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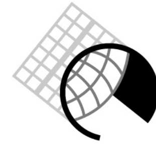

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From the Managing Editor

This first issue of Vol 20 of The AJLE is a little late this year due to some production problems and delays with papers which hopefully will be rectified in time for the next issue. Nevertheless, the articles in this issue are well worth waiting for. Boyd Hunter and Matthew Gray contribute the latest in the series of reviews of issues of interest to labour economists and practitioners by explaining the dynamics of indigenous and non-indigenous labour markets. If you have ideas of topics you think would be of interest in our series of reviews, or you have a contribution you would like to make, please let me know. The remaining articles cover a number of Australian and international issues including non-regular work in Japan and, for Australia, unions and training plus immigration, earnings and employment.

Finally, the Australian Labour Market Research Workshop (ALMR) and the Asian and Australasian Society of Labour Economics (AASLE) Conferences were held in Canberra this year. They were co-located and jointly timed to provide an opportunity for labour economists to engage the broader community across Australasia and beyond. Selected papers from these conferences will appear in next year's issues of the Journal.

Best Wishes

Phil Lewis
Managing Editor

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Dynamics of Indigenous and Non-Indigenous Labour Markets

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Abstract

This paper uses data from the Australian Census Longitudinal Dataset to conduct the first representative analysis of labour force transitions for Indigenous and non-Indigenous Australians. The main finding is that Indigenous females and males are more than 10 percentage points more likely than their non-Indigenous counterparts to move from employment in 2006 to non-employment in 2011. Indigenous females had relatively high employment instability, which was probably largely driven by the increased probability of part-time employed Indigenous women leaving employment between 2006 and 2011. For Indigenous males, the findings reflect the high rate of movement out of employment from both part-time and full-time employment. Younger Indigenous Australians and those living in remote areas have a substantially lower flow into employment and a higher flow out of employment than their non-Indigenous counterparts. This paper considers several possible explanations for these transitions, such as marginal attachment to the labour force, job search methods that rely on family and friends, labour market segmentation where Indigenous workers tend to secure less stable jobs (because of educational attainment, skills and, possibly, discrimination) and the relative scarcity of Indigenous-friendly workplaces.

JEL Codes: J15, J22, J78
Keywords: Indigenous, labour market, social policy, labour economics

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Introduction

Information about the dynamics of paid employment and labour force participation of Indigenous Australians and how they compare with those of non-Indigenous Australians is crucial to understanding the reasons for labour market disadvantage experienced by many Indigenous Australians and where policy responses need to focus. A paucity of longitudinal data on Indigenous Australians' labour market experiences means that little is known about the labour market dynamics of this group. For groups experiencing prolonged and entrenched disadvantage, finding sustainable employment can be an enormous challenge. Researchers and policy makers are interested in understanding the characteristics that are associated with finding employment, as well as those that are associated with retaining employment, and moving between part-time and full-time employment.

The existing Australian research is based on data from a single survey of Indigenous jobseekers conducted during the late 1990s – the Indigenous Job Seeker Survey (IJSS). Gray and Hunter (2005a) provided the first analysis of the labour market dynamics of Indigenous Australians, but it was confined to jobseekers and therefore cannot provide insights into other elements of the Indigenous population. The release of the Australian Census Longitudinal Dataset (ACLD) for the 2006 and 2011 censuses provides information on 5% of the Australian population enumerated in the 2006 Census and thus a substantial number of Indigenous people. This paper uses the ACLD, which has recently been made available to users via the Data Analyser software to provide the first analysis of the labour market dynamics for a representative sample of the *whole* working age Indigenous population.[1] The ACLD also provides a relatively large Indigenous sample, and so it possible to estimate labour market dynamics for population subgroups and in different areas of Australia.

The remainder of this article is structured as follows. The next section provides an overview of the literature on the dynamics of Indigenous labour force status. This is followed by a short introduction to the data and method, and a descriptive analysis of labour force transitions by gender, age and remoteness status. The final section provides a discussion of the key findings, potential implications for policy and areas for further research, including those that could use the ACLD.

1 The dataset of choice for analysing labour market dynamics in Australia is the Household, Income and Labour Dynamics in Australia (HILDA) survey. Until recently, the HILDA survey contained only a small Indigenous sample, and analysis of the Indigenous population using the HILDA data was very limited. In 2011 (wave 11), the HILDA sample was augmented and this has increased the number of Indigenous sample members; in wave 11 there were 460 Indigenous respondents and 14,200 non-Indigenous respondents. With the increased Indigenous sample, the HILDA survey may provide some opportunities for analysis of Indigenous labour market dynamics, although the still-small sample size and the lack of representativeness of the sample for Indigenous populations in remote Australia limits the scope the possible analysis (see Howlett, Gray and Hunter 2015).

Labour supply meets labour demand in the Indigenous labour market: a brief literature review

Indigenous Australians have low employment rates relative to other Australians. The research evidence points to the significance of both supply and demand factors. Indigenous Australians, on average, face more significant constraints on their ability to supply their labour than non-Indigenous Australians. Reasons for this include complex kinship obligations, more caring responsibilities due to larger numbers of children, more disability (Hunter and Daly 2013, Biddle *et al.* 2014) and more interactions with the criminal justice system (Borland and Hunter 2000).

Although labour supply and demand are often discussed as if they are independent and distinct phenomena, in reality, labour market outcomes are determined by their interaction. For example, an individual's decision to supply labour is likely to be influenced by the demand for labour in the local, national and even international labour markets. If there are no available jobs because of poor employment prospects at either a macroeconomic or local level, then a person may give up looking for work, a phenomenon termed the 'discouraged worker effect' (Hunter and Gray 2001, 2012). The presence of significant discrimination in the labour market can have a particularly discouraging effect on labour supply (Goldsmith et al. 2004).

Hunter and Gray (2012) analysed changes in the labour force status of Indigenous and other Australians since the mid-1990s, which was a period of relatively strong macroeconomic growth.[2] The high levels of labour demand and increases in Indigenous education levels were important factors in the substantial increases in Indigenous employment rates; however, Hunter and Gray (2012) concluded that future progress in increasing Indigenous employment is likely to require addressing the labour supply issues that discourage people from looking for work, including labour market discrimination, and the ongoing high level of Indigenous interaction with the criminal justice system (also see Biddle *et al.* 2013). The lack of representative longitudinal data for the Indigenous population has meant that analysis of Hunter and Gray (2012) and other studies of Indigenous labour force status is based on cross-sectional data. This has limited our understanding of how the labour supply of the Indigenous population adjusts to increases or decreases in labour demand associated with macroeconomic cycles.

Conventionally the working-age population is categorised as being in the labour force – which comprises the employed and the unemployed – or not in the labour force (NILF). Sometimes the NILF group is split into those who want a job but are not actively looking for work, termed the 'marginally attached', and those who do not want a job, termed 'other NILF'. A further distinction is often made between the marginally attached who have given up looking for work because they believe they cannot find work (due to a lack of jobs or discrimination), generally called discouraged workers or the 'hidden unemployed', and those who are not looking for paid employment for other reasons (Blundell, Ham and Meghir 1998). While analysis of labour force transitions that distinguish the marginally attached are relatively rare, there is some evidence that transitions into employment are similar for the marginally attached and unemployed

2 Hunter and Gray (2012) analyse up to the 2008 NATSISS.

groups in the general Australian population (Gray and Hunter 2005a).[3] The census does not contain the necessary questions to identify the marginally attached and so this issue cannot be addressed using census data.

Ideally, the analysis of labour market transitions should distinguish between the marginally attached and other NILF groups; however, like most analyses of labour market dynamics, this paper focuses on transitions among three labour force states: employment, unemployment and NILF.

Using the IJSS, Gray and Hunter (2005a) showed that the Indigenous unemployed were around half as likely to move to employment during a 15-month period, as were the non-Indigenous unemployed. One explanation is that Indigenous Australians are more likely to be employed in casual jobs and seasonal work than other employees (Campbell and Burgess 2001). Another possible explanation is that some Indigenous workers leave jobs to meet cultural obligations (when the jobs do not provide the necessary flexibility) (Hunter and Gray 2013a) or for other factors such as poor health or caring responsibilities (Hunter Gray and Crawford 2016).

Analysis of the IJSS provided evidence that Indigenous Australians' labour force status was relatively dynamic. However, the IJSS data have several limitations. First, as noted above, it is representative of jobseekers, but not the working age population as a whole. Second, the IJSS collected data for only a 15-month period in 1996 and 1997, and thus only focused on short-term labour market dynamics.

Data and method

An important development by the Australian Bureau of Statistics (ABS) was the creation of the ACLD, which creates a longitudinal file for a 5% random sample of the 2006 Census with the 2011 Census using data linkage techniques.[4] The ACLD includes linked census data for 800,759 individuals – of whom 14,802 identified as being Indigenous in 2006.[5] This number represents substantially less than 5% of the Indigenous population, but nonetheless forms the largest longitudinal dataset of Indigenous Australians currently available (ABS 2013a). There were substantial changes in Indigenous identification between 2006 and 2011 among the linked sample. Of those who were identified as being Indigenous in 2006, 9.2% were identified as being non-Indigenous in 2011 and 1.1% had not stated Indigenous status in 2011. Of those identified as being non-Indigenous in 2006, 0.2 % identified as Indigenous in 2011 and 0.9% did not state a response (ABS 2013a). The instability in the identification of Indigenous status presents a challenge for analysis and interpretation of the data. In this paper, we have defined Indigenous status as measured by the 2006 Census.

3 Gray and Hunter (2005a) used the IJSS data, which is now over two decades old and focuses on a relatively small Indigenous sub-population.

4 Linked records in the ACLD identified through probabilistic matching.

5 Although the ACLD is a 5% sample of the Australian population, the Indigenous sample is less than 5% of the Indigenous population. The underrepresentation of the Indigenous sample in the ACLD is because of a lower rate of successful linkage for the Indigenous sample.

The analysis is restricted to the population aged less than 59 years in 2006 to ensure that all respondents were in the working-age population in both 2006 and 2011. The majority of the analysis is for the 20–59-year-old population, to allow a focus on the post-secondary school population. The penultimate section of this paper analyses labour force transitions for the population aged 15–19 years in 2006 according to whether they were full-time students in 2006.

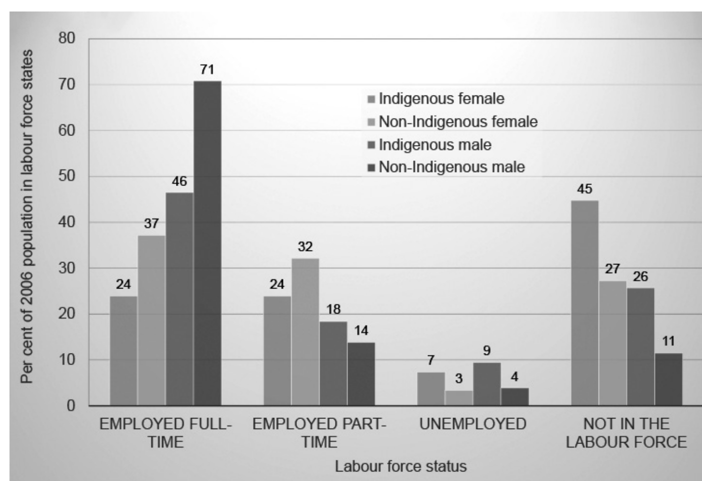
Labour market transitions

Transitions between detailed labour force states

This section describes the transitions of disaggregated labour force states by Indigenous status and gender between 2006 and 2011. The labour force states examined are employed full-time (works 35 hours a week or more), employed part-time, unemployed and NILF.

Figure 1 shows labour force status in 2006 by Indigenous status and gender using the ACLD longitudinal sample. Indigenous males and females were substantially less likely than their non-Indigenous counterparts to be employed full-time, and more likely to be unemployed and NILF. Indigenous females were also less likely to be employed part-time than non-Indigenous females, while Indigenous males were more likely to be employed part-time than non-Indigenous males. The biggest difference in labour force status in 2006 was that Indigenous males were 24 percentage points less likely to be employed full-time than their non-Indigenous counterparts. The labour force status for the ACLD longitudinal sample is broadly consistent with the 2006 estimates for the full population (Hunter, Gray and Crawford 2016).

Figure 1: Labour force status by Indigenous status and gender, 2006



Note: The data are from the ACLD linked longitudinal sample; population aged 20–59 years in 2006.
Source: ACLD, 2006–11, Data Analyser

Table 1 shows the transitions between detailed labour force states. Indigenous men and women who were employed in 2006 were more likely to be not employed in 2011 than their non-Indigenous counterparts.[6] The difference in exit rates from employment between the Indigenous and non-Indigenous was larger for the part-time employed than the full-time employed. For example, among Indigenous women who were employed full-time in 2006, 19% were not employed in 2011 compared with 14% of non-Indigenous women, whereas for Indigenous women who were employed part-time in 2006, 37% were not employed in 2011 compared with 19% of non-Indigenous women. Indigenous men were also substantially more likely to leave employment between 2006 and 2011 than were non-Indigenous men, with the difference being much larger for the part-time employed than for the full-time employed.

Indigenous females and males who were unemployed or outside of the labour force in 2006 were more likely to remain not employed in 2011 than their non-Indigenous counterparts. The instability in employment status of Indigenous females (relative to non-Indigenous females) is largely driven by the increased probability of Indigenous females leaving part-time employment between 2006 and 2011.

The analysis of transitions between labour force states suggests that the lower employment rates of Indigenous women are driven by a combination of higher exit rates from employment among Indigenous women (mainly for the part-time employed) and a much lower rate into employment from unemployment among Indigenous women. Indigenous women who were NILF in 2006 also had a lower rate of movement into employment than non-Indigenous women, but the difference was smaller than it was for the unemployed. This pattern of labour force transitions reinforces the disadvantages among Indigenous females. Long-term unemployment is also likely to be a substantial problem, as Indigenous females were twice as likely to be unemployed in the past two censuses compared with other Australian females.

Both the full-time and part-time employed Indigenous males were more likely to leave employment than non-Indigenous males. Nonetheless, if a male was employed full-time in 2006, he will be more than likely still employed full-time in 2011 for both populations (71% and 80%, respectively). The other labour force status that was relatively stable was the NILF category, where around 60% were outside the labour force in both censuses irrespective of Indigenous status. Regardless of the original labour force status in 2006, Indigenous males were more likely to be either unemployed or NILF than other Australian males. For example, in both categories of employed in 2006, Indigenous males were more than twice as likely as their non-Indigenous counterparts to be NILF at the time of the 2011 census (cf. 12% versus 6% for transitions from full-time employment and 28% versus 13% from part-time employment).

6 The higher rates of movement out of employment during a five-year period may be related to the nature of jobs Indigenous people hold. Indigenous Australians are more likely to be in low-skilled jobs than non-Indigenous Australians, and the evidence from the HILDA survey is that Indigenous Australians have shorter tenure in their jobs compared with non-Indigenous Australians (5 versus 7 years with current employer; 1 versus 4 years with previous employer) and are more likely to have changed jobs in the past 12 months (16% versus 13%). These estimates are for the employed population aged 15 and over from wave 11 (2011) of the HILDA survey. HILDA is not representative of population in remote areas. Differences between Indigenous and non-Indigenous people reported in this paper are statistically significant at the 5% confidence level.

Table 1: Transitions in disaggregated labour force status between 2006 and 2011 by Indigenous status and gender

	Labour force status in 2011 (%)					
Labour force status in 2006	*Employed full-time*	*Employed part-time*	*Unemployed*	*NILF*	*Total*	*ACLD sample size*
Indigenous females						
Employed full-time	59	22	4	15	100	889
Employed part-time	24	39	6	31	100	846
Unemployed	16	24	19	41	100	236
NILF	11	15	8	67	100	1,425
Non-Indigenous females						
Employed full-time	60	26	2	12	100	83,152
Employed part-time	29	52	2	17	100	73,147
Unemployed	27	31	10	32	100	6,721
NILF`	12	23	4	61	100	55,379
Indigenous males						
Employed full-time	71	12	5	12	100	1,222
Employed part-time	41	22	10	28	100	442
Unemployed	28	16	23	33	100	224
NILF	17	12	10	62	100	611
Non-Indigenous males						
Employed full-time	80	11	2	6	100	145,787
Employed part-time	56	27	4	13	100	27,745
Unemployed	45	17	15	23	100	7,026
NILF	27	11	5	57	100	20,977

NILF = not in the labour force
Note: Linked longitudinal sample for people aged 20–59 years in 2006. Estimates based on data weighted to estimated residential populations.
Source: ACLD, 2006–11, Data Analyser

Transitions between employed and not employed, and in and out of the labour force

Table 2 re-presents the information provided in Table 1 to show the transitions from employment to not employed (i.e. full-time and part-time employed are combined into the single category of employed and unemployed and NILF are combined into the single category of not employed). Indigenous males and females are more than 12 percentage points less likely to be employed in both of the past two censuses than their non-Indigenous counterparts. More disturbingly, non-employed Indigenous females and males are around 10 percentage points less likely to become employed between 2006 and 2011.

Table 2: Transitions in employment status between 2006 and 2011 by Indigenous status and gender

	Employment status in 2011 (%)			
	Indigenous		*Non-Indigenous*	
Employment status in 2006	*Employed*	*Not employed*	*Employed*	*Not employed*
Female employed	72	28	84	16
Female not employed	28	72	38	62
Male employed	77	23	90	10
Male not employed	33	67	44	56

Note: Linked longitudinal sample for people aged 20–59 years in 2006. Estimates based on data weighted to estimated residential populations.
Source: ACLD, 2006–11, Data Analyser

Between 2006 and 2011, there were two distinct periods with differing macroeconomic conditions. Between 2006 and 2009, the Australian economy was growing strongly (largely due to the investment phase of the mining boom). However, the onset of the global financial crisis meant that economic growth was slower between 2009 and 2011. Despite the economic slow-down following the global financial crisis, there was economic growth for most quarters during this period. In fact, 53 of the highest monthly employment-to-population ratios ever recorded in the labour force survey fell in the past intercensal period (ABS 2015).

Indigenous Australians are much more likely than other Australians to be marginally attached and discouraged workers (Hunter and Gray 2012; Gray and Hunter 2016). During a period of historically high national employment rates, such as those experienced between 2006 and 2011, marginally attached could be expected to be more likely to enter the labour force. Hence, the transitions into the labour force could be expected to be higher than they would have been during a period with slower economic growth.[7]

Table 3 shows the transitions in and out of the labour force between 2006 and 2011 (employed and unemployed have been combined into the category ‘in the labour force’). This provides information on the stability of labour supply. Indigenous males and females in the labour force in 2006 were about 10 percentage points more likely to have left the labour force by 2011 than their non-Indigenous counterparts. However, the Indigenous who were NILF in 2006 were about three percentage points less likely to enter the labour force between 2006 and 2011 than were the non-Indigenous NILF.

7 Economic theory also predicts that, during periods of strong economic growth, rising household incomes may mean that some workers leave the labour force due to an income effect – the so-called added worker effect. Although the economic growth in the Australian economy was particularly strong to 2009, the rate of growth slowed after the global financial crisis. Notwithstanding, the probability of employment was extraordinarily high in this intercensal period. From 2006 to 2011, one of the adjustments made by the Australian labour market to the variations in macroeconomic growth was for employers to employ workers for fewer hours rather than reduce the overall number of jobs. So, while the economy may have continued to grow, albeit a bit more slowly, the scope for an income effect reducing the number of added workers in the economy is limited.

Table 3: Transitions in labour force participation between 2006 and 2011 by Indigenous status and gender

	Labour force participation in 2011 (%)			
	Indigenous		*Non-Indigenous*	
Labour force participation in 2006	*In the labour force*	*NILF*	*In the labour force*	*NILF*
Females in the labour force	75	25	85	15
Females NILF	33	67	39	61
Men in the labour force	78	22	91	9
Men NILF	38	62	43	57

NILF = not in the labour force
Note: Linked longitudinal sample for people aged 20–59 years in 2006. Estimates based on data weighted to estimated residential populations.
Source: ACLD, 2006–11, Data Analyser

Transitions by geographic remoteness

This section considers the transitions between employment and non-employment by geographic remoteness. To have a sufficient sample in each geographic area, the estimates are for males and females combined.

Indigenous Australians living in remote areas who were not employed in 2006 were less likely to be employed in 2011, and those who were employed in 2006 were more likely to be not employed in 2011 than their non-Indigenous counterparts (Table 4). Between 2006 and 2011, there was a substantial decline in remote Indigenous employment, with the number of Community Development Employment Program (CDEP) participants falling by about 22 000, most of whom were living in remote areas (Hunter and Gray 2013b).[8] CDEP participants have largely been classified as being employed in ABS data collections. The ACLD does not include information about CDEP participants (in any case, the census data on CDEP is based on partial, and probably declining, identification of CDEP participants),[9] so it is not possible to identify the impact of the decline in the number of CDEP participants on the labour market transitions. Given the reduction in the number of CDEP participants, the substantial outflow of Indigenous Australians from employment in remote areas between 2006 and 2011 is not unexpected (Gray, Hunter and Lohoar 2012).

8 The CDEP is an example of an Indigenous-specific program that combines community development and labour market program elements. The scheme involves participants working for a notional equivalent of their income support payment. Labour force comparisons between the 2006 and 2011 censuses may also be affected by the recent changes to the CDEP (ABS 2013b).

9 The total number of people employed as part of the CDEP identified in the census is much lower than the number of participants recorded in administrative data (e.g. 14,497 in the 2006 Census compared to more than 32,000 participants recorded at the time). Even though CDEP information for 2011 is collected and processed by the ABS in the same way it was for the 2006 Census, the ABS (2013b) recommends that care should be taken when comparing 2006 and 2011 Census CDEP counts because the recent reforms 'may have an impact on the numbers of people reporting that they are CDEP participants'.

The decline in the number of CDEP participants would have had a very minimal impact on the labour market transitions in regional areas and major cities, as there were few CDEPs in those areas by 2006. A remarkable feature of the employment transitions is that, in major cities, the likelihood of the employed in 2006 still being employed in 2011 is similar for the Indigenous (84%) and non-Indigenous populations (87%).

In major cities, and regional and remote areas, the likelihood of changing labour force status from not employed to employed between 2006 and 2011 was about 10 percentage points lower for Indigenous people than for non-Indigenous people. Even though the Indigenous capacity to hold a job in major cities and regional areas is reasonably high, the ability to move into the labour market appears to be constrained. When labour force transitions by remoteness are expressed in terms of labour force participation (see Table A1 in Appendix A), it is clear that Indigenous people in major cities, and regional and remote areas were between five and eight percentage points less likely to have moved from NILF into the labour force than their non-Indigenous counterparts. The employment transitions for Indigenous residents are the major drivers in the changes in labour force participation described in Table 3; hence, they are likely to be factors in the differential labour supply outcomes between Indigenous and non-Indigenous Australians. To the extent that low employment transitions reflect the level of demand for particular groups, the correlation of this demand with labour supply transitions is suggestive of a role for the discouraged worker effect in explaining the observed labour market outcomes. The discouraged worker phenomenon for Indigenous Australians needs to be understood in terms of the overall state of the macroeconomic labour market, but also with reference to the state of the local labour markets and the employment options for this group of potential workers.

The major difference for transitions in labour force participation between Indigenous and non-Indigenous people was observed in remote areas, with Indigenous people being 22 percentage points less likely to be in the labour force in both 2006 and 2011 (Table A1). The flows out of the labour force were correspondingly higher for Indigenous residents of remote areas compared with non-Indigenous residents. Arguably, the remote populations were very different in terms of attachment to the (mainstream) labour force, which may reflect the labour supply preferences or more opportunities for productive non-labour market activities such as hunting and gathering, and customary practices. However, for the remote residents who started off NILF in 2006, Indigenous people were only slightly less likely to move into the labour force by 2011 than non-Indigenous people (40% and 47%, respectively). It is likely that constraints in the ability to find jobs in remote Australia will reduce the extent to which the skills of the average workers are matched to the jobs they secure (i.e. because jobseekers have to accept the first job they find). Of course, the migration of a substantial number of non-Indigenous people into the remote areas to take up work keeps the non-Indigenous participation rates high relative to both Indigenous Australians and non-Indigenous residents in non-remote areas. However, data limitations resulting from the relatively small Indigenous sample mean that the effects of internal migration are not considered in this paper.

Table 4: Transitions in employment status between 2006 and 2011 by Indigenous status and geographic remoteness

	Employment status in 2011			
	Indigenous		*Non-Indigenous*	
Employment status in 2006	*Employed*	*Not employed*	*Employed*	*Not employed*
Major city – employed	84	16	87	13
Major city – not employed	30	70	41	59
Regional – employed	76	24	85	15
Regional – not employed	28	72	38	62
Remote – employed	62	38	87	13
Remote – not employed	33	67	44	56

Note: Linked longitudinal sample for people aged 20–59 years in 2006. Estimates based on data weighted to estimated residential populations.
Source: ACLD, 2006–11, Data Analyser

Transitions by age

Table 5 looks at transitions by age group for females and males. Younger Indigenous females (aged 20–29 years) have a substantially lower flow into employment and a higher flow out of employment than their non-Indigenous counterparts. For older age groups, there is some measure of convergence among the Indigenous and non-Indigenous populations, especially for those who were not employed in 2006. Perhaps one should not overstate the level of convergence, because there are still substantial differences in the transitions of most age groups for the Indigenous and non-Indigenous populations. However, the employment transitions are particularly high out of employment and particularly low into employment for Indigenous females in their 20s (i.e. about two and half times the respective rates for their non-Indigenous counterparts). For females in their 50s, the transitions are similar or identical. For the other age groups, the differential in transitions is about 10 percentage points.

Table 5: Transitions in employment status between 2006 and 2011 by Indigenous status, gender and age group

		Employment status in 2011 (%)			
		Non-Indigenous		*Non-Indigenous*	
Age group	*Employment status in 2006*	*Employed*	*Not employed*	*Employed*	*Not employed*
Females 20–29 years	Employed	66	34	82	18
	Not employed	26	74	53	47
Females 30–39 years	Employed	74	26	86	14
	Not employed	35	65	49	51
Females 40–49 years	Employed	77	23	89	11
	Not employed	26	74	39	61
Females 50–59 years	Employed	71	29	75	25
	Not employed	15	85	15	85
Males 20–29 years	Employed	78	22	92	8
	Not employed	45	55	71	29
Males 30–39 years	Employed	80	20	94	6
	Not employed	40	60	53	47
Males 40–49 years	Employed	78	22	93	7
	Not employed	23	77	40	60
Males 50–59 years	Employed	69	31	81	19
	Not employed	17	83	21	79

Note: Linked longitudinal sample for people aged 20–59 years in 2006. Estimates based on data weighted to estimated residential populations.
Source: ACLD, 2006–11, Data Analyser

The broad labour force dynamics by age and Indigenous status are similar for males. However, Indigenous males were more than 10 percentage points more likely to leave employment between census collections in all age groups. The differentials are smallest for the transitions from non-employment to employment for males in their 50s. However, this is likely because non-Indigenous men in their 50s who did not have a job in 2006 were less likely to find and retain employment up to 2011. That is, the lack of a differential is not much of an achievement for Indigenous males per se, but a reflection of the difficulty of finding and keeping work at that stage of the life course due to a range of factors, including employer behaviour and personal poor health. It may be important to recognise the role of choice in these transitions – many people choose to retire in their late 50s. However, it is unlikely that more Indigenous workers would choose to retire (for reasons other than poor health or disability) earlier than non-Indigenous workers when shorter careers have a negative effect on superannuation entitlements (Hunter, Kalb and Le 2014).

Transitions among 15–19-year-olds

Young Indigenous people have both low rates of educational participation and paid employment (Biddle 2013, Gray, Howlett and Hunter 2014, Crawford and Biddle 2015). Understanding the labour market dynamics of this group is thus particularly important for developing labour market and educational policies relating to this group. This section describes the labour market dynamics of teenagers aged 15 to 19 years in 2006. Given the relatively high rates of educational participation (secondary and postsecondary) of this group, we analyse labour market dynamics according to whether the individual was studying in 2006. In principle, it would be desirable to consider separately those in part-time and full-time education, but in practice there are only a small number of Indigenous students employed full-time, so we combine part-time and full-time students into a single group.

Table 6 presents information on the labour force transitions for nonstudents aged 15–19 years by Indigenous status, and Table 7 presents the same information for students. Indigenous teenagers who were not a student in 2006 and who were employed in 2006 are more than twice as likely to leave the labour force or be unemployed by 2011 than non-Indigenous teenagers. There are not enough data to disaggregate the results by gender, but the likely explanations for these observations involve relatively high fertility and arrest rates for females and males, respectively. Similar factors are also likely to be true for the unemployed and NILF in 2006, with Indigenous people much more likely to remain unemployed or NILF in 2011. Although the reported results do not distinguish between full-time and part-time employment because of the sample size issues for the Indigenous student population, it is possible to estimate those transitions for nonstudents.

