–11, linked vocational education with higher employment probability for women, but not for men.

3.3 Hypothesis

As discussed, in comparison to Japan's qualification system, the Australian qualifica-

[2] Specialised training colleges are authorised to grant 'diplomas' or 'advanced diplomas' if: 1. the duration of the study is two years or more; 2. the number of unit hours required for graduation is 1,700 or more; and 3. examinations are required to grant units.

tion systems are more developed, and their qualifications are more widely recognised. According to previous research including Polidano and Ryan (2016), vocational education raises the probability of employment and wages, particularly for women, in Australia.

Our hypothesis is that VET in Australia has a significant positive effect on the four labour market outcomes for women but not for men, as shown by previous research. We also hypothesise that VET in Japan is not effective for labour market outcomes for either men or women. The reason for these hypotheses is that the linkages between educational institutions, qualifications, and enterprises are still weak in Japan.

Our contribution is that we collect data and specify the econometric model to estimate in a coherent manner for Japan and Australia. Specifically, we carefully define the treatment status of Japanese data comparable to the Australian counterpart. We further apply a modified version of Coelli and Tabasso's (2019) model to the panel data for both countries.

4. Estimation methodology

To evaluate the effect of vocational education, we employed a panel-based difference-in-differences method. Let y_{it} be the individual labour market outcome i ($i = 1, 2, \ldots, N$) for wave t ($t = 1, 2, \ldots, T$). We defined a time-invariant dummy, $Treated_i$, by indexing the treatment status such that $Treated_i = 1$ if the i represents vocational education in any wave between $t = 0$ and $t = T$; otherwise $Treated_i = 0$. We further defined $After_{it}$ as a dummy to capture the period of educational training that was completed for the $Treated_i = 1$ groups. Note that the period of vocational education varies among individuals and ranges from $t = 1$ to T. Once $After_{it}$ turns to unity, it remains so for the remaining waves.

Let us assume that the individual outcome y_{it} obeys the following process:

$$y_{it} = \delta Treated_i \times After_{it} + x'_{it}\beta + c_i + g(t) + \epsilon_{it.} \quad (1)$$

Here, x'_{it} is a vector of control variables that adjust for the potential differences of time trends between the treated ($Treated_i = 1$) and control ($Treated_i = 0$) groups. Term c_i is the individual effect that is unobservable and unchanged over T waves. Note that $Treated_i$ was excluded from the right-hand side of Equation (1) because it is spanned by c_i. Function $g(t)$ is a model of the trend components in Equation (1). As a robustness check, we used a simple time trend, that is, $g(t) = t$, and nonparametric, free $T - 1$ wave dummies. The last term ϵ_{it} is a disturbance and is uncorrelated with other left-hand side variables.

Under these conditions, the coefficient δ of equation (1) measures the average treatment effect on the treated of training (Wing et al., 2018). We estimated the parameters using fixed-effects estimation.

One of the most important assumptions in the difference-in-difference analysis is the parallel trend of outcomes for the treated and control groups. If the treated and control have different, distinctive trends in outcomes, the treatment effect is not identified by the fixed effect estimation of δ. Therefore, it is customary to use control variables accounting for potential disparity in the trends. See Heckman et al. (1997) and Abadie (2005) in detail for the conditionally parallel trends by the use of controls. We verify the conditional parallel trends by checking that our estimation results are insensitive to the specifications of control variables and trend terms.

5. Variables and data

5.1 Scope of vocational education

The KHPS classifies voluntary vocational education outside business enterprises into 11 types: (1) specialised vocational schools, (2) miscellaneous vocational schools,[3] (3) public vocational training, (4) undergraduate courses, (5) graduate courses, (6) correspondence courses, (7) extension courses at universities, (8) TV or radio programs or books, (9) seminars and lectures, (10) voluntary study groups within firms, and (11) others. In our analysis, we defined (1), (2), and (6) as vocational education for comparison with the vocational education of Australia, as VET qualifications in Australia are obtained after attending educational institutions for a fixed period, such as six months, one year, or two years.

For the HILDA Survey, we limited vocational education to courses that grant qualifications: Certificate III, Certificate IV, Diploma, Associate degree, or Advanced diploma.

5.2 Treated groups

As defined in the previous section, the dummy variable *Treated* equalled 1 for the KHPS if the respondent received vocational education only once during the survey period, and 0 otherwise. For the HILDA Survey, *Treated* took the value of 1 if the respondent received a new qualification during the survey period, and 0 otherwise. Thus, *Treated* was time invariant. The dummy variable *After* took the value 1 for the year in which the respondents received vocational education (for the KHPS) or a qualification (for the HILDA Survey). We used the interactive term *Treated*×*After* as an explanatory variable. For example, for a KHPS respondent who received vocational education in the fourth wave, *Treated*×*After* took a value of 0 for the first three waves, and 1 for waves 4–14.

