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Financial Literacy and Self-Employment

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This article uses individual-level data collected in the Household, Income and Labour Dynamics in Australia (HILDA) survey in 2016 to econometrically explore the direction of causation between financial literacy and self-employment. The empirical approach is based on applying instrumental variables (IV) analysis in a three-outcome labour supply model (i.e. self-employment, employee employment and non-employment) that controls for selection into employment. In keeping with a small number of studies, the analysis suggests that there is a positive relationship between financial literacy and self-employment. The analysis also suggests that the likely causal direction is from financial literacy to self-employment. However, this is also found for employee employment. Therefore, policies aimed at increasing financial literacy will likely not only increase self-employment but also employee employment. This suggests that financial literacy may be a form of "general human capital," such as education, work experience or training. However, the impact of financial literacy on self-employment is not larger (more positive) for self-employment compared to employee employment. Clearly much more research is needed to understand the numerous relationships between financial literacy and other labour market outcomes.

Keywords: financial literacy, human capital, self-employment, Australia.

1. Introduction

This article is concerned with the relationship between financial literacy and self-employment. Financial literacy is the: "... ability to process economic information and make informed decisions about financial planning, wealth accumulation, debt, and pensions" (Lusardi & Mitchell, 2014, p. 6). It is the understanding of financial concepts such as the operation of interest rates, the difference between nominal and real values/prices and the importance of the risk-and-return trade-off in investment decisions. Financial literacy is often viewed as a form of "human capital" (Lusardi & Mitchell, 2014). If true, one would expect financial literacy to impact on employment and other labour market outcomes in a manner similar to other forms of human capital such as education, work experience and training. If so, it should also have a "return" in the labour market. If there is a financial benefit associated with financial literacy, then there should be an incentive for individuals to invest in its

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acquisition, which should improve employability and earnings. If financial literacy is human capital, it is reasonable to hypothesise that there is a positive empirical association between financial literacy and employment. However, there is no reason to assume that the magnitude of the association between financial literacy and employment is the same for employee employment (working for an employer) and self-employment (working for oneself). This can only be determined empirically.

While there are many studies concerned with the determinants of employment, there is little research concerned with the relationship between financial literacy and employment, especially self-employment (e.g. Ekelund *et al*., 2005; Ahn, 2010; Furdas & Kohn, 2010; Bonte & Piegeler, 2013; Koellinger *et al*., 2013; Bernat *et al*., 2017). This is surprising given that self-employment, and more generally "entrepreneurship," is believed to be an important driver of economic growth, in both "rich" and "poor" countries. This lack of research is even more puzzling given that in most countries, and especially in rich countries, there are usually finance-related policy initiatives aimed at fostering self-employment, such as the *New Enterprise Incentive Scheme* in Australia and the *Enterprise Finance Guarantee* scheme in the United Kingdom. Given the importance of self-employment in economic growth, understanding the determinants of self-employment is important. Therefore, the role, if any, that financial literacy plays as a potential determinant of self-employment needs to be understood.

There are several potential mechanisms or channels through which financial literacy could impact on self-employment. For example, individuals with higher levels of financial literacy may be better able to evaluate the risks associated with self-employment. Such individuals might also be more efficient at obtaining grants and accessing capital and loans at lower borrowing costs (Huston, 2012; Disney & Gathergood, 2013). Individuals with higher levels of financial literacy are likely better able to evaluate the financial decisions that impact on self-employment survival (Ćumurović & Hyll, 2019). Somewhat surprisingly, there has only been a small number of published studies concerned with the financial literacy and self-employment relationship (Ćumurović & Hyll, 2019; Oggero *et al*., 2020; Struckell *et al*., 2022). These studies are considered further in Section 2 next. They all presented empirical evidence supportive of a positive statistical association between financial literacy and self-employment.

One issue that complicates the understanding of the relationship between financial literacy and self-employment is the direction of causation. For reasons already discussed, it is reasonable to hypothesise that financial literacy impacts on self-employment, which implicitly assumes that the causal direction is from financial literacy to self-employment (FL➔SE). However, it is equally reasonable to hypothesise that self-employment impacts on financial literacy, which implicitly assumes the opposite causal direction—from self-employment to financial literacy (SE➔FL). It may be the case that the self-employed obtain higher financial literacy by carrying out the tasks associated with self-employment itself, in a "learning by doing" manner not dissimilar to on-the-job financial training for employees. This casual direction becomes even more sensical remembering that for individuals who are employees many financial decisions (e.g. relating to retirement savings) are made on their behalf by their employer. This is not the case for those who are self-employed—such individuals must make such decisions themselves or purchase financial advice to assist them.

Understanding the direction of causation is critical in understanding the likely impact of policies that increase financial literacy on self-employment. If the causal direction is from financial literacy to self-employment, then policies aimed at increasing financial literacy should have the desirable "cause and effect" outcome of increasing self-employment. This will only be true if the direction of causation runs from financial literacy to self-employment. It will not be true, if the direction of causation runs in the opposite direction from self-employment to financial literacy. Under the latter policies that increase financial literacy will *not* increase self-employment. In our view, it makes little sense to speculate about financial literacy as a possible determinant of self-employment without first trying to establish what the causal direction is. In addition, if the direction of causation runs from self-employment to financial literacy, then government policies aimed at increasing financial literacy cannot be justified by alleging that such policies will increase self-employment. Empirical research is, therefore, needed to establish the direction of causation to understand the likely labour market impacts of policies aimed at improving financial literacy. Furthermore, understanding the direction of

causation will lead to a more comprehensive understanding of the determinants of self-employment. We are aware of only one study that has attempted to address the direction of causation: Ćumurović and Hyll (2019). Given the importance of this study, it is discussed in detail in Section 2 next.

With this brief background in mind, this article uses individual-level data collected in the Household, Income and Labour Dynamics in Australia (HILDA) survey in 2016 to econometrically explore the direction of causation between financial literacy and self-employment. The empirical approach is based on applying instrumental variables (IV) analysis in a three-outcome labour supply model (i.e. self-employment, employee employment and non-employment) that controls for selection into employment. This analysis makes several contributions to the literature. The first is that it confirms that there is a positive statistical association between financial literacy and employment. This is observed for both self-employment and employee employment. The second is that for both types of employment, there is empirical support for the causal direction being from financial literacy to self-employment. Therefore, policies aimed at increasing financial literacy may increase not only self-employment but also employee employment. The third is that the impact of financial literacy on self-employment is not larger (more positive) compared to employee employment. Finally, the finding that financial literacy impacts on both types of employment suggests that financial literacy may be a form of "general human capital," such as education, work experience or training. This being the case the expectation is that financial literacy should impact on a variety of other labour market outcomes, such as unemployment, earnings and occupational mobility. Clearly much more research is needed to understand the numerous relationships between financial literacy and labour market outcomes.

The remainder of this article is organised as follows. Section 2 reviews previous studies concerned with the relationship between financial literacy and employment. Section 3 is a brief discussion of trends in self-employment in Australia. The main goal of this section is to provide some Australian context for international readers. The econometric approach is outlined in Section 4. Results of the analysis are presented in Section 5. Conclusions are given in Section 6, along with some directions for future research.