The differences between Indigenous and non-Indigenous labour force transitions for students employed, unemployed or NILF in 2006 is arguably small (Table 7). Getting an education is, in the long term, associated with better employment prospects, and lower rates of fertility or arrest. All else being equal, we should expect former students to eventually become more attached to the labour force once they complete their studies (i.e. greater transitions into the labour force for both Indigenous and non-Indigenous students than the nonstudent cohorts). Nonetheless, if an Indigenous student was NILF in 2006, then they were about twice as likely as their non-Indigenous counterparts to also be NILF in 2011 (40% and 21%, respectively). The probability of securing a job between the censuses is much smaller for Indigenous students who were NILF in 2006 than the analogous non-Indigenous students (45% and 71%, respectively). Clearly, just knowing the experience of educational participation is not everything; we also need to know what skills were attained through their studies. Of course, educational attainment will almost certainly lead to improved employment prospects for many former students in the long run, but there is no necessary reason why recent educational participation will be manifest in the short-run labour force transitions. In remote areas, additional education may not always result in better labour market outcomes as the state of the local labour market will also be important (see Table A1).

Table 6: Transitions in disaggregated labour force status between 2006 and 2011 by Indigenous status, non-students aged 15 to 19 years in 2006

	Labour force status in 2011 (%)				
Labour force status in 2006	*Employed*	*Unemployed*	*NILF*	*Total*	*Size of ACLD sample*
Indigenous – employed	63	11	26	100	204
Indigenous – unemployed	39	25	36	100	75
Indigenous – NILF	28	14	57	100	180
Non-Indigenous – employed	84	5	11	100	7,547
Non-Indigenous – unemployed	64	14	21	100	2,676
Non-Indigenous – NILF	51	11	38	100	1,294

NILF = not in the labour force
Note: Estimates based on data weighted to estimated residential populations.
Source: ACLD, 2006–11, Data Analyser

Table 7: Transitions in disaggregated labour force status between 2006 and 2011 by Indigenous status, students aged 15 to 19 years in 2006

	Labour force status in 2011 (%)				
Labour force status in 2006	*Employed*	*Unemployed*	*NILF*	*Total*	*Size of ACLD sample*
Indigenous – employed	79	5	16	100	140
Indigenous – unemployed	74	14	12	100	43
Indigenous – NILF	45	15	40	100	468
Non-Indigenous – employed	86	4	10	100	14,342
Non-Indigenous – unemployed	76	9	15	100	1,755
Non-Indigenous – NILF	71	8	21	100	19,685

NILF = not in the labour force
Note: Estimates based on data weighted to estimated residential populations.
Source: ACLD, 2006–11, Data Analyser

Discussion

This paper has analysed the labour market transitions over a five-year period of the working-age Indigenous and non-Indigenous populations. There are substantial differences in the labour market dynamics of the Indigenous and non-Indigenous populations, and these differences provide important insights into the reasons for the relatively low Indigenous employment rates.

Indigenous Australians are much more likely to move out of employment than their non-Indigenous counterparts and Indigenous Australians who are not employed are less likely to be employed five years later than their non-Indigenous counterparts. The transitions into and out of the labour force are broadly consistent with those of transitions into and out of employment. Indigenous people are more likely to leave the labour force than are their non-

Indigenous counterparts, and are less likely to move into the labour force.

Both Indigenous and non-Indigenous women employed full-time in 2006 were more likely to be employed in 2011 (full-time or part-time) than those who were employed part-time in 2011. For both Indigenous men and women, the 2006 part-time employed were much less likely to be employed in 2011 than their part-time employed non-Indigenous counterparts.

For the Indigenous population, the rate of movement out of employment between 2006 and 2011 increased with geographic remoteness (from 16% in major cities to 24% in regional areas to 38% in remote areas). For the non-Indigenous population, there is no relationship apparent between geographic remoteness and movements out of employment. Interestingly, for the Indigenous population, the rate of movement into employment is highest in remote areas, followed by major cities; it is lowest in regional areas. The same pattern is evident for the non-Indigenous population, although the rates of movement into employment are higher for non-Indigenous than they are for Indigenous people in all areas.

Indigenous people are more likely to leave employment and less likely to move into employment than are non-Indigenous for all the age groups, but the difference is greatest for those aged 20–29 years. For women, the difference in transition rates between Indigenous and non-Indigenous is smallest for the 50–59 age group. This is also the case for men, but the convergence in labour force transition rates with age is smaller for men than it is for women. The gap in employment in later working life is higher for Indigenous men than for Indigenous women.

This analysis of longitudinal census data suggests that increasing employment rates of Indigenous Australians will require both a focus on assisting those who are not employed to find employment, and on reducing the rates of transition out of employment. That is, policies need to operate on both the demand and supply side of the labour market.

The higher rates of movement out of employment among employed Indigenous people are likely to have several explanations, including:

- the types of jobs that Indigenous people tend to be employed in
- the differences in average characteristics between the Indigenous and non-Indigenous populations, which mean that if they lose a job, they are, on average, less likely to find another job quickly
- the Indigenous population is more likely to voluntarily leave employment because of conflicts between paid employment and family and community responsibilities, or because of workplaces not always being as Indigenous friendly as they could be.

Dual labour market theory describes a labour market phenomenon in which there are two segments or sectors that have limited movement between them. The primary sector has 'high wages, good working conditions, employment stability, chances of advancement, equity, and due process in work rules', whereas the secondary sector is characterised by 'low wages and fringe benefits, poor working conditions, high labour turnover, and little chance of advancement' (Doeringer and Piore 1971, p. 165). In this theory, the high turnover is associated with the characteristics of the job, not the worker.

Hunter and Hawke (2002) provide evidence from the Australian Workplace Relations Survey that internal labour markets do not feature in workplaces with Indigenous employees. Furthermore, Hunter and Hawke (2001) show that workplaces with Indigenous employees are more likely to have casuals and contractors than other workplaces, especially in the private, non-commercial sector. They argue that the relatively short tenure of Indigenous workers in jobs is a probably a reflection of a greater prevalence of casual and non-permanent work, and the historic concentration of Indigenous workers in the secondary labour market. That is, the relatively high rates of Indigenous transitions into and out of employment are at least partially explained by the types of jobs provided by firms (i.e. the demand side).

Even in the dual labour market theory, the extent of promotion into better jobs in the primary sector is probably limited for people with relatively low levels of educational attainment – which may effectively confine Indigenous workers to the secondary sector.

Enhancing educational attainment is one policy option, but another consideration is to facilitate Indigenous access to recruitment processes within larger firms that tend to provide stable employment and career paths. Diversification of Indigenous job search methods is important so that Indigenous people can find information about these 'good' jobs and enhance the transitions into employment. Indigenous job searching relies excessively on families and friends for information about jobs (Gray and Hunter 2005b; Hunter and Gray 2006).

There are a range of policies (public policy and employer) that may be effective in increasing Indigenous retention in employment, including:

- introducing multiple and complementary support mechanisms such as mentoring and support, and flexible work arrangements that allow employees to meet their work and their family/community responsibilities
- providing family support
- reducing racism in the workplace
- increasing human capital via the provision of formal education and training programs to increase chances of finding more secure employment and of finding a new job in case a job is lost
- using pre-employment assessment and customised training
- using non-standard recruitment strategies to increase the likelihood of Indigenous people finding employment
- increasing the number of Indigenous owned businesses
- using wage subsidy and other labour market programs (see policy options canvassed in Gray, Hunter and Lohoar 2012; Hunter 2014; and Hunter 2015).

The relatively low rates of movement into employment for Indigenous people is likely to be explained – at least in part – by the high rates of marginal attachment to the labour force among Indigenous Australians (i.e. labour supply decisions interacting negatively with a relatively low demand for Indigenous labour). Marginal attachment can be driven by a low chance of finding employment (the discouraged worker is a subset of the marginally attached) or by labour supply preferences. For

example, alternative uses of time, including customary practices such as hunting and gathering, could lead to some Indigenous people placing lower priority in participating in the mainstream labour market (Altman and Biddle 2015). Such factors are likely to be particularly pronounced in remote areas where the attachment to customary practices and opportunities for hunting and gathering are likely to be important for Indigenous wellbeing.

Gray and Hunter (2016) use recent National Aboriginal and Torres Strait Islander Social Survey (NATSISS) data to show that the trends in Indigenous employment at an aggregate level mirror those of the Australian population as a whole. During the overall period 2008 to 2014–15, there was a small net move of Indigenous people out of the labour force as job opportunities dwindled. While Australia was relatively unaffected by the global financial crisis, the economic slowdown since 2008 has affected labour market opportunities for Indigenous people and there was a small increase in the number of Indigenous marginal attached. That is, Indigenous people still want to work, but some may have given up looking for work in the short-run.

Cross-sectional analysis using data such as NATSISS necessarily focuses on what economists call the *stock* of people in various labour force states. While such analysis is important, this paper focuses on the *flow* of Indigenous people between those states. The analysis of flows requires longitudinal data which will yield different insights from the analysis of stocks. This paper provides some first steps towards analysis of Indigenous labour market flows that should be developed when ACLD is augmented and extended using 2016 Census data.

Indigenous peoples experience poor employment outcomes and have weaker attachment to the labour market than non-indigenous people in countries with a similar history as British colonies. Hunter and Daly (2013) demonstrate that labour market outcomes of Indigenous Australians compare unfavourably with those for similar First Nations around the world. The detailed analysis of Indigenous labour market dynamics in this paper is relatively unique in that large-scale longitudinal data is rare in both Australia and in other countries. The labour market dynamics of sub-populations are linked to both national economic growth and historically specific circumstances faced by a particular groups, but the recent availability of quality longitudinal information on Indigenous Australians mean that Indigenous labour force dynamics analysed in this paper will potentially yield useful insights for indigenous populations in other developed countries.

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Appendix A. Supplementary transition table

Table A1: Transitions in labour force participation between 2006 and 2011 by Indigenous status and remoteness, aged 20–59 in 2006

		Labour force participation in 2011 (%)			
		Indigenous		*Non-Indigenous*	
Location	*Labour force participation in 2006*	*In labour force*	*NILF*	*In labour force*	*NILF*
Major city	In labour force	84	16	89	11
	NILF	33	67	41	59
Regional	In labour force	80	20	85	15
	NILF	33	67	38	62
Remote	In labour force	67	33	89	11
	NILF	40	60	47	53

NILF = not in the labour force
Note: Linked longitudinal sample for people aged 20–59 years in 2006. Estimates based on data weighted to estimated residential populations.
Source: ACLD, 2006–11, Data Analyser

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Non-Regular Female Workers in Japan's Prolonged Economic Recession: Evidence from the Japanese Panel Survey of Consumers

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Abstract

Using the 1993-2014 Japanese Panel Survey of Consumers, this paper examined labour force participation and earnings of female workers with non-regular employment by birth cohort. The results confirmed that age and experience generally increased labour force participation of female workers with non-regular employment. Education and parents' cohabitation with financial sharing reduced labour force participation of part-time female employees, while being married and having children increased it. The reverse results were evident for female employees with fixed-term employment. Estimates also showed that female workers with non-regular employment earnt less than those with regular employment; however, variations in wage differentials across generations were more prominent for female workers with fixed-term employment than those with part-time employment. The returns to education decreased as a cohort progressed, the experience premiums were apparent only for the young cohorts, and an age premium was nonexistent across generations among Japanese female workers.

Key Words: Non-Regular Employment, Labour Force Participation, Wage, Cohort
JEL Classification: J21, J24, J31

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1. Introduction

The prolonged recession and progressive labour law reforms[2] after 1990 in Japan led to substantial changes in structures of employment. During the 'Lost Decades', Japan's labour market experienced significant growth in the share of non-regular employment, especially among women (Abe, 2013; Asano *et al.*, 2013; Esteban-Pretel *et al.*, 2011; Kishi, 2013; Nakata and Ryoji, 2002; and Sano, 2012), with further increased expected due to the slowdown in productivity growth (Miyamoto, 2016). This raised the question of how non-regular employees fared worse than regular permanent employees in the prolonged recession.

Japan's employment was officially classified into three categories: permanent, fixed-term, and part-time. Permanent employment also was known as regular employment or full-time employment,[3] and a permanent employee[4] was hired directly by an employer under a specified contract with employment benefits. On the other hand, fixed-term and part-time employment was known as non-regular employment. Fixed-term employment, which includes a 'dispatched-temporary' or a 'fixed-term-contract', was also likely to became full time employment. A 'dispatched-temporary' worker was employed by a temporary labour agency, and dispatched to work for a specific firm for a fixed term, while a 'fixed-term-contract' worker was hired by an employer under the terms of a contract for a specified period of time. A part-time employee[5] was under an unspecified contract term with flexible working hours and earns a lower wage (relative to the wages of full-time employees), without employment benefits. However, whether part-time employees fared worse than full time employees in the prolonged recession had not been fully established.

Numerous studies had documented how non-regular workers were disadvantaged in terms of working conditions and career opportunities (Asano, 2011; Hori, 2014; and Takahashi, 2015). They were likely to develop less firm-specific human capital because non-regular workers had short job tenures, often being placed in lower-paid occupations, such as clerical and secretarial positions in which skills, training and knowledge were easily transferable to other firms, and thus earn lower wages (Acemoglu and Pischke, 1999). This raised the question of how education played a role in women's employment, and whether the returns of education changed over time among female workers with increased education and work commitments.

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2 Act on Improvement, etc. of Employment Management for Part-Time Workers (No. 76) amended in 1993 was to improve employment management for part-time workers, and Labour Standards Act (Article 14 of No. 49) amended in 2012 and Ordinance for Enforcement of the Labour Standards Act (Article 5 of No. 23) amended in 2013 set forth standards for fixed-term labour contracts in order to protect dispatched workers. See details on Labour Standards Act at the Japan Institute for Labour Policy and Training and the Ministry of Health, Labour and Welfare.

3 Full time employment was defined as employment with predetermined working hours per week of about 40 hours (e.g., 8 hours a day, 5 days a week), according to the Labour Force Survey conducted by the Statistics Bureau of the Ministry of Internal Affairs and Communications.

4 Permanent employee was also referred to as 'Sei Shyain' in Japanese.

5 Part-time employment in Japan includes 'paato' and 'arubaito.' 'Paato' refers to a traditional part-time employment and 'Arubaito' refers to part-time-temporary employment. See Houseman and Osawa (1995) for detail.

In the era of prolonged economic recession in Japan, the workforce population became more heterogeneous. The oldest cohort, born between 1965 and 1969, known as the 'Bubble generation',[6] entered the workforce during the economic miracle with ample job opportunities, and were in their 40s to 50s. The 'Ice Age generation',[7] born between 1970 and 1984, suffered from a prolonged hiring freeze during the 'Lost Decades', being in their 30s-40s. The youngest cohort, called the 'Yutori generation'[8], were born between 1985 and 1989, and were in their 20s. They joined the workforce after being schooled under the 'relaxed education system'[9] with a label of being academically inferior. This raised the question 'did the experiences of those entering the labour market during the prolonged recession differ from those who were already in the labour market?'

The first purpose of this paper was to contribute to the growing literature on non-regular employment. A large body of research evidenced non-regular employees being likely to face job insecurity (Takahashi, 2015), earn lower wages (Genda *et al.*, 2010; Ohta and Genda, 2007; Takahashi, 2015), and encounter an 'employee-employer mismatch' (Genda and Kurosawa, 2001; and Ohta *et al.*, 2008). This paper added to the literature by taking a closer look Japan, and examining how labour force participation and earnings of Japanese women differed by employment status with a particular focus on the era of Japan's prolonged economic recession and thereafter.

Another purpose of this paper was to expand on existing studies on the lifecycle of women's employment. A considerable literature documented women's decisions on employment status: lead to significant differences in women's earnings (Abe and Oishi (2007) for Japan); was largely influenced by the presence of children (Kishi (2013) and Fukuda (2006) for Japan; Baxter (2012) for Australia); and also varied by birth cohort (Kishi (2013) for Japan; Baxter (2012) for Australia). Existing studies confirmed that education had a uniform effect on labour market (Kishi (2013) for Japan, Baxter (2012), Austen and Seymour (2006) and Parr (2012) for Australia), and increased labour force participation, especially among younger cohorts (Baxter (2012) and Austen and Seymour (2006) for Australia). Moreover, marriage affected women's labour market outcomes differently, varying by birth cohort (Fukuda (2013) for Japan; Baxter (2012) for Australia; Goldin and Mitchell (2017) for the U.S.). This paper added to the literature by using cohort analyses to investigate how, in a Japanese context, labour market outcomes of women varied by birth cohort during the 'Lost Decades'.

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6 The "Bubble generation (also known as "Baburu sedai" in Japanese) refers to those who entered the workforce in the 1980s and the early 1990s at the height of Japan's postwar economic miracle.

7 The "Ice Age generation" (also known as "Hyogaki sedai" in Japanese) refers to those who entered the workforce during the "Lost Decade" and experienced difficulty in finding full-time employment. See As ano et al., 2013; Abe, 2013; Genda et al., 2010; and Ohta et al. 2008 for detail.

8 The "Yutori generation" (also known as "Yutori sedai" in Japanese) refers to those who were educated under the revised educational system, and they were often challenged by scholastic ability and competitiveness. See Fujioka (2008) and the Ministry of Education, Culture, Sports, Science and Technology (2001, 2003, 2008) for detail.

9 The "relaxed education system" (also known as "Yutori-kyoiku" in Japanese), starting 2002, reduced the hours and the content of the curriculum. See Fujioka (2008) and the Ministry of Education, Culture, Sports, Science and Technology (2001, 2003, 2008) for detail.

The results of this study first supported existing literature, finding labour force participation differed among Japanese women by employment status. Labour force participation of female workers with part-time employment declined with education and parents' cohabitation with financial sharing,[10] while it increased with experience, age, marriage, and the presence of a child. On the other hand, labour force participation of female workers with full time employment, both fixed-term and permanent, decreased with being married and the presence of a child. However, it increased with other socio-economics factors, including education, experience, age, parents' cohabitation with financial sharing, and metropolitan living. The effects were smaller for female workers with fixed-term employment relative to those with permanent employment.

This study also verified the following findings concerning the earnings of Japanese female workers. The wages of female employees in part-time employment were positively influenced by educational attainment of at least a Bachelor's degree and metropolitan living, but experience and age had no effect on earnings. On the other hand, the wages of those with fixed-term employment were positively related to age and metropolitan living, but inversely related to educational attainment of a high school diploma and an associate degree, while experience and age had no effect. Additionally, there were large within-occupation and within-industry wage differences that varied by employment status, and the premiums were smaller for female workers in non-regular, both part-time and fixed-term, employment than for those with permanent employment. Lastly, there were also between-occupation and between-industry wage differentials that also differed by employment status, and the disparities appeared to be smaller for female workers in part time employment than for those in full time employment.

The results of this study offered new key findings regarding the changing patterns of Japanese women's earnings by birth cohort. First, there was a considerable wage differential between part-time and permanent employment among all ages of female Japanese workers, which was also apparent across generations. Additionally, variations in wage disparity across cohorts became larger among female workers when they were aged 24-29. When aged 24-29 the wages of the 1965–1969 birth cohort, with part-time employment was 22 per cent lower than the wages of their same birth cohort counterparts aged 24-29 with permanent employment. While when aged 24-29 the wages of the 1985–1989 birth cohort, with part-time employment was 36 per cent lower. Similarly, there was a visible earning disparity between fixed-term and permanent employment among female workers of all ages, which also varied across generations. Furthermore, variations in wage disparity across cohorts became more prominent among Japanese female workers when aged 24-29. During this period, the wages of the 1985–1989 birth cohort with fixed-term employment did not differ from

10 Parents' cohabitation with financial sharing refers to a living arrangement in which a respondent cohabitates with parents in a form of a (i) "traditional integrated multi-generational household" or (ii) "single generation household." Those who were in "traditional integrated multi-generational households" (e.g., married women) tend to increase non-market hours in order to take care of family member in exchange for financial benefits provided by (usually the husband's) parents. Those who were in "single generation households" (e.g., single or young women, as well as divorced women with children) may had reduced non-market hours and/or increased financial pressure to assist family members or possibly to receive financial benefits from parents.

those with permanent employment, while the wages of the 1985–1989 birth cohort, when aged 24-29, with fixed-term employment were lower. Second, both the returns to education and the returns to experience differed for each cohort; education premiums decreased as a generation progressed, and experience premiums were apparent only for the 1980-1984 birth cohort of female workers at all ages. Lastly, age premiums were only apparent for older cohorts of Japanese female workers of all ages, suggesting that the premiums varied by each cohort; however, an age premium was nonexistent across all cohorts of female workers aged 24-29. These results suggested that the observed cohort wage differentials in relation to employment status, education, experience and age among Japanese female workers likely resulted not only from age effects and time trends but also from cohort effects.

This paper made four notable and new contributions. It first provided deeper insights into understanding long-term trends of labour force participation and wages of Japanese women with the binomial logit, the multinomial logit, and the Heckman's sample selection models using the 1993-2014 Japanese Panel Survey of Consumers data. It also found new patterns in Japanese women's earnings that varied by birth cohort, particularly with women in non-regular employment. Further, moving forward, it helps workers, firms, and policy makers in re-evaluating the ways to improve the current state of labour market welfare of female employees in Japan. Lastly, it was useful for developing new, or reexamining existing, policies to increase labour participation, reduce wage differentials, and decrease job segregation in Japan's labour market, as women's labour force participation became more in demand and important in light of the declining population and the aging society.

2. Empirical strategy and data

Empirical strategy

The first objective of this paper was to use the Japanese Panel Survey of Consumers to empirically examine long-term trends of labour force participation of Japanese women during the years 1993-2014 using the following binomial logit model.

$$p(y_{it} = 1) = \frac{e^{b'x_{it}}}{1 + e^{b'x_i}} \tag{1-1}$$

The likelihood of labour force participation being observed depended on socio-economic variables, (x_{it}), which included the respondent's: (i) education; (ii) experience; (iii) age; (iv) marital status; (v) number of children; (vi) parents' cohabitation with financial sharing; (vii) housing tenure; (viii) metropolitan living status; and (ix) birth cohort.

I extended the analyses with the following multinomial logit (MNL) model for employment choice with four employment outcomes: (a) part-time; (b) fixed-term; (c) permanent; and (d) not in the labour force.

$$p(y_{it} = j) = \frac{e^{\beta'_j x_i}}{\sum_{k=1}^{4} e^{\beta'_k x_i}}, j = 1,....,4 \tag{1-2}$$

I specified one of the employment outcomes, that was, (d) not in the labour force as the base outcome, and selected the remaining three employment outcomes: (a) part-time; (b) fixed-term; (c) permanent, as the dependent variables. A post-estimation analysis was recommended in both the logit and the MNL model; hence, I further estimated the marginal effects of all explanatory variables in the estimated specifications.

The second objective of this study was to examine long-term trends of wages among Japanese female workers, particularly attending to those with non-regular employment; that was, part-time and fixed-term employment, by birth cohort. To accomplish this, the empirical analyses were extended to estimate the standard wage equation, and researchers were aware of potential endogeneity bias, heterogeneity bias, and sample selection bias into employment (Newmark and Korenman, 1994; and Semykina and Wooldridge, 2010).

The wages of an individual were estimated over the life cycle in this study, so education can be treated as exogenous, and individuals in the data sample were drawn from a homogeneous population from longitudinal data, and thus both the endogeneity and the heterogeneity biases were not inherited or at least were minimal. Hence, I focused on the treatment of sample selection bias and employed the following Heckman's sample selection model, which considers a random sample of *I* observations and equations for respondent *I*, using the data sample that included both working and non-working individuals.

$$\begin{aligned} y_{1i}^* &= x_{1i}\beta_1 + \varepsilon_{1i} \\ y_{2i}^* &= x_{2i}\beta_2 + \varepsilon_{2i} \quad (i = 1, ..., I). \end{aligned} \tag{2-1}$$

The sample selection model consisted of: (i) a participation equation that

$$y_{1i} = \begin{cases} 1 & if\ y_{1i}^* > 0, \\ 0 & if\ y_{1i}^* \le 0 \end{cases} \tag{2-2}$$

where y_{1i}* determined whether or not respondent *i* had participated in the labour force; and (ii) a resultant outcome (or wage) equation that

$$y_{2i} = \begin{cases} y_{2i}^* & if\ y_{1i}^* > 0, \\ - & if\ y_{1i}^* \le 0 \end{cases} \tag{2-2'}$$

where y_{2i}* was observed when y_{1i}*=1, whereas y_{2i} need not take on any value when y_{1i}*≤ 0.

The participation equation (y1i*) that measured the likelihood of labour force participation being observed depended on socio-economic variables, (x1t), which were the same as (xit) in equation (1-1). The resultant outcome (or wage) equation (y2i*) was the actual log hourly wage of a respondent i at time t, (ln(wit)), was a function of control variables, (x2t), which include the respondent's: (i) education; (ii) experience; (iii) experience squared; (iv) age; (v) age squared; (vi) metropolitan living status; (vii) occupation; (viii); industry; and (ix) a mean zero individual error term at time t, (εi). The sample selection model was estimated with Heckman's two-stage procedure by employment status as well as by birth cohort.

Data

To estimate the proposed empirical models, this paper used microdata obtained from the 1993-2014 waves of the Japanese Panel Survey of Consumers (JPSC) conducted by the Institute for Research and Household Economics. The JPSC gathers information on the demographic status of Japanese females aged 24-34 years. Five cohorts were currently included, starting in 1993 with the oldest cohort, Cohort A, involving 1,500 Japanese women born between 1965 and 1969. In 1997 a further 500 Japanese females of the same age (Cohort B), born between 1970 and 1973, were surveyed, with 836 Japanese females aged 24-29 years (Cohort C) (born between 1974 and 1979) included in 2003. In 2008, 636 Japanese females aged 24-28 born between 1980 and 1984 (Cohort D) were included, and finally in 2013, 648 Japanese females of the same age, born between 1985 and 1989 (Cohort E), were included. There were 39,675 observations (see Appendix 1 for details on the initial data sample). The JPSC contains respondents' age, education, marital status, employment status, metropolitan living status, wage, weeks worked, and family members' characteristics.

In this study, I used several socio-economic variables. The respondents' 'education' dummy variables were constructed for five education levels: less than a high school diploma; a high school diploma or equivalent (GED); technical or trade school diploma; an associate degree; and at least a Bachelor's degree. The respondents' work experience was measured in total service length at work in years after graduation.[11] The respondent's employment status was divided into four categories: part-time; fixed-term; permanent; and not in the labour force. Other variables of interest include age, marital status, number of children, parents' cohabitation with financial sharing, housing tenure, metropolitan living status, occupation, and industry.

In addition, I used hourly wages. Earnings in the JPSC data were reported in three different measures: (i) monthly or weekly salary; (ii) daily earnings; and (iii) hourly wage, and the hourly wages were derived from these three variables. The hourly wage for individuals who reported daily earnings were calculated as the daily earnings divided by the hours worked per day. The hourly wage for individuals who reported a monthly salary was calculated by: (i) obtaining the salary per day (which was calculated as the monthly salary divided by the working days per month); and (ii)

11 The respondent's work experience was calculated as the sum of total months of work after graduation in the first survey year and total months of work in each year thereafter, and then this sum was divided by 12 months to obtain total years of work after graduation.

salary per day divided by the hours worked per day. The hourly wage for respondents who reported it was used as reported.

In order to examine the employment decisions and the wages of Japanese female workers, I constructed a dataset that included both working and non-working individuals for estimation. The likelihood of labour force participation being observed depended on various socio-economic variables, (x_{1t}), which were consistent with (x_{it}) in equation (1). Respondents who reported invalid responses for spouse's age and/or spouse's annual income were eliminated from the sample.[12]

In addition, the actual log hourly wage of a respondent i at time t, ($\ln(w_{it})$), was a function of control variables, (x_{2t}), which was also shown in (2). The hourly earnings in the data sample were top coded at \15,180, which represents only 0.01 per cent of the entire sample. The data sample was further restricted to respondents who had valid hourly earnings and those who reported hourly earnings of at least \150 per hour.[13] The log hourly wage, which was a dependent variable, was then calculated based on the hourly earnings. After these restrictions, the sample size for the wage equations for the 1993-2014 JPSC data, defined as the labour force participation data, was reduced to 39,635 (see Table 1 for details of this data sample).

Descriptive statistics

Table 1 reports selected socioeconomic characteristics of respondents by employment status for the years 1993-2014 using labour force participation data. First, educational attainment appears to steer employment selection among Japanese female workers. While nearly 60 per cent of female workers with no more than a high school diploma settled into part-time employment, only 37 per cent and 35 per cent of those with the same educational level entered fixed-term and permanent employment, respectively. The reverse situation holds: less than nine per cent of those with at least a Bachelor's degree settled into part-time employment, while approximately 21 per cent and 25 per cent of those with at least a Bachelor's degree aquaired fixed-term and permanent employment, respectively. It was evident that women with less education were more likely to accept part-time employment.