5.3 Variables

Table 4 summarises the dependent variables used in the estimation for both the KHPS and the HILDA Survey: *Employed, FT* (full-time employment)*, Ongoing*, and *Wages* (gross weekly wages). For both datasets, *Employed* took a value of 1 if the respondent was employed, and 0 otherwise; *FT* took a value of 1 if the respondent worked 35 hours a week or more, and 0 otherwise; and *Ongoing* took a value of 1 if the respondent's labour contract was ongoing or permanent instead of fixed or casual, and 0 otherwise.

In addition, multiple explanatory variables were included, which are listed below.

1. Dummy variables for the various age classes: *Ages 30–39, Ages 40–49, Ages 50–59,* and *Ages 60+*.
2. A dummy variable for being married or partnered: *Partnered* for the HILDA Survey and *Married* for the KHPS.[4]
3. Dummy variables for resident children: *Children 0–4, Children 5–14, Children 15–24*.
4. Dummy variables for waves: *Wave 2–Wave 14* for the KHPS, and *Wave 2–Wave 17* for the HILDA Survey.

We have provided descriptive statistics for the variables in Appendices 1–4.

[3] Miscellaneous vocational schools differ from specialised vocational schools in aspects of annual hours of classes, number of students per class, and qualifications for admission. These schools cannot grant qualifications.

[4] This is because the proportion of unmarried partners is higher for the HILDA Survey than for the KHPS.

Table 4 Dependent variables, KHPS and the HILDA Survey

Variable	KHPS	HILDA Survey
Employed	Dummy variable equal to 1 if the respondent is employed (including self-employment)	Same as KHPS
FT	Dummy variable equal to 1 if the respondent works 35 hours or more per week	Same as KHPS
Ongoing	Dummy variable equal to 1 if the respondent works under ongoing/ permanent contract	Same as KHPS
Wages	Gross wages and salary per week (10,000 yen)	Gross wages and salary per week (AUD)

5.4 Data

We used two sets of longitudinal data from Japan and Australia: the KHPS and the HILDA Survey, respectively. The KHPS is conducted annually by Keio University. The first wave, in 2004, included observations for 4,005 men and women aged 20–69 years. The HILDA Survey was developed by the Melbourne Institute of Applied Economic and Social Research, and funded by the Australian Department of Social Services. Data are collected annually through interviews with men and women over 15 years of age in selected households. In wave 1, in 2001, data were collected from 7,682 households (13,969 individuals).

We combined waves 1–14 of the KHPS and waves 1–17 of the HILDA Survey by selecting samples with responses for the entire period; this helped to ensure a balanced panel for this analysis. We also excluded observations for the respondents who received vocational education twice or more during the survey period, were below 20 or over 50 years of age during the first wave, or reported themselves as 'full-time students' or answered 'commuting to schools' as a daily routine.

6. Estimation results and discussion

6.1 Estimation results

We applied the model described in the previous section to each of the longitudinal data to estimate the four outcomes: *Employed, FT, Ongoing,* and *Wages* (per week). For the KHPS, the results for the outcome variable of *Employed* are listed in Table 5 and the other results are in Table 6. For the HILDA Survey, the results for the outcome variable of *Employed* and other outcomes are shown in Tables 7 and 8, respectively. For each estimation, four models were applied: (1) a full model with wave dummies, (2) a full model with time trends, (3) a model with wave dummies but without individual characteristics, and (4) a model with time trends but without individual characteristics.[5]

As seen in Table 5, the estimated coefficient for *Treated×After* is positive (+3%) and significant at the 10% significance level for *Employed* for the KHPS men. In contrast, Table 6 indicates that *Treated×After* is positive (+9%) and significant at the 10% significance level for *Ongoing* but not significant for *FT* and *Wages* for men. The estimated coefficients for *Treated×After* are not significant for any of the four outcomes for women. The statistical significance of *Treated×After* is not very different between the estimations controlling for

[5]The full tables are available on request.