2. Previous Research

As indicated, there are only a small number of studies that have examined the relationship between financial literacy and self-employment. Ćumurović and Hyll (2019) were among the first to explore this relationship. In addition (as far as we are aware), it is also the only study that has attempted to establish, empirically, the direction of causation between financial literacy and self-employment. Using individual-level data for Germany, collected in the 2009 *Survey of Health, Ageing and Retirement in Europe* (SAVE), they find a positive and statistically significant relationship between a ten-point index of financial literacy and the probability of self-employment relative to employee employment (what they term "wage employment"). Their analysis is restricted to individuals who are employed. They also use instrumental variables (IV) to examine the direction of causation. The instrument that they use is "mother's education". Therefore, their so-called "identification strategy" is that mother's education is an important determinant of financial literacy and an unimportant determinant of self-employment. Based on this empirical approach, they conclude that the direction of causation is from financial literacy to self-employment. Since their analysis is restricted to only individuals who are employed, it follows that policies that increase financial literacy in the employed population should increase self-employment and decrease employee employment.

There are several issues with the analysis carried out by Ćumurović and Hyll (2019) that casts doubt on their main conclusion. They estimate ten IV-probit regressions with up to twenty-nine explanatory variables with samples ranging from 173 to 591 individuals, with 591 individuals being the maximum sample size. We believe these samples are too small to generate reliable estimates. They only report the marginal effects of financial literacy for what they label their three "Main Specifications": (1) $N = 591$ individuals, $k = five$ variables; (2) $N = 583$, $k = eighteen$ variables and (3) $N = 530$ individuals, $k = twenty\text{-}nine$ variables. We have carried out a statistical power analysis for the estimated marginal effects of financial literacy associated with these three specifications. Assuming a statistical significance level of 5 per cent, statistical power for the marginal effect of financial literacy

for these three specifications are: 65 per cent, 39 per cent and 27 per cent. All the values are well below the 80 per cent level, which is usually assumed to be the critical threshold. Put slightly differently, these power values suggest that the sample would need to be significantly larger to reach this critical threshold. For example, for the specification that includes twenty-nine explanatory variables, the required sample size would need to be 1727 individuals, which is over three times the size of actual sample used of 530 individuals. Not only do their estimates "lack power", their samples are likely not large enough to support a meaningful IV analysis. It has been known for some time that in small samples IV estimates are biased towards the probability limit of OLS estimates, which means that as sample size declines, IV estimates become inflated and diverge away from their true value (see, e.g., Nelson & Startz, 1990; Angrist *et al*., 1999, Angrist & Kolesaru, 2023). The advice of Angrist and Krueger (2001, p. 71) with respect to sample size and IV analysis is clear: "Since instrumental variables estimates are consistent, but not unbiased, researchers should aspire to work with large samples." Therefore, their conclusion of a sizeable positive causal effect of financial literacy on self-employment is at best questionable.

Another potential weakness with the analysis of Ćumurović and Hyll (2019) is that they only analyse individuals who are employed. Individuals who are not employed are unlikely to be similar to individuals who are employed in terms of both observable and unobservable characteristics. Put slightly differently, individuals who are employed are not likely representative of all individuals. Restricting the analysis to only individuals who are employed can lead to "sample selection bias" of the type popularised by Heckman (1979). In terms of the relationship between financial literacy and self-employment, analysing only employed individuals can lead to inaccurate estimates of the impact of explanatory factors (including financial literacy) on the probability of self-employment. By restricting the analysis to only employed individuals, Ćumurović and Hyll (2019) are effectively assuming that selection into employment is a random process. In addition, they are effectively assuming that financial literacy has no effect on the selection into employment. Or put slightly differently, they assume implicitly that the only effect of financial literacy is on the probability of self-employment relative to wage employment. Few would agree that the labour supply model that underlies their empirical analysis is realistic. A more realistic underlying labour supply model (i.e. empirically testable) assumes that financial literacy can affect both the employment decision and the self-employment versus wage employment decision. Also restricting the analysis to only employed individuals complicates the interpretation of the regression estimates. If it is the case, like Ćumurović and Hyll (2019) suggest, that financial literacy increases the probability of self-employment, their empirical specification implies that financial literacy decreases the probability of wage employment. This must be the case since financial literacy is assumed not to have an effect on selection into employment. The increase in self-employment implied by higher financial literacy results in individuals leaving wage employment for self-employment and is not a result of individuals entering self-employment or wage employment from non-employment. None of this is very realistic.

Ćumurović and Hyll (2019) constructed a measure financial literacy based on nine financial literacy questions. This index is a summation of the number of correct responses to each of these questions and ranges from *zero* to *nine*. In constructing this ten-point index in this way they are assigning equal weight to each question. To be clear, they assume that getting question X correct is equally important to getting question Y correct in terms of measured financial understanding. No reason is given for this assumption. Our view is that this equal weighting is not justified. There are large differences across these questions with respect to the shares answering correctly. As far as we can make out from their Figure 1 (mean values are not given), about 90 per cent got the question relating to compound interest correct. On the other hand, only 10 per cent got the question relating to bond prices correct. Clearly assuming that these two questions are equally important in measuring the differences across individuals in financial understanding is at best doubtful. At a minimum, the index should be weighted for question difficulty. This is trivial to do—more difficult questions have a higher proportional weighting (e.g. one-share correct). This would increase meaningful variation in the index, which is desirable. It is not the case that more financial literacy questions will in some way

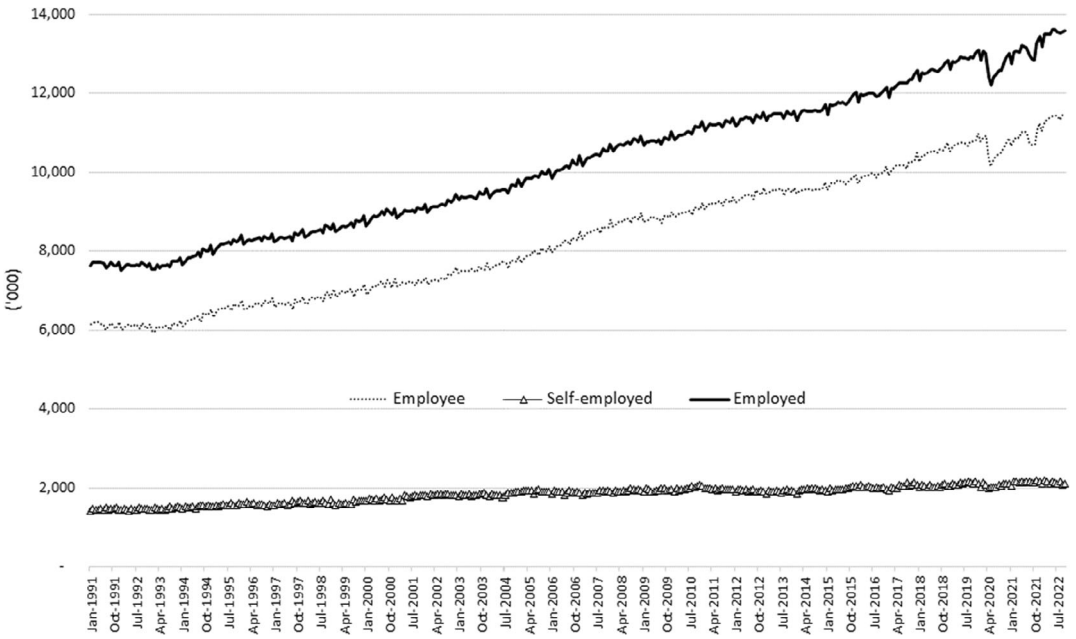

Figure 1. *Number of persons employed, employees and self-employed Australia, 1991–2022Notes: Estimates cover persons aged 15+. The period covered is from January 1991 to October 2022. Source: ABS (2022), Table 8.*

lead to a better measure for capturing cross-section variation in financial understanding through simply adding up the number of correct responses.