Second, marital status and the presence of children had large impacts on Japanese female workers' employment type. Nearly 80 per cent of part-time female workers were married, while 55 per cent of fixed-term and 50 per cent of permanent female workers were married. Similar trends existed for women with at least one child: they contributed 75 per cent of part-time female workers, about 50 per cent of fixed-term and 45 per cent of permanent female workers. It was apparent that being married and the presence of children reduced full time employment, both fixed-term and permanent, and increased part time employment that allowed flexible work arrangements to meet a high demand for household labour (Estévez-Abe, 2013; Okamura and Islam, 2011; and Tsutsui, 2016).

12 Invalid responses refer to the value expressed as '99', '999', or '9999' submitted by respondents in a questionnaire in the survey.

13 The data sample includes respondents who earn less than the minimum wage (that refers to the national weighted average amount per hour), which was set at 583 yen in 1993 and 764 yen in 2014. See details on minimum wages in Japan at the Ministry of Health, Labour and Welfare.

Lastly, parents' cohabitation with financial sharing, which refers to the living arrangement in a (i) 'traditional integrated multi-generational household' or (ii) 'single generation households,' affected both household income and one's non-market hours, and, in turn, affected Japanese women's employment decisions and their employment status. For example, women living in a traditional integrated multi-generational household (e.g., married women) were likely to devote increased non-market hours to caring for family members and/or benefit from financial contributions by parents, and thus they may had reduced their market hours. In contrast, those living in a single generation household (e.g., single or young women, as well as divorced women with children) possibly experience reduced non-market hours and/or increased financial pressure to assist family members, and thus increase market hours. Table 1 shows that about 28 per cent of Japanese women with part-time employment, 40 per cent of them with fixed-term employment, and 44 per cent of them with permanent employment were in households that had parents' cohabitation with financial sharing. These results indicated that parents' cohabitation with financial sharing affected women's labour force decisions and selection of employment.

Figure 1A, reveals a few important points, showing the overall trends of employment status by birth cohort for women of all ages. First, members of younger cohorts, many of whom were likely to be unmarried, were more likely than older cohorts to hold full time employment. In contrast, members of older cohorts, many of whom were likely to be married and/or a family caregiver, were more likely to select voluntary part-time employment or to be out of the labour force than members of younger cohorts. These results suggested the potential existence of age effects. Second, fixed-term employment was likely to be more common among the younger cohorts (Cohorts C, D and E), born between 1974 and 1989. In particular, members of the cohorts born between 1974 and 1984 (Cohorts C and D) appeared to be disadvantaged compared to the youngest cohort, with a lower percentage in permanent employment, and a higher percentage out of the labour force. This supports previous findings that 'Lost Decades' job seekers were likely to involuntarily land in non-regular employment (Abe, 2013; and Genda *et al.*, 2010).

Figure 1B shows additional data on the trends of employment status by birth cohort for women aged 24-29, in an attempt to control the age effects. It presents some interesting points. First, when the oldest members, the 'Bubble generation,'(Cohort A, born 1965–1969), were aged 24-29 they were less likely to be employed part-time, and more likely to stay out of the labour force relative to members of other cohorts at that age. Second, fixed-term employment was more pronounced among the younger cohorts, (Cohorts C, D and E, born between 1974 and 1989), which was consistent with the previous finding. Third, members of Cohort E (born 1985–1989), the youngest cohort, showed the highest percentage of members in permanent employment, followed by Cohort A, the oldest cohort (born 1965–1969). Lastly, it is worth noting that members of the cohorts born between 1974 and 1984 (Cohorts C and D) appeared to be disadvantaged since they had a lower percentage of permanent employment when they were 24-29 years of age, compared to other cohorts at the same age, supporting previous findings.

Figure 2 offers additional insights into the patterns of labour force participation of each birth cohort by employment status over the 1993 to 2014 period. To account for unbalanced panel data, labour force participation was measured by obtaining the number of respondents who were in a specific employment category, divided by the total respondents in a specific year in the data sample, and it was calculated for each employment status and for each year. Considering two major economic episodes, the 2007-2009 Great Recession and Japan's economic policy regime called 'Abenomics' that started in 2012,[14] Figure 2 presents the three remarkable points.

First, Figure 2A shows that labour force participation of the younger cohorts (Cohorts D and E, born between 1980 and 1989) in part-time employment increased over time regardless of these economic episodes, while that of cohorts born between 1965 and 1979 (Cohorts A, B and C) increased over time except during the Great Recession period. Second, Figure 2B confirms that although there were some year-on-year variations in labour force participation within each cohort in fixed-term employment, labour force participation in fixed-term employment of all cohorts increased over time. Lastly, Figure 2C shows that labour force participation of cohorts born between 1965 and 1979 (Cohorts A, B and C) in permanent employment was relatively constant until the Great Recession period, slowly rebounding afterwards. Conversely, labour force participation of the birth cohort of 1980-1984 (Cohort D) in permanent employment declined after they entered the labour market in 2008, while that among youngest birth cohort of 1985–1989 (Cohort E) increased after they joined the labour market in 2013. These results suggest that economic and political events appear to had affected labour force participation and the selection of employment status among Japanese women.

3. Empirical results

Japanese women's labour force participation decisions

Table 2 presents the empirical results of binomial logit and MNL estimates in order to examine the factors that influenced a respondent's labour force participation. Based on the marginal effects in Rows (1)-(4), Column (1), only educational attainment of at least a Bachelor's degree increased the average probability of Japanese women's decision to participate in the labour market (by 0.037). However, the MNL estimates in the same rows, Columns (2)-(4), show a different trend and offer more insight. Education, in general, increased the average probability of a respondent's decision to participate in the labour market with full time employment, both permanent and fixed-term. But, the education effects were less prominent for female workers with fixed-term employment than for those with permanent employment. This was because the effects were only 0.02 for female workers in fixed-term employment regardless of education, while the effects were the largest, 0.26, for female workers with at least a Bachelor's degree in permanent employment. On the other hand, education decreased the average probability of a respondent's decision to participate in the labour market

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14 "Abenomics" refers to the new economic policies advocated by Prime Minister Shinzo Abe under the Abe cabinet since 2012, and it consists of three arrows: (1) unconventional monetary policy; (2) expansionary fiscal policy; and (3) economic growth strategies to encourage private investment. See Fukuda (2015) for detail.

with part-time employment. However, education effects varied by education level, for example, Japanese women with only a high school diploma decreased their labour market participation with part-time employment by 0.05, while those with at least a Bachelor's degree decreased it by 0.25.

As expected, both experience and age positively influenced the average probability of a respondent's decision to participate in the labour market, based on the estimates in Rows (5)-(6), Column (1). The MNL estimates offered additional insights by employment status, as shown in Rows (5)-(6), Columns (2)-(3). Experience effects on labour force participation were apparent for Japanese women, regardless of employment status; however, the effects were smallest for those with fixed-term employment (0.001) and were largest for female workers with permanent employment (0.021). As for age, it increased the average probability of a respondent's decision to participate in the labour market with part-time employment (by 0.007) and with fixed-term employment (by 0.004), while it reduced with permanent employment (by 0.009), according to Row (6), Columns (2)-(3). These results suggest that age increased Japanese women's labour force participation with non-regular employment. Additionally, firms had fewer incentives to hire full-time middle-age workers (Kambayashi and Kato, 2011), and to offer firm-specific human capital investment to older employees (Hashimoto and Kondo, 2012); and/or Japanese women prefer flexible work arrangements for their increased unpaid-work hours at home (Estévez-Abe, 2013; Okamura and Islam, 2011; and Tsutsui, 2016).

Unsurprisingly, both marital status and the presence of children significantly impacted on labour force participation among Japanese women, but the effect differed by employment status. Based on Rows (7)-(11), Columns (2)-(4), the negative effect of being married and having children was smaller for women with fixed-term employment (0.019 and 0.02-0.04, respectively) compared to those with permanent employment (0.125 and 0.05-0.10, respectively). On the other hand, being married and having children increased the average probability of a respondent's decision to participate in the labour market with part-time employment (by 0.039 and 0.026-0.031, respectively). Japanese women preferred to allocate their time for unpaid-work hours at home to family, leading them to move toward non-regular-work that allowed more flexible work arrangements, or non-labor-force-participation, after they get married and bear children, (Estévez-Abe, 2013; Okamura and Islam, 2011; and Tsutsui, 2016).

Column (1) in Table 2 further shows that parents' cohabitation with financial sharing reduced the average probability of a respondent's decision to participate in the labour market (by 0.028, as shown in Row (11), Column (1)). This finding was consistent with part-time and permanent employment, based on the estimates in the same row, Columns (2) and (4). These findings indicate that the increased unpaid-work hours at home for parents and/or the financial gain from parents outweigh the willingness to participate in the labour market, especially for those with part-time employment. Conversely, it increased the average probability of participating in the labour force among women with fixed-term employment (by 0.01, according to the same row, Column (3)). This suggests that the willingness to work dominated unpaid-work commitments at home and/or financial gains from parents given female workers with fixed-term employment were likely to be from younger cohorts and enter non-regular employment involuntarily.

Further, metropolitan living status increased the average probability of participating in the labour force among female workers with fixed-term employment, and housing tenure also increased it among those with permanent employment.

Japanese female workers' earnings by employment status

Table 3 presents the empirical results from the Heckman's sample selection estimates. Rows (1)-(21) in the table present the estimated coefficients from the outcome (or wage) equation, while rows (22)-(31) shows the estimated coefficients from the participation equation, separately, for each employment status, with Column (1) for part-time employment, Column (2) for fixed employment, and Column (3) for permanent employment.

The estimates of the outcome (or wage) equation in Rows (1)-(4), Column (3), in the table show that a significant positive return to education on wages was apparent for permanent female employees, and that effect got larger as the level of education increased (from 11 per cent (exp(0.102)-1) to 42 per cent (exp(0.353)-1)) relative to permanent female employees with 'less than a high school diploma.' On the other hand, the estimates in the same rows, Column (1), show that a positive return to education on wages was only observed for part-time female employees with only 'at least a Bachelor's degree' (by 14 per cent (exp(0.131)-1) relative to their counterparts. Moreover, the return to education was not only nonexistent for fixed-term female employees with 'technical or trade school' education and 'at least a Bachelor's degree,' but also a wage penalty was realised for those with a 'high school diploma' and an 'associate degree,' as presented in the same rows, Column (2). It was verified that the returns to education were smaller for female workers with non-regular employment.

Estimates in Table 3, Rows (5) and (7), Columns (1)-(3), convey unfavorable results in regard to the returns to experience and to age. Experience had no effect on the wages of female employees, regardless of employment status. This finding confirms firms' reluctance to offer firm-specific human capital investment to women who had short job tenures (Nakata and Ryoji, 2002)[15] and a zero return to experience on the earnings of Japanese female workers (Ono, 2010).[16] Age also had no effect on the wages among female workers in part-time employment, while it increased the wages of those with full time employment, both permanent and fixed-term, the premiums were smaller for female workers with non-regular employment (4% (exp(0.038)-1) vs. 6% (exp(0.055)-1)). This result indicates that an age-based wage premium existed only for those who work full time in the labour market, with the effect differing by employment status.

15 A large accumulation of wage differentials exist between male and female workers with equal productivity as a results of lower work appraisal points given to female workers by an employer and that the effect of job tenure through age and experience on the wages of women was less pronged compared to those of men in Japan. See Nakata and Ryoji (2002) for detail.

16 Japanese female workers did not benefit from the lifetime employment system, and Japanese women, who seek mid-career re-employment, in particular, did so into part-time or temporary position. See Ono (2010) for detail.

Table 3 also shows that there were substantial differences in wage premiums by employment status in relation to occupations. First, across all occupations, the wage premiums for female workers with non-regular employment, both part-time and fixed-term, were substantially lower than the premiums for those with permanent employment, as shown in Rows (11)-(15), Columns (1)-(3). Second, there was a large within-occupation wage dispersion that was different by employment status. In the professional occupations (O1), shown in Row (11), Columns (1)-(3), permanent female workers earnt 52 per cent (exp(0.418)-1) more than those in the same employment status with 'other' occupations (O6), while female workers with part-time and fixed-term earn only 29 per cent (exp(0.255)-1) and 19 per cent (exp(0.177)-1), respectively, more than their counterparts. These findings confirm not only that occupation but also employment status matters for female workers' wages. Lastly, between-occupation wage differentials were present, and they appear to be smaller for females working part-time than for those working full time. This was because the wages of part-time female workers who were in office administration (O3) and manufacturing & operations (O4) were not significantly different from those in the same employment status with 'other' occupations (O6), based on estimates in Rows (13)-(14), Column (1), but the earnings of permanent female workers who were in (O3) and (O4) were 42 per cent (exp(0.352)-1) and 18 per cent (exp(0.165)-1), respectively, lower than their counterparts, as shown in Rows (13)-(14), Column (3), suggesting occupational choice matters less for part-time employment.

Table 3 further confirms that there were differences in the wage premiums by employment status in relation to industries. First, there was a considerable within-industry wage dispersion that varied by employment status. In the public administration industry (I5), the wages of female workers with permanent employment status earn 16 per cent (exp(0.146)-1) more than those with the same employment status in 'other' industries (I6)), based on Row (20), Column (3); on the other hand, the wages of female employees with part-time employment did not differ, while the earnings of those with fixed-term were 23 per cent (exp(0.210)-1) less than their counterparts, as shown in the same row, Column (2). Second, between-industry wage differentials were apparent, varying by employment status. For part-time employment, industry differences had a minimal effect since the earnings of female workers, except for those who were in retail trade (I2), did not differ from the wages of those who were in 'other' industries (I6), as shown in Rows (16)-(20), Column (1). By contrast, industry differences had a larger effect, especially for those with permanent employment, as female workers who were in public administration (I5) earn 16 per cent (exp(0.146)-1) more, as shown in Row (20), Column (3), while those who were in service (I4) earn eight per cent (exp(0.074)-1) less, relative to their counterparts, based on Row (19), Column (3). Lastly, for all industries, the wage penalties were larger for those with fixed-term employment compared to those with permanent employment (e.g., 22% (exp(0.201)-1) vs. 12% (exp(0.111)-1) in retail trade (I2)), as in Row (17), Columns (2)-(3).

Japanese female workers' earnings by birth cohort

Table 4 presents the empirical results from the Heckman's sample selection estimates by birth cohort. In an attempt to capture the cohort effect and the age effect, two sets of the empirical results were presented by taking into an account for the nature of differences in both the time and the age span of each cohort in the data sample. Table 4A offers the estimates from Japanese women of all ages and Table 4B presents the estimates from Japanese women aged 24-29. The analyses in this section were focused on evaluating the effects of employment status and human capital investment on Japanese female workers' earnings.

A. Employment status

The estimates of the outcome (or wage) equation in Rows (1)-(2), Columns (1)-(5) in Table 4A show, for all cohorts, female workers with non-regular employment, both part-time and fixed-term, earn less than their same birth cohort counterparts with regular employment (that was, permanent employment). Additionally, wage differences between non-regular employment and regular permanent employment vary across each cohort. For example, the oldest cohort born between 1965 and 1969 (Cohort A) with part-time employment earns 39 per cent (exp(-0.331)-1) less than the same birth cohort with permanent employment, as shown in Row (1), Column (1), while the cohort born between 1970 and 1973 (Cohort B) with part-time employment earns 31 per cent (exp(-0.269)-1) less than their counterparts, as shown in the same row, Column (2). This phenomenon was also apparent for fixed-term employment: that was, the oldest birth cohort earns 14 per cent (exp(-0.133)-1) less than the same birth cohort with permanent employment, as shown in Row (2), Column (1), while the wages of the cohort born between 1974 and 1979 (Cohort C) were nine per cent (exp(0.090)-1) less than those of their counterparts, based on the same row, Column (3).

The wage disparities across cohorts in relation to employment status shown in Table 4A were likely to be drawn from age effects and time trends. To verify this, additional estimates of the outcome (or wage) equation in Table 4B were presented as a robustness check. The estimates first find that, across generations, the wages of female workers aged 24-29 with part-time employment were 22 per cent (exp(0.199)-1) - 36 per cent (exp(0.306)-1) lower than their same birth cohort counterparts aged 24-29 with permanent employment, according to Row (1), Columns (1)-(5). Furthermore, the penalties became larger as generations progress, which implies that there were some variations in wage differences and cohort-wage disparity among Japanese female workers aged 24-29. In contrast, wages of cohorts born between 1965 and 1969 (Cohort A) and 1974 and 1979 (Cohort C) with fixed-term employment did not differ from their counterparts, while wages of the youngest cohort, born between 1985 and 1989 (Cohort E), with fixed-term employment were 13 per cent (exp(-0.122)-1) less than the same birth cohort with permanent employment, according to Row (2), Column (5). This indicates sizeable variations in earning differences, and that a cohort-wage disparity among Japanese female workers aged 24-29 was evident across generations.

These results display a cohort-wage differential between part-time and permanent employment among Japanese female workers as a result of age effects and

time trends; however, the cohort effects appear to be minimal. In addition, there was a noticeable cohort-wage disparity between fixed-term employment permanent and employment among Japanese female workers due to both age and cohort effects and time trends over the period of 1993 to 2014.

B. Returns to human capital investment

Based on the estimates of the outcome (or wage) equation, Columns (1)-(5) in Table 4A, there were several undesirable results regarding the returns to human capital investment in relation to birth cohorts. First, according to Rows (3)-(6), educational attainment of at least a Bachelor's degree increased the wages of all cohorts, except for the 'Yutori generation,' the youngest cohort, born between 1985 and 1989 (Cohort E). Furthermore, the education premium was 24 per cent (exp(0.212)-1) for the oldest cohort born between 1965 and 1969 (Cohort A). It fell to 19 per cent (exp(0.172)-1) for the cohort born between 1980 and 1984 (Cohort D), and to zero for the youngest cohort born between 1985 and 1989 (Cohort E). These results indicate the return on education declined for Japanese women. Second, the return on experience was also minimal for Japanese women since an experience premium of ten per cent (exp(0.092)-1) was reported only for the cohort born between 1980 and 1984 (Cohort D), as shown in Row (7), Column (4). This possibly resulted from a lack of incentives for firms' to invest in human capital for women and middle-aged workers (Kambayashi and Kato, 2011). On the other hand, an age premium was present only for older generations because four to seven per cent premiums were observed only for the cohorts born between 1965 and 1979 (Cohorts A, B and C), based on the estimates shown in Row (9), Columns (1)-(3). This result likely was derived from age effects and time trends since the seniority system still played a role in determining workers' earnings.

The extended estimates in Columns (1)-(5) in Table 4B confirm the previous finding, indicating that educational attainment of at least a Bachelor's degree lifted the earnings of all cohorts with the exception of the youngest, Cohort E, born between 1985 and 1989. Additionally, the education premiums became smaller as a cohort progressed, and it became zero for this cohort, confirming previous findings. In addition, the extended estimates confirmed that a return on experience (of about 5% (exp(0.047)-1)) only existed for the cohort born between 1980 and 1984 (Cohort D), and that the return on experience was negligible for Japanese women aged 24-29, according to Row (7), Columns (1)-(5). On the contrary, the estimates reveal that an age premium was nonexistent for all cohorts of Japanese female workers aged 24-29, as shown in Row (9), Columns (1)-(5), suggesting cohort effects were absent. This result was likely because the age group was young (only 24-29 years of age). Therefore, additional analysis in order to ensure reliable conclusions.

These findings suggest returns to education decreased as a generation progressed, while the returns to experience were apparent only for the younger cohorts, suggesting a cohort-earning disparity in relation to education and experience for Japanese women due to age effects, time trends and cohort effects. Additionally, the cohort-wage differentials associated with age among Japanese women was apparently a result of mainly age effects and time trends.

C. Discussion on Japanese women's labour market outcomes

In light of the empirical findings in this study, there were a few important points that could enhance Japanese women's labour market outcomes. Labour force participation of Japanese women with part-time employment increased with age, experience, being married and the presence of children. Part-time employment serves a specific need for women, including married ones, who prefer flexible work arrangements. In order to improve the labour market welfare of part-time female workers, it was advantageous to have an educational attainment of at least a Bachelor's degree, metropolitan living, and employment in professional, and technical and healthcare support that allow them to earn wage premiums. Also, a sizable cohort-wage disparity between part-time and permanent employment was observed mainly due to age effects and time trends, but it was not apparent across cohorts.

With the aim of lifting the labour market welfare of fixed-term female workers, it was beneficial to aim for metropolitan living status and professional occupations that guarantee wage premiums, such as technical and healthcare support, and service and sales. In addition, age not only increased labour force participation but also wages; hence, Japanese women, particularly, mid-age career seekers, could enter the labour market with fixed-term employment status. Given this, it was expected that the prime-age in fixed-term employment would increase. Furthermore, there was a considerable cohort-wage differential between fixed-term employment and permanent employment across cohorts due to age effects and time trends, which were also present across generations due to cohort effects.

To improve the overall labour market welfare of women in Japan, the attainment of regular employment (rather than non-regular employment), at an earlier age, is favorable since it produced not only higher labour force participation and earnings, but also longer job tenure with a higher return from experience. To accomplish this, it is desirable for Japanese women to attain a higher level of education, given this increased permanent employment. Even though the returns to education diminished as a cohort progressed, acquiring appropriate knowledge, skills and training led to high-paying jobs, such as professional, and technical, and healthcare support occupations, in high-paying industries such as finance, insurance, real estate or public administration. Alternatively, government and private firms could reconsider existing programs, such as the Childcare Leave Act and work-life balance policies, that support women's participation and gender equity in the workforce, as Japanese women faced many challenges in the labour market (Kawaguchi, 2013; and 2015).[17]

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17 Kawaguchi (2013, 2015) discusses the existing government policies that promote women's labour force participation in Japan, and documents the increased female retention and the improved gender equality in the workforce; however, there is still room for improvement in many areas for Japanese women, including slow relative wage growth, limited promotional opportunities at work, low retention after childbirth, and gender inequality in the workforce.

4. Concluding remarks

This paper examines recent long-term trends of women's employment, major determinants of labour force participation and earnings differentials among female workers, with a focus on non-regular employees during the prolonged economic recession in Japan. To do so, I employed the binomial logit, the multinomial logit model, and the Heckman's sample selection models using the 1993-2014 Japanese Panel Survey of Consumers data.

The empirical results of this study first validated existing findings in literature regarding labour force participation among Japanese women. In Japan, labour force participation of female workers with part-time employment declined with higher education and cohabitation with parents' who share finances, but it increased with experience, age, marriage, and the presence of a child. In the case of female workers with fixed-term employment, their labour force participation decreased with marriage and the presence of a child, but it increased with greater education, experience, age, parents' cohabitation with financial sharing, and metropolitan living.

This study also confirms the following findings concerning the earnings of Japanese female workers: the earnings of females in part-time employment were positively influenced by education and metropolitan living, but were not affected by experience and age. As for the wages of those with fixed-term employment, their wages were positively related with age and metropolitan living, but were inversely related to educational attainment of a high school diploma and an associate degree, while experience and age had no effect. Furthermore, there were large within-occupation and within-industry wage disparities that differed by employment status, and the premiums were smaller for female workers with non-regular employment than for those with full time employment. In addition, between-occupation and between-industry wage differentials that varied by employment status were apparent, and the differential appeared to be smaller for female workers with part time employment than for those with full time employment.

The results of this study present new findings revealing patterns of change in earnings of Japanese women by birth cohort. First, a sizeable wage differential between part-time and permanent employment among Japanese female workers of all ages was observed, with relatively consistent differentials observed across all cohorts; however, variations in wage disparity across generations becomes even larger when only considering workers aged 24-29. Likewise, there was not only a noticeable earnings disparity between fixed-term and permanent employment among female workers of all ages, and varied wage disparities across cohorts, but also a high degree of variation in wage disparity across generations when only workers aged 24-29 were examined. Second, the returns to education and the returns to experience both differ by cohort, such that education premiums decreased as a generation progressed, and experience premiums were apparent only for the 1980-1984 birth cohort. Lastly, the age premiums were only evident for earlier cohorts of Japanese female workers, regardless of age, suggesting premiums differ by cohort; however, when only female workers aged 24-29 were considered no age premium existed, across all cohorts. These results indicate that age effects, time trends and

cohort effects played a substantial role when determining the observed cohort-wage differentials in relation to employment status and human capital among Japanese female workers.

This paper extends existing literature by offering deeper insights into understanding long-term trends of labour force participation and wages of Japanese women in the prolonged recession period of 1993 to 2014. It also shows the ongoing transformation of earning patterns among Japanese women that vary by birth cohort, focusing on non-regular employment. The findings in this study show how socio-economic factors, employment selection and birth cohort affect labour market outcomes in Japan impacting the welfare of female workers. Further, as women's labour force participation becomes more in demand given Japan's the aging population, these findings informs employees, firms, and policy makers in initiating efforts to promote labour force participation, and reduce earning's penalties among female workers, while re-evaluating ways to improve the labour market welfare of female employees in Japan.

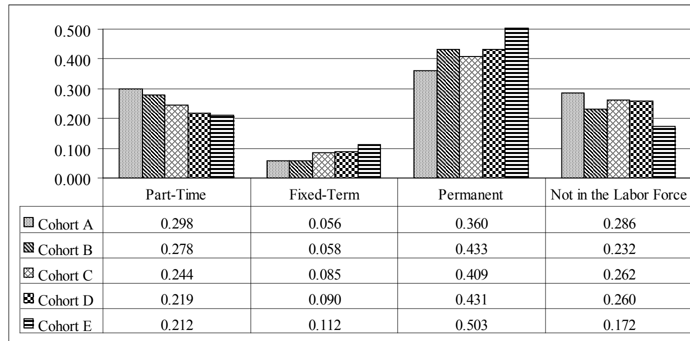
Table1 - Labour Force Participation Data: 1993-2014

	All Sample n=39635			*Part-Time n=10922*			*Fixed-Term n=2633*			*Permanent n=15453*			*No Employment n=10627*		
	Total	*Mean*	*S.D*	*Total*	*Mean*	*S.D*	*Total*	*Mean*	*S.D*	*Total*	*Mean*	*S.D*	*Total*	*Mean*	*S.D*
Education															
Less than HS Diploma	2406	0.061	0.239	863	0.079	0.270	93	0.035	0.185	514	0.033	0.179	936	0.088	0.283
High School Diploma or Equivalent	15519	0.392	0.488	5366	0.491	0.500	879	0.334	0.472	4903	0.317	0.465	4371	0.411	0.492
Technical or Trade School Diploma	6764	0.171	0.376	1748	0.160	0.367	451	0.171	0.377	2840	0.184	0.387	1725	0.162	0.369
Associate Degree	8219	0.207	0.405	2021	0.185	0.388	666	0.253	0.435	3346	0.217	0.412	2186	0.206	0.404
At least a Bachelor's degree	6727	0.170	0.375	924	0.085	0.278	544	0.207	0.405	3850	0.249	0.433	1409	0.133	0.339
Experience (= Total Service Length in Years)	39635	13.29	9.053	10922	14.68	7.683	2633	15.14	7.450	15453	17.3	8.35	-	-	-
Age	39635	34.91	6.989	10922	36.51	7.067	2633	35.58	7.240	15453	34.0	6.98	10627	34.45	6.55
Marital Status															
Married (yes=1)	27222	0.687	0.464	8473	0.776	0.417	1434	0.545	0.498	7793	0.504	0.500	9522	0.896	0.305
Unmarried (yes=0)	12413	0.313	0.464	2449	0.224	0.417	1199	0.455	0.498	7660	0.496	0.500	1105	0.104	0.305
Number of Children															
Zero	13940	0.352	0.478	2727	0.250	0.433	1327	0.504	0.500	8460	0.547	0.498	1426	0.134	0.341
One	6828	0.172	0.378	1857	0.170	0.376	374	0.142	0.349	2357	0.153	0.360	2240	0.211	0.408
Two	12910	0.326	0.469	4272	0.391	0.488	693	0.263	0.440	3261	0.211	0.408	4684	0.441	0.497
Three or more	5957	0.150	0.357	2066	0.189	0.392	239	0.091	0.287	1375	0.089	0.285	2277	0.214	0.410
Living & Financial Status															
Living & sharing finance w/ parents (yes=1)	13072	0.330	0.470	3056	0.280	0.449	1040	0.395	0.489	6758	0.437	0.496	2218	0.209	0.406
Living & sharing finance w/ parents (no=1)	26398	0.666	0.472	7813	0.715	0.451	1582	0.601	0.490	8633	0.559	0.497	8370	0.788	0.409
Housing Tenure															
Housing Tenure (yes=1)	26142	0.660	0.474	7311	0.669	0.470	1723	0.654	0.476	10502	0.680	0.467	6606	0.622	0.485
Housing Tenure (no=1)	13456	0.339	0.474	3598	0.329	0.470	907	0.344	0.475	4934	0.319	0.466	4017	0.378	0.485
Metropolitan Living Status															
Living in a Large City	10569	0.267	0.442	2741	0.251	0.434	869	0.330	0.470	4122	0.267	0.442	2837	0.267	0.442
Living in a Medium City	23726	0.599	0.490	6688	0.612	0.487	1502	0.570	0.495	9140	0.591	0.492	6396	0.602	0.490
Living in a Small City	5265	0.133	0.339	1488	0.136	0.343	250	0.095	0.293	2157	0.140	0.347	1370	0.129	0.335

Partner/Spouse															
Age	27222	38.65	7.649	8473	40.03	7.772	1434	39.75	7.625	7793	38.33	7.747	9522	37.53	7.242
Annual Income	25484	537.7	301.1	7944	515.7	274.3	1349	501.6	277.9	7240	519.7	316.7	8951	577.3	310.2

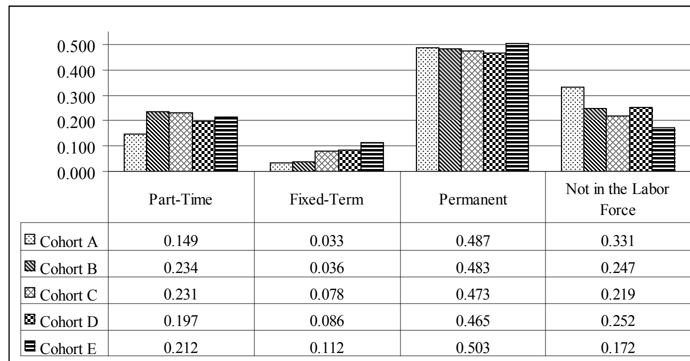
*Living & Financial Status: 165 out of 39635 (or 53/10922 part-time, 11/2633 fixed-term, 62/15453 permanent, 39/10627 unemployed) respondents had invalid responses.
*Housing Tenure: 37 out of 39635 (or 13/10922 part-time, 3/2633 fixed-term, 17/15453 permanent, 4/10627 unemployed) respondents had invalid responses.
*Metropolitan Living Status: 75 out of 39635 (or 5/10922 part-time, 12/2633 fixed-term, 34/15453 permanent, 24/10627 unemployed) respondents had invalid responses.
*Partner/Spouse Income: 1738 out of 27222 (or 529/8473 part-time, 85/1434 fixed-term, 553/7793 permanent, 571/9522 unemployed) married respondents had invalid responses.