Table 5 Estimation results for *Employed*, KHPS, all educational levels

Men	(1)	(2)	(3)	(4)
Treated ×After	0.029 (1.89)*	0.027 (1.81)*	0.031 (2.26)**	0.030 (2.21)**
Ages 30–39	0.025 (1.04)	0.022 (0.91)		
Ages 40–49	0.024 (0.83)	0.021 (0.73)		
Ages 50–59	0.025 (0.81)	0.021 (0.71)		
Ages 60+	–0.064 (–1.45)	–0.062 (–1.41)		
Married	0.023 (1.37)	0.024 (1.46)		
Children 0–4	–0.008 (–1.26)	–0.007 (–1.18)		
Children 5–14	–0.003 (–0.75)	–0.004 (–0.91)		
Children 15–24	0.006 (1.02)	0.006 (0.96)		
Wave dummies	Yes		Yes	
Trend†		–0.002 (–1.84)*		–0.002 (–2.61)**
N of observations	4,606	4,606	4,606	4,606
Women	(1)	(2)	(3)	(4)
Treated ×After	0.007 (0.14)	0.006 (0.12)	0.056 (1.00)	0.055 (0.99)
Ages 30–39	–0.026 (–0.70)	–0.028 (–0.79)		
Ages 40–49	0.008 (0.17)	0.005 (0.11)		
Ages 50–59	–0.023 (–0.47)	–0.027 (0.55)		
Ages 60+	–0.118 (–1.85)*	–0.116 (–1.82)*		
Married	–0.139 (–3.29)***	0.139 (–3.26)***		
Children 0–4	–0.199 (–5.49)***	–0.198 (–5.48)***		
Children 5–14	0.006 (0.29)	0.005 (0.25)		
Children 15–24	0.065 (3.85)***	0.064 (3.81)***		
Trend		0.006 (2.57)**		0.008 (3.81)***
Wave dummies	Yes		Yes	
N of observations	5,474	5,474	5,474	5,474

Notes:
The rows (1), (2), (3), and (4) are for: (1) a full model with wave dummies, (2) a full model with time trends, (3) a model with wave dummies but without individual characteristics, and (4) a model with time trends but without individual characteristics, respectively. Intercepts are not listed in this table.
Figures in parentheses are t-values. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% significance level.
† Trend = 1, 2, …, 14 for years 2004, 2005, …, 2017.

individual characteristics (in the first and second rows) and estimations not controlling for them (in the third and fourth rows). This suggests that the parallel trend assumptions of the econometric model hold.

Coming to other variables, the dummy variables of age, marital status, and children did not have significant effects on the outcome of *Employed* for men. However, marriage and children aged 0–4 years had significant negative effects on the outcome of *Employed* for women (Table 5).

Appendices 5 and 6 are the estimated results for those with and without a bachelor's degree in the initial period of the KHPS, respectively.[6] They show that the treatment effects of the VET are observed only for the outcome of *Ongoing* for men and women with a

[6] As educational attainment was almost fixed throughout the entire period for most of the respondents, we could not use it as an explanatory variable. Instead, we split the data according to the acquisition of the bachelor's degree.

Table 6 Summary of the estimation results, KHPS, all education levels

Dependent variable: *FT*				
Men (N=4,606)	(1)	(2)	(3)	(4)
Treated ×After	0.013 (0.38)	0.013 (0.37)	0.011 (0.35)	0.014 (0.42)
Wave dummies	Yes		Yes	
Trend		−0.002 (−1.15)		−0.003 (−2.11)**
N of observations	4,606	4,606	4,606	4,606
Women	(1)	(2)	(3)	(4)
Treated ×After	0.044 (0.65)	0.044 (0.65)	0.024 (0.35)	0.022 (0.33)
Wave dummies	Yes		Yes	
Trend		−0.009 (−3.34)***		−0.007 (−3.24)***
N of observations	5,474	5,474	5,474	5,474
Dependent variable: *Ongoing*				
Men	(1)	(2)	(3)	(4)
Treated ×After	0.092 (1.85)*	0.088 (1.80)*	0.093 (1.94)*	0.094 (1.97)*
Wave dummies	Yes		Yes	
Trend		−0.002 (−0.80)		−0.004 (−2.03)**
N of observations	4,606	4,606	4,606	4,606
Women	(1)	(2)	(3)	(4)
Treated ×After	−0.020 (−0.29)	−0.019 (−0.29)	−0.001 (−0.01)	−0.001 (−0.01)
Wave dummies	Yes		Yes	
Trend		−0.001 (−0.28)		−0.002 (−1.15)
N of observations	5,474	5,474	5,474	5,474
Dependent variable: *Wages* (10,000 yen)				
Men	(1)	(2)	(3)	(4)
Treated ×After	0.763 (1.64)	0.873 (1.80)*	0.860 (1.80)*	1.054 (2.09)**
Wave dummies	Yes		Yes	
Trend		0.073 (2.90)***		0.067 (2.88)***
N of observations	4,472	4,472	4,472	4,472
Women	(1)	(2)	(3)	(4)
Treated ×After	−0.057 (−0.24)	−0.055 (−0.23)	0.214 (0.84)	0.215 (0.84)
Wave dummies	Yes		Yes	
Trend		0.031 (2.43)**		0.055 (5.06)***
N of observations	5,314	5,314	5,314	5,314

Notes:
The rows (1), (2), (3), and (4) are for: a full model with wave dummies, a full model with time trends, a model with wave dummies but without individual characteristics, and a model with time trends but without individual characteristics, respectively. Intercepts are not listed in this table.
Figures in parentheses are t-values. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% significance level.