Oggero *et al*. (2020) examined the relationship between financial literacy and self-employment in Italy. They use individual-level data collected in two years (2008 and 2010) of the *Survey of Household Income and Wealth*. This survey does have a panel element, with about half of respondents in any year being interviewed in previous years. However, the panel element is not used in this study—the two survey years are pooled into a single cross-section. Their sample is very large (more than 25,000 individuals) consisting of both employed and not employed people. They use two measures of self-employment. The first is a "narrow" measure, which is dummy variable coded "1": "...if the respondent is either an individual entrepreneur or owner or member of a family business (p. 317)." The second is a "broad" measure, which is also a dummy variable coded "1": "... if the respondent is an individual entrepreneur, owner or member of a family business, a professional, a self-employed craftsman, or a business partner (p. 317)." For both measures, the dummies are coded "0" if the individual is "not self-employed." Therefore, they model the probability of being self-employed relative to being wage employed or not employed. Their measure of financial literacy is based on two financial understanding questions. It is a dummy coded "1" if the respondent answers both of these questions correctly and coded "0" otherwise (i.e. only one correct or both incorrect). For males, they find a positive and statistically significant relationship between financial literacy and self-employment for both measures. For females, they find no such relationship.

There are several problems with the empirical approach of Oggero *et al*. (2020). First, it is important to note that only 3 per cent of males and 1 per cent of females are self-employed based of their "narrow" measure. The shares are larger for their "broad measure"—13 per cent for males and 5 per cent for females. The shares associated with their "narrow" measure are too small to be reliably analysed with OLS regression. Such low shares imply that self-employment is a "rare event," which

complicates modelling (see King & Zeng, 2001; Falk *et al*., 2011). Second, the regression they estimate are "linear probability models," which is just an OLS regression with a dummy variable as the outcome. This is not an appropriate estimator for outcome variables that are skewed. It has been known for some time that logit or probit regression is a more appropriate estimator for such outcome variables. OLS coefficients will only approximate probit or logit marginal effects (at the mean) the closer the split on the outcome variables is to 50:50 (see Aldrich & Nelson, 1984). Furthermore, analysing a 1 per cent or 3 per cent outcome with a limited probability model is at best questionable. Third, their empirical approach assumes that the marginal effect of financial literacy on self-employment is the same regardless of whether you are wage employed or not employed. In other words, the impact of financial literacy on the probability of self-employment is constrained to be the same for both groups. This seems very unlikely given there are well-documented differences between these two groups in terms of both observable and unobservable characteristics. The authors provide no justification for why they make this assumption. However, it is testable, but not with a limited probability model approach. Fourth, there is no analysis or discussion for why they assume causation runs from financial literacy to self-employment. Their results will only hold if financial literacy is exogenous.

Struckell et al. (2022) examined the relationship between financial literacy and self-employment in the United States. They used individual-level data collected in two years (2015 and 2018) of the *National Financial Capability Study*. Pooling these two survey years together generates a large sample of over 15,000 individuals. There is no panel element in this survey, so their analysis is purely cross-sectional. Their sample is restricted to individuals who are employed, though they do make some distinction between part- and full-time wage employment. Individuals who are not employed are excluded. Their outcome variable is a dummy coded "1" if the respondent self-reports being self-employed and coded "0" if they report being an employee. Based on this definition, 10.7 per cent of the sample are self-employed. This is a considerably smaller share than what is stated in their *Abstract*: "…[self-employment] … is *now 40% of the workforce* (p. 639)." Their financial literacy measure is the summation of correct responses on five financial knowledge questions. Logit regression is used. They find a positive and statistically significant relationship between financial literacy and self-employment. Part of their analysis is concerned with differences in the relationship by gender and race. They find that it is stronger (more positive) for females compared to males. However, there is no difference between "white and non-whites" [sic].

Struckell et al., (2022) recognised that their findings are dependent on their assumed direction of causation (p. 651). They also recognised that instrumental variables could be used to examine the direction of causation and then dismissed it as an unfeasible strategy for not very convincing reasons. They also noted that financial literacy is higher among the self-employed than the wage employed. They failed to recognise that higher levels of financial literacy among the self-employment may be an outcome of the causation running from self-employment to financial literacy. Their lack of any empirical evidence in support of their chosen causal direction does not temper their view that policies that promote financial literacy should increase self-employment. In addition, they do not consider selection effects since their sample only includes employed individuals.

In summary, there are issues with all the studies reviewed that casts doubt on their conclusions relating to the relationship between financial literacy and self-employment. The analysis carried out in this article aims to address these issues. More specifically, we use a large sample of individuals in our analysis. Therefore, a lack of statistical power and its impact on inference is not a concern. The second is that our empirical approach explicitly models selection into employment. We believe that ignoring these selection effects is a serious limitation both statistically and substantially. The third is that our empirical approach is designed to take into consideration the discreetness in the way in which financial literacy and employment are measured. This is achieved through the application of logit, ordered logit and multinominal logit regression. The fourth is that serious attention is paid to the causal direction between financial literacy and self-employment through the application of instrumental variables.

3. Self-Employment in Australia

Within Australia, the Australian Bureau of Statistics (ABS) defines a person as being self-employed if they are an owner manager of their own business (with or without employees) (ABS, 2018). Estimates from the ABS *Labour Force Survey* (, 2022) show that over recent decades total employment growth in Australia has been strong, underpinned by strong population growth and associated growth in employee employment (Figure 1). Although sizeable (around 2.1 million), the number who are self-employed has changed little over the last decade. In the 10 years to October 2010, the number of employees in Australia increased by 26 per cent. The corresponding increase in self-employment was 21 per cent. Between October 2010 and October 2022, employee employment increased by a further 26 per cent, while self-employment increased by only 3 per cent.

The slow growth in self-employment alongside a strong growth in employee employment means that the incidence of self-employment is on the decline in Australia. This falling incidence is not unique to Australia. It is also a feature in other high-income countries, including Germany, Italy, Sweden and the United States (OECD, 2017). In October 2000, the employment/population ratio in Australia was, nationally, equal to 59 per cent. By October 2022, the equivalent ratio was 64 per cent. Of those employed at October 2000, 80 per cent were employees, 19 per cent were self-employed and the balance were unpaid family helpers. By October 2022, employees comprised 84 per cent of total employment and the self-employed made up the balance (16 per cent) (see Figure 2).