Figure 1A - Overall Trends of Employment Status by Birth Cohort for Japanese Women All Ages: 1993-2014 (unit: per cent)



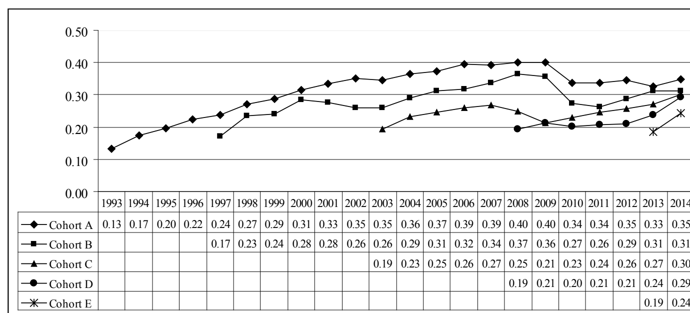
	Part-Time	Fixed-Term	Permanent	Not in the Labor Force
Cohort A	0.298	0.056	0.360	0.286
Cohort B	0.278	0.058	0.433	0.232
Cohort C	0.244	0.085	0.409	0.262
Cohort D	0.219	0.090	0.431	0.260
Cohort E	0.212	0.112	0.503	0.172

Figure 1B - Overall Trends of Employment Status by Birth Cohort for Japanese Women Aged 24-29: 1993-2014 (unit: per cent)



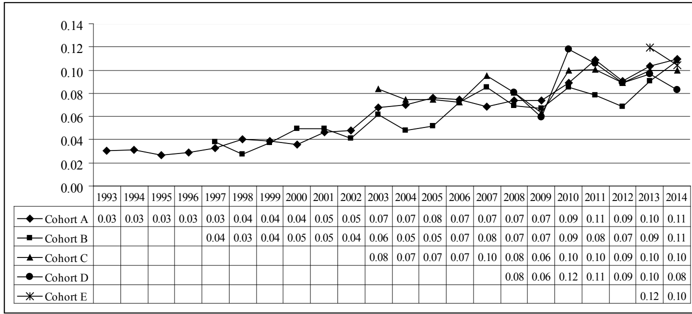
	Part-Time	Fixed-Term	Permanent	Not in the Labor Force
Cohort A	0.149	0.033	0.487	0.331
Cohort B	0.234	0.036	0.483	0.247
Cohort C	0.231	0.078	0.473	0.219
Cohort D	0.197	0.086	0.465	0.252
Cohort E	0.212	0.112	0.503	0.172

Figure 2A - Recent Trends of Employment Status by Birth Cohort: 1993-2014 – Part-Time (unit: per cent)



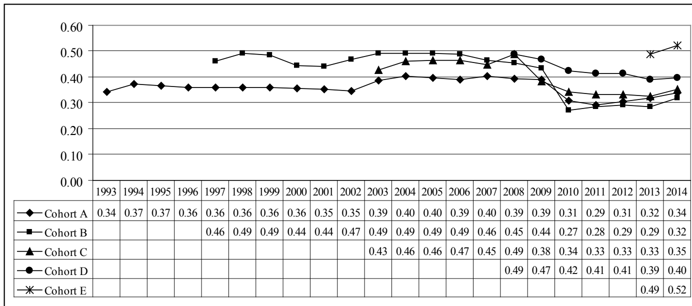
	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Cohort A	0.13	0.17	0.20	0.22	0.24	0.27	0.29	0.31	0.33	0.35	0.35	0.36	0.37	0.39	0.39	0.40	0.40	0.34	0.34	0.35	0.33	0.35
Cohort B					0.17	0.23	0.24	0.28	0.28	0.26	0.26	0.29	0.31	0.32	0.34	0.37	0.36	0.27	0.26	0.29	0.31	0.31
Cohort C											0.19	0.23	0.25	0.26	0.27	0.25	0.21	0.23	0.24	0.26	0.27	0.30
Cohort D																0.19	0.21	0.20	0.21	0.21	0.24	0.29
Cohort E																					0.19	0.24

Figure 2B - Recent Trends of Employment Status by Birth Cohort: 1993-2014 – Fixed-Term (unit: per cent)



	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Cohort A	0.03	0.03	0.03	0.03	0.03	0.04	0.04	0.04	0.05	0.05	0.07	0.07	0.08	0.07	0.07	0.07	0.07	0.09	0.11	0.09	0.10	0.11
Cohort B					0.04	0.03	0.04	0.05	0.05	0.04	0.06	0.05	0.05	0.07	0.08	0.07	0.07	0.09	0.08	0.07	0.09	0.11
Cohort C											0.08	0.07	0.07	0.07	0.10	0.08	0.06	0.10	0.10	0.09	0.10	0.10
Cohort D																0.08	0.06	0.12	0.11	0.09	0.10	0.08
Cohort E																					0.12	0.10

Figure 2C - Recent Trends of Employment Status by Birth Cohort: 1993-2014 – Permanent (unit: per cent)



	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Cohort A	0.34	0.37	0.37	0.36	0.36	0.36	0.36	0.36	0.35	0.35	0.39	0.40	0.40	0.39	0.40	0.39	0.39	0.31	0.29	0.31	0.32	0.34
Cohort B					0.46	0.49	0.49	0.44	0.44	0.47	0.49	0.49	0.49	0.49	0.46	0.45	0.44	0.27	0.28	0.29	0.29	0.32
Cohort C											0.43	0.46	0.46	0.47	0.45	0.49	0.38	0.34	0.33	0.33	0.33	0.35
Cohort D																0.49	0.47	0.42	0.41	0.41	0.39	0.40
Cohort E																					0.49	0.52

Table 2 - Logit & MNL Estimates and Marginal Effects of Participation Equation: 1993-2014
Dependent Variable: Labour Force Participation

n=39635	*Logit*		*Multinomial Logit (MNL)*					
Base=10627 (Not in the Labour Force)	*(1)*		*(2)*		*(3)*		*(4)*	
	In the Labour Force n=29008		*Part-Time n=10922*		*Fixed-Term n=2633*		*Permanent n=15453*	
Independent Variables	*Estimated coefficient*	*Marginal effect*	*Estimated coefficient*	*Marginal effect*	*Estimated coefficient*	*Marginal effect*	*Estimated coefficient*	*Marginal effect*
(1) High School with Diploma (yes=1)	0.020	0.002	-0.094	-0.048***	0.304**	0.012*	0.255***	0.043***
	(0.134)	(0.016)	(0.063)	(0.009)	(0.124)	(0.007)	(0.077)	(0.010)
(2) Technical or Trade School (yes=1)	0.155	0.018	-0.215***	-0.125***	0.627***	0.018**	0.768***	0.133***
	(0.145)	(0.017)	(0.071)	(0.010)	(0.131)	(0.007)	(0.083)	(0.011)
(3) Associate Degree (yes=1)	0.124	0.014	-0.271***	-0.133***	0.793***	0.030***	0.716***	0.124***
	(0.141)	(0.016)	(0.069)	(0.010)	(0.128)	(0.007)	(0.082)	(0.011)
(4) At least Bachelor's Degree (yes=1)	0.318**	0.037**	-0.579***	-0.248***	0.846***	0.020***	1.313***	0.255***
	(0.149)	(0.017)	(0.076)	(0.011)	(0.132)	(0.007)	(0.084)	(0.011)
(5) Experience (=Service Length in Years)	0.218***	0.025***	0.188***	0.004***	0.213***	0.001***	0.268***	0.021***
	(0.006)	(0.000)	(0.003)	(0.000)	(0.004)	(0.000)	(0.003)	(0.000)
(6) Age	0.022***	0.002***	0.037***	0.007***	0.063***	0.004***	-0.018***	-0.009***
	(0.007)	(0.001)	(0.003)	(0.000)	(0.005)	(0.000)	(0.003)	(0.000)
(7) Married (yes=1)	-0.998***	-0.115***	-0.603***	0.039***	-1.167***	-0.019***	-1.285***	-0.125***
	(0.090)	(0.011)	(0.057)	(0.007)	(0.075)	(0.003)	(0.058)	(0.006)
(8) Children (1)	-0.785***	-0.091***	-0.583***	-0.007	-0.989***	-0.023***	-0.816***	-0.052***
	(0.087)	(0.010)	(0.060)	(0.007)	(0.085)	(0.004)	(0.060)	(0.007)
(9) Children (2)	-0.909***	-0.105***	-0.589***	0.026***	-1.098***	-0.019***	-1.137***	-0.103***
	(0.096)	(0.011)	(0.057)	(0.007)	(0.081)	(0.004)	(0.059)	(0.007)

(10) Children (3 or more)	-0.825***	-0.095***	-0.511***	0.031***	-1.276***	-0.035***	-1.020***	-0.085***
	(0.109)	(0.013)	(0.064)	(0.008)	(0.101)	(0.005)	(0.069)	(0.008)
(11) Living & Sharing Finance w/ Parents (yes=1)	-0.241***	-0.028***	-0.282***	-0.026***	-0.093	0.007**	-0.237***	-0.010*
	(0.079)	(0.009)	(0.044)	(0.006)	(0.065)	(0.003)	(0.046)	(0.005)
(12) Housing Tenure (yes=1)	0.133**	0.015**	0.076**	-0.006	0.037	-0.005*	0.193***	0.025***
	(0.065)	(0.007)	(0.037)	(0.005)	(0.058)	(0.003)	(0.040)	(0.005)
(13) Metropolitan Living (Big City)	-0.031	-0.004	-0.006	0.008	0.275***	0.021***	-0.144**	-0.033***
	(0.100)	(0.012)	(0.056)	(0.007)	(0.088)	(0.005)	(0.059)	(0.007)
(14) Semi-Metropolitan Living (Medium City)	-0.051	-0.006	-0.040	-0.001	0.071	0.007*	-0.074	-0.011*
	(0.091)	(0.011)	(0.049)	(0.007)	(0.081)	(0.004)	(0.052)	(0.006)
(15) Constant	-1.419***	-	-2.511***	-	-5.886***	-	-1.761***	-
	(0.289)	-	(0.138)	-	(0.230)	-	(0.149)	-
Pseudo R-Square	0.372	-	0.236	-	0.236	-	0.236	-

Notes: Standard errors were shown in parentheses. ***, **, * indicate significance at the 1%, 5% and 10% levels, respectively.

Table 3 - Heckman's Sample Selection Estimates of Wage Equation: 1993-2014; Dependent Variable: Log Hourly Wage

		(1) Part-Time		*(2) Fixed-Term*		*(3) Permanent*	
Independent Variables		*Estimated Coefficient*	*Standard Error*	*Estimated Coefficient*	*Standard Error*	*Estimated Coefficient*	*Standard Error*
Outcome (=Wage) Equation							
(1)	High School with Diploma (yes=1)	-0.063*	(0.033)	-0.183***	(0.052)	0.102***	(0.026)
(2)	Technical or Trade School (yes=1)	-0.038	(0.037)	-0.077	(0.056)	0.187***	(0.027)
(3)	Associate Degree (yes=1) (E4)	-0.023	(0.036)	-0.140**	(0.056)	0.217***	(0.027)
(4)	At least Bachelor's Degree (yes=1)	0.131***	(0.042)	0.016	(0.057)	0.353***	(0.029)
(5)	Experience	-0.003	(0.004)	0.004	(0.005)	0.003	(0.002)
(6)	Experience Squared	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)
(7)	Age	-0.005	(0.011)	0.038***	(0.013)	0.055***	(0.005)
(8)	Age Squared	0.000	(0.000)	-0.001***	(0.000)	-0.001***	(0.000)
(9)	Metropolitan Living (Big City)	0.134***	(0.028)	0.158***	(0.032)	0.160***	(0.013)
(10)	Semi-Metropolitan Living (Medium City)	0.054**	(0.025)	0.084***	(0.030)	0.052***	(0.011)
(11)	Professional/Specialist/Mgmt/Teacher (O1)	0.255***	(0.055)	0.177***	(0.037)	0.418***	(0.018)
(12)	Programmer/Nurse/Nutritionist (O2)	0.412***	(0.050)	0.269***	(0.041)	0.513***	(0.016)
(13)	Office Administration (O3)	0.058	(0.038)	0.080***	(0.031)	0.352***	(0.013)
(14)	Manufacturing & Operations (O4)	0.056	(0.040)	0.051	(0.038)	0.165***	(0.019)
(15)	Services and Sales (O5)	0.081**	(0.040)	0.097***	(0.035)	0.273***	(0.016)
(16)	Manufacturing (I1)	-0.060	(0.040)	-0.061*	(0.033)	-0.024	(0.015)
(17)	Retail Trade (I2)	-0.078**	(0.036)	-0.201***	(0.033)	-0.111***	(0.014)
(18)	Finance/Insurance/Real Estate (I3)	0.038	(0.056)	-0.020	(0.038)	0.073***	(0.016)
(19)	Service (I4)	-0.003	(0.035)	-0.076***	(0.026)	-0.074***	(0.013)
(20)	Public Administration (I5)	0.060	(0.007)	-0.210***	(0.033)	0.146***	(0.017)
(21)	Constant	6.866***	(0.215)	6.405***	(0.228)	5.441***	(0.096)
	lambda	-0.863***	(0.275)	-0.275***	(0.091)	0.460***	(0.136)

	Participation Equation						
(22)	High School with Diploma (yes=1) (E2)	0.186*	(0.100)	0.142	(0.159)	0.474***	(0.087)
(23)	Technical or Trade School (yes=1) (E3)	0.150	(0.117)	0.415**	(0.172)	0.536***	(0.094)
(24)	Associate Degree (yes=1) (E4)	-0.144	(0.107)	0.533***	(0.170)	0.556***	(0.093)
(25)	At least Bachelor's Degree (yes=1) (E5)	-0.117	(0.124)	0.376**	(0.174)	0.669***	(0.094)
(26)	Experience	0.034***	(0.005)	0.034***	(0.006)	0.042***	(0.003)
(27)	Age	0.037***	(0.006)	0.027***	(0.007)	-0.003	(0.004)
(28)	Metropolitan Living (Big City)	-0.014	(0.103)	-0.177	(0.133)	0.078	(0.069)
(29)	Semi-Metropolitan Living (Medium City)	-0.149*	(0.089)	-0.323***	(0.123)	0.045	(0.060)
(30)	Marital Status (married: yes=1)	-0.095	(0.094)	-0.322***	(0.099)	-0.286***	(0.059)
(31)	Constant	0.304	(0.249)	-0.637**	(0.324)	0.966***	(0.176)
(32)	Other Defined Control Variables	YES	-	YES	-	YES	-
	Rho	-1.000		-0.655		1.000	

Notes: Standard errors were shown in parentheses. ***, **, * indicate significance at the 1%, 5% and 10% levels, respectively. Estimated coefficients of the number of children, parents' cohabitation with financial sharing, housing tenure, and birth cohort in the participation equation were not reported; yet they were available upon request. The base category was Japanese women with 'no high school diploma' for education, living in a 'small city' for metropolitan living, with ''other' occupations (O6)' for occupation, and with ''other' industries (I6)' for industry.

Table 4A - Heckman's Sample Selection Estimates of Wage Equation for Japanese Women All Ages: 1993-2014; Dependent Variable: Log Hourly Wage

	(1)		(2)		(3)		(4)		(5)	
	Cohort A		*Cohort B*		*Cohort C*		*Cohort D*		*Cohort E*	
Independent Variables	*Estimated Coefficient*	*Standard Error*	*Estimated Coefficient*	*Standard Error*	*Estimated Coefficient*	*Standard Error*	*Estimated Coefficient*	*Standard Error*	*Estimated Coefficient*	*Standard Error*
Outcome (=Wage) Equation										
(1) Part-Time Employment	-0.331***	(0.008)	-0.269***	(0.014)	-0.273***	(0.014)	-0.335***	(0.020)	-0.306***	(0.034)
(2) Fixed-Term Employment	-0.133***	(0.013)	-0.091***	(0.024)	-0.090***	(0.018)	-0.096***	(0.024)	-0.122***	(0.037)
(3) High School with Diploma (yes=1)	-0.028*	(0.014)	-0.058**	(0.026)	-0.016	(0.030)	-0.064*	(0.039)	-0.047	(0.073)
(4) Technical or Trade School (yes=1)	0.031**	(0.016)	0.027	(0.029)	0.022	(0.033)	0.031	(0.042)	0.058	(0.085)
(5) Associate Degree (yes=1) (E4)	0.028*	(0.015)	0.039	(0.027)	0.021	(0.031)	0.123***	(0.044)	-0.014	(0.084)
(6) At least Bachelor's Degree (yes=1)	0.212***	(0.017)	0.212***	(0.030)	0.206***	(0.033)	0.172***	(0.045)	0.104	(0.099)
(7) Experience	-0.010***	(0.003)	-0.007	(0.008)	0.014*	(0.007)	0.092***	(0.013)	0.047	(0.032)
(8) Experience Squared	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)	-0.004***	(0.001)	-0.002	(0.002)
(9) Age	0.042***	(0.004)	0.047***	(0.015)	0.070***	(0.021)	-0.058	(0.058)	-0.353	(0.290)
(10) Age Squared	-0.001***	(0.000)	-0.001***	(0.000)	-0.001***	(0.000)	0.001	(0.001)	0.007	(0.005)
(11) Metropolitan Living (Big City)	0.149***	(0.010)	0.142***	(0.020)	0.101***	(0.020)	0.233***	(0.031)	0.201***	(0.050)
(12) Semi-Metropolitan Living (Medium City)	0.036***	(0.009)	0.056***	(0.019)	-0.006	(0.018)	0.171***	(0.029)	0.125***	(0.047)
(13) Constant	6.081***	(0.089)	6.142***	(0.249)	5.536***	(0.331)	6.631***	(0.835)	11.216***	(3.844)
(14) Occupation and Industry	YES	-	YES	-	YES	-	YES	-	YES	-
lambda	-0.041*	(0.023)	-0.110**	(0.054)	0.085*	(0.046)	0.314***	(0.060)	0.202	(0.133)

Participation Equation										
(15) High School with Diploma (yes=1) (E2)	0.095**	(0.047)	-0.024	(0.092)	0.104	(0.086)	0.250**	(0.123)	0.535*	(0.280)
(16) Technical or Trade School (yes=1) (E3)	0.092*	(0.051)	0.080	(0.104)	0.277***	(0.095)	0.593***	(0.132)	0.910***	(0.294)
(17) Associate Degree (yes=1) (E4)	0.084*	(0.051)	0.102	(0.098)	0.201**	(0.090)	0.416***	(0.135)	0.771**	(0.302)
(18) At least Bachelor's Degree (yes=1) (E5)	0.181***	(0.057)	0.192*	(0.102)	0.324***	(0.092)	0.743***	(0.128)	1.353***	(0.285)
(19) Experience	0.111***	(0.002)	0.149***	(0.005)	0.141***	(0.004)	0.201***	(0.007)	0.361***	(0.021)
(20) Age	0.050***	(0.002)	0.053***	(0.006)	-0.028***	(0.006)	-0.027**	(0.012)	-0.138***	(0.038)
(21) Marital Status (married: yes=1)	-0.540***	(0.044)	-0.117	(0.082)	-0.505***	(0.062)	-0.638***	(0.088)	-0.229	(0.191)
(22) Children (1)	-0.521***	(0.048)	-0.637***	(0.087)	-0.316***	(0.064)	-0.301***	(0.088)	-0.443	(0.202)
(23) Children (2)	-0.783***	(0.045)	-0.765***	(0.087)	-0.261***	(0.064)	0.056	(0.096)	0.165	(0.229)
(24) Children (3 or more)	-0.794***	(0.048)	-1.023***	(0.100)	-0.170**	(0.081)	0.400***	(0.132)	0.248	(0.325)
(25) Metropolitan Living (Big City)	0.000	(0.038)	-0.124	(0.089)	-0.095	(0.073)	0.076	(0.100)	0.223	(0.238)
(26) Semi-Metropolitan Living (Medium City)	-0.085**	(0.033)	-0.005	(0.081)	-0.066	(0.068)	0.081	(0.092)	0.163	(0.226)
(27) Constant	-1.742***	(0.084)	-1.773***	(0.198)	0.575***	(0.193)	-0.163	(0.359)	2.222**	(1.013)
(28) Other Defined Control Variables	YES	-	YES	-	YES	-	YES	-	YES	-
Rho	-0.108	-	-0.292	-	0.224	-	0.773	-	0.533	-

Notes: Standard errors were shown in parentheses. ***, **, * indicate significance at the 1%, 5% and 10% levels, respectively. Estimated coefficients of occupations and industry (in the outcome (wage) equation) and parents' cohabitation with financial sharing and housing tenure (in the participation equation) were not reported; yet they were available upon request.

Table 4B - Heckman's Sample Selection Estimates of Wage Equation for Japanese Women Aged 24-29: 1993-2014; Dependent Variable: Log Hourly Wage

	(1)		*(2)*		*(3)*		*(4)*		*(5)*	
	Cohort A		*Cohort B*		*Cohort C*		*Cohort D*		*Cohort E*	
Independent Variables	*Estimated Coefficient*	*Standard Error*	*Estimated Coefficient*	*Standard Error*	*Estimated Coefficient*	*Standard Error*	*Estimated Coefficient*	*Standard Error*	*Estimated Coefficient*	*Standard Error*
Outcome (=Wage) Equation										
(1) Part-Time Employment	-0.199***	(0.023)	-0.275***	(0.023)	-0.239***	(0.022)	-0.296***	(0.025)	-0.306***	(0.034)
(2) Fixed-Term Employment	-0.070	(0.043)	-0.114**	(0.049)	-0.036	(0.029)	-0.094***	(0.030)	-0.122***	(0.037)
(3) High School with Diploma (yes=1)	-0.014	(0.041)	-0.024	(0.044)	0.011	(0.049)	-0.031	(0.048)	-0.047	(0.073)
(4) Technical or Trade School (yes=1)	0.076*	(0.045)	0.001	(0.049)	-0.010	(0.053)	0.059	(0.053)	0.058	(0.085)
(5) Associate Degree (yes=1)	0.097**	(0.044)	0.081*	(0.046)	0.011	(0.052)	0.191***	(0.056)	-0.014	(0.084)
(6) At least Bachelor's Degree (yes=1)	0.229***	(0.047)	0.218***	(0.049)	0.156***	(0.054)	0.207***	(0.057)	0.104	(0.099)
(7) Experience	-0.001	(0.006)	0.005	(0.008)	-0.021*	(0.012)	0.047***	(0.017)	0.047	(0.032)
(8) Experience Squared	0.000	(0.000)	0.000	(0.000)	0.001**	(0.000)	-0.001*	(0.001)	-0.002	(0.002)
(9) Age	0.299	(0.203)	0.336	(0.221)	0.082	(0.208)	0.078	(0.207)	-0.353	(0.291)
(10) Age Squared	-0.005	(0.004)	-0.006	(0.004)	-0.001	(0.004)	-0.002	(0.004)	0.007	(0.005)
(11) Metropolitan Living (Big City)	0.098***	(0.027)	0.097***	(0.032)	0.147***	(0.028)	0.232***	(0.036)	0.201***	(0.050)
(12) Semi-Metropolitan Living (Medium City)	0.037	(0.024)	0.050*	(0.028)	0.036	(0.025)	0.160***	(0.034)	0.125***	(0.047)
(13) Constant	2.262	(2.720)	2.249	(2.954)	5.603**	(2.793)	5.031*	(2.764)	11.216***	(3.844)
(14) Occupation and Industry	YES	-	YES	-	YES	-	YES	-	YES	-
lambda	-0.115***	(0.037)	-0.015	(0.050)	-0.064	(0.060)	0.200***	(0.069)	0.202	(0.133)

Participation Equation										
(15) High School with Diploma (yes=1) (E2)	-0.004	(0.109)	-0.094	(0.145)	0.108	(0.156)	0.201	(0.168)	0.535*	(0.280)
(16) Technical or Trade School (yes=1) (E3)	-0.011	(0.127)	-0.058	(0.169)	0.299*	(0.175)	0.591***	(0.180)	0.910***	(0.294)
(17) Associate Degree (yes=1) (E4)	0.049	(0.127)	-0.019	(0.158)	0.173	(0.168)	0.469**	(0.189)	0.771**	(0.302)
(18) At least Bachelor's Degree (yes=1) (E5)	0.251*	(0.141)	-0.177	(0.164)	0.376**	(0.172)	0.839***	(0.177)	1.353***	(0.285)
(19) Experience	0.096***	(0.005)	0.111***	(0.007)	0.189***	(0.008)	0.241***	(0.011)	0.361***	(0.021)
(20) Age	0.001	(0.022)	0.137***	(0.027)	0.015	(0.026)	-0.127***	(0.026)	-0.138***	(0.038)
(21) Marital Status (married: yes=1)	-0.878***	(0.103)	-0.146	(0.126)	-0.307**	(0.125)	-0.557***	(0.113)	-0.229	(0.191)
(22) Children (1)	-0.657***	(0.092)	-1.080***	(0.126)	-0.713***	(0.128)	-0.349***	(0.122)	-0.443**	(0.202)
(23) Children (2)	-0.834***	(0.100)	-1.296***	(0.138)	-0.801***	(0.132)	0.000	(0.133)	0.165	(0.229)
(24) Children (3 or more)	-0.826***	(0.154)	-1.610***	(0.206)	-0.844***	(0.206)	0.175	(0.200)	0.248	(0.325)
(25) Metropolitan Living (Big City)	-0.030	(0.097)	-0.166	(0.127)	-0.144	(0.127)	0.079	(0.137)	0.223	(0.238)
(26) Semi-Metropolitan Living (Medium City)	-0.157*	(0.082)	-0.041	(0.114)	-0.024	(0.113)	0.129	(0.127)	0.163	(0.226)
(27) Constant	0.339	(0.583)	-3.365***	(0.729)	-0.706	(0.697)	2.190***	(0.706)	2.222**	(1.013)
(28) Other Defined Control Variables	YES	-	YES	-	YES	-	YES	-	YES	-
Rho	-0.317	-	-0.043	-	-0.176	-	0.563	-	0.533	-

Notes: Standard errors were shown in parentheses. ***, **, * indicate significance at the 1%, 5% and 10% levels, respectively. Estimated coefficients of occupations and industry (in the outcome (wage) equation) and parents' cohabitation with financial sharing and housing tenure (in the participation equation) were not reported; yet they were available upon request.