Table 7 Estimation results for *Employed*, HILDA Survey, all education levels

Men	(1)	(2)	(3)	(4)
Treated ×After	–0.003 (–0.21)	–0.003 (–0.16)	0.009 (0.54)	0.012 (0.72)
Ages 30–39	0.036 (2.99)***	0.044 (3.62)***		
Ages 40–49	0.071 (4.56)***	0.080 (5.12)***		
Ages 50–59	0.081 (4.56)***	0.090 (5.08)***		
Ages 60+	–0.062 (–2.61)***	–0.063 (–2.64)***		
Married	–0.006 (–0.51)	–0.005 (–0.45)		
Children 0–4	–0.014 (–2.64)***	–0.014 (–2.53)**		
Children 5–14	–0.003 (–0.74)	–0.003 (–0.64)		
Children 15–24	0.009 (1.85)*	0.010 (2.03)**		
Wave dummies	Yes		Yes	
Trend[#]		–0.008 (–9.44)***		–0.008 (–11.85)***
N of observations	24,446	24,446	24,446	24,446
Women	(1)	(2)	(3)	(4)
Treated ×After	0.071 (3.27)***	0.070 (3.25)***	0.082 (3.45)***	0.083 (3.48)***
Ages 30–39	0.077 (3.94)***	0.082 (4.27)***		
Ages 40–49	0.135 (5.79)***	0.142 (6.14)***		
Ages 50–59	0.125 (4.84)***	0.132 (5.16)***		
Ages 60+	–0.047 (–1.50)	–0.049 (–1.56)		
Married	–0.017 (–1.09)	–0.016 (–1.07)		
Children 0–4	–0.194 (–19.17)***	–0.193 (–19.15)***		
Children 5–14	–0.036 (–5.76)***	–0.036 (–5.72)***		
Children 15–24	0.003 (0.52)	0.004 (0.56)		
Trend		–0.007 (–6.79)***		–0.004 (–4.26)***
N of observations	27,234	27,234	27,234	27,234

Notes:
The rows (1), (2), (3), and (4) are for: a full model with wave dummies, a full model with time trends, a model with wave dummies but without individual characteristics, and a model with time trends but without individual characteristics, respectively. Intercepts are not listed in this table.
Figures in parentheses are t-values. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% significance level.
[#] Trend =1, 2, …, 17 for years 2001, 2002, …, 2017.

bachelor's degree or higher in the initial period.

Table 7 shows the HILDA Survey results. Among women, the estimated coefficient for *Treated×After* was positive (+7%) and significant at the 1% significance level for the outcome of *Employed*. Furthermore, the effects of *Treated×After* were positive (+7%) and significant at the 1% significance level for *FT*, and positive (+5%) and significant at the 10% significance level for *Ongoing* (Table 8). However, the estimated coefficients for *Treated×After* were not significant for *Wages* among women or for any of the four outcomes among men.

For other variables, we obtained the following observations: both men and women from 30 to 59 years of age were more likely to be employed than those in their 20s. Marital status did not affect employment, while having children aged from 0 to 4 years had significant negative effects on the employment of both men and women. Children from 5 to 14 years of age also had significant negative effects on the employment of women (Table 7).

Appendices 7 and 8 depict results of participants with a bachelor's or higher degree and those without these degrees in the initial period, respectively. They show that significant

Table 8 Summary of the estimation results, the HILDA Survey, all education levels