4. Methodology

4.1. Data

To empirically examine the relationship between financial literacy and self-employment, individual-level data from the *HILDA* survey is used (see Summerfield *et al.*, 2022). *HILDA* is an annual, large

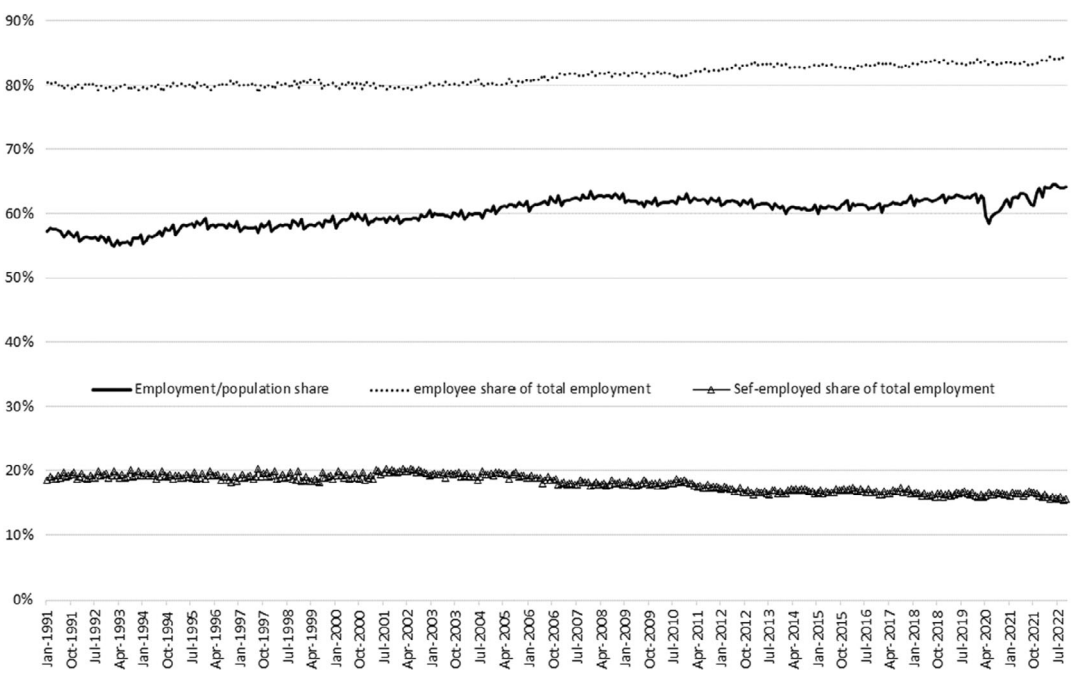

Figure 2. *Employed, employee and self-employed shares Australia, 1991–2022Notes: Estimates cover persons aged 15+. The period covered is from January 1991 to October 2022. Source: ABS (2022), Table 8.*

scale, nationally representative (after weighting), household longitudinal social survey. It differs from other major longitudinal surveys in other countries because all members of the household (aged fifteen and older) are interviewed. One advantage for our purpose of using *HILDA* is that five questions relating to financial literacy are included (for the first time) in Wave 16, with these data being collected in 2016 (discussed further next). In addition, HILDA contains detailed employment, demographic, socioeconomic, financial and attitudinal information about respondents and their households. Therefore, it is a rich database to explore empirically the relationship between financial literacy and self-employment.

HILDA is a longitudinal survey with some individuals being interviewed in subsequent waves. In fact, the same financial literacy questions included in Wave 16 (2016) are also included in Wave 20 (2020). Therefore, in principle it is possible to carry out a longitudinal analysis, for example, that focuses on changes in financial literacy and self-employment. However, we believe that HILDA is not capable of supporting an analysis of this type at this time. The reason being that financial literacy questions in the two waves were collected using different survey instruments. More specifically, in Wave 16, the financial literacy questions were asked through face-to-face CAPI interviews (*computer-assisted personal interviewing*). In Wave 20, because of COVID restrictions, these questions were asked through CATI interviews (*computer-assisted telephone interviewing*). This change in survey instrument was an outcome caused by legal restrictions, introduced because of COVID that impacted on ability to carry out face-to-face interviews. We believe that the change in the way that the financial literacy information is collected (so-called "mode effects") makes comparing actual changes in financial literacy for the same individuals between the two waves is (at best) ill-advised (see, e.g., St-Pierre & Béland, 2004).

There is some research that compares the financial literacy information collected in Waves 16 (2016) and 20 (2020) of HILDA (Wilkins *et al.*, 2022). The authors find that there has been a sizeable *decline* in financial literacy in the four-year period between 2016 and 2020. This is found cross-sectionally—the mean value of number of correct responses in 2020 is lower than the mean value in 2016.This is also observed after "holding constant" factors that likely impact on financial literacy using regression analysis. Even more surprisingly is the finding that financial literacy has declined for sex-specific and age-specific cohorts. That is, for individuals who are interviewed in both 2016 and 2020, the mean value of number correct responses in 2020 is lower than the mean value in 2016. These findings led Wilkins et al. to state: "The unavoidable conclusion is that no progress has been made on improving the financial literacy of the Australian population since 2016, and in fact we have gone backward (p. 65)."

We believe this conclusion is doubtful for several reasons. First, it contradicts a large body of empirical research concerned with the relationship between age and financial literacy (see Lusardi & Mitchell, 2014). Second, we believe that this finding is likely a product of mode effects caused by the shift from face-to-face interviews to telephone interviews (see Watson *et al.*, 2021). Third, the authors fail to present any reasons for why financial literacy should have declined in this four-year period. Therefore, the analysis carried out below is purely cross-sectional. We believe such an analysis has its own value and is not *de facto* inferior to a longitudinal analysis. Clearly once the issue of comparability is fully understood and an empirical strategy designed to address it adopted (e.g. through weighting), then a meaningly longitudinal analysis will be possible.

The original (Wave 1) sample of households included HILDA was drawn following a multi-stage clustered design. Sampling was restricted to households living in private dwellings. Some very remote parts of Australia were excluded. The sampling was stratified by the eight states and territories. For the five most populated states (New South Wales, Victoria, Queensland, South Australian and Western Australia), sampling was stratified further by metropolitan and non-metropolitan areas. From these thirteen geographic regions, around 500 "Census Collection Districts (CCD)" were selected, with selection being proportional to the number of occupied dwellings. For most CCDs, around twenty-five dwellings were randomly selected. Subsequent waves were "topped-up" in order to address sample shrinkage and non-representativeness caused by attrition. Representativeness is further enhanced through the use of weights. HILDA weights are intended to adjust for non-

representativeness related to the probability of selection and household non-response. For our purpose, the use of cross-sectional weights helps ensure that HILDA data are representative of the Australian population in 2016. Hence, all figures, tables and regression estimates are weighted. The specific weight used is, "*hhwtrp*," which is the so-called "Responding person population weight." This is the cross-sectional weight that HILDA recommends researchers to use when the unit of analysis is the individual or person (see Watson, 2012).