Appendices

Appendix A1 - Initial Data Observations by Birth Cohort: 1993-2014

Panel #	*Year*	*Age*	*Total*	*Cohort*	*Obs*	*Cohort*	*Obs*	*Cohort*	*Obs*	*Cohort*	*Obs*	*Cohort*	*Obs*
1	1993	24-34	1500	A	1500								
2	1994	25-35	1415	A	1415								
3	1995	26-36	1341	A	1341								
4	1996	27-37	1289	A	1289								
5	1997	24-38	1749	A	1249	B	500						
6	1998	25-39	1628	A	1193	B	435						
7	1999	26-40	1537	A	1131	B	406						
8	2000	27-41	1481	A	1098	B	383						
9	2001	28-42	1421	A	1057	B	364						
10	2002	29-43	1373	A	1030	B	343						
11	2003	24-44	2139	A	980	B	323	C	836				
12	2004	25-45	1980	A	944	B	312	C	724				
13	2005	26-46	1870	A	904	B	292	C	674				
14	2006	27-47	1774	A	875	B	278	C	621				
15	2007	28-48	1706	A	847	B	271	C	588				
16	2008	24-49	2284	A	828	B	260	C	560	D	636		
17	2009	25-50	2168	A	799	B	255	C	541	D	573		
18	2010	24-51	2089	A	778	B	246	C	522	D	543		
19	2011	27-52	2024	A	765	B	243	C	507	D	509		
20	2012	28-53	1966	A	750	B	234	C	496	D	486		
21	2013	24-54	2550	A	735	B	231	C	480	D	456	E	648
22	2014	25-55	2391	A	704	B	222	C	462	D	436	E	567
All	**1993-2014**	**24-55**	**39675**	**Cohort A**	**22212**	**Cohort B**	**5598**	**Cohort C**	**7011**	**Cohort D**	**3639**	**Cohort E**	**1215**
Born Year	**1959-1989**	**-**	**-**	**1959-1969**	**-**	**1970-1973**	**-**	**1974-1979**	**-**	**1980-1984**	**-**	**1985-1989**	**-**
Age	**-**	**24-55**	**-**	**24-55**	**-**	**24-44**	**-**	**24-40**	**-**	**24-34**	**-**	**24-29**	**-**

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The Impact of Trade Unions on Work Related Training in Australia

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Abstract

This paper uses data from the Household, Income and Labour Dynamics Survey in Australia (2009-2014) to examine the role played by unions in workplace training. We focus on the incidence, intensity, transferability of training, as well as associated wage effects. We find that there is some evidence that unions have a positive effect on the incidence and transferability of training. We find no evidence of a union effect on training intensity. We also find that unions influence wage growth in a way that is consistent with the view that unions trade off wage growth for training opportunities. Our results are not consistent with the predicted role on unions in the standard Becker model. They are consistent with predictions about union influence in imperfectly competitive labour markets, or with the idea that unions directly negotiate better training opportunities.

Keywords: Union training effects, training incidence, training intensity, transferable skills, HILDA.
JEL Classification numbers: J01, J51, J24

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1. Introduction

Endogenous growth theory gives investment in human capital a central role in the growth performance of modern economies (Romer, 1990). Workplace training plays an important role in this human capital formation and is crucial in allowing workers to acquire the new skills required to adapt to changes in tastes and technology. There is a significant international literature investigating the effect of unions on workplace training. Despite its importance, research into the effects of unions on work related training in Australia is limited. This is mainly due to data limitations. The paper attempts to extend this small Australian literature. The paper has the following structure. In the next section the theoretical and empirical literature on the effects of unions on workplace training is reviewed. In section 3 the data limitations mentioned above are discussed in detail. We deal with these by using information on collective agreements to proxy union-covered and information on individual contracts to proxy union-non-covered. The section contains a justification for this approach as well as a discussion of its limitations. Section 4 discusses our data and presents some descriptive statistics. In section 5 the empirical approach is outlined as are the results. We find some evidence that unions have a positive effect on the incidence of workplace training and may trade-off wages to achieve this. In section 6 some concluding remarks are made.

2. Literature review

2.1 Review of the theoretical literature

In this section we review the theoretical and empirical literature on union effects on workplace training. The key issues are whether or not the labour market is viewed as competitive or non-competitive, and whether unions effect training directly through bargaining or indirectly via wages.

2.2 Indirect effects via wages in perfectly competitive labour market

In a perfectly competitive labour market workers are paid their marginal product and the firm extracts no rent out of the employment relationship. General training provides skills that are equally valuable to all employers in the relevant market. As these skills are transferable between firms, firms cannot finance this training since they cannot be certain of recouping the costs. General training therefore needs to be financed by the worker. This may occur by the worker accepting a low wage during the training period. This requires wages to be flexible, and hence able to be lowered to reflect the lower marginal product during the training period. It also requires that workers are not credit constrained, and are therefore able to survive during the low pay training period. Under these conditions workers will invest optimally in general training (Becker, 1962).

It is well known that trade unions tend to compress wages by raising the wages of the lowest paid, and restraining wages at the top of the distribution (Freeman and Medoff, 1984). Whereas under perfect competition the wage-skill profile and the productivity-skill profile coincide, wage compression implies that the wage-skill profile is flatter than the productivity-skill profile. At low skill levels the wage-skill profile is above the productivity-skill profile. At high skill levels the wage-skill profile is below the productivity-skill profile. A compressed wage structure in an otherwise competitive labour market will result in inefficiently low investment in general training. This is so since it prevents workers from accepting low wages during training and also inhibits their ability to reap the benefits in the form of higher wages in the post-training period. Thus clear predictions emerge from this model. Trade unions will be associated with less general training and lower returns to any general training that occurs.

2.3 Indirect effects via wages in an imperfectly competitive labour market

Recent research has relaxed the assumption of perfect competition in the labour market, and as a result generated quite different predictions in relation to the role of unions in workplace training outcomes. Firms with monopsonistic power in the labour market are able to extract rents from the employment relationship by paying wages that are below marginal product (Manning, 2005). The wage-skill profile lies below the productivity-skill profile by a constant amount equal to the rent. In principle this rent could be used to finance general training. However in a series of papers Acemoglu and Pischke (1999a, 1999b) have demonstrated that the existence of rent *per se* is not sufficient for the firm to be willing to pay for general training. What is required is rent and a compressed wage structure. If the rent the firm can earn from trained and untrained workers is the same, then the firm would prefer untrained workers since they get the same rent while incurring zero training costs. But if the wage structure is compressed in a monopsonistic labour market, the wage-skill profile lies below the productivity-skill profile and the gap between the two profiles (the rent) increases with skill level. In this case post-training productivity will increase at a faster rate than do post-training wages, and the firm may make more rent (net of training costs) from trained than untrained workers. Therefore, if unions compress wage structures, the prediction is that they may facilitate firm financed general training. [2] The prediction for returns to training is ambiguous. Wage returns to general training will be lower as a result of the union induced wage compression. This lowers the return at the higher end of the wage distribution that trained workers receive compared to what they would get under a less compressed wage structure. On the other hand wage returns will be higher as a result of the greater investment in training that results from the compressed wage structure.

2 In the literature numerous sources of wage compression are modelled, not just unions. Pischke (2005) points out that wage compression emerges naturally from the operation of imperfectly competitive labour markets; asymmetric information, search and bargaining can all give rise to wage compression. He also points out that it can emerge from institutional considerations like minimum wages and unions. See Acemoglu and Pischke (1999a and 1999b) for more detail about non-union based explanations for wage compression and how these impact on training.

Another line of research focuses on the fact that monopsonistic firms financing general training face poaching and quitting externalities. These externalities effect the choices the firms make and lead to socially sub-optimal levels of training. The sub-optimal outcomes result from the fact that these externalities make a firm's marginal private benefit from the training it provides less than the marginal social benefit. From the worker's perspective the monopsony power of the firm means wages are below marginal product. This reduces the worker's incentive to invest in training. But any training the worker has is general and so for any trained worker there is an incentive to 'quit' and work for an outside firm who may pay a wage closer to their post-training marginal product. Moreover outside firms have the incentive to seek opportunities to 'poach' trained workers since they avoid the training costs. The presence of these quitting and poaching externalities leads to an inefficiently low level of training. The literature identifies two scenarios in which unions may help improve these outcomes. First, an industry wide union can move outcomes to the social optimum by setting industry wide wages and training opportunities in a way to maximise the utility of a representative worker. In doing so the union internalises the externality and may produce the socially optimal outcome (Booth, Francesconi and Zoega, 2002). Second, a firm level union may also lead to more training by using its power to increase the relative wages of its members and therefore deter inefficient quits (Booth and Chaterji, 2008; Booth, Francesconi and Zoega, 2002). The predictions from this line of research are more training and higher returns to training in unionised environments.

2.3 Bargaining over the compensation package

A more direct role for unions to influence training outcomes comes through union-firm bargaining over wages and conditions. Most models of union behaviour, such as the monopoly model and the efficient bargaining model, employ a union utility function that has both wages and employment as arguments (for a definitive survey of the trade union literature see Booth, 1995). In other words the union is interested in both the wage and employment prospects of its members. One way in which employment prospects can be fostered is through training to maintain and enhance skills. The testable prediction to come from this hypothesis is that union-covered firms will provide more training and better returns to training than will similar non-union-covered firms. This will be especially so if the firm operates in non-competitive product markets where strong unions can extract some of the surplus in the form of better wages and training. If the product market is more competitive we get a variation in this hypothesis. Unions may achieve better training outcomes by trading-off wage growth for training, which will nevertheless improve the longer term wage and employment prospects of union-covered workers (Booth, Francesconi and Zoega, 2003).

Green, Machin and Wilkinson (1996) have pointed out that such workforce stability in turn provides an incentive for firms to invest in training workers because they are more likely to get the opportunity to earn a return on these training expenditures. Unions in the UK (Green, Machin and Wilkinson, 1996) and Australia (Cooney, 2012) have begun to show a greater interest in securing training opportunities for their members often through provisions in collective agreements.

2.4 Review of the empirical literature

The evidence from the international literature is mixed. Using USA data from the Panel Survey of Income Dynamics (PSID) for white male heads of households for the years 1976 and 1978, Mincer (1993) found a negative and statistically significant relationship between union membership and the length of time it took an employee to become fully trained. Mincer acknowledged that this measure of training, while the best available in the PSID, is far from ideal. He nevertheless interpreted this result as implying that unions reduced the amount of training completed within any given time period. Barron, Black and Loewenstein (1987) analysed employer level data from the USA Employment Opportunity Pilot Project. They found a negative relationship between the union variable and the incidence of training. The estimated effect was statistically insignificant making this evidence weak. A study using 1997 data from the Canadian Adult Education and Training Survey found a statistically significant negative relationship between being a union member and training (Green and Lemieux, 2007). These studies offer support for the predictions coming from Becker's model.

Other studies support alternative views. Research for the UK tends to find that unions have a positive impact on training probability and, when studied, also a positive impact on training related wage outcomes. For instance Booth, Francesconi and Zoega (2003), using the British Household Panel Survey from 1991-96 find strong evidence that union coverage at the workplace is positively associated with both the incidence and intensity of workplace training. Moreover they also find that both wage levels and growth rates are positively impacted by union coverage at the workplace. In an earlier UK study Booth (1991) using the British Survey of Social Attitudes from 1987 also found evidence of a positive relationship between workplace training and the presence of unions at the workplace. Greenhalgh and Mavrotas (1994) used the Individual Study from the Training in Britain survey and found a positive relationship between trade union membership and training. In addition, Green, Machin and Wilkinson (1996) drew on both individual-level data – the Autumn 1993 Quarterly Labour Force Survey – and establishment-level data – the 1991 Employers Manpower and Skills Practices Survey and examined the relationship between union recognition in the workplace and the incidence of training and the intensity of training. They found that both measures of training were strongly and positively related to union recognition in the workplace.

Studies finding a positive relationship between unions and training in the USA include Lynch (1992), Veum (1995) and Osterman (1995). Lynch (1992) and Veum (1995) using the National Longitudinal Survey of Youth, found that the probability of workplace training was positively related to the extent of union coverage at the workplace. These studies, based on young workers, may not be representative of the broader workforce. Osterman (1995) used establishment level USA data for non-managerial non-supervisory employees and found a positive relationship between union presence and training. These results from the UK, Canada and the USA tend to favour the imperfectly competitive theories, and or, the hypothesis that unions bargain directly for better training outcomes for their members.

The Australian evidence is limited and the results are mixed. Kennedy *et al.* (1994) used data from the Australian Workplace Industrial Relations Survey 1989-90

(AWIRS). AWIRS is a matched establishment individual data set which has measures of individual union membership as well as indicators of how 'active' the union is. Interestingly, Kennedy *et al*. find that while individual membership is insignificant, the 'active' union indicator had a positive and statistically significant impact on a number of training measures. On the other hand a later study using AWIRS 1995-96 found no statistically significant effects of either individual union membership or the presence of recognised unions at the workplace on whether workers received employer provided training (Almeida-Santos and Mumford 2004). Unfortunately AWIRS was discontinued after the 1995-96 wave and so cannot be used for more contemporary research.

More recently, Waddoups (2014) used cross-section data from the 2005 Survey of Education and Training (SET) to examine the relationship between individual union membership and the incidence, transferability between employers, and employee perceived efficacy of training. He found that union members were more likely to receive employer sponsored training, and that this training was more likely to improve job performance than was the case for non-union members. The transferability of skills generated in this training did not seem to be effected by union status. A limitation of studies based on cross-section data is that the nature of that data does not allow issues of heterogeneity and selectivity to be addressed, as it is reasonable to suppose such issues are relevant.

2.5 Summary comments on literature review

In sum, the literature presents a number of predictions about the effect of unions on the incidence, intensity and wage impacts of workplace training. Our data is not detailed enough to allow us to definitively distinguish between all of these approaches. Such a task would be made more complicated by the fact that several of these ideas could be at work simultaneously producing complicated patterns in the data. Our data does permit us to determine whether the patterns in the data support the predictions of Becker's model, or whether they support in broad terms the predictions of the alternatives. It is to this more limited goal that the paper makes a contribution. In the next section we attempt to justify our use of collective agreements as a proxy for union-covered, and individual contracts as a proxy for union-non-covered.

3. Unions, collective agreements and individual contracts in Australia

Exploring the relationship between unions and training is difficult in Australia because of the relative absence of data sets that provide information about unions and training at the workplace- or enterprise-level. The Australian Workplace and Industrial Relations Survey (AWIRS) was conducted in 1989-90 and 1995 before it was abandoned. This survey did provide workplace-level data on union presence at the workplaces, and also on how actively unions pursued their goals at the workplace (Wooden, 2001). Since then the only data available concerning union membership and training is individual-level cross-sectional data from the Australian Bureau of Statistics (ABS) such as the Survey of Education and Training or individual-level panel data from the Household, Income and Labour Dynamics in Australia (HILDA) survey. This individual-level data only

identifies whether an individual worker is, or is not, a union member. Under the Australia Human Rights Commission Act (1986) it is illegal to discriminate on the basis of trade union membership, and as such union negotiated wages and conditions at a workplace cannot be limited to only union members at the workplace. The same problem applies to attempts to identify union wage effects in Australia. This notwithstanding, union wage effects for Australia have been identified with the aid of an individual membership union indicator (see Cai and Waddoups, 2011; Nahm, Dobbie and MacMillan, 2017). There are a number of reasons advanced in the literature for why individual union membership might be associated with a union wage effect (see Nahm, Dobbie and MacMillan, 2017 for a discussion). However it is difficult to think of similar ways to justify linking individual union membership with access to union negotiated workplace training.[3]

As noted above, unions in the UK (Green, Machin and Wilkinson, 1996) and Australia (Cooney, 2012) have begun to show a greater interest in securing training opportunities for their members often through provisions in collective agreements. Therefore, one strategy for examining the impact of unions on training is to compare the training provided to workers whose terms and conditions of work are determined by a collective agreement with those whose terms and conditions of employment are determined by individual arrangements. Moreover, information about whether workers are employed under individual arrangement or a collective agreement is gathered in the HILDA survey. The effectiveness of this strategy in turn depends on whether collective agreements can be demonstrated to be a good proxy for union influence, something we discuss next.

In Australia, the terms and conditions of employment can be determined in four broad ways (i) by an award (ii) by a collective agreement (iii) by an individual arrangement and (iv) by owner managers of incorporated enterprises. Awards are determined by the Fair Work Commission typically after a period of consultation with the relevant employer and employee associations representing the firms and workers covered by the award.[4] Collective agreements are negotiated at the enterprise level, as opposed to the industry level, and involve the relevant employer and groups of employees typically represented by trade unions or other employee associations. Individual arrangements include individual contracts between an employer and an individual employee. While unions could theoretically negotiate an individual agreement on behalf of a member, it is unusual for this to occur because of the commitment of unions to collective agreement making. The last mode of wage-setting includes owner managers who largely unilaterally set their own terms and conditions of employment.

3 We note that Waddoups (2014) using Australian data from the 2005 wave of the Survey of Education and Training did find some evidence of a union training effect using individual union membership as the union identifier. No discussion of how such an effect could occur was provided.

4 The Fair Work Commission was established in 2009 and is the national or federal industrial relations tribunal created by the Fair Work Act (2009). Prior to this the tribunal was called the Australian Industrial Relations Commission.

The relative incidence of these different types of pay-setting methods for the period covered by this study are reported in Table 1. According to the table the proportion of employees covered by the different types of wage-setting has not changed much between 2010 and 2014. The only small change is an increase in award coverage and a fall in the proportion of all employees covered by collective agreements. Specifically, in 2010, 43.5 per cent of employees had their terms and conditions of employment determined by a collective agreement and by 2014 coverage had fallen to 41.4 per cent. By contrast, the proportion of workers covered by awards increased from 15.2 per cent to 18.8 per cent over the same period.

Table 1: The Percentage of All Employees Covered by Different Pay-Setting Methods

	All employees		
Method of pay-setting	*2010 (%)*	*2012 (%)*	*2014(%)*
Award	15.2	16.1	18.8
Collective Agreement (Federally Registered)	31.5	32.0	32.6
Collective Agreement (State Registered)	11.9	9.8	8.6
Collective Agreement (Unregistered)	0.1	0.2	0.2
Individual Agreement (Registered and Unregistered)	37.3	38.7	36.4
Owner/Managers of Incorporated Enterprises	4.1	3.3	3.4

Source: Table adapted from the Department of Employment's Trends in Federal Enterprise Bargaining September Quarter 2016. Data originally from ABS, Employee Earnings and Hours, Cat. No. 6306.0, May 2010, May 2012, May 2014 and unpublished data.

In terms of the current study, the two types of pay setting of interest are collective agreements and individual arrangements. When investigating the training experiences of workers, those covered by awards are not analysed because awards do not stipulate training opportunities. In addition, owner managers by definition are not represented by unions and this group is also not analysed. Workers covered by individual arrangements are included because these arrangements are typically negotiated without unions. Therefore, these workers can be regarded as non-union and their training opportunities not due to union influence. By contrast, if collective agreements are typically negotiated by unions, or more precisely the overwhelming majority of workers covered by collective agreements are covered by union negotiated agreements then the training opportunities of workers under collective agreements can be assumed to be due to union influence. Further evidence needs to be considered to determine if this assumption is reasonable.

From 1991 in Australia collective bargaining at the enterprise or workplace level became the dominant form of collective agreement making (Gahan and Pekarek, 2012). Table 2 shows the relative importance of registered union negotiated collective agreements compared to non-union collective agreements over the period 2009 to 2015 that were Federally registered. Federally registered collective agreements represent more than 75 per cent of all collective agreements. A union versus non-union breakdown of State registered agreements is not available, so Federal agreements are relied on here. In terms of the number of agreements, the proportion that are union agreements has increased from 42 per cent in 2009 to 62 per cent in 2015. At the same time the proportion of agreements that are non-union has decreased from 58 per cent to 38 per cent.[5] More informatively, union collective agreements cover a much greater proportion of workers covered by collective agreements and this proportion has been increasing overtime from 75 per cent in 2009 to 89 per cent in 2015 (DEEWR, 2010). By contrast, the coverage of non-union agreements has fallen from 25 per cent in 2009 to 11 per cent in 2015 (DEEWR, 2010). This data clearly indicates that the overwhelming number of workers covered by collective agreements are covered by union agreements. In addition, over the period 2007 to 2009, 80 per cent of union collective agreements and 76 per cent of workers covered by union collective agreements had one or more training provisions in the agreement, whereas the figures for non-union agreements were much lower, 52 per cent and 58 per cent respectively. Overall, these statistics indicate that for the clear majority of workers whose terms and conditions of work are set by a collective agreement, they are covered by a union collective agreement. Furthermore, union collective agreements are more likely to include training provisions than non-union agreements. Consequently, in this study the training experiences of workers covered by collective agreements are assumed to be due to union influence and the training experiences of workers employed on individual agreements are assumed to be not due to union influence.

5 The Department of Employment notes that a degree of caution should be taken in interpreting the breakdown of agreements as union or non-union because under the Fair Work Act 2009 ‘it is possible for a union to have been involved in bargaining for an agreement and then not be covered by the approved agreement. It is also possible for a union to be covered by an agreement because they were a bargaining representative, even if they did not take an active role in the negotiations.’ (Department of Employment, 2016, p. 43). Notwithstanding this caveat, analysis of the union and non-union breakdown of collective agreements approved during 2008 – the year prior to the Fair Work Act 2009 – showed very similar proportions to 2009 in terms of the number of agreements (46 per cent union and 54 per cent non-union) and the number of workers covered (78 per cent union and 22 per cent non-union) (DEEWR, 2010). Therefore, it would seem reasonable to take the figures on union and non-union agreements at face value for the period 2009 to 2014 while continuing to bear in mind the concern expressed by the Department of Employment.

Table 2: Federal Collective Agreements Current on the last day of the December Qtr each year by Union Coverage 2009 - 2015

	2009	*2011*	*2013*	*2015*
Union				
No. of CA	9,306	9,505	13,889	9,032
%	42	42	60	62
No. of Employees (1,000s)	1,541	2,128	2,312	2,032
%	75	83	88	89
Non-Union				
No. of CA	12,983	12,957	9,360	5,562
%	58	58	40	38
No. of Employees (1,000s)	518	437	304	241
%	25	17	12	11

Source: Data are taken from the Department of Employment Trends in Federal Enterprise Bargaining March Quarter 2012, June Quarter 2013 and September Quarter 2016.

4. Description of the Data

The data has been extracted from the Household, Income and Labour Dynamics in Australia (HILDA) survey, which is a household-based longitudinal survey covering a broad range of social and economic questions. All the members of the households that responded in the initial national probability sample formed the panel to be pursued in each subsequent wave (year). The present study analyses six waves from wave 9 (2009) to wave 14 (2014), bounded by the availability of key variables.[6]

The sample includes: male employees who are directly interviewed, full-time worker for the whole period, born in or after 1949, pay is set either by collective agreement (hereafter referred to as union covered) or individual agreement/contract (hereafter referred to as union non-covered). The decision to include only male full-time workers is consistent with other studies in this general area (see for instance, Booth, Francesconi and Zoega, 2003; Booth and Katic, 2011). The decision to focus on full-time employees is justified on the basis that part-time and casual employees by definition have less access to entitlements than full-time employees. Logically, it also follows that because part-time and casual employees are less attached to the firm, employers have less incentive to offer them training opportunities. The decision to include only males is designed to facilitate comparison with other key studies in the area, in particular, Booth *et al.* (2003) that also only considers male full-time employees. The analysis based on the changes in the union and training status, which will be explained later, requires data that are available for continuous waves. So although the panel could be unbalanced, the sample used is a balanced one that only includes those whose data are available for all six waves. The use of a balanced panel

6 The major variable that restricts the sample period is the variable used to create the union-coverage variable (the collective agreements variable). Although it is available from wave 8 (2008), the sample period starts from wave 9 because including only those individuals for whom all necessary variables are available from wave 8 reduces the sample size significantly.

also prevents the sample from being affected by other factors, such as discontinuation of employment or new entry, effects which are not explicitly analysed. This results in the sample of 3,966 observations consisting of 6 yearly observations across 661 individuals.

Table 3 shows training incidence and intensity, and average hourly wages by union coverage. According to the table, about 37 per cent of worker-years received work-related training, of which the average length was approximately 52 hours a year. The overall average real hourly wage rate is 39.75 dollars, with the average wage for those who had training ($40.45) being slightly (and insignificantly) higher than that for those without training ($39.34). The bottom panel of the table shows average wages in the year of training and the year before training. Although the average wage in the period of training ($41.25) is about 3 per cent higher than the average in the year before training ($39.96), the difference is statistically insignificant at 5 per cent. The latter remains true even if the sample is divided into union-covered and union non-covered.

Out of all 3,966 cases of wage setting, about 45 per cent were covered by union and 55 per cent were non-covered.[7] Those who are union-covered are more likely to receive training and to be trained more intensely, and tend to earn a lower wage on average than those non-covered ($37.76 versus $41.40), with the differences (–$3.64) being statistically significant at one per cent. The difference is more pronounced for those who received training (–$5.06) than for the non-trained (–$3.15)

The control variables used for the wage equations include: work experience (years) and its square, occupation tenure (years) and its square, firm tenure (years) and its square, regional unemployment rate (per cent); and dummies for marital status, disability, country of birth, change of occupation in the previous year, permanent employment, education levels, regions, occupations, industries, public sector, non-profit organisation, ranges of the size of company, and waves. The models for training incidence and training intensity include age in addition to all the control variables for the wage equations.

There is the potential for feedback relationships between wages and union coverage, between wages and training, and between training and union coverage (Booth, Francesconi and Zoega, 2003). The use of collective agreements and individual contracts as opposed to individual union membership should mitigate against this somewhat. While for some workers, working under a collective agreement or an individual contract may be the result of a choice, for many others it can more reasonably viewed as feature of the job rather than the result of an individual choice. Nevertheless the present study attempts to test for, and when necessary, deal with potential endogeneity. To that end the paper utilises the following two dummy variables as external instrumental variables to test for endogeneity of union coverage

7 Union density in Australia is currently around 17 per cent (ABS, cat, no.6310.0, 2015). Our decision to treat collective agreements as in effect union agreements therefore considerably overstates the numerical reach of unions in Australia. However, the reality of the Australian industrial relations system is that unions do have a reach that goes beyond density, i.e. union negotiated outcomes can and often do apply to unionists and non-unionists. Moreover 'threat' effects give additional amplification to union influence.

and training. The first instrumental variable is a dummy based on the response to a question that asks whether the respondent often or very often gets involved in, or encourages others to get involved in activities for a union, political party, or group that is for or against something. The second instrument is a dummy based on whether the respondent is dissatisfied with their current main job considering all things such as total pay and job security. When the variables are found to be endogenous, the same set of instrumental variables are used to control for the endogeneity in the control function approach to estimating the model. The sample statistics for the explanatory variables and instrumental variables are presented in Table A.1 in the appendix.

Table 3: Training and Wages by Union Coverage

	All Men	*Union Covered*	*Union Non-Covered*	*(Union – Non-union)*
Proportions (%)		45.34	54.66	(–9.32)
Training				
Incidence (%)	36.69	43.99	30.63	(13.36**)
Intensity given trained (hours)	52.24	59.45	43.65	(15.80**)
Hourly wages (A$)[a] – all	39.75	37.76	41.40	(–3.64**)
If trained	40.45	38.14	43.20	(–5.06**)
If non-trained	39.34	37.46	40.61	(–3.15**)
(Trained – Non-trained)	(1.11)	(0.68)	(2.59*)	
Pre-training & training-period wages (A$)				
Training-period	41.25	38.88	44.06	(–5.18**)
Pre-training	39.96	37.94	42.35	(–4.41**)
(Training-period – Pre-training)	(1.29) (3.23 %)	(0.94) (2.48 %)	(1.71) (4.04 %)	
No. of observations	3,966	1,798	2,168	

a: Nominal hourly wages are deflated with the consumer price index for all groups.
**: significant at 1 per cent. *: significant at 5 per cent.