Dependent variable: *FT*				
Men	(1)	(2)	(3)	(4)
Treated ×After	−0.015 (−0.68)	−0.014 (−0.63)	0.004 (0.18)	0.008 (0.35)
Wave dummies	Yes		Yes	
Trend		−0.011 (−10.58)***		−0.010 (−13.49)***
N of observations	24,446	24,446	24,446	24,446
Women	(1)	(2)	(3)	(4)
Treated ×After	0.071 (3.06)***	0.071 (3.04)***	0.078 (2.96)***	0.078 (2.95)***
Wave dummies	Yes		Yes	
Trend		−0.009 (−7.54)***		−0.003 (−3.47)***
N of observations	27,234	27,234	27,234	27,234
Dependent variable: *Ongoing*				
Men	(1)	(2)	(3)	(4)
Treated ×After	0.007 (0.25)	0.015 (0.54)	0.015 (0.60)	0.029 (1.05)
Wave dummies	Yes		Yes	
Trend		0.002 (1.24)		0.001(1.43)
N of observations	24,446	24,446	24,446	24,446
Women	(1)	(2)	(3)	(4)
Treated ×After	0.048 (1.95)*	0.043 (1.93)*	0.058 (2.25)**	0.060 (2.31)*
Wave dummies	Yes		Yes	
Trend		0.004 (3.15)***		0.007 (7.87)***
N of observations	27,234	27,234	27,234	27,234
Dependent variable: *Wages* (AUD)				
Men	(1)	(2)	(3)	(4)
Treated ×After	−22.800 (−0.53)	−22.306 (−0.51)	15.426 (0.35)	21.936 (0.50)
Wave dummies	Yes		Yes	
Trend		26.318 (10.16)***		27.526 (13.20)***
N of observations	22,757	22,757	22,757	22,757
Women	(1)	(2)	(3)	(4)
Treated ×After	40.469 (1.63)	39.497 (1.64)	53.020 (1.97)*	54.381 (1.98)*
Wave dummies	Yes		Yes	
Trend		13.964 (9.36)***		18.543 (14.91)***
N of observations	25,275	25,275	25,275	25,275

Notes:
The rows (1), (2), (3), and (4) are for: a full model with wave dummies, a full model with time trends, a model with wave dummies but without individual characteristics, and a model with time trends but without individual characteristics, respectively. Intercepts are not listed in this table.
Figures in parentheses are t-values. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% significance level.

positive effects of the VET are observed for all four outcomes among women without a bachelor's degree in the first wave.

6.2 Discussion

Contrary to the hypothesis, the treatment effects of vocational education were identified for men's employment and ongoing employment in the KHPS data. However, VET effects were not observed for women, as hypothesised. In the HILDA Survey, treatment effects of VET were observed for employment, full-time employment, and ongoing employment for women, while they were not observed for men. Moreover, the HILDA Survey data indicated that VET had a higher contribution in the career formation of those with lower academic backgrounds, while the reverse applied for the KHPS respondents.

The differences can be partly explained by the fields of VET, as the top three industries for which the treated female participants worked were different between the two countries. The top three industries in which the female respondents of the KHPS worked were: medical and other healthcare services (20.1%), education services (13.1%), and wholesale and retail (12.6%). For the female respondents of the HILDA Survey, the corresponding categories were: social assistance (12.3%), preschool and school education (10.6%), and medical and other healthcare services (5.9%). It is possible that in Japan, female participants in VET have a high probability of quitting jobs, as they are concentrated in the medical and other healthcare services sector, where working conditions are harsh. However, as the fields of vocational education were not directly questioned in the surveys, the precise reason remains a topic for future research.

7. Conclusion

This study compared the effects of VET on subsequent employment status and wages in both Japan and Australia. As far as possible, we applied similar econometric models to the panel data for both countries. We hypothesised that VET would have significant effects on labour market outcomes for the HILDA female respondents, but not for the HILDA male or the KHPS respondents. The hypothesis was partly supported and partly rejected. For the KHPS, unexpectedly, the VET effects were observed for men's employment and ongoing employment. In contrast, for the HILDA Survey, the VET effects were observed only for employment, full-time employment, and ongoing employment for women. Another important finding was the observed effect of VET on labour market outcomes for the HILDA female respondents with a lower educational background; however, this effect was not observed among the KHPS female respondents. This suggests that the future challenge of VET in Japan is to reform the qualification system so that it contributes to the career formation and development of those with a limited academic background and few opportunities for corporate-based trainings.

Our analysis is still ongoing, as the scope of VET in Japan and Australia is not equivalent. The number of observations for completed VETs in Japan is much smaller than that the observations for Australia. Collecting VET data in Japan that is equivalent to the VET data of Australia is the next step for a more accurate and consistent comparative analysis.

Appendices

Appendix 1 Descriptive statistics, KHPS, men

Variable	N of observations	Mean	Standard deviation	Minimum	Maximum
Treated	4,606	0.085	0.279	0	1
Treated ×After	4,606	0.057	0.232	0	1
Employed	4,606	0.970	0.170	0	1
FT	4,606	0.915	0.278	0	1
Ongoing	4,606	0.705	0.456	0	1
Wages/week (*10,000 yen*)	4,472	10.607	6.500	0	89.076
Ages 30–39	4,606	0.244	0.429	0	1
Ages 40–49	4,606	0.385	0.487	0	1
Ages 50–59	4,606	0.289	0.453	0	1
Ages 60+	4,606	0.037	0.189	0	1
Married	4,606	0.783	0.412	0	1
Children 0–4	4,606	0.133	0.340	0	1
Children 5–14	4,606	0.379	0.485	0	1
Children 15–24	4,606	0.311	0.463	0	1