In Wave 16, there are 17,694 individuals (responding persons) aged fifteen and older. After restricting the sample to those aged twenty to sixty-four, the sample is reduced to 12,858 individuals. This is a much larger sample (by a factor of twenty-four) than the maximum sample of 530 individuals analysed by Ćumurović and Hyll (2019). Our larger sample also allows for meaning sub-groups analysis and robustness testing. It is also worth mentioning here that that a sizeable share of these individuals is self-employed. More specifically, 23.9 per cent ($N = 3078$) are not employed; 65.4 per cent ($N = 8406$) are employees (waged and salaried workers or unpaid family workers) and 10.7 per cent ($N = 1374$) are self-employed. Fortunately, self-employment in our sample is not a "rare event," which is an issue that creates a series of problems for econometric analysis.

4.2. Measuring Financial Literacy

We measure financial literacy using information from three questions testing financial knowledge. These are the same questions developed by Lusardi and Mitchell (2014) and which are now widely used in financial literacy research (see, also, Bucher-Koenen *et al*., 2021). The questions are used to construct two summary measures of financial literacy. The first is a count measure (*NumCorrect*), which is the number of questions correctly answered (0,3). The second is a threshold measure (*AllCorrect)* that intends to capture what we believe is a "high" level of financial literacy. An individual is assumed to have high financial literacy if they correctly answer all three questions. This variable is therefore a dummy variable set equal to one if all three questions are correctly answered and zero if not. The questions involved in the construction of our financial literacy measures are described next. All questions offered a "do-not-know" response and a "refuse-to-answer" response to minimise guessing.

Q1: Interest Rate: "Suppose you put $100 into a no-fee savings account with a guaranteed interest rate of 2% per year. You don't make any further payments into this account and you don't withdraw any money. How much would be in the account at the end of the first year, once the interest payment is made?"

Q2: Inflation: "Imagine now that the interest rate on your savings account was 1% per year and inflation was 2% per year. After one year, would you be able to buy more than today, exactly the same as today, or less than today with the money in this account?"

Q3: Diversification: "Buying shares in a single company usually provides a safer return than buying shares in a number of different companies." [True, False]

Across the entire sample of 12,858, the mean number of correct responses was 2.4 questions. With respect to high levels of financial literacy, 56 per cent answered all three questions correctly. As Table 1 shows, the self-employed have significantly higher financial literacy than other groups with the share answering all questions correct equal to 67.5 per cent and the mean number correct equal to 2.6 questions, Figure 3 summarises the differences across these groups. Across the entire sample, the share unable to correctly answer any question is relatively low, especially among those employed. While 10 per cent of those not employed scored zero (i.e. were unable to correctly answer any of the three questions), this falls to 4 per cent among employees and to 3.6 per cent among the self-employed.

Table 1. *Descriptive Statistics for Financial Literacy Variables by Employment Status Persons, Aged 20–64, Australia, 2016*

	(1)	(2)	(3)	(4)	(5)
Employment status (*EmpStat*)	All	Not employed	Employed	Employees	Self-employed
Number of correct responses (*NumCorrect*)[(1)]	*2.4*	*2.1*	*2.4*	*2.4*	*2.6*
	(0.9)	*(1.0)*	*(0.8)*	*(0.8)*	*(0.8)*
All three responses correct (*AllCorrect*)[(2)]	*56.4%*	*45.8%*	*59.8%*	*58.3%*	*67.5%*
N	*12,858*	*3078*	*9780*	*8406*	*1374*

Notes: (1) Difference in means is statistically significant below the *1*% level ($F = 215$).
(2) Difference in proportions is statistically significant below the *1*% level ($\chi^2 = 265$).
Standard deviation in parentheses.
Estimates weighted to reflect population values.
Source: Household, Income and Labour Dynamics in Australia (HILDA) survey, 2016.

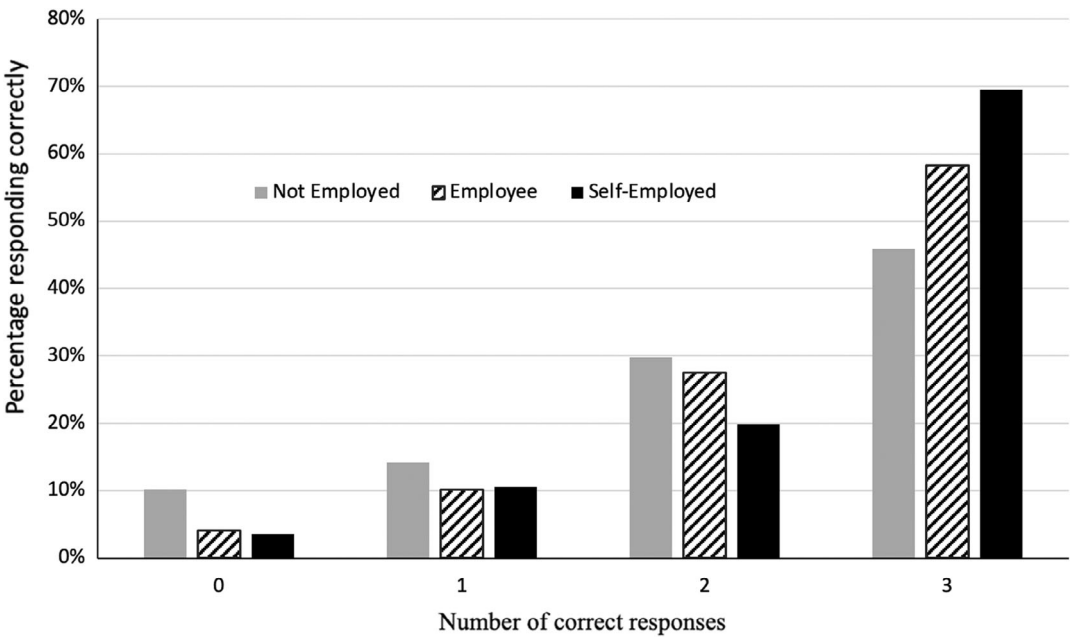

Figure 3. *Financial literacy by employment status persons, aged 20–64, Australia, 2016Notes: Estimates weighted to reflect population values. Source: Household, Income and Labour Dynamics in Australia (HILDA) survey, 2016.*

4.3. Econometric Approach

Our econometric approach has two parts. The first part focuses on the relationship between financial literacy and employment, with *no* distinction being made between self-employment and employee employment. The second part focuses on the relationship between financial literacy and employment, with the distinction between the two forms of employment being made. The underlying model is based on the well-established "labour supply" equation derived from standard labour economics (Killingsworth, 1983). The focus is on how the probability of being employed is affected by financial

literacy while "holding constant" other determinants of employment (discussed next). Including non-employed individuals into the estimation is intended to reduce the sample selection bias resulting from restricting the analysis to those only employed. In the first part of the analysis, where there are only two outcomes, logit regression is used—the dependent variable, *Emp*, is equal to one if employed and zero if not employed. In the second part of the analysis, where there are three outcomes, multinomial logit (MNL) is used—the dependent variable, *EmpStat*, is equal to one if not employed, two if an employee and three if self-employed.