5. Empirical results and discussion

5.1 Effects of union coverage on training incidence, Intensity and transferability

The model used to measure the effect of union coverage on the incidence of training is given by

$$r_{it} = 1[\alpha^r + \gamma^r U_{it} + \beta^{r\prime} X_{it} + v^r_i + e^r_{it} > 0] \qquad (1)$$

where r_{it} is 1 if individual i in year t receives work-related training and 0 otherwise, U_{it} is 1 if union covered and 0 otherwise, X_{it} is the vector of the control variables explained in the previous section, v^r_i is heterogeneity of individual i, e^r_{it} is the random error term that is assumed to follow the standardised normal distribution, α^r and γ^r are scalar coefficients, and β^r is the coefficient vector for X. The function

denoted by 1[.] is the index function taking on value 1 if the condition inside the square brackets is satisfied and 0 otherwise. Since it is widely accepted in the literature that variables like education are closely correlated with individual heterogeneity, estimating this model as a random-effects model is not appropriate. Estimating this as a fixed-effects probit model is also known to result in inconsistent estimates due to the incidental parameters problem when the number of time periods is small. We employ the Mundlak (1978) – Chamberlain (1980) device (Wooldridge, 2010, Ch. 15) where the heterogeneity term, v^r_i, is replaced by

$$v^r_i = \delta^{r'}\bar{X}_i + w^r_i \quad (2)$$

where $\bar{X}_i = \sum_{t=1}^{T} X_{it}$, i.e., within-group means, δ^r is the coefficient vector, and $w^r_i \sim N(0,\sigma_{wr}^2)$, which is uncorrelated with X_{it}.[8]

The first two columns of Table 4 report the pooled probit and the Mundlak-Chamberlain estimates of the partial effect of union-coverage on the probability of training. The two estimates are similar. The estimates imply that, when other characteristics remain unchanged, union-coverage increases the probability of training by 4-5 percentage points. The pooled probit estimate is significant at 5 per cent. The Mundlak-Chamberlain estimates are statistically significant at 10 per cent (p-value is actually 0.07). The null hypothesis that the group-mean variables are jointly unimportant is strongly rejected with a p-value of 0.003, implying that heterogeneity across individuals is significant. Given this test result, the pooled probit estimate is likely to be biased and hence the Mundlak-Chamberlain result is more reliable.[9] There has been concern in the literature about potential feedback effects between training and union coverage. Endogeneity of union coverage was tested, but the null of exogenous union coverage could not be rejected at the usual level of significance (with the p-value of 0.38).[10]

Our finding that unionists are 4-5 percentage points more likely to receive training is consistent with similar research from Waddoups (2014) and Booth, Francesconi and Zoega (2003). Waddoups (2014) found that male union members in Australia were 8.7 percentage points more likely to receive in-house general training, and 4.7 percentage points more likely to receive in-house or external work related training. Waddoups used cross-sectional data from the 2005 wave of SET and so

8 The within-group means of the dummy variables for union coverage, change of occupation and industries are not included in the heterogeneity equation due to lack of within-group variation for a large proportion of individuals.

9 Only the coefficients of interest are reported in Table 4. Full results for the Mundlak-Chamberlain estimates are reported in Appendix Table A2. For brevity all other Tables in the paper report only the coefficients of interest. Full results for all the regressions reported in this paper are available on request.

10 For this test, the reduced-form probit model (Mundlak-Chamberlain type) for union coverage is estimated using the two instrumental variables explained above and all the internal explanatory variables in (1) other than union coverage as the explanatory variables. The generalised-residual term obtained from this regression is then added to the model defined by (1) and (2), and the significance of the coefficient for the generalised residual term is tested to determine whether or not union coverage is endogenous.

was not able to control for heterogeneity and did not consider endogeneity. Booth, Francesconi and Zoega (2003) used the BHPS for the period 1991-1996. As such they were able to attempt to control for heterogeneity. They also did not consider endogeneity. Moreover unlike HILDA and SET, the BHPS has a variable indicating whether each respondent is in a workplace covered by a union or not. So their union indicator is closer to the ideal than either ours or that used by Waddoups. Booth, Francesconi and Zoega (2003) find that in a pooled cross-sectional model male employees are 9.2 percentage points more likely to receive training if they are union-covered. Once individual heterogeneity is controlled for using a fixed effects model the probability falls to 5.2 percentage points (and is just significant at 5 per cent). It is interesting that the results from Booth, Francesconi and Zoega (2003) and Waddoups (2014) are similar to ours. But caution should be exercised when making comparisons as the three studies each have significant differences in terms of how the union indicator is defined and the econometric methodology employed.

The effect of union coverage on training intensity is analysed using only those who received training. This renders selection into the sample non-random. The model for training intensity is thus defined as follows, taking account of non-random selection into the sample.

$$h_{it} = \alpha^h + \gamma^h U_{it} + \beta^{h\prime} X_{it} + v^h_i + e^h_{it} \qquad (3)$$

where h_{it} is the total length of training individual i received during year t (hours), and the other variables and the coefficients are similarly defined as before. The h_{it} is observed only if $r_{it} = 1$, the probability of which is determined by the reduced-form probit model given by

$$r_{it} = 1[\alpha^s + \gamma^s U_{it} + \beta^{s\prime} Z_{it} + v^s_i + e^s_{it} > 0]. \qquad (4)$$

The Z includes all the external and internal instrumental variables. The model is estimated by the Heckman's two-step method with heterogeneity being controlled by the Mundlak-Chamberlain device as explained above. Note that the device for equation (4) includes $\bar{Z}_i = \sum_{t=1}^{T} Z_{it}$, which includes the within-group means of X_{it} and the external instrumental variables. The middle two columns of Table 4 report the OLS and the Heckman estimates of the coefficients for union coverage. The two estimates are similar. The estimates imply that union coverage increases the length of training by about 9-12 hours, *ceteris paribus*, which is just over one day. The estimates in the present study are, however, statistically insignificant. We do suspect that the intensity variable could be subject to measurement error. While it is easy to remember if any training was undertaken in the previous twelve months (the incidence variable) remembering exactly how many days of training was undertaken might be more difficult. Having said that, our results for intensity are quite different from those of Booth, Francesconi and Zoega (2003). They estimated that union covered workers received a statistically significant 4.3 days more training per annum using a cross-sectional Tobit model, and 3 days more using a censored least absolute deviations

model. As a final point we note that union coverage was also tested for endogeneity in our intensity equation, the null of exogeneity could not be rejected (p-value of 0.21).

To measure the effect of unions on how much transferable training occurs the model defined by (1)-(2) is re-estimated using the observations where training occurred, after replacing the dependent variable with the binary variable representing transferability of training. Training is defined as transferable if the respondent answered 'to a great extent' or 'to a very great extent' to the question 'to what extent do you think you could use the new skills you have acquired from any of this training if you got a new job with a different employer?' The estimates of the coefficients for union coverage are reported in the last two columns of Table 4. They imply that, out of all those who received work-related training, union-covered workers are 7-8 percentage points more likely to receive transferable training than union-non-covered workers. The pooled-probit estimates and the Mundlak-Chamberlain estimates are significant at 10 per cent, with the Mundlak-Chamberlain estimate just failing to be significant at 5 per cent (p-value is 0.054). Union coverage was also found to be exogenous in this equation. Our results offer some evidence that union-coverage is associated with a greater likelihood of transferable/general training. This result is in contrast to Waddoups who found no effect of union membership on transferability. This may be a case where Waddoups' use of individual union membership mitigates against him being able to find any effect. We do note the point made by Waddoups (2014, p.760-61) that this 'transferable' variable is possibly subject to greater measurement error than incidence, and we would add for the same reason intensity. While incidence and intensity relate to things that have actually happened and are therefore in principle able to be remembered accurately, the nature of the transferability question is such that it is asking respondents about a counterfactual that has not happened.

In sum, the findings reported here suggest that unions increase the incidence of work related training and of transferable training. There is no evidence that unions increase the intensity of training. As such these results do not support the Becker model and may offer some evidence in support of the other approaches outlined.

Table 4: Effect of Union Coverage on Training Incidence and Intensity

	Training Incidence		*Training Intensity (given trained)*		*Transferable Training (given trained)*	
	Pooled Probit	*Mundlak-Chamberlain Probit*	*Pooled OLS (Trained only)*	*Mundlak-Chamberlain Heckman*	*Pooled Probit*	*Mundlak-Chamberlain Probit*
Effect of Union Coverage[b]	0.05* (0.02)[a]	0.04# (0.02)	9.10 (6.58)	11.53 (7.61)	0.07# (0.04)	0.08# (0.04)

a: Huber-White sandwich standard errors in parentheses.
b: Evaluated at the sample means.
*: significant at 5 per cent. # significant at 10 per cent

- Tests for the endogeneity of union coverage: the coefficient for the generalised residual term

Training incidence equation: z = 0.88 (p-value = 0.376)
Training intensity equation: z = –1.26 (p-value = 0.208)
Transferable training equation: z = –1.12 (p-value = 0.264)

5.2. Effects of union coverage and training on wages

5.2.1 Relationship in Levels

The model we employ to analyse the effects of union coverage and training on wages in levels is defined as

$$ln y_{it} = \beta_0 + \gamma_1 U_{it} + \gamma_2 T_{it} + \gamma_3 U_{it} \times T_{it} + \beta' X_{it} + v_i + e_{it} \tag{5}$$

where y_{it} is real hourly wage earned by individual i in year t (in dollars), U_{it} is 1 if union covered and 0 otherwise, and T_{it} is either the dummy variable taking on 1 if received training and 0 otherwise (incidence), or the length of training in hours (intensity). The other terms are as defined above, with the exception that X does not include age. Joint tests for endogeneity of the three variables associated with union coverage and training indicate that union coverage and training incidence are jointly endogenous (p-value being 0.005). The test statistic for joint endogeneity of union coverage and training length is insignificant at 5 per cent (with the p-value being 0.064). The endogeneity associated with union coverage and training is controlled for by including the residuals (generalised residuals when the variable is binary) from the reduced-form regressions for U, T and U×T in equation (5). This approach is referred to as the control-function (CF) approach.[11]

Table 5 reports the estimates of the coefficients for these three variables. In light of the endogeneity test results, the control-function fixed-effects (FE/CF) estimates are the most reliable in the case where training incidence is used, while the fixed-effects (FE) estimates are the most reliable in the case of training intensity. The training incidence equation indicates that while training and union coverage are not significant when entered separately, the interaction between these two variables is statistically significant and implies that the average wage for those who received

11 See, for example, Wooldridge (2010, Ch. 6) for more detailed explanation of this approach.

training while union-covered is higher than the average wage for union-non-covered employees who did not receive training by 18.9 per cent (if insignificant coefficients are interpreted as zeros).[12] This result supports the view that union-coverage mediates higher wage returns to training. This result is consistent with Booth, Francesconi and Zoega (2003, p.80) who found that union-covered trained workers earned 6 per cent more than non-union-covered non-trained workers.

It is important to note that the intensity equation includes only those workers who received training, and that in this case the variable 'training' measures training intensity in this equation. The results indicate that the intensity of training has no effect on wages (the variable 'training' is insignificant). This is not what would be expected and may be due to measurement error in this variable. Whereas respondents can reasonably be expected to be able to recall accurately whether they undertook any training in the previous twelve months (the 'incidence' question), they may have more difficulty accurately recalling the number of days spent in training in the previous twelve months. It should also be noted that while in Booth, Francesconi and Zoega, the intensity variable was positive and significant, it was numerically very small, implying little impact of variation in training intensity on wage levels (Booth, Francesconi and Zoega, 2003, p.80). Likewise the training union interaction variable reported in the intensity equation in Table 5 is also insignificant. The only significant variable is the union dummy. This result implies that, irrespective of training intensity, wages are lower for union-covered workers than for union-non-covered by 10.2 per cent on average, *ceteris paribus*.[13] Given that all the workers in this sample are involved in workplace training, this result could be viewed as evidence in favour of the wage compression model. The wage compression model suggests that the return to training may be lower for union-covered than for otherwise comparable union-non-covered workers.

Table 5: Effects of Union Coverage and Training on Log Wages in Levels

	Using Incidence			*Using Intensity*	
Variable	*Pooled OLS*	*FE*	*FE/CF*[b]	*Pooled OLS*	*FE*
Union	−0.025	−0.018	0.049	−0.014	−0.108*
	(0.018)[a]	(0.019)	(0.063)	(0.033)	(0.050)
Training	−0.005	−0.001	0.116	−0.000	−0.000
	(0.017)	(0.012)	(0.116)	(0.000)	(0.000)
Union*Training	0.005	−0.004	0.173*	0.000	0.000
	(0.022)	(0.016)	(0.087)	(0.000)	(0.000)

a: Huber/White sandwich standard errors in parentheses. b: Control-function fixed-effects model. Endogeneity of U, T and U×T has been controlled for. *: significant at 5 per cent.

* Joints test for endogeneity of union, training, and union×training.

Incidence: Chi-square(3) = 12.67 (p-value = 0.005)
Intensity: Chi-square(3) = 7.260 (p-value = 0.064)

12 $e^{0.173} - 1$.
13 $1 - e^{-0.108}$.

5.2.2 Relationship in changes without interactions

The above model in levels analyses instant effects of union coverage and training on wages. However, the effects may occur with a lag. Alternatively, wages may be effected by the transitions that can be made between various union and training statuses. To analyse such effects, the following model is estimated after generating the dummy variables representing how the statuses of union coverage and training can change:

$$\Delta ln y_{it} = \beta_0 + \sum_{j}^{3} \alpha_j \Delta U_{j,it} + \sum_{k}^{3 \text{ or } 5} \gamma_k \Delta T_{k,it} + \beta' \Delta X_{it} + \Delta e_{it} \quad (6)$$

where Δ denotes first difference over time (eg. $\Delta x_{it} = x_{it} - x_{i,t-1}$), U denotes union coverage status, and T denotes training. When T denotes training incidence, there are four status-changing modes for each of U and T: stay non-covered or untrained in both the previous and the current years (0), entry into union coverage or training (e), exit from union coverage or training (x), and stay covered or trained in both years (1). The ΔU_j's and ΔT_k's, where j and k are 0, e, x and 1, are dummy variables representing those modes for status changes. When T represents the number of hours of training, six modes of status change are defined as: stay untrained (0), entry into training (e), exit from training (x), trained in both years and the number of hours increased by more than 7 hours (1), trained in both years and the number of hours decreased by more than 7 hours (–), and trained in both years and the change in the number of hours is between –7 and 7 (s). The dummy variables representing the stay union non-covered (ΔU_0) and the stay untrained modes (ΔT_0) are excluded to avoid perfect collinearity. Note that the heterogeneity term disappears when all the variables are measured in changes over time. Similarly, the effect of any variable in X that is fixed over time cannot be measured and is hence excluded.

The models are estimated via the usual OLS method, with the standard errors computed using a robust estimator to account for possible non-spherical disturbances. The estimates of the coefficients for the union and training dummies are presented in Table 6. The results are similar regardless of whether training incidence or training intensity is used. All the coefficients for the training dummies are positive, meaning that receiving training in either year has a positive effect on wage growth (between 0.3 per cent for increasing intensity and 1.5 per cent for decreasing intensity). Union coverage, however, only has a positive effect when one exits from coverage. Compared with those who remain non-covered in both years, those who exit in the current year enjoy a higher wage growth rate by about 1.2 per cent ~ 1.3 per cent on average, *ceteris paribus*. On the other hand, those who are newly covered in the current year while non-covered in the previous year have a lower wage growth rate than that for those who remained non-covered in both years by 1.6 per cent. Average growth rate for those who stay covered in both years is lower than that for those who remain non-covered by 0.1 per cent. None of these estimates are, however, significant at the usual level of significance. Joint endogeneity of union and training dummy variables is tested and we fail to reject the null of their exogeneity for both models based on training incidence and training intensity (p-values being 0.60 and 0.81 respectively).

These results for training are similar to Booth, Francesconi and Zoega (2003) with the important qualification that in the latter study the estimates are statistically significant. The results for union status in Booth, Francesconi and Zoega (2003) are quite different from ours. In Booth, Francesconi and Zoega (2003) gaining union coverage is associated with statistically significant wage growth while losing union coverage leads to statistically significant reduction in wage growth. The fact that our results fail to attain statistical significance could be due to the fact that this model neglects what might be important interactions between union-coverage and training. The next model remedies this by considering all possible transitions and their interactions.

Table 6: Effects of Union Coverage and Training on Log Wages in Changes – without Interactionsa

Category	*Coeff.*	*Training Incidence*	*Training Intensity*
Union			
Entry	α_e	–0.016 (0.023)[b]	–0.016 (0.023)
Exit	α_x	0.012 (0.027)	0.013 (0.027)
Stay Covered	α_s	–0.001 (0.008)	–0.001 (0.008)
Training			
Entry	γ_e	0.007 (0.012)	0.007 (0.012)
Exit	γ_x	0.012 (0.012)	0.012 (0.012)
Stay Trained/Unchanged	γ_s	0.008 (0.010)	0.007 (0.017)
Increase Training	γ_+		0.003 (0.015)
Decrease Training	γ_-		0.015 (0.016)

a: The base category is stay non-covered and untrained. b: Huber/White sandwich standard errors in parentheses.

Joint test for endogeneity of union coverage and training dummies.
Incidence: Chi-square (8) = 6.42 (p-value = 0.600)
Intensity: Chi-square (10) = 6.09 (p-value = 0.808)

5.2.3 Relationship in changes with interactions

The following model also represents the relationship in changes but it includes interactions between changes in union coverage and changes in training.

$$\Delta ln y_{it} = \sum_{j}^{4}\sum_{k}^{4}\gamma_{jk}\left(\Delta U_{j,it} \times \Delta T_{k,it}\right) + \beta'\Delta X_{it} + \Delta e_{it} \qquad (7)$$

All the variables except ΔT for changes in training intensity are as defined above. To avoid close multicollinearity, the six categories of changes in training intensity are reduced to four categories by combining those for exit from training (ΔT_x), decrease in training intensity (ΔT_-), and no change in training intensity (ΔT_s) into one category, ΔT_x. The other three categories of change in training intensity are: remain untrained in both periods (ΔT_0), entry into training (ΔT_e), and trained in both years with an increase in length of training of more than 7 hours (ΔT_1). Consequently, sixteen dummy variables representing interactions between four union and four

training categories are included in the model without an overall intercept term. Their estimates and robust standard errors are reported in Table 7.

Again, the results based on training incidence and training intensity are fairly close to each other. According to the incidence-based result, the effects are statistically significant at 5per cent only when workers receive training in both years. However, the effects of remaining trained are opposite depending on whether one enters union coverage (negative) or exits from coverage (positive). The average wage for employees who receive training in both years grows by 19 per cent (γ_{x1}) per year when they exit from union coverage but it decreases by 18 per cent (γ_{e1}) when they enter union coverage, *ceteris paribus*.[14] According to the training intensity-based result, wages decrease by 38 per cent (γ_{e1}) on average when one changes from union-non-covered to covered while increasing the intensity of training. We consider this unrealistically large effect to be unreliable since it is based on a very small number of observations in this category. This result should be ignored. Joint tests on endogeneity of the union and training dummies for both the training incidence based model and the training intensity based model failed to reject the null hypothesis of exogeneity.

These results are again very different from those of Booth, Francesconi and Zoega (2003). The later study finds that gaining union coverage is associated with large statistically significant wage growth. Moreover the combination of union coverage and training produces significant wage growth. In our results gaining coverage is associated with reduced wage growth. It is not obvious whether this difference reflects something fundamentally different in the way unions impact on wages (including how they mediate training effects) in the two countries, or whether it also partly or wholly reflects the proxy we have used for union coverage. Our data does not permit further exploration of this issue.

14 $e^{0.177} - 1 = 0.194$, and $1 - e^{-0.202} = 0.183$. While the change rates calculated this way may not be much different from the coefficient values when the changes are small, the former can be significantly different from the latter when the changes are large as is the case here.

Table 7: Effects of Union Coverage and Training on Log Wages in Changes – Including Interactions

t–1		*t*			*Incidence*		*Intensity*	
Union	*Train*	*Union*	*Train*		*coeff.*	*(s.e.)*[a]	*coeff.*	*(s.e.)*
No	No	No	No	γ_{00}	–0.013	(0.047)	–0.020	(0.047)
		No	Yes	γ_{0e}	–0.013	(0.052)	–0.020	(0.052)
		Yes	No	γ_{e0}	–0.008	(0.053)	–0.015	(0.053)
		Yes	Yes	γ_{ee}	–0.027	(0.078)	–0.034	(0.078)
No	Yes	No	no[b]	γ_{0x}	0.005	(0.047)	–0.004	(0.047)
		No	yes[c]	γ_{01}	–0.010	(0.048)	–0.031	(0.050)
		Yes	no[b]	γ_{ex}	0.020	(0.086)	–0.010	(0.068)
		Yes	yes[c]	γ_{e1}	–0.202*	(0.098)	–0.472**	(0.171)
Yes	No	No	No	γ_{x0}	–0.042	(0.054)	–0.049	(0.054)
		No	Yes	γ_{xe}	–0.051	(0.089)	–0.057	(0.089)
		Yes	No	γ_{10}	–0.014	(0.048)	–0.021	(0.048)
		Yes	Yes	γ_{1e}	0.004	(0.049)	–0.003	(0.049)
Yes	Yes	No	no[b]	γ_{xx}	0.086	(0.119)	0.130	(0.090)
		No	yes[c]	γ_{x1}	0.177*	(0.078)	0.114	(0.077)
		Yes	no[b]	γ_{1x}	–0.018	(0.049)	–0.021	(0.047)
		Yes	yes[c]	γ_{11}	–0.005	(0.048)	–0.002	(0.052)

a: Huber/White sandwich standard errors in parentheses.
b: When training intensity is used, this category includes exit from training, trained in both years and the length decreasing by more than 7 hours, trained in both years and the length changing by between –7 hours ~ 7 hours.
c: When training intensity is used, this category represents trained in both years and the length increasing by more than 7 hours.
**: significant at 1 per cent. *: significant at 5 per cent.

* Joint tests for endogeneity of category dummies.

Incidence: Chi-square(16) = 13.529 (p-value = 0.634)
Intensity: Chi-square(16) = 24.852 (p-value = 0.072)

6. Conclusion

In this paper we add to the small but important literature exploring union effects on workplace training in Australia. Our point of departure is that a major limitation on such research in Australia is data related. We utilise an approach that allows us to avoid the need to use individual union membership as the union identifier. While it is true that in the related area of union wage effects, a union effect can be identified using individual union membership, we argue that it is more difficult to justify the use of such an approach in relation to training. Under Australia's Industrial Relations framework training opportunities, and any wage effects that flow from those opportunities, cannot be quarantined to only union members, nor is it obvious that there are other mechanisms through which such quarantining could occur.

We find that there is evidence that workers who are union-covered have a higher incidence of workplace training, and that that training is more likely to be in transferable skills. We find no evidence that being union-covered delivers more intensity in training outcomes. However we note again that our use of collective agreements to proxy union-covered will bias away from finding any union training effect. The actual effect is therefore likely to be greater than we have found. This is not consistent with the prediction of the Becker model based on otherwise perfectly competitive labour markets. It is consistent with the predictions from many of the alternative models.

When looking at all workers (those who train and those who do not) we find that the level of wages (equation 5, Table 5) is highest for those workers who are involved in training, but only when that training occurs in conjunction with being union-covered. This supports the view that when we look at all workers (those who train and those who don't train) unions mediate higher training returns for those who train compared to those who do not train. This is not consistent with Becker, but is consistent with many of the alternative models.

If we restrict the sample to include only workers who engage in workplace training, as we do in the intensity regression reported in Table 5, we find that there is a statistically significant inverse relationship between wage levels and being union-covered. In other words returns to training are lower for union-covered workers than they are for comparable union-non-covered workers engaged in training. Taken in conjunction with the result that union-covered workers get more training in transferable skills, this result is consistent with the wage compression model. It could also be consistent with the idea that unions may trade-off wages for better training opportunities.

We also looked at wage growth with two specifications, one that interacted all the union training transitions and one that did not have interactions. The fully interacted specification proved (equation 7, Table 7) to be the best and produced the conclusion that wage growth occurred for those who trained in both periods, and that it was positive when moving from union to non-union, and negative when moving from non-union to union. While this was at odds with the findings from Booth, Francesconi and Zoega (2003), it is consistent with the idea that for those workers who train, the returns to training are lower for the union covered than for comparable union non-covered workers. Again this offers some support for the wage compression model. It could also simply reflect the idea that union collective agreements trade-off wage growth for training opportunities in Australia.

Further research could explore whether union coverage versus non-union coverage varies by industry and skill level, and then whether any differences found are associated with differences in the incidence of training. Preliminary analysis of descriptive statistics (not reported here) found that some industries (education and public administration) had a much greater proportion of workers covered by a collective agreement than covered by an individual agreement. By contrast, the opposite pattern was found for industries associated with business services, recreation services and the arts. In addition, these descriptive statistics support the view that for the workers in our sample, union-covered tend to be about two years older, have less

formal education, to be slightly more concentrated in lower skilled occupations, but to have more general experience, firm tenure and occupational tenure, compared to their non-union covered counterparts. These differences may have implications for training requirements of these workers. However without a more detailed analysis it is not obvious what these different requirements might be. Both data and space limitations mean that this analysis cannot be pursued further in this paper. It will be subject to future research.[15]

In sum, the results reported in this paper offer little support for the predictions of the Becker model. They do offer support for some of the alternative lines of inquiry, although our data do not permit us to say much more than this. We can say that our results do not support the view that unions have an adverse effect on workplace training outcomes. On the contrary our results, which are probably underestimates of the true effect, suggest that unions have a positive impact in this important area. Further research with better data would be invaluable.