Appendix 2 Descriptive statistics, KHPS, women

Variable	N of observations	Mean	Standard deviation	Minimum	Maximum
Treated	5,474	0.110	0.313	0	1
Treated ×After	5,474	0.063	0.242	0	1
Employed	5,474	0.727	0.445	0	1
FT	5,474	0.631	0.483	0	1
Ongoing	5,474	0.334	0.472	0	1
Wages/week (*10,000yen*)	5,314	2.512	2.963	0	18.231
Ages 30–39	5,474	0.266	0.442	0	1
Ages 40–49	5,474	0.391	0.488	0	1
Ages 50–59	5,474	0.264	0.441	0	1
Ages 60+	5,474	0.020	0.138	0	1
Married	5,474	0.788	0.409	0	1
Children 0–4	5,474	0.130	0.337	0	1
Children 5–14	5,474	0.381	0.486	0	1
Children 15–24	5,474	0.360	0.480	0	1

Appendix 3 Descriptive statistics, the HILDA Survey, men

Variable	N of observations	Mean	Standard deviation	Minimum	Maximum
Treated	24,446	0.131	0.338	0	1
Treated × After	24,446	0.073	0.259	0	1
Employed	24,446	0.886	0.317	0	1
FT	24,446	0.805	0.396	0	1
Ongoing	24,446	0.569	0.495	0	1
Wages/ week (AUD)	22,757	1049.135	1011.279	0	16990
Ages 30–39	24,446	0.219	0.414	0	1
Ages 40–49	24,446	0.379	0.485	0	1
Ages 50–59	24,446	0.294	0.456	0	1
Ages 60+	24,446	0.061	0.239	0	1
Partnered	24,446	0.657	0.475	0	1
Children 0–4	24,446	0.199	0.517	0	4
Children 5–14	24,446	0.546	0.909	0	7
Children 15–24	24,446	0.364	0.735	0	6

Appendix 4 Descriptive statistics, the HILDA Survey, women

Variable	N of observations	Mean	Standard deviation	Minimum	Maximum
Treated	27,234	0.159	0.365	0	1
Treated × After	27,234	0.084	0.277	0	1
Employed	27,234	0.729	0.444	0	1
FT	27,234	0.374	0.484	0	1
Ongoing	27,234	0.459	0.499	0	1
Wages/week (AUD)	25,275	563.708	625.895	0	7864
Ages 30–39	27,234	0.206	0.404	0	1
Ages 40–49	27,234	0.370	0.483	0	1
Ages 50–59	27,234	0.310	0.462	0	1
Ages 60+	27,234	0.066	0.248	0	1
Partnered	27,234	0.655	0.475	0	1
Children 0–4	27,234	0.177	0.489	0	4
Children 5–14	27,234	0.577	0.912	0	7
Children 15–24	27,234	0.450	0.776	0	6

Appendix 5 Summary of the estimation results, the KHPS, bachelor's or a higher degree

Dependent variable: *Employed*				
Men (N=1,680)	(1)	(2)	(3)	(4)
Treated ×After	0.024 (1.43)	0.019 (1.25)	0.019 (1.42)	0.017 (1.34)
Wave dummies	Yes		Yes	
Trend		−0.002 (−0.80)		−0.001 (−0.78)
Women (N=770)	(1)	(2)	(3)	(4)
Treated ×After	0.151 (1.33)	0.150 (1.36)	0.163 (1.40)	0.162 (1.43)
Wave dummies	Yes		Yes	
Trend		0.005 (0.70)		0.002 (0.26)
Dependent variable: *FT*				
Men (N=1,680)	(1)	(2)	(3)	(4)
Treated ×After	0.025 (0.59)	0.025 (0.60)	0.021 (0.51)	0.021 (0.52)
Wave dummies	Yes		Yes	
Trend		−0.0004 (−0.18)		−0.002 (−1.06)
Women (N=770)	(1)	(2)	(3)	(4)
Treated ×After	−0.046 (−0.34)	−0.043 (−0.32)	−0.027 (−0.21)	−0.024 (−0.19)
Wave dummies	Yes		Yes	
Trend		−0.007 (−1.05)		−0.0002 (−0.04)
Dependent variable: *Ongoing*				
Men (N=1,680)	(1)	(2)	(3)	(4)
Treated ×After	0.150 (2.17)**	0.146 (2.16)**	0.119 (1.67)*	0.119 (1.67)*
Wave dummies	Yes		Yes	
Trend		0.003 (1.23)		−0.001 (−0.54)
Women (N=770)	(1)	(2)	(3)	(4)
Treated ×After	0.147 (1.73)*	0.146 (1.78)*	0.150 (1.76)*	0.151 (1.82)*
Wave dummies	Yes		Yes	
Trend		0.005 (0.76)		−0.001 (−0.27)
Dependent variable: *Wages* (10,000 yen)				
Men (N=1,628)	(1)	(2)	(3)	(4)
Treated ×After	0.932 (1.48)	1.085 (1.60)	0.539 (0.84)	0.751 (1.04)
Wave dummies			Yes	
Trend		0.121 (2.89)***		0.132 (3.32)***
Women (N=757)	(1)	(2)	(3)	(4)
Treated ×After	0.952 (2.19)**	0.921 (2.22)**	1.187 (2.36)**	1.149 (2.40)**
Wave dummies	Yes		Yes	
Trend		0.051 (1.18)		0.055 (1.47)