In addition to financial literacy, the specification includes a set of variables intended to capture other possible determinants of employment. Given the main focus of our analysis is on effect of financial literacy, we include these variables primarily as control variables. Therefore, they are not of direct interest to us beyond their consistency with the large body of research concerned with the empirical determinants of labour supply. These variables include the respondent's: gender (*sex*); years of schooling completed (*school*); age and its square (*age, age*^{2}); non-labour income (*NonLabInc*); marital status (*single*, *married*, *SepWidDiv*); children (*child* <5 and *NumChild*) place of birth (*ForBornNot*, *ForBornEng*, *ForBornNonEng*) and housing tenure (*Rent, NoMortgage, Mortgage*). In addition, variables are included relating to the where the respondent resides. These include: a neighbourhood measure of socio-economic disadvantage (*MiddleNeigh*, *PoorNeigh*, *RichNeigh*); rural or urban residence (*Urban*) and state or territory of residence (*NSW, VIC, QLD, SA, WA, TAS, NT* and *ACT*). Further information relating to these variables, along with descriptive statistics, can be found in Table 2.

In our empirical analysis, we begin by first treating financial literacy as an exogenous determinant. We then follow Ćumurović and Hyll (2019) and adopt an IV approach in an attempt generate information relating to the likely direction of causation between financial literacy and self-employment. This involves using information on mothers and fathers schooling as instruments. The use of family background characteristics to instrument financial literacy is not uncommon in the literature. Behrman *et al*. (2012), for example, used the schooling attainment of mothers to isolate the causal effect of financial literacy on wealth accumulation. As already discussed, Ćumurović and Hyll (2019) similarly used mothers schooling attainment as an instrument in their study of financial literacy and self-employment.

The approach is, however, not without its challenges. For example, parental schooling may influence child schooling. To help rule out the possibility that the IV affects the choice of employment type (e.g. the decision to be self-employed) through education factors, we again follow Ćumurović and Hyll (2019) and control for respondent's schooling. Paternal schooling may also correlate with the wealth accumulation by parents and their ability to transfer financial resources to their children to support entry into self-employment. While we are unable to observe any wealth transfers, we again control for any wealth effects through non-labour income, housing tenure and neighbourhood socio-economic disadvantage. Such concerns point to the larger issue of "instrument validity."

For an instrument to be valid, it needs to be "relevant" and "exogenous." To be relevant, the instrument (mothers and fathers schooling) must be correlated (preferably highly correlated) with the potentially endogenous variable (financial literacy). Instruments with weak correlations can be relevant, but this is less likely. To be exogenous, the instrument (mothers and fathers schooling) must not be correlated with the error term in the outcome variable of interest equation (employment), which is only strictly achieved when the instrument is not correlated at all with the outcome variable of interest. This is almost always not going to the case in applied work. Instrument validity relates mainly to the strength of these two statistical correlations. One dimension is whether the correlation between the instrument and the potentially endogenous variable is "strong enough" for the instrument to be deemed relevant. The second dimension is whether the correlation between the instrument and the outcome variable of interest is "weak enough" to ensure that the error term in the outcome of interest regression is well behaved.

It is also necessary to state that most of the formal statistical tests relating to instrument validity are for the so-called "IV-TSLS" (two-stage least squares) estimator. This estimator is only appropriate when the both the potentially endogenous variable and outcome variable are continuous. This estimator is not appropriate for our analysis since both the potentially endogenous variable and the

Table 2. *Descriptive Statistics for Regression Variables Persons, Aged 20–64, Australia, 2016*

Mnemonic	Variable description	(1) All	(2) Not employed	(3) Employed	(4) Employee	(5) Self-employed
Employment						
Emp	= 0 if not employed; = 1 if employed	75.8%	—	—	—	—
EmpStat	Employment status = 1 if not employed; = 2 if employee; = 3 if self-employed	—	23.9%	—	65.4%	10.7%
Financial literacy						
NumCorrect	Number of financial literacy questions answered correctly (range: 0 ➔ 3)	2.35 (0.9)	2.11 (1.0)	2.42 (0.8)	2.40 (0.8)	2.56 (0.8)
AllCorrect	= 1 if all three financial literacy questions answered correctly	56.4%	45.8%	59.8%	58.3%	69.6%
Sex						
Male	= 1 if male	49.3%	36.6%	53.3%	51.3%	66.0%
Education						
School	Schooling completed (years)	13.9 (2.3)	13.1 (2.1)	14.1 (2.3)	14.2 (2.3)	13.8 (2.2)
Age						
Age	Age (years)	41.0 (12.8)	43.7 (14.2)	40.2 (12.2)	39.4 (12.2)	44.7 (11.1)
Non-labour income						
NonLabInc	Household gross total (previous) financial year income divided by 52, minus respondent's gross weekly labour income. Measured in AUD 1000, 2016 prices	$1.9 ($2.4)	$2.1 ($2.5)	$1.8 ($2.4)	$1.7 ($2.1)	$2.8 ($3.4)
Marital status						
Single	= 1 if never married (excluded category)	24.9%	28.3%	23.8%	25.2%	15.1%
Married	= 1 if married or cohabitating	65.4%	58.6%	67.5%	66.0%	77.2%
SepWidDiv	= 1 if widowed, separated or divorced	9.7%	13.1%	8.6%	8.7%	7.7%
Children						
Child <5	= 1 if has a dependent child of pre-school age (age <5)	15.9%	17.5%	15.3%	15.4%	15.0%
NumChild	Number of dependent children (age <15)	0.57 (1.0)	0.56 (1.0)	0.58 (0.9)	0.56 (0.9)	0.66 (1.0)
Place of birth						
ForBornNot	= 1 if born in Australia, i.e., not foreign-born (excluded category)	69.5%	67.4%	70.2%	70.1%	70.5%
ForBornEng	= 1 if foreign-born in an English-speaking country	9.5%	7.6%	10.1%	9.8%	11.6%

Table 2. (*Continued*)

Mnemonic	Variable description	(1) All	(2) Not employed	(3) Employed	(4) Employee	(5) Self-employed
ForBornNonEng	= 1 if foreign-born in a non-English-speaking country	21.0%	25.0%	19.8%	20.1%	17.9%
Housing tenure						
Rent	= 1 if home is rented (excluded category)	43.8%	54.7%	40.4%	40.8%	37.6%
NoMortgage	= 1 if home is fully paid	12.9%	14.6%	12.4%	11.7%	16.6%
Mortgage	= 1 if home is mortgaged	43.2%	30.7%	47.2%	47.4%	45.7%
Index of relative socio-economic disadvantage (see text)						
MiddleNeigh	= 1 if resides in neither bottom 20% or top 20 (i.e. "middle" 60%) (excluded category)	60.6%	56.9%	61.8%	62.0%	60.6%
PoorNeigh	= 1 if resides in an area of high disadvantage (bottom 20%)	18.1%	26.4%	15.4%	16.0%	11.6%
RichNeigh	= 1 if resides in an area of low disadvantage (top 20%)	21.3%	16.7%	22.8%	22.0%	27.8%
Rural–urban residence						
Urban	= 1 if resides in a main urban area	66.7%	64.3%	67.5%	68.0%	64.2%
State/Territory						
NSW	= 1 if resides in New South Wales (excluded category)	32.3%	34.2%	31.7%	31.7%	31.6%
VIC	= 1 if resides in Victoria	26.4%	23.1%	27.4%	27.4%	27.7%
QLD	= 1 if resides in Queensland	19.9%	22.2%	19.2%	19.3%	18.5%
SA	= 1 if resides in South Australia	6.9%	7.1%	6.8%	6.9%	6.5%
WA	= 1 if resides in WA	9.8%	8.8%	10.2%	9.9%	11.9%
TAS	= 1 if resides in Tasmania	2.1%	2.5%	2.0%	2.0%	1.9%
NT	= 1 if resides in Northern Territory	0.8%	0.5%	0.9%	1.0%	0.5%
ACT	= 1 if resides in Australian Capital Territory	1.7%	1.6%	1.8%	1.9%	1.3%
Parents education						
FatherSch	Father's years of schooling	12.7 (1.9)	12.4 (2.0)	12.8 (1.9)	12.9 (1.9)	12.7 (2.0)
MotherSch	Mother's years of schooling	12.2 (2.0)	11.9 (1.9)	12.3 (2.0)	12.3 (2.0)	12.1 (2.0)
N		12,858	3078	9780	8406	1374

Notes: Estimates weighted to reflect population values.