15 We would like to thank an anonymous referee for pointing out this potential line of inquiry.

Appendix

Table A1: Descriptive Statistics of the Variables[a]

Variable	*Mean*	*S.D.*	*Variable*	*Mean*	*S.D.*
Age[b]	41.13	10.39	Industry		
Married/de facto	0.82	0.38	Primary	0.01	0.09
Disability	0.13	0.33	Blue collar	0.35	0.48
Country of birth			Wholesale/transp.	0.14	0.34
Australia	0.83	0.38	Retail	0.04	0.19
Other English	0.09	0.29	Hospitality	0.02	0.12
Non-English	0.09	0.28	Business services	0.11	0.31
Changed occupation	0.10	0.30	Government	0.12	0.33
Permanent	0.91	0.28	Education	0.06	0.23
Public sector	0.26	0.44	Health/community	0.03	0.17
Non-profit org.	0.04	0.19	Recreation/other	0.14	0.35
Education			Firm size		
Tertiary	0.37	0.48	< 20	0.11	0.31
Adv. Dip & Dip.	0.11	0.31	20–99	0.14	0.35
Cert. III or IV	0.29	0.45	100–499	0.18	0.39
Year 12	0.13	0.34	500–999	0.09	0.29
Year 11 or below	0.11	0.31	1,000–4,999	0.18	0.38
Work experience[b]	22.29	10.77	≥ 5,000	0.30	0.46
Occupation tenure[b]	10.93	9.37	Region		
Firm tenure[b]	9.25	8.67	Sydney	0.17	0.38
Occupation			Other NSW	0.10	0.30
Manager	0.24	0.43	Melbourne	0.22	0.41
Professional	0.28	0.45	Other VIC	0.05	0.22
Technician/Traders	0.18	0.39	Brisbane	0.11	0.32
Com. & pers. services	0.04	0.19	Other QLD	0.10	0.30
Clerical & admin.	0.08	0.28	Adelaide	0.06	0.23
Sales	0.03	0.18	Other SA	0.02	0.15
Machinery operator	0.10	0.30	Perth	0.07	0.26
Labourer	0.04	0.20	Other WA	0.01	0.11
Unemployment rate[c]	5.35	0.85	TAS	0.03	0.16
External IVs			NT	0.01	0.09
Political activity	0.07	0.25	ACT	0.05	0.22
Dissatisfied with job	0.08	0.27			

a: Proportions unless indicated otherwise.
b: Years
c: per cent

Table A2: Union Effects on Training Incidence and Intensity[a,b,c]

	Training Incidence (Mundlak-Chamberlain Probit)	*Training Intensity (Mundlak-Chamberlain Heckman)*	*Transferable Training Incidence (Mundlak-Chamberlain Probit)*
	Marginal Effect on Probability at Means	*Marginal Effect on Number of Hours*	*Marginal Effect on Probability at Means*
Union	0.043 (0.024)#	11.531 (7.608)	0.083 (0.043)#
Experience[c,d]	–0.087 (0.113)	–40.055 (33.538)	–0.026 (0.215)
Occupation tenure[c,d]	0.005 (0.002)*	0.381 (0.679)	–0.002 (0.004)
Job tenure[c,d]	–0.000 (0.003)	0.288 (0.887)	0.004 (0.006)
Age	0.002 (0.004)	–1.991 (0.953)*	–0.008 (0.006)
Married/de facto	0.059 (0.022)**	5.911 (7.588)	–0.004 (0.041)
Disability	0.013 (0.038)	5.650 (10.710)	0.061 (0.067)
Country of birth (base: *Australia*)			
Other English Speaking	–0.025 (0.030)	–8.705 (8.759)	0.030 (0.056)
Non-English Speaking	–0.031 (0.031)	–5.244 (8.550)	0.126 (0.054)*
Changed occupation	0.055 (0.028)*	14.117 (8.477)#	0.020 (0.049)
Permanent employment	0.128 (0.031)**	17.728 (13.163)	0.084 (0.058)
Public sector	0.120 (0.028)**	6.380 (11.098)	–0.154 (0.048)**
Non-profit organisation	0.056 (0.048)	30.183 (14.645)*	0.013 (0.093)
Education (base: ≤ *Year 11*)			
Tertiary	0.125 (0.038)**	–2.912 (14.346)	0.133 (0.069)*
Adv.dip & dip.	0.125 (0.040)**	7.580 (14.503)	0.194 (0.074)**
Cert. III or IV	0.063 (0.032)#	–0.342 (10.889)	0.140 (0.063)*
Year 12	0.023 (0.036)	–10.965 (11.236)	0.102 (0.071)
Occupation (base: *Clerical/ administrative workers*)			
Manager	0.076 (0.039)#	20.903 (13.242)	0.061 (0.077)
Professional	0.097 (0.037)**	23.723 (13.170)#	0.010 (0.072)
Tech/Trade worker	0.131 (0.038)**	34.772 (14.579)*	–0.015 (0.071)
Community service	0.284 (0.053)**	48.277 (22.797)*	–0.195 (0.086)*
Sales workers	0.049 (0.055)	23.343 (17.161)	–0.195 (0.106)#
Machinery operator	0.005 (0.047)	17.329 (14.137)	0.043 (0.090)
Labourer	0.037 (0.057)	30.448 (17.083)#	–0.120 (0.109)
Industry (base: *Blue collar*)			
Primary	–0.105 (0.089)	–7.745 (32.763)	–0.238 (0.205)
Wholesale/transport	–0.020 (0.028)	11.403 (8.437)	–0.042 (0.053)
Retail	0.002 (0.046)	–16.562 (13.466)	0.136 (0.085)
Hospitality	–0.197 (0.087)*	–12.481 (35.951)	0.176 (0.200)
Business services	0.008 (0.030)	–9.256 (8.468)	0.041 (0.054)
Government	–0.127 (0.039)**	–4.364 (13.298)	–0.030 (0.064)
Education	–0.019 (0.045)	–15.648 (11.977)	0.159 (0.077)*
Health/community	–0.083 (0.051)	–26.325 (15.171)#	0.088 (0.090)
Recreation/other	0.054 (0.028)*	–13.421 (8.658)	–0.013 (0.049)

Firm size (base: *<20*)			
20–99	0.130 (0.037)**	15.184 (16.098)	0.015 (0.077)
100–499	0.136 (0.040)**	11.705 (16.740)	–0.078 (0.079)
500–999	0.136 (0.049)**	20.775 (18.335)	–0.118 (0.094)
1000–4999	0.129 (0.052)*	10.186 (18.454)	–0.007 (0.096)
≥5000	0.152 (0.059)**	20.932 (20.601)	–0.059 (0.105)
Region (base: *Sydney*)			
Other NSW	0.189 (0.064)**	32.574 (20.707)	0.040 (0.099)
Melbourne	0.062 (0.033)$^{\#}$	5.175 (9.812)	0.093 (0.057)
Other VIC	0.123 (0.052)*	26.305 (15.907)$^{\#}$	–0.093 (0.088)
Brisbane	0.016 (0.032)	–4.529 (9.009)	0.050 (0.057)
Other QLD	0.161 (0.055)**	25.159 (18.129)	0.018 (0.088)
Adelaide	0.170 (0.058)**	33.056 (19.117)$^{\#}$	–0.050 (0.095)
Other SA	0.009 (0.069)	29.294 (20.361)	0.067 (0.127)
Perth	–0.048 (0.063)	–53.683 (16.279)**	0.045 (0.101)
Other WA	0.051 (0.088)	–31.326 (23.073)	0.103 (0.144)
TAS	0.103 (0.088)	51.545 (25.120)*	0.038 (0.155)
NT	0.011 (0.131)	–71.251 (27.503)**	0.032 (0.174)
ACT	–0.074 (0.089)	–78.367 (22.282)**	0.212 (0.137)
Unemployment rate in the region	0.006 (0.019)	4.114 (4.922)	0.036 (0.031)
Wave (base: *9 (2009)*)			
10 (2010)	0.044 (0.121)	36.968 (33.808)	0.043 (0.214)
11 (2011)	0.112 (0.233)	72.516 (65.497)	0.100 (0.415)
12 (2012)	0.188 (0.350)	115.479 (98.199)	0.156 (0.621)
13 (2013)	0.263 (0.468)	157.079 (131.820)	0.190 (0.834)
14 (2014)	0.336 (0.585)	187.732 (164.269)	0.117 (1.040)
Sample size	3,966	3,966 (1,455)[e]	1,455
Chi-square (overall)[f]	–2406.74 (0.0000)**	116.80 (0.0002)**	155.96 (0.000)**

Notes: a: Asymptotic standard errors in parentheses. The standard errors for the marginal effects on probability are computed using the delta method. b: Within-group means of the regressors are also included in the estimation to represent heterogeneity, but their coefficient estimates are not reported to save space. c: The models include the level and square terms of these variables. d: Standard errors for the marginal effects of quadratic variables are computed using the delta method. e: The number in parentheses is the number of observations used for the censored regression. f: The chi-square statistic for the overall significance of the model. The p-values are provided in parentheses. #: significant at 10%, *: significant at 5%, **: significant at 1%.

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The Impacts of Immigration on Earnings and Employment: Accounting for Effective Immigrant Work Experience

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Abstract

A large segment of New Zealand's population is made up of foreign-born individuals. Despite the significant role that foreign-born individuals play in New Zealand society, little research has been done to address the impact of immigration on the labour market. In this paper we re-examine the impact of immigration in New Zealand using a panel of individual-level New Zealand Income Survey data and the national level methodology. We extend the model to include regional effects, and we incorporate measures of effective immigrant work experience, which reflect the values placed on immigrants' human capital (work experience) in the host country. We find that immigration has little impact on earnings and employment hours. The results further confirm that the effective-experience measure improves the precision of the immigration impact estimates.

Keywords: Immigrants, Earnings effects, Employment effects, Regions, Effective work experience
JEL Classification: J61, J62, J31, J3, J24

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1. Introduction

Almost a quarter of New Zealand's population are immigrants (born outside New Zealand).[1] The impact from the inflow of migrant workers on the labour market is of special interest. A key question is whether or not immigration affects wages and the labour market opportunities in the domestic labour market. Do they raise or drive down the wages and employment of pre-existing workers? If immigration raises income and productivity in the economy, then government policy should facilitate the economic gains by encouraging immigration. However, if immigration decreases income and productivity in the economy, then policy may be required to limit immigration or attract only migrants who will positively contribute to the economy.

Despite the large inflow of migrants in the last decade, little research has been done to address the impact of immigration on pre-existing labour market opportunities. The few studies that have examined this issue find small positive effects (see Maré and Stillman 2009; Maani and Chen 2012; Leem 2008). This paper re-examines the impact of immigration in New Zealand using the national-level methodology introduced by Borjas (2003). Individual-level data from the New Zealand Income Survey (2002 to 2007) are analysed at the national level. We define skill groups based on education and work experience, and examine the changes in the economic opportunities for these pre-existing skill groups that are due to the supply of immigrant workers. This approach is appealing because at the national level, any internal movements of pre-existing workers do not dilute the estimated results.

Economic theory tells us that the impact of immigration depends heavily on the degree of substitution between pre-existing and immigrant workers. If the degree of substitution is high, then pre-existing workers face greater competition from immigrants and this may lead to adverse outcomes. Using a congruence coefficient we explore the correlation between native-born and immigrant workers, defined by skill groups and their occupational distributions. The results from this analysis indicate workers with higher education have a higher occurrence of employment in the same occupations. However, complementarity may also be greater among high-skilled workers due to conglomeration and knowledge spill-overs. Therefore, the question is to be answered empirically.

Applying a panel analysis of skill groups, we estimate the effects of immigrant supply shocks on domestic earnings and employment. The basic results indicate immigration causes little impact on the economic opportunities of pre-existing workers.

We apply two extensions of the national-level model that make the results more precise. These extensions are spatial regional impacts and extended specifications to incorporate immigrant effective work experience. First, the distribution of migrant workers in New Zealand is asymmetric amongst the various regions. In 2007, approximately 40 percent of the immigrant population resided in Auckland. Since immigrant workers are unevenly distributed throughout the country, it is interesting to examine skill groups within geographic boundaries. By differentiating the analysis of skill groups by regions, we are able to isolate labour market outcomes due to immigrant supply shocks for regions where the supply shock is greater.

1 See, for example, New Zealand Census of Population and Dwellings, 2013 (Statistics New Zealand).

Second, the analysis in this paper approaches workers/immigrants from the point of view of their human capital. The standard approach of such analyses has ignored the market value of different types of human capital. However, employers value skills acquired in the domestic environment differently to skills acquired in a foreign setting. To capture the various market values of human capital, we introduce the concept of 'effective experience' as defined in Borjas (2003). In effect, we are using more realistic measures of human capital and this enables us to produce more accurate estimates of the impact of immigration. Using the effective human capital framework, the estimates of the impact of immigration become negative. However, even though the outcomes are adverse, the absolute sizes of the effects remain small. Overall, the results indicate the impact of immigration is small and close to zero.

The rest of the paper is as follows: Section 2 examines the literature on the impact of immigration on labour market outcomes. Section 3 examines the New Zealand labour market data and discusses trends in common economic measures. Section 4 introduces the methodology of the national-level approach, including the congruence framework and examines at the index of congruence between immigrant and native workers. Section 5 reports the estimates of the impact of immigration and the two extensions of the national-level model that make the results more precise.

2. A Review of the Literature

The impact of immigration on domestic labour market outcomes is a topic that receives much commentary in most developed countries. There have been many attempts in the literature to estimate the changes in labour market outcomes of pre-existing workers due to the inflow of immigrant workers, but there is no consensus on the impact of immigration. For example, Altonji and Card (1991), Card (1990, 2001), Dustmann *et al*. (2005), and Dustman *et al*. (2008) find little impact on native earnings from immigration; Borjas (2003, 2004, 2005) finds significant negative effects; and Mishra (2007) and Kifle (2009) find significant positive effects due to immigration. Unsurprisingly, the results differ across different countries, and it is of interest to see what results appear when this analysis is conducted on the New Zealand labour market.

The effect of immigration on labour market outcomes is not clear-cut. The inflow of immigrants may affect the earnings of existing workers in a negative or positive way. The direction of the impact is dependent on a number of factors: these include the substitutability between immigrants and natives, and the contribution of immigration towards aggregate supply and demand.

The elasticity of substitution is an important factor in determining of the impact of immigration on earnings. The basic textbook theory of demand and supply indicates that, holding all else constant, an increase in the supply of labour would decrease wages. Given that capital is held constant and there are constant returns to scale in production technology, this simple description is intuitively appealing – as a resource becomes less scarce, the value placed upon a unit of that resource becomes less. If immigrants and natives are substitutes, then the inflow of immigrants would reduce wages across groups (Borjas 2003; Orrenius and Zavodny 2007). The strength of the reduction to wages depends on the degree of substitution and it is most severe

when immigrants and natives are perfect substitutes. However, if there is imperfect substitution between immigrants and natives, then the magnitude of wage reductions is smaller. Further, if immigrants complement native workers, then we would expect positive changes to earnings from immigration (Ottaviano and Peri 2007; Borjas *et al.* 2008). A complementary relationship raises the marginal productivity of labour in the economy and leads to positive economic outcomes for workers.

It should be noted that the elasticity of substitution is not constant across the entire workforce. The substitutability between immigrants and pre-existing workers is expected to vary across a number of different dimensions (Orrenius and Zavodny 2007; Dustman *et al.* 2008). Considering the skill requirement specific to different industries, in industries that require less skill, immigrants and pre-existing workers are more likely to be substitutes. However, it is more difficult to interchange immigrant and native workers in industries that demand a considerable amount of industry-specific skill and technical knowledge. Such industries may require a high degree of language proficiency and relevant domestic knowledge. Foreign training is likely to be of lower value than comparable local training and thus it is more difficult to substitute existing workers with immigrant workers.

Education and experience are also important factors in determining the degree of substitution between immigrants and pre-existing workers. It is well-documented that the value placed on education and experience acquired abroad is often less than the value placed on domestic education and experience (Lalonde and Topel 1991; Duleep and Regets 2002; Akresh 2006; Antecol *et al.* 2006).[2] As a result, it is more difficult to transfer foreign work experience to the domestic labour market. In particular, high-skilled immigrants suffer a larger earnings penalty compared to their lesser-skilled cohorts (Orrenius and Zavodny 2007). One of the implications of imperfect skill transferability for immigrants is that the pre-existing worker group that is impacted by immigration inflow may possess fewer years of work experience.

An equally important factor is the change to aggregate supply and aggregate demand due to immigration. Immigration adds to the supply of workers and this leads to greater aggregate supply in the economy. However, the inflow of immigrants also increases aggregate demand, as immigrants are consumers of both public and private goods (Addison and Worswick 2002). If aggregate supply increases more than aggregate demand, then we expect reduced earnings and lower employment in the labour market. However, when the addition to aggregate demand from immigration exceeds the change to aggregate supply, positive economic impacts are expected. It is only possible to identify whether the supply or demand effect is stronger through empirical means.

Increase in aggregate demand encourages firms to expand production and capture larger economic benefits. To expand production, firms utilise high levels of the factors of production in which labour is an important part. Immigrants contribute to higher levels of aggregate demand through greater consumption of household and government goods and services; these may include housing and infrastructure.

2 Many studies have also found that while immigrants suffer an initial earnings penalty for their less-than-relevant foreign education and experience, over time immigrants experience faster wage growth than do natives (see Chiswick (1978), Hu (2000), and Duleep and Regets (2002)).

Thus, the wage that prevails in the labour market depends on the size of the effect of immigration on labour supply and labour demand.

In general, there are two major approaches to the study of the impact of immigration. The first is the spatial approach, which incorporates geographic clustering and changes across local labour markets to determine the impact of immigration on wages (Altonji and Card 1991; Card 1990, 2001, 2005; Dustmann *et al*. 2005). This spatial approach assumes cities or regions within a particular country are discrete labour markets (Kifle 2009). The idea is that immigrant inflows change the wage structure within a labour market. Immigrant inflows that raise the number of workers in a particular group would depress wages in the labour market. By examining the changes across local labour markets, the empirical work of Card (1990, 2001, 2005) finds little impact from immigration on native earnings in the US labour market. Similarly, Dustmann *et al*. (2005) analyse British labour market data, Maré and Stillman (2009) analyse New Zealand Census data, and Maani and Chen (2012) use the Household Labour Force Survey (HLFS) data and they all find little evidence of negative effects on employment and earnings based on the spatial approach.[3]

The spatial approach is widely used, but there are a few weaknesses that should be considered. The main issue of spatial analysis is that it may ignore the movement of workers between local labour markets (Card 2001; Borjas 2003). The influx of immigrants may lower the wages in a particular local labour market and this encourages existing workers to internally migrate to other markets that have higher wages. If this situation prevails, then internal migration would equalise any reduction in earnings. There may also be a positive correlation between immigrants and wages (Borjas 2001, 2003). It may be the case that immigrants are attracted to cities or regions that have good economic progress. This would imply a positive bias from immigration in local labour markets where demand shocks raise wages and employment. This concern is addressed through the use of instrumental variables in local labour market analysis.

The second approach (which is used in this paper) analyses the impact of immigration using national-level data and defining groups along the skills dimension (Borjas 2003, 2004, 2005; Orrenius and Zavodny 2007). The classic work of Becker (1975) and Mincer (1974) on human capital and earnings shows that the skills of workers prior to entry to the labour market and post-entry are important factors in the determination of earnings. We can interpret their findings as implying both education and experience are important components in the labour market. Borjas (2003) defines immigrant and pre-existing groups by both education and experience to utilise the importance of both factors in wage determination. Borjas shows that immigration is not constant across all groups. This heterogeneous immigrant supply creates sufficient variation to estimate the impact of immigration inflows on the economic outcomes of pre-existing workers.

3 However, Maré and Stillman (2009) do find that the intermediate skill group is worse off, but this is offset by positive effects on the better-skilled group.

Using US Census and CPS[4] data, Borjas (2003) finds significant negative effects on earnings and employment due to immigration. Borjas (2004) also finds evidence that immigration causes earnings depression for pre-existing workers, regardless of including both the legal and illegal immigrants in the analysis, or only immigrants with legal status. Focusing on doctoral recipients, Borjas (2005) continues to find adverse effects from immigration. Evidence from the US suggests immigration causes serious negative effects on the existing working population by as much as a three percent decrease in wages of competing workers for a 10 percent increase in the number of immigrant workers.

However, a review of studies that utilise similar methodology yields a wider range of results. D'Amuri *et al*. (2010) study German data and estimate the impact of immigration on the German labour market. According to the authors Germany is the European country that has the greatest immigrant population.[5] The authors also estimate the elasticity of substitution between immigrants and natives; the resulting estimate suggests less-than-perfect substitution between natives and immigrants.[6] Breaking down the analysis with respect to groups by education, D'Amuri *et al*. estimate immigration causes a negative impact of around 1 percent on the highly-educated group. For the less-educated, the authors estimate a positive impact of a similar magnitude. Thus, the average impact of immigration is zero.

Ottoviano and Peri (2007) allow for imperfect substitution between immigrants and natives. After relaxing the typical assumption of perfect substitution, their results show positive wage effects from immigration. These results differ from earlier analyses that find significant negative effects on earnings (e.g. Borjas *et al*. 1996; Jaeger 2007).

Analysing four different data sources from Spain, Carrasco *et al*. (2008) do not find significant negative effects of immigration on native employment or earnings.[7] However, Kifle (2009) examines the Australian labour market and finds a positive impact from immigration. The only negative results are found in low-skill occupations, but the author suggests they are the result of a mismatch rather than a negative effect. Immigrants in low-skill occupations tend to be overeducated and as a result earn more than their native co-workers. Similarly, Mishra (2007) finds significant positive effects in the Mexican market.

There is no consensus as to the impact of immigration on pre-existing workers' economic outcomes. It appears the results are both country and time dependent. This conclusion is confirmed by a review of international meta-analyses (Longhi et al. 2010; Okkerse 2008), which finds that the impact of immigration on the earnings and employment of the existing population is small and that it varies across countries.

4 Decennial Censuses from 1960 to 1990 and Current Population Surveys from 1998 to 2001.
5 D'Amuri et al (2010) find no effect on the native-born but significant adverse effects on the earnings of existing immigrants from new immigration.
6 D'Amuri et al. also estimate the elasticity of substitution between old immigrants and new immigrants; they find the degree of substitution to be almost perfect.
7 Carrasco et al. (2008) use the Census for 1991 and 2001, data on work permits from 1993 to 1999, the labour force survey, and the wage structure survey 2002.

Little work has been done with New Zealand labour market data on the effect of immigration on the labour market, despite New Zealand being a major immigrant-receiving country. This paper follows the national-level framework (Borjas 2003) because it is intuitively appealing. However, the analysis is also extended to incorporate (1) regional impacts and (2) better measures of skill.

3. Data and Descriptive Analysis

This research utilises data from the 2002 to 2007 New Zealand Income Survey (NZIS). These are individual-level data released under the Confidentialised Unit Record File (CURF) format. The NZIS is run as an annual supplement to the Household Labour Force Survey (HLFS). The HLFS is a quarterly survey of approximately 15,000 households (29,000 individuals) that represent urban and rural New Zealand. The focus of the NZIS is to collect information on actual and usual earnings, employment, and various components of income.

The analysis in this paper is restricted to employed men. Individuals are defined as natives if they are born in New Zealand and immigrants if otherwise. The focal point in this analysis is to examine education-experience groups over time rather than individuals. The time period of the data corresponds with a period of normal to buoyant economic and labour market conditions. The time period also signifies a period of stable prices (low inflation). Although the choice of the years of data is determined by data availability, the time period 2002-2007 is fortuitously outside of unusual occurrences, such as the global financial crisis.

Workers are classified into four distinct groups: those without a high school degree; school qualifications (high school degree); post-school qualifications; and bachelor or higher degree. In the NZIS, individuals record their highest level of qualification rather than their years of completed schooling. This classification of education groups is similar to other studies, which also use comparable numbers of education categories – Borjas (2003) and Carrasco et al. (2008) use four education groups and D'Amuri et al. (2010) use three education groups.

We first use the conventional method of organising individuals into experience groups based on potential years of experience. Each of the eight experience groups include five years of experience. Past literature has shown that workers with similar experience are more likely to influence the economic outcomes of each other (Welch 1979). So, by combining workers with similar years of experience it is possible to capture similarities (Borjas 2003).

The New Zealand Income Survey provides information for deriving the conventional measures of potential years of experience At this stage we use the simple conventional definition: experience is $Age - A_T$, where Age is the age of the individual and A_T is the age of entry into the labour market. The entry age of a worker depends on his/her level of education. Those with no school qualifications (without high school degree) have entry at 16 years of age; at 18 years for those with school qualifications; at 20 years for those with a post-school qualification; and at 22 years for workers with a bachelor or higher degree. The focus is on workers with experience between 1 and 40 years. Observations that include work experience of more than 40 years are

dropped from the analysis to keep the results in this paper comparable to other major studies. This results in a pooled sample of 38,315 employed males, of whom 7,692 are immigrants (foreign born).

Supply Shock

Table 1 shows the percentage of the New Zealand population that is foreign born across the time period of the study and regions of New Zealand. It is readily apparent that immigrants comprise a significant proportion of New Zealand population; that the growth in the immigrant share of the population is significant on an annual basis; and that while all regions of New Zealand have experienced increases in their immigrant proportion of the population, this change has varied across regions. As such, the data lends itself particularly well to national level analyses that also allow for regional impacts.

As Table 1 shows, the concentration of immigrants is highest in the Auckland region. In 2002, 37 percent of immigrants lived in Auckland and this proportion continued to rise in the following years. By 2007, 44 percent of the population residing in Auckland were immigrants. The region with the next biggest immigrant population is Wellington, with 29 percent in 2007.

There are numerous reasons to explain this observation. Immigrants tend to reside in areas that have higher numbers of fellow immigrants with similar ethnicity (Eden et al. 2003; Wang and Maani 2014a, 2014b). Also, they may be attracted to areas with good economic opportunities. Since Auckland is regarded as the economic powerhouse of New Zealand, it makes sense for immigrants to reside in Auckland. While Auckland has the greatest number of immigrants, from 2002 to 2007 there was a general upward trend in the immigrant population in all regions.

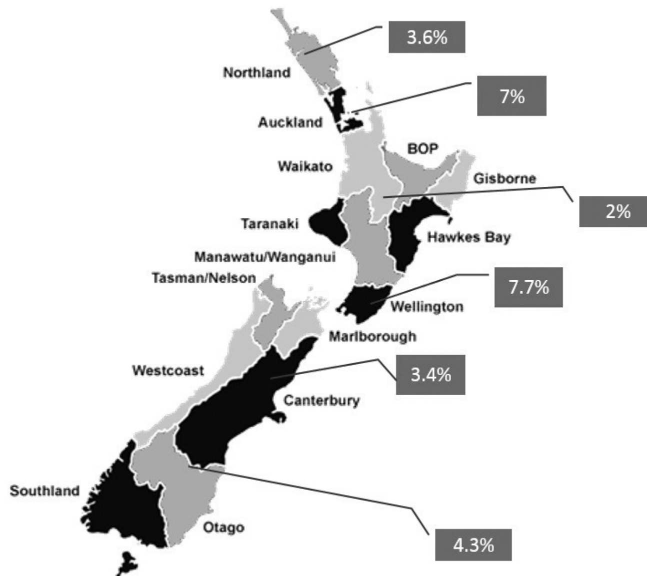
Table 1 - Immigrant Proportion in each Region (Percentage of regional population)

	2002	*2003*	*2004*	*2005*	*2006*	*2007*
Regions						
North North Island	12.0	12.2	13.7	13.4	16.0	15.6
Auckland	36.9	36.5	39.7	42.7	43.4	43.9
Central North Island	10.8	10.4	12.0	12.1	11.5	12.8
Wellington	21.0	22.3	21.2	23.4	24.2	28.7
South Island	9.0	8.1	10.8	11.0	13.0	13.3
Canterbury	14.7	15.9	16.5	19.4	18.7	18.1

Note: Based on Household Labour Force Survey (HLFS)/Income Survey (IS), 2002-2007.

In addition, Figure 1 shows the *change* in the immigrant proportion of the population across New Zealand regions between 2002 and 2007. All regions of New Zealand show significant immigrant supply shocks during the time period. The Auckland and Wellington regions experience increased immigrant population changes of over seven percent over the five-year period.

Figure 1 - Change in Immigrant Share of Population across Regions (2002-2007)



Note: The percentages illustrate the increases in immigrants' share by region in New Zealand during 2002 to 2007. Immigrants are defined as foreign born.

Statistics for Education-Experience Groups

It is interesting to examine how immigrants and natives are distributed along different qualification and experience levels. Table 2 shows the percentage of immigrants and natives in various categories of education and experience. The different population shares are calculated for 2002 and 2007. In general, most workers hold some sort of post-school qualifications; these include vocational training and trade qualifications. From 2002 to 2007 there was a 1 percentage point decrease in the number of immigrant workers in the post-school qualification category. However, the bachelor or higher degree group saw almost a doubling of immigrant workers – from 17 percent in 2002 to 32 percent in 2007. This increase in skilled immigration reflects the intention of New Zealand's immigration system. Looking at the native and immigrant shares in experience groups, there is a remarkably even and stable distribution of workers across years of experience.

Table 2 - Education And Experience Of Natives And Immigrants (Percentage of group)

	2002		*2007*	
	Natives	*Immigrants*	*Natives*	*Immigrants*
Education				
Less than High School	20.32	14.97	19.36	14.00
High School Qualification	19.03	23.49	20.00	16.99
Post School Qualification	48.58	37.84	44.14	36.97
Bachelor or Higher Degree	12.08	23.7	16.5	32.13
Experience				
1 - 5	11.56	7.97	10.7	9.85
6 - 10	11.08	9.08	10.34	11.65
11 - 15	13.40	13.44	11.82	12.04
16 - 20	14.67	18.57	12.55	14.8
21 - 25	15.46	14.07	14.56	17.11
26 - 30	13.26	13.31	14.87	14.18
31 - 35	11.16	13.58	13.84	11.42
36 – 40	9.42	9.98	11.32	8.95

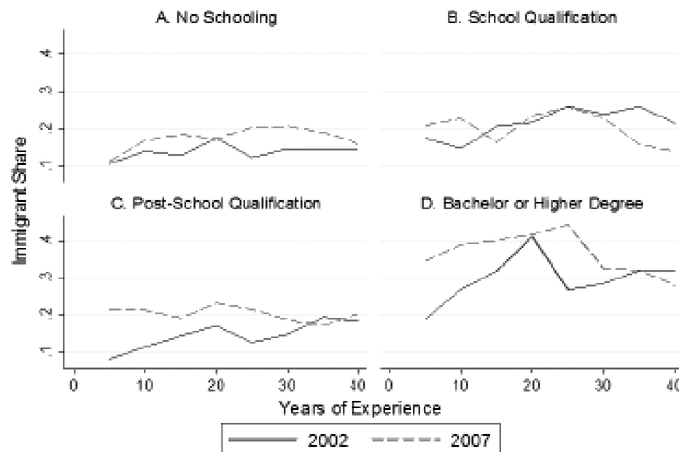
Note: Figures are in percentage terms e.g. 20.32 means 20.32%.

Given the distribution of immigrants across experience and education groups, Figure 2 is useful in showing the immigrant supply shocks for different education-experience groups for the years 2002 and 2007. The supply shock fluctuates between 10 percent and 20 percent across different experience levels. However, for the highly skilled groups (those with bachelor or higher degree), immigrants count for up to 40 percent of the group population. In particular, the largest immigrant supply in the highly skilled groups is those with 20 to 25 years of experience. This observation is not overly surprising, because New Zealand operates a skilled-immigrant filtering system. Preference is given to foreign workers who are highly skilled, so we expect immigrants to form a larger portion of the highly skilled workforce compared to the lesser skilled groups. Comparing 2002 and 2007, there is a noticeable increase in the share of immigrants in each education group. The exception is for those with less than high school qualifications, where the proportion of immigrants actually fell in 2007 relative to 2002.

One interesting question is whether or not native workers move out of regions where there is a large immigrant inflow. To examine this, we computed the percentage change in native population in each region for each year. We found that from 2002 to 2006, in contrast to the significant inflow of immigrants, there are minor changes in cross-region movements of the native population, and there are no distinct trends in these results. Therefore, the data do not support the concern that working age native workers change regions away from where there is an influx of immigrants.[8]

8 Also, a general comparison of weekly earnings and the hourly wage for the native-born in all four groups of education shows growth rates of at least 10% in real terms during the time period.

Figure 2 - Immigrant Labour Market Share (2002 and 2007)
(Immigrants as fraction of the labour force in educational categories)



4. Methodology

The analytical approach in this study follows the framework conceived by Borjas (2003) to examine the impact of labour supply shocks due to immigration on the labour market outcomes of pre-existing workers. The analysis employs national-level data from six years of the New Zealand Income Survey (2002 to 2007). Workers are classified into skill groups based on two aspects of human capital: education and experience.[9] This grouping of workers relies on the implicit assumption that even if workers have the same education, they are not perfect substitutes if they have different levels of experience. Similarly, workers with the same years of experience are not perfect substitutes if they have different levels of educational attainment.