Appendix 6 Summary of the estimation results, the KHPS, lower than a bachelor's degree

Dependent variable: *Employed*				
Men (N=2,926)	(1)	(2)	(3)	(4)
Treated ×After	0.043 (1.37)	0.042 (1.30)	0.045 (1.56)	0.045 (1.53)
Wave dummies	Yes		Yes	
Trend		−0.001 (−2.07)**		−0.002 (−2.91)**
Women	(1)	(2)	(3)	(4)
Treated ×After	−0.027 (−0.49)	−0.030 (−0.54)	0.030 (0.48)	0.029 (0.45)
Wave dummies			Yes	
Trend		0.007 (2.73)***		0.009 (4.08)***
Dependent variable: *FT*				
Men (N=2,926)	(1)	(2)	(3)	(4)
Treated ×After	−0.005 (−0.09)	−0.006 (−0.11)	−0.004 (−0.08)	−0.001 (−0.02)
Wave dummies	Yes		Yes	
Trend		−0.002 (−1.07)		−0.003 (−1.82)*
Women (N=4,704)	(1)	(2)	(3)	(4)
Treated ×After	0.060 (0.79)	0.059 (0.78)	0.032 (0.39)	0.029 (0.36)
Wave dummies	Yes		Yes	
Trend		−0.010 (−3.24)***		−0.008 (−3.48)***
Dependent variable: *Ongoing*				
Men (N=2,926)	(1)	(2)	(3)	(4)
Treated ×After	0.007 (0.17)	0.004 (0.11)	0.035 (1.04)	0.039 (1.10)
Wave dummies	Yes		Yes	
Trend		−0.005 (−1.60)		−0.005 (−2.02)**
Women (N=4,704)	(1)	(2)	(3)	(4)
Treated ×After	−0.069 (−0.84)	−0.070 (−0.85)	−0.047 (−0.54)	−0.047 (−0.55)
Wave dummies	Yes		Yes	
Trend		−0.001 (−0.49)		−0.002 (−1.11)
Dependent variable: *Wages* (10,000 yen)				
Men (N=2,844)	(1)	(2)	(3)	(4)
Treated ×After	0.272 (0.49)	0.342 (0.61)	0.861 (1.29)	1.056 (1.56)
Wave dummies	Yes		Yes	
Trend		0.051 (1.67)*		0.032 (1.12)
Women (N=4,577)	(1)	(2)	(3)	(4)
Treated ×After	−0.355 (−1.31)	−0.361 (−1.33)	−0.067 (−0.23)	−0.072 (−0.24)
Wave dummies	Yes		Yes	
Trend		0.031 (2.45)**		0.054 (4.95)***

Appendix 7 Summary of the estimation results, the HILDA Survey, bachelor's or a higher degree