Standard deviation in parentheses.

Source: Household, Income and Labour Dynamics in Australia (HILDA) survey, 2016.

outcome variable are discrete (categorical). More specifically our potentially endogenous variable, financial literacy, is measured in two ways. The first is the number of correct responses (*NumCorrect*), which can only take on four discrete values: (1) zero correct responses; (2) one correct response; (3) two correct responses and (4) three correct responses. There are also "hard" lower and upper bounds —you cannot get more than three questions correct and you cannot get less than zero questions correct. In addition, the questions vary considerably in terms of difficulty. This fact casts doubt on the appropriateness of assuming linearity. It seems unlikely that the marginal effect of a given factor (e.g. schooling) on the number of correct responses will be the same moving from zero to one correct response and from one to two correct responses and from two to three correct responses. The number of correct responses is best considered as an ordinal variable and not a continuous variable. An appropriate estimator for such a variable is ordered logit. Our second measure of financial literacy is a binary variable for getting all three questions correct (*AllCorrect*), which we assume proxies a high level of financial literacy. An appropriate estimator for such a variable is logit. There are also two outcome variables in our analysis. Neither of these variables are continuous or ordinal. The first is a binary variable that indicates whether the respondent is employed or not (*Emp*). An appropriate estimator for such a variable is logit. The second is a discrete three-category variable that indicates whether the individual is not employed, an employee or self-employed (*EmpStat*). These categories are not ordered so multinomial logit is an appropriate estimator.

The fact that our estimator is not the standard IV-TSLS estimator reduces our ability to formally test for instrument validity. Most of these tests are specific to this estimator and not appropriate for estimators using maximum likelihood (such as logit, ordered logit and multinominal logit). Some of these tests can be extended to maximum likelihood estimators, such as the likelihood ratio test for improvements in the goodness of fit and the Hausman test for endogeneity. The main reason for most of the IV-TSLS tests not being appropriate is because they are based on some sort of analysis of residuals. The concept of a residual is not sensical in the context of logit, ordered logit and multinominal logit. Although we recognise the importance of such tests in demonstrating instrument validity, we are limited in terms of what we can do empirically. While this is unfortunate, we also believe the tests we have carried out are indicative of instrument validity.

As already discussed, we have two instruments relating to the schooling of the respondent's parents: father's years of schooling (*FatherSch*) and mother's years of schooling (*MotherSch*). The means and standard deviations of these variables are given in Table 2. It is important to note that this information is missing for a sizeable share of respondents. In order to maintain the representatives of the sample used, and remembering that these two variables are IVs (and hence not included in the outcome equations), we have decided to impute these missing values (see Allison, 2002). For 9.2 per cent of fathers and 8.1 per cent of mothers, years of schooling was imputed based on occupational information. For 3.4 per cent of fathers and 4.6 per cent of mothers, there was not sufficient information relating to occupation to make imputation feasible. For these respondents, the mean values of parental years of schooling (by sex) were assigned. If we had removed the respondents with missing parental schooling, the sample would likely be less representative of the Australian population. Since the parental schooling variables are irrelevant for the regressions where financial literacy is exogenous, we believe the priority should be in maintaining, as much as possible, the representative of these estimates.

In our main regressions, we do not control for characteristics such as cognitive ability and financial risk tolerance. We note that these may be important predictors of self-employment (Caliendo *et al*., 2009). Although HILDA has information on cognitive ability and financial risk preferences, this information is not observed for all sample members in 2016. Indeed, selecting on these two characteristics reduces the sample from 12,858 to 10,265 observations (a fall of 20.2 per cent), thus limiting our ability to conduct an analysis based on nationally representative data. We consider these characteristics in the robustness section.

Table 2 provides a complete list of variables included in the main regressions, together with information on parental schooling and summary statistics. The table also provides mnemonic variable names and variable definitions. Across the full sample [Column (1)] the average time (years) spent in

schooling is 13.9 years (13.8 if self-employed) and the average age is 41 years (44.7 if self-employed). The mean gross weekly household income (not including the respondent's labour earnings) is $1900 per week ($2800 for the self-employed). A large share (43.8 per cent) of the sample rent their home, though this falls to 37.6 per cent among the self-employed.

5. Results

5.1. Main Findings

Table 3 reports the marginal effects from logit and multinomial logit (MNL) regressions. In the logit model the dependent variable is a binary variable (*Emp*), equal to one if the individual is employed and zero if not. In the MNL regression, the dependent variable (*EmpStat*) is equal to one if not employed (reference category), equal to two if an employee and equal to three if self-employed. In Columns (1) to (3) of Table 3, financial literacy is the number of correct responses (*NumCorrect*). In Columns (4) to (6), financial literacy is binary variable for three correct responses (*AllCorrect*).

The results show that there is a positive association between financial literacy and employment. Each additional question correctly answered increases the likelihood of being employed by 3.7 percentage points [Column (1)]. Column (4) shows that those who can correctly answer all three questions are 5.4 percentage points more likely to be employed than their counterparts who are not financially literate (i.e. who could not correctly answer all three financial literacy questions). The MNL estimates show that, relative to the base group (not employed), each additional financial literacy question correctly answered increases the likelihood of being employed as an employee by 2.6 per cent and being employed as a self-employed person by 1.1 per cent [Columns (2) and (3) respectively]. All results are highly significant at the 1 per cent level of significance.

The coefficients and signs on the other variables in the regression accord with previous studies in this area. Men, for example, are significantly more likely than women to be self-employed. The estimates in Table (3) show men are 7.4 percentage points more likely to be self-employed than women. The negative sign on the schooling variable in Columns (3) and (6) is also consistent with previous Australian based studies. Kidd (1993), for example, showed that among the Australian born, self-employment is less likely among the more educated. The age variables show a significant and non-linear relationship with the propensity to be employed (including as an employee or self-employed). This is also a common result in the literature (Le, 1999). The household income variable is also highly significant, though it is noteworthy that the relationship is negative for employees and positive for the self-employed. It shows that the greater the access the individual has to non-labour income, the more likely they are to choose not to work as an employee and the more likely they are to choose to work in self-employment. Being legally married (or cohabiting) is positively and significantly associated with being employed, while children only affect the employment decision of employees. Relative to the Australian born (omitted group), those born in a non-English speaking country are significantly less likely to choose to work as an employee. There is no difference in their likelihood of being self-employed when compared with other birth groups.