Individuals are sorted into education-experience groups. There are four different categories of educational attainment: below high school qualification, high school, post-school (includes vocational and trade) qualifications, and bachelor or higher degree. In addition, we also define eight groups of experience levels.[10] This classification gives us 32 groups over 6 years – this is 192 cells in total (based on a pooled sample of 38,315 individual-level employed observations).

9 In the form of the Confidentialised Unit Record File.

10 1-5 years, 6-10 years, 11-15 years, 16-20 years, 21-25 years, 26-30 years, 31-35 years, and 36-40 years of experience.

The main component of this model is an immigrant supply shock variable (Borjas 2003). For notation purposes, the cell (*i, j, t*) defines the educational attainment or qualification *i*, experience group *j*, and year *t*. The immigrant supply shock for a particular education-experience group in a particular period is defined as follows:

$$p_{ijt} = \frac{M_{ijt}}{M_{ijt}+N_{ijt}} \quad (1)$$

M_{ijt} is the number of immigrants in a given education-experience time cell, N_{ijt} is the number of native workers in the same cell. Eq. 1 shows the proportion of immigrants that make up a particular skill group at time t. In other words, the above fraction gives us p_{ijt}, the immigrant supply shock variable.

This leads us to the basic empirical model in this paper. We want to analyse the impact of immigrant supply on domestic labour market outcomes. The general approach is to regress the immigrant supply shock on pre-existing economic measures such as earnings and employment. More specifically, this paper uses the following model as seen in Borjas (2003):

$$y_{ijt} = \beta p_{ijt} + a_i + b_j + c_t + (a_i \times b_j) + (a_i \times c_t) + (b_j \times c_t) + u_{ijt} \quad (2)$$

The model includes the immigrant supply shock variable, p_{ijt}. It also includes a number of fixed effects and interactions of these fixed effects. a_i is the vector of fixed effects for education, b_j indicates the work experience group, and c_t is a vector for time periods. These fixed effects are important because they control for any differences across the various education groups, experience groups, and also over time. It is also useful to control for changes in education and experience over time. $(a_i \times b_j)$ is the interaction term between education and experience. It controls for the different experience levels across the various education groups. $(a_i \times c_t)$ and $(b_j \times c_t)$ are interaction terms that control for education and experience changes over time.

y_{ijt} is the dependent variable. Three measures are used in this analysis: mean of log usual hourly earnings, mean of log usual weekly earnings, and mean of the fraction of hours worked in a week. Usual hourly and weekly earnings are deflated to 2002 levels.11 The fraction of hours worked in a week is calculated as usual hours worked in a week divided by 40 hours.12 The inclusion of the above fixed and interaction terms implies the variation in earnings and employment for a particular cell over time can be attributed to the impact from the immigrant supply shock variable.

Later in the paper we will use a more sophisticated definition of experience – effective experience, and there are other variations of Eq. 2 in later sections. These models incorporate additional variables and restrictions to ensure the variation in the dependent variables can be correctly attributed to the variation from immigrant supply.

11 Since we have six consecutive years of data, inflation plays a very minor role.
12 The typical number of hours worked for a full-time worker is 40 hours.

Index of Congruence

An important assumption of the model is that immigrants and natives who have similar education but different levels of experience are not perfect substitutes (Borjas 2003). Using an index of congruence (Welch 1979), it is possible to examine the degree of similarity between native and immigrant groups across the various occupations in the data. Suppose there are two skill groups, *a* for natives and *b* for immigrants; the following is the definition of the congruence coefficient:

$$G_{ab} = \frac{\sum_c (q_{ac} - \bar{q}_c)(q_{bc} - \bar{q}_c)/\bar{q}_c}{\sqrt{\left(\sum_c \frac{(q_{ac} - \bar{q}_c)^2}{\bar{q}_c}\right)\left(\sum_c \frac{(q_{bc} - \bar{q}_c)^2}{\bar{q}_c}\right)}} \quad (3)$$

q_{ac} represents a particular skill group of natives in a particular occupation c and q_{bc} gives a different immigrant skill group in the same occupation. q_c is the fraction of the entire working population that is employed in occupation c. G_{ab} is the congruence index and can be interpreted as a correlation coefficient between two groups a and b. When the coefficient is one, the two groups have equal occupation distribution, and negative one means the two groups have completely different occupation distributions.

Using the 2007 NZIS, Table 3 illustrates the various congruence indices on male workers.

Table 3 - Index of Congruence in Occupation Distribution, 2007

	Experience of corresponding immigrant group			
Education - experience of native groups:	*1 - 10 years*	*11 - 20 years*	*21 - 30 years*	*31 - 40 years*
Less-than High School				
1 - 10 years	-0.372	-0.160	-0.121	-0.240
11 - 20 years	-0.339	-0.134	-0.101	-0.290
21 - 30 years	-0.292	-0.190	-0.134	-0.258
31 - 40 years	-0.280	-0.154	-0.129	-0.256
School Qualification				
1 - 10 years	-0.085	-0.444	-0.404	-0.536
11 - 20 years	-0.551	-0.627	-0.540	-0.577
21 - 30 years	-0.470	-0.659	-0.564	-0.664
31 - 40 years	-0.556	-0.551	-0.460	-0.509
Post School Qualification				
1 - 10 years	-0.424	-0.448	-0.541	-0.585
11 - 20 years	-0.615	-0.536	-0.619	-0.606
21 - 30 years	-0.827	-0.725	-0.767	-0.721
31 - 40 years	-0.842	-0.759	-0.805	-0.763
Bachelor or Higher Degree				
1 - 10 years	0.756	0.808	0.726	0.490
11 - 20 years	0.719	0.815	0.857	0.632
21 - 30 years	0.682	0.804	0.830	0.598
31 - 40 years	0.609	0.745	0.774	0.519

The NZIS provides two-digit codes to classify individuals into different occupations. The results from the table of congruence values show a distinct break between the highly skilled group and the other education groups.[13]

Notably, experience groups with a bachelor or higher degree all have positive congruence values. For instance, consider workers with bachelor or higher degree and 11 to 20 years of experience. The congruence coefficient is 0.815; this is close to 1 and suggests workers in this education-experience group are found in very similar occupations. Thus, it is reasonable to conclude the degree of substitution may be high for these workers.

For all other education-experience groups, the results confirm a negative congruence coefficient between immigrants, implying that native workers and immigrant workers are in different occupations. While the index of congruence is by no means a complete measure of the degree of substitution between two groups of individuals, it offers a good indication of the groups that the analysis should focus on. In this case, the large positive coefficients for workers with bachelor or higher degrees, suggests that it is worth examining these workers in greater detail.

13 In this particular analysis, experience groups are defined by ten-year intervals rather than the five-year intervals employed earlier. This is to reduce the number of cells with few observations due to further classifications by two-digit-level occupation categories.

5. Results

Eq. 2 is estimated using the education-experience cells over the six years of the NZIS. Recall Eq. 2 is as follows:

$$y_{ijt} = \beta p_{ijt} + a_i + b_j + c_t + (a_i \times b_j) + (a_i \times c_t) + (b_j \times c_t) + u_{ijt}$$

Table 4 shows the results from this estimation, based on the basic model where the estimation is completed based on the data for working men who have 1 to 40 years of experience. The three dependent variables are log weekly earnings, log hourly earnings, and fraction of time spent working. The table shows the coefficient β on the immigrant supply shock variable, and cluster robust standard errors. The standard errors on many of the coefficients in Table 4 are very large and this implies the coefficients are insignificant. These initial results suggest immigrant supply shocks have little effect on the earnings of pre-existing workers.

Table 4 - Impact of Immigrant Supply on Labour Market Outcomes
Conventional Experience Skill Groups

Coefficients (elasticities)
(cluster robust standard errors)

	Dependent Variables		
Specification:	*Log Weekly Earnings*	*Log Hourly Earnings*	*Fraction of Hours Worked*
Basic model	0.058 [0.03] (0.149)	0.005 [0.003] (0.159)	0.187* [0.11] (0.096)

Notes: The figures in the table report the coefficient on the immigrant share variable;
Elasticity [in brackets];
Auxiliary estimation results are in italics;
*p<.10,**p<.05,***p<.01.

It is easier to interpret the values in Table 4 if they are converted to elasticity figures, as also reported in the table [in brackets]. Looking at the impact of supply shock on working hours, the elasticity of 0.11 indicates that a 10 percent increase in immigrant workers raises the fraction of hours worked in a week by 1.1 percent. However, the confidence interval includes zero and we cannot reject the hypothesis that the supply shocks have no impact on the hours of work.[14]

14 One concern may be that the effect on employment is imprecise since the sample includes both full-time and part-time workers. When we restrict the estimation to full-time workers the coefficients remain positive and small, suggesting that the initial results do not include imprecision from the inclusion of part-time workers.

Model Specification: Is Fixed Effects Correct?

It is important to test the appropriate model is employed in this paper. Generally, we expect the fixed effects model to be correct since most studies utilise this approach. First we examine the fixed effects and random effects models. Using the Hausman test, the null hypothesis tested is that the coefficients in the random effects and fixed effects models are the same. The p-value of 0.02 suggests we can reject the null hypothesis that the coefficients are the same, at the 5 percent level of significance. That is, the fixed effects model is more appropriate.

Education Groups

We also restrict the estimates by schooling groups to identify if the results are stronger for certain groups. Table 5 shows the results when the estimation is restricted to workers with similar educational attainment: those with no schooling (less than a high school degree); at least high school qualifications; and higher education. Elasticities are also reported for coefficients that are statistically significant (at least at the 10 percent level of significance). We find insignificant results for earnings and the hourly wage for all groups, but statistically significant results for employment outcomes.

The last column of Table 5 illustrates the results for the highly-educated group. It is important to focus on this group because New Zealand operates a skilled immigration filter system. Immigrants account for a larger share of the skilled workforce than is the case for the lesser skilled workforce.

The NZIS provides two-digit codes to classify individuals into different occupations.[15] The results from the table of congruence values show a distinct break between the highly skilled group and the other education groups. [16]

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15 This results in 25 occupation categories. The categories are then combined into 9 distinct one digit occupation categories by Statistics New Zealand, as applied in our estimation of the Index of Congruence in this section.

16 In this particular analysis, experience groups are defined by ten-year intervals rather than the five-year intervals employed earlier. This is to reduce the number of cells with few observations due to further classifications by two-digit-level occupation categories.

Table 5 - Impact of Immigrant Supply on Labour Market Outcomes by Education Group

Coefficients (elasticities)
(cluster robust standard errors)

Dependent variable	*Below high school degree*	*At least school qualification*	*Bachelor or higher degree*
Log Weekly Earnings	0.163	0.044	0.347
	(0.515)	(0.233)	(0.275)
Log Hourly Earnings	0.160	0.010	0.100
	(0.248)	(0.214)	(0.157)
Fraction of Hours Worked	-0.311	0.207* [0.11]	0.535* [0.30]
	(0.319)	(0.115)	(0.286)
--sub-sample of full-time employed	-0.231	0.266** [0.15]	0.519** [0.22]
	(0.189)	(0.116)	(0.225)

Notes: The figures in the table report the coefficient on the immigrant share variable; Elasticity [in brackets] for statistically significant coefficients;
Auxiliary estimation results are in italics;
*p<.10,**p<.05,***p<.01.

The estimated coefficients are positive and larger when we restrict the analysis to workers with higher educational attainment. Nevertheless, the absolute size of the elasticity of supply remains small and the large standard errors indicate the impact of immigration is not significant. The results for the highly educated groups are not what we expect, since the index of congruence suggests that highly educated immigrants and natives are potentially more competitive than are other education groups. It may be the case that immigrant workers are not as readily substitutable to pre-existing workers in the highly educated groups, and this leads to small but positive effects from immigration. One explanation for these results is that immigrants lack characteristics that natives have. These may be proficiency in the domestic language, and less familiarity with local customs and experiences, or complementarities among workers. We find generally similar results for the sub-sample of full-time men (last row of Table 5).

The following sections estimate the effect of immigrant supply shocks using different and more rigorous frameworks. It would be useful to see how the results change and create a more robust illustration of how immigration may affect the economic outcomes of pre-existing workers.

Spatial Correlation

The first extension we apply is to combine the typical spatial approach with the education-experience groups approach (Borjas 2003). The spatial approach literature finds little impact from immigration (Dustmann et al. 2005) and the results presented so far also suggest immigration plays a minor role in the labour market outcomes of pre-existing workers. It would be useful to see how the results change when skill groups are defined within each local labour market (regions) – does the impact on earnings become more positive? More negative? Or is there still no significant change?

To conduct this analysis, each cell is now defined as *(r, i, j, t)*. That is, each cell is determined by a specific region, education level, experience group, and year. The NZIS lists six local government regions in New Zealand: North North Island (Northland, Waikato, and Bay of Plenty); Auckland; Central North Island (Gisborne, Hawkes Bay, Manawatu, Wanganui, and Taranaki); Wellington; South Island (excluding Canterbury); and Canterbury. We know that immigrants account for approximately 10 percent to 20 percent of the working population in each region except in Auckland and Wellington. From 2002 to 2007, the immigrant share has risen from 21 percent to 29 percent in Wellington, and from 37 percent to 44 percent in Auckland (see Table1).

Table 6 reports the results from region-education-experience-year analysis. Column (1) shows the base specification where only fixed effects are included – there are fixed effects for region, education level, experience, and year. The base specification shows the impact of immigration on skill groups within each region. The coefficients for the impact on earnings are both negative and significant.

The second column of Table 6 reports the results when two-way interaction effects are included. This is useful as it controls for any changes in education, experience, and regions over time. Further, there are controls for interactions between region and education, region and experience, and education and experience. These controls serve to improve the accuracy of the estimate of the impact of immigration on pre-existing workers' outcomes. Again the effect on earnings is negative. Weekly earnings fall by 1.4 percent for a 10 percent increase in the supply of immigrant workers and this coefficient is highly significant. When we consider the impact on hourly earnings, a 10 percent rise in supply reduces hourly earnings by 0.5 percent. Immigration also causes a negative effect on the working hours of pre-existing workers. Similar to before, the impact on employment is small and becomes insignificant.

The last column in Table 6 shows the estimates when three-way interaction terms are also included in the regressions.[17] We can isolate the variation in the shock from immigrant supply to the region-education-experience-year level through the inclusion of fixed effects and interaction terms. In other words, the impact of immigration on labour market outcomes is very specific. This specification

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17 Interactions between region and education; region and experience; region and year; education and experience; education and year; experience and year; region, education, and experience; region, education, and year; region, experience, and year; and education, experience, and year.

should return even more accurate results than the first and second specifications. Surprisingly the wage elasticity of supply remains similar to the previous results in column (1) and (2). The impact on weekly and hourly earnings is minus 1.3 percent and minus 0.5 percent for a 10 percent increase in immigration. The impact on working hours is small and insignificant.

Table 6 - Impact of Immigrant Supply on Labour Market Outcomes by Region-Skill Groups

Coefficients (elasticities)
(cluster robust standard errors)

Dependent variable	*(1)*	*(2)*	*(3)*
Log Weekly Earnings	-0.252*** [- 0.14] (0.061)	-0.242*** [- 0.14] (0.062)	-0.227*** [- 0.13] (0.064)
Log Hourly Earnings	-0.086** [- 0.05] (0.043)	-0.083** [- 0.05] (0.039)	-0.090* [- 0.05] (0.051)
Fraction of Hours Worked	-0.086* [- 0.04] (0.051)	-0.063 (0.055)	-0.045 (0.057)
Controls for:			
Fixed effects	Yes	Yes	Yes
Interaction effects	No	Yes	Yes
Three way Interactions	No	No	Yes

Notes: The figures in the table report the coefficient on the immigrant share variable; Elasticity [in brackets] for statistically significant coefficients;
*p<.10,**p<.05,***p<.01.

Overall, when we define skill groups by region as well, the earnings results become negative and mostly significant, at least at the five percent level of significance. When the size of the labour market is restricted by regional boundaries, the results are more definite. One explanation of this result is that Auckland and Wellington region have disproportionately more immigrants. Thus, by including regional labour markets in the analysis, the estimated effects are more representative of the uneven distribution of immigrants in New Zealand. This outcome is quite different to what Borjas (2003) finds in his analysis. In his paper, Borjas suggests the inclusion of local labour markets conceal much of the impact from immigration. However, we are examining a different country and it is likely there are fundamental differences in the structure of immigration between New Zealand and the US.

The impact of immigration changes in a number of ways when skill groups are distributed across local labour markets. At the national level, we find that immigrant supply shocks cause little effect on the economic outcomes. However, when skill groups are defined by regions, the estimated impact of immigration on earnings and employment becomes significant and negative.

We restrict the spatial approach to specific regions to identify if any specific local labour markets are driving the results. As suspected, when we restrict the analysis to Auckland, the sizes of the estimated coefficients become larger.[18]

We can draw a number of interesting conclusions from the results in this section, and the regional statistics in the earlier sections. First, there is little indication of movement of native workers across different regions in New Zealand. This suggests that the inclusion of regions does not dilute the estimates of the effects from supply shocks. In fact, more precise results may be derived when we examine skill groups by regions compared to the national level. Second, the negative coefficients indicate the inflow of immigrant workers are associated with small negative effects on wages and employment. Finally, because Auckland has the largest immigrant population, pre-existing immigrant workers in this region may suffer more adverse effects from immigration, compared to other regions in New Zealand.

However, when, in auxiliary estimates, we restrict the estimation to effects for the native-born sub-sample of the workforce, the coefficients for wage effects become significantly smaller in size, and they become insignificant for the native-born group. This result is consistent with the expectation that the wage effect observed in Auckland pertains to immigrant groups, including earlier immigrant groups for whom new immigrants are closer substitutes.

Defining Effective Experience

The analysis so far has the conventional measure of work experience as simply the age of an individual minus the age at which the individual enters the labour market. This is a very simple definition and is unlikely to be an accurate measure of experience. This approximation is reasonable for native men since it reflects their years of schooling and of workforce entry. However, this framework for experience is simplified because it assigns the same value to local and foreign experience. Employers in host countries are likely to place more value on domestic experience than foreign experience. We address this problem as below.

Using US data, Chiswick (1978) finds that employers assign different values to foreign experience and local experience. It seems appropriate to redefine labour market experience as "effective experience" (Borjas 2003). The objective is to define effective experience such that a year of foreign labour market experience is not the same as a year of domestic experience. Let X be the effective experience of an immigrant worker:

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18 Looking at the impact on weekly earnings in Auckland, a 10 percent rise in the number of immigrants reduces earnings for workers in Auckland by almost 2.5 percent.

$$X = \begin{cases} \alpha(A_m - A_T) + \mu(A - A_m), & if\ A_m > A_T \\ \tau(A - A_T), & if\ A_m \leq A_T \end{cases} \quad (5)$$

A_m is the age of entry into New Zealand, A_T is the age of entry into the labour market, and A is the age of the individual. So, if an individual migrated as an adult then $A_m > A_T$ and their experience would comprise of two components: experience acquired abroad ($A_m - A_T$) and experience acquired since migration to New Zealand ($A - A_m$). The coefficient α measures the value that New Zealand firms place on foreign experience and μ values local labour market experience. However, if an immigrant migrated as a child then $A_m \leq A_T$. Child migrants would acquire only domestic experience $A - A_T$. The coefficient τ measures the value of experience acquired by immigrant children.

The three coefficients above (α, μ, τ) can be estimated easily. Using all six years of the NZIS we can run a standard immigrant assimilation regression of the form19;

$$w = s_i + \theta_c \boldsymbol{I^c} + \theta_d \boldsymbol{I^d} + \varphi_n \boldsymbol{N}(A - A_T) + \varphi_c \boldsymbol{I^c}(A - A_T) + \varphi_{d0} \boldsymbol{I^d}(A_m - A_T) + \varphi_{d1} \boldsymbol{I^d}(A - A_m) + \rho Y + u \quad (6)$$

The dependent variable w is the log of weekly wage. s_i is the fixed effects for education. $\boldsymbol{I^c}$=1 if an immigrant entered as a child, $\boldsymbol{I^d}$=1 if entry as adult an $\boldsymbol{N}$ is the indicator for native-born individuals. The term Y indicates the year of entry into New Zealand. Notice that the square of each of the three experience terms is also included in the regression. In effect, there are three sets of regressions being performed. Table 7 reports the results from this estimation of the relevant parameters20.

The parameters of interest are the φ's. φ_n is the value employers place on a year of experience that a native worker acquires or, put differently, it is the market value of a year of native experience. φ_c gives the market value of a year of experience acquired by an immigrant who entered as a child. φ_{d0} is the value of a year of foreign experience and φ_{d1} is the value assigned to a year of domestic experience acquired by immigrant workers. These values allow us to define the effective experience coefficients:

$$\alpha = \frac{\varphi_{d0}}{\varphi_n}, \quad \mu = \frac{\varphi_{d1}}{\varphi_n}, \quad \tau = \frac{\varphi_c}{\varphi_n} \quad (7)$$

Using the estimated values reported in Table 7 we can compute the effective experience coefficients.

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19 See Borjas (2003).

20 The confidentialised NZIS does not identify the exact number of years since migration for each immigrant. Instead the years since migration variable in the NZIS is reported in intervals. This is not appropriate for the estimation of Eq. 5. To overcome this problem, immigrants in each interval are randomly assigned (with a uniform distribution) to a year since migration value inside that particular interval. Following Borjas (2003) we use this method rather than the midpoints of each interval, where the distribution of assigned years in New Zealand reflects that of the actual data, but smooths out the ends of the distribution.

Table 7 - Wage Rewards for Different Types of Labour Market Experience

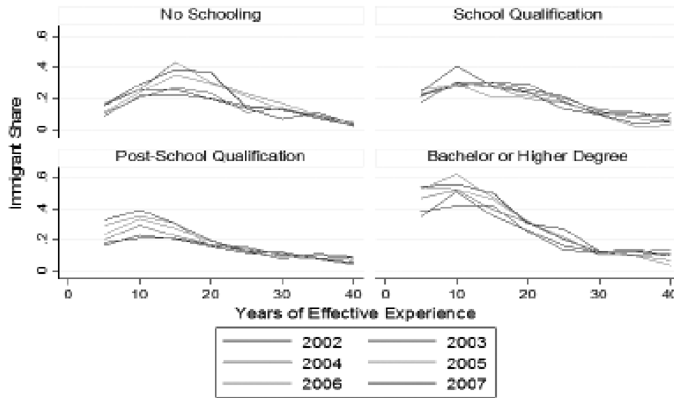
	Dependent variable: Logarithm of weekly wage in host country		
	Group		
Coefficient on:	*Natives*	*Immigrant entry as child*	*Immigrant entry as adult*
Foreign experience	–	–	0.0347***
			(0.010)
Foreign experience squared	–	–	-0.0009***
			(0.000)
Local experience	0.0788***	0.0882***	0.0555***
	(0.001)	(0.005)	(0.004)
Local experience squared	-0.0015***	-0.0017***	-0.0011***
	(0.000)	(0.000)	(0.000)

Notes: The figures in the table report the coefficient on the immigrant share variable; Robust standard errors are reported in brackets; *p<.10,**p<.05,***p<.01, – not applicable.

The first thing to note is that the market value for experience acquired by natives and for experience acquired by child immigrants are similar. In fact, slightly more value is placed on the experience acquired by child immigrants than comparable natives. This implies the coefficient τ=1.1. As expected, the value assigned to local experience acquired by adult immigrants is less than that assigned to native or child immigrant experience. Further, foreign experience has the lowest market value of 0.035. Thus, the coefficients in question are α=0.4 and μ=0.7.

With these estimated coefficients, it is possible to calculate the effective experience for each worker in the sample. Instead of assigning workers to experience groups, we now assign workers to effective experience groups. Figure3 shows the immigrant supply shock for each education group and effective experience level. The distribution of immigrant share in each education-experience group is quite different from before (Figure1).

Figure 3 - Immigrant Supply Shock
(Skill Groups Based on Effective Experience)



There are now obvious trends in the supply shock. In the bachelor or higher degree group, immigrants account for almost 60 percent of workers with 10 years of experience. As the years of experience increase, the immigrant share falls. In the group of workers with school qualifications or post-school training, immigrants account for 40 percent of the workers with 10 years of experience and this falls as experience increases. Defining skill groups with effective experience has increased the size of the immigrant supply shock in general and there are obvious 'peaks' in the distribution.

Table 8 reports the results of running Eq. 2 again but with effective experience groups rather than groups established under the standard definition of experience. The first obvious difference is that the impact of immigration on weekly earnings and working hours is now negative. The coefficient, when weekly earnings is the dependent variable, is – 0.281 and this is highly significant. Translating this coefficient into an elasticity of supply interpretation we have a 1.6 percent fall in earnings when the supply of immigrants increases by 10 percent. Notice that the other coefficients are very small in value and mostly insignificant. Overall, when defining skill groups by effective experience, the impact of immigration is small but it tends towards a negative outcome. This is different to the results found when using the base specification, where the impact of immigration is minor but tends towards a positive outcome.

Table 8 - Impact of Immigrant Supply on Labour Market Outcomes (Effective Experience Skill Groups)

Coefficients (elasticities)
(cluster robust standard errors)

	Dependent Variables		
Specification:	*Log Weekly Earnings*	*Log Hourly Earnings*	*Fraction of Hours Worked*
Extended model	-0.281*** [- 0.16] (0.091)	0.006 (0.006)	-0.073 (0.090)

Notes: The figures in the table report the coefficient on the immigrant share variable;
Elasticity [in brackets] for statistically significant coefficients;
*p<.10,**p<.05,***p<.01.

The standard definition of labour market experience is too simple and does not reflect the value employers place on different types of experience. Thus, it makes sense to create a framework that allows domestic and foreign experience to be valued differently. Utilising this effective experience framework, while the sizes of the coefficients are small, the standard errors indicate the effects on weekly earnings are significant.

Again, when in auxiliary analyses we restrict the estimation to wage and employment effects for the native-born sub-sample of the workforce, the coefficients for wage effects become significantly smaller in size and they become insignificant, indicating that the wage effect observed reflects results for the group of earlier immigrants, for whom new immigrants are closer substitutes.

6. Summary

In this paper we examine the impact of immigration on labour market outcomes in New Zealand. With so much interest in the impact of immigration, and given that workers form a substantial segment of the New Zealand workforce, this topic is worthy of special attention. We have employed the methodology proposed by Borjas (2003), which analyses individual-level data at the national level. Education-experience groups are first defined and each group is assigned an immigrant supply shock variable. By regressing the supply shock against various measures of labour market outcomes, it is possible to derive the elasticity of supply of immigrants.

The estimated supply elasticities suggest the earnings of pre-existing workers increase by less than one percent for a ten percent increase in the supply of immigrants. The size of these coefficients together with the large standard errors provides evidence for the hypothesis that immigration has little impact on earnings. As New Zealand operates a skilled immigration system, it is worth restricting the analysis to the various levels of education. In particular, when we restrict the analysis to highly skilled workers (bachelor or higher degree) we continue to find no substantial change in the impact of immigration on the earnings or employment of pre-existing workers.

We extend the standard national-level approach to incorporate local government regions in the analysis. This is an interesting extension because it illustrates the geographic distribution of immigration and the effect of this distribution in each region. For New Zealand this is important as a large proportion of immigrants reside in a particular region (the Auckland region). When groups are defined by region-education-experience the results change. In fact the estimates report negative effects on labour market outcomes. However, even though results are statistically significant, the size of the negative impact from immigration is still small – an approximately 1.5 percent reduction in earnings from a ten percent rise in immigrant inflow.

It is common for firms to value experience acquired in the domestic market differently from experience acquired abroad. To take into account these different values placed on labour market experience, we define 'effective experience' for each worker. Depending on the type and level of experience of each worker, experience is rescaled to reflect estimated market value. However, human capital comprises multiple dimensions and it is not practical to rescale every dimension of skill. Instead we assign individuals into various segments of the earnings distribution with the assumption that similarly skilled workers fall in the same region of the earnings distribution. Based on this skill framework the estimates of elasticity of supply continue to be small. In summary, it seems to be the case that immigration in New Zealand causes unsubstantial changes to the economic outcomes of pre-existing workers.

The effects of immigration on wages and employment hours per worker reported in this paper suggest they are minor, but there is evidence that the effects tend towards the negative direction. Further analysis shows that effects for the sub-sample of native-born men remains insignificant, indicating the effects observed reflect outcomes for earlier immigrants for whom recent immigrants are closer substitutes. These results fall between the findings of Borjas (2003), who finds significant negative effects, and those of Dustmann et al. (2005), who find no significant effects.

However, the picture is not complete. It would be useful to also evaluate the long-term adjustments to the factors of production due to immigration; account for potential changes in the productivity factor of the economy; and also create a framework that captures the potential benefits (and consequences) of immigration and the resulting spill-over effects.

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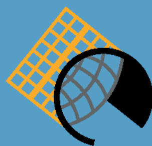

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