Dependent variable: *Employed*				
Men (N=6,001)	(1)	(2)	(3)	(4)
Treated ×After	0.070 (3.18)***	0.070 (3.21)***	0.071 (3.22)***	0.073 (3.33)***
Wave dummies	Yes		Yes	
Trend		−0.008 (−5.81)***		−0.008 (−6.86)***
Women (N=7,463)	(1)	(2)	(3)	(4)
Treated ×After	0.057 (1.46)	0.058 (1.47)	0.053 (1.13)	0.052 (1.12)
Wave dummies	Yes		Yes	
Trend		−0.007 (−4.01)***		−0.0003 (−1.92)*
Dependent variable: *FT*				
Men (N=6,001)	(1)	(2)	(3)	(4)
Treated ×After	0.116 (1.95)*	0.117 (1.97)*	0.117 (1.95)*	0.120 (1.99)*
Wave dummies	Yes		Yes	
Trend		−0.010(−5.26)***		−0.011(−7.58)***
Women (N=7,463)	(1)	(2)	(3)	(4)
Treated ×After	−0.012 (−0.31)	−0.014 (−0.38)	−0.012 (−0.24)	−0.014 (−0.27)
Wave dummies	Yes		Yes	
Trend		−0.010(−4.34)***		−0.005 (−2.18)**
Dependent variable: *Ongoing*				
Men (N=6,001)	(1)	(2)	(3)	(4)
Treated ×After	0.038 (0.93)	0.049 (0.62)	0.038 (0.48)	0.052 (0.62)
Wave dummies	Yes		Yes	
Trend		−0.004 (−1.57)		−0.016 (−0.91)
Women (N=7,463)	(1)	(2)	(3)	(4)
Treated ×After	0.013 (0.29)	0.004 (0.10)	0.012 (0.23)	0.003 (0.07)
Wave dummies	Yes		Yes	
Trend		0.006 (2.75) ***		0.008 (4.09)***
Dependent variable: *Wages* (AUD)				
Men (N=5,545)	(1)	(2)	(3)	(4)
Treated ×After	−187.003 (−1.51)	−190.192 (−1.53)	−196.454 (−1.55)	−187.366 (−1.46)
Wave dummies	Yes		Yes	
Trend		44.456 (5.50)***		46.988 (7.41)***
Women (N=6,845)	(1)	(2)	(3)	(4)
Treated ×After	0.070 (0.00)	−4.859 (−0.08)	5.653 (0.08)	−0.468 (−0.01)
Wave dummies	Yes		Yes	
Trend		25.294 (6.68)***		30.134 (9.32)***

Appendix 8 Summary of the estimation results, the HILDA Survey, lower than a bachelor's degree

Dependent variable: *Employed*				
Men (N=18,445)	(1)	(2)	(3)	(4)
Treated ×After	−0.015 (−0.81)	−0.015 (−0.78)	−0.001 (−0.07)	0.002 (0.09)
Wave dummies	Yes		Yes	
Trend		−0.007 (−7.69)***		−0.008 (−9.81)***
Women (N=19,771)	(1)	(2)	(3)	(4)
Treated ×After	0.074 (2.90)***	0.074 (2.89)***	0.091 (3.28)***	0.093 (3.36)***
Wave dummies	Yes		Yes	
Trend		−0.008 (−5.81)***		−0.004 (−3.80)***
Dependent variable: *FT*				
Men (N=18,445)	(1)	(2)	(3)	(4)
Treated ×After	−0.036 (−1.51)	−0.035 (−1.48)	−0.014 (−0.59)	−0.010 (−0.43)
Wave dummies	Yes		Yes	
Trend		−0.011 (−9.20) ***		−0.010 (−11.26) ***
Women (N=19,771)	(1)	(2)	(3)	(4)
Treated ×After	0.097 (3.51) ***	0.097 (3.51) ***	0.104 (3.46) ***	0.105 (3.47) ***
Wave dummies	Yes		Yes	
Trend		−0.008 (−5.87) ***		−0.003 (−2.70) ***
Dependent variable: *Ongoing*				
Men (N=18,445)	(1)	(2)	(3)	(4)
Treated ×After	−0.003 (−0.10)	0.004 (0.15)	−0.008 (−0.30)	0.021 (0.72)
Wave dummies	Yes		Yes	
Trend		0.003 (2.37) **		0.002 (2.20) **
Women (N=19,771)	(1)	(2)	(3)	(4)
Treated ×After	0.061 (2.11) **	0.062 (2.13) **	0.073 (2.47) **	0.077 (2.59) ***
Wave dummies	Yes		Yes	
Trend		0.003 (1.90) *		0.001 (1.17)
Dependent variable: *Wages* (AUD)				
Men (N=17,212)	(1)	(2)	(3)	(4)
Treated ×After	42.661 (0.95)	42.768 (0.95)	78.422 (1.77) *	84.763 (1.88) *
Wave dummies	Yes		Yes	
Trend		20.060 (9.30) ***		21.006 (11.97) ***
Women (N=18,430)	(1)	(2)	(3)	(4)
Treated ×After	62.511 (2.44) **	62.022 (2.42) **	75.585 (2.73) ***	77.211 (2.79) ***
Wave dummies	Yes		Yes	
Trend		9.939 (6.68) ***		14.175 (12.05) ***

Notes for Appendices 5–8:
The rows (1), (2), (3), and (4) are for: a full model with wave dummies, a full model with time trends, a model with wave dummies but without individual characteristics, and a model with time trends but without individual characteristics, respectively. Intercepts are not listed in this table.
Figures in parentheses are t-values. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% significance level.

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