The housing tenure and controls for relative socio-economic advantage show that, relative to those who rent, those who are mortgaged or have their house paid are significantly more likely to select into employment as employees. These same housing tenure variables have no bearing on the decision to be self-employed. Residing in a poor neighbourhood is associated with a significantly lower likelihood of being employed (employee or self-employed), whereas those in areas of high advantage have a significantly higher likelihood of being self-employed than those in the base group.

Table 4 reports the marginal effects from logit regressions with financial literacy treated as being endogenous. The dependent variable is *Emp*, which is a binary variable if employed. Here, we are essentially just considering the relationship between financial literacy and being employed. As required under this approach, the parental schooling instruments should be a "good" predictor of the respondent's financial literacy, but a "bad" predictor of the respondent's employment status (however measured). Columns (2) and (7) report the first stage regression results—Column (6) is for *Noncorrect* and Column (7) is for *AllCorrect*. The main explanatory variables of interest in the first stage are

Table 3. *Financial Literacy and Employment Status, Marginal Effects, Persons, Aged 20–64, Australia (Financial Literacy Exogenous)*

Mnemonic	(1) NumCorrect	(2)	(3)	(4) AllCorrect	(5)	(6)
Estimator	Logit	Multinomial logit	Multinomial logit	Logit	Multinomial logit	Multinomial logit
Outcome variable	Emp	EmpStat (outcome 2: employee)	EmpStat (outcome 3: self-employed)	Emp	EmpStat (outcome 2: employee)	EmpStat (outcome 3: self-employed)
NumCorrect	0.037***	0.026***	0.011***	—	—	—
	(0.004)	(0.005)	(0.004)			
AllCorrect	—	—	—	0.054***	0.033***	0.021***
				(0.008)	(0.009)	(0.006)
Male	0.099***	0.019**	0.074***	0.101***	0.022**	0.074***
	(0.007)	(0.009)	(0.006)	(0.007)	(0.009)	(0.006)
School	0.024***	0.028***	−0.003**	0.025***	0.029***	−0.003***
	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)
Age	0.026***	0.014***	0.013***	0.026***	0.014***	0.013***
	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)
Age^2	−0.000***	−0.000***	−0.000***	−0.000***	−0.000***	−0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
NonLabInc	−0.016***	−0.045***	0.016***	−0.016***	−0.045***	0.016***
	(0.002)	(0.005)	(0.002)	(0.002)	(0.005)	(0.002)
Married	0.130***	0.120***	0.021***	0.132***	0.121***	0.021***
	(0.012)	(0.014)	(0.008)	(0.012)	(0.014)	(0.008)
SepWidDiv	0.064***	0.051***	0.013	0.065***	0.051***	0.014
	(0.012)	(0.017)	(0.013)	(0.012)	(0.017)	(0.013)
Child <5	−0.130***	−0.133***	−0.002	−0.129***	−0.132***	−0.002
	(0.015)	(0.016)	(0.009)	(0.015)	(0.016)	(0.009)
NumChild	−0.036***	−0.041***	0.004	−0.036***	−0.041***	0.004
	(0.005)	(0.006)	(0.003)	(0.005)	(0.006)	(0.003)
ForBornEng	0.013	−0.001	0.011	0.013	−0.000	0.011
	(0.014)	(0.016)	(0.009)	(0.013)	(0.016)	(0.009)
ForBornNonEng	−0.045***	−0.060***	0.012	−0.050***	−0.064***	0.012
	(0.014)	(0.015)	(0.009)	(0.014)	(0.015)	(0.009)
NoMortgage	0.057***	0.070***	−0.003	0.058***	0.072***	−0.003
	(0.010)	(0.013)	(0.008)	(0.010)	(0.013)	(0.008)
Mortgaged	0.136***	0.151***	−0.004	0.137***	0.152***	−0.004
	(0.008)	(0.009)	(0.006)	(0.008)	(0.009)	(0.006)
PoorNeigh	−0.101***	−0.082***	−0.023***	−0.102***	−0.084***	−0.023***
	(0.011)	(0.012)	(0.007)	(0.011)	(0.012)	(0.007)
RichNeigh	0.023**	0.004	0.024***	0.023**	0.005	0.024***
	(0.010)	(0.012)	(0.007)	(0.010)	(0.012)	(0.007)
Urban	0.017**	0.047***	−0.028***	0.017**	0.047***	−0.028***
	(0.008)	(0.009)	(0.006)	(0.008)	(0.009)	(0.006)
VIC	0.010	0.013	−0.003	0.009	0.012	−0.003
	(0.010)	(0.011)	(0.007)	(0.010)	(0.011)	(0.007)

Table 3. (*Continued*)

Mnemonic	(1) NumCorrect	(2)	(3)	(4) AllCorrect	(5)	(6)
Estimator	Logit	Multinomial logit	Multinomial logit	Logit	Multinomial logit	Multinomial logit
Outcome variable	Emp	EmpStat (outcome 2: employee)	EmpStat (outcome 3: self-employed)	Emp	EmpStat (outcome 2: employee)	EmpStat (outcome 3: self-employed)
QLD	−0.028***	−0.027**	−0.004	−0.027**	−0.026**	−0.004
	(0.011)	(0.012)	(0.007)	(0.011)	(0.012)	(0.007)
SA	−0.025*	−0.025	−0.002	−0.025*	−0.025	−0.002
	(0.015)	(0.016)	(0.010)	(0.015)	(0.016)	(0.010)
WA	−0.006	−0.005	0.001	−0.003	−0.003	0.001
	(0.015)	(0.017)	(0.010)	(0.015)	(0.017)	(0.010)
TAS	−0.011	−0.001	−0.014	−0.011	−0.000	−0.014
	(0.022)	(0.025)	(0.014)	(0.022)	(0.025)	(0.014)
NT	0.087***	0.124***	−0.034*	0.087***	0.125***	−0.034*
	(0.031)	(0.038)	(0.020)	(0.031)	(0.038)	(0.021)
ACT	−0.045	−0.017	−0.027*	−0.046	−0.018	−0.027*
	(0.031)	(0.031)	(0.015)	(0.031)	(0.031)	(0.014)
Pseudo R^2 (%)	14.7%	13.0%	-	14.5%	12.9%	-

Notes: Persons, aged 20–64 years.

N = 12,858.

Robust standard errors in parentheses.

Statistical significance levels: ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$.

Estimates weighted.

Source: Household, Income and Labour Dynamics in Australia (HILDA) survey, 2016.

the two parental schooling variables. The coefficients on *MotherSch* and *FatherSch* are positive and highly significant. The chi-square test is equal to 82.0 when the dependent variable is the number of financial literacy questions correctly answered [Column (2)] and 76.2 when financial literacy is a binary variable [Column (7)]. In other words, the inclusion of father's and mother's schooling leads to a large and highly significant improvement in goodness of fit. These tests suggest that we do not have a weak instrument (Angrist & Kolesaru, 2023; Bound *et al.*, 1995). The reduced form results in Columns (3) and (8) show that these two variables are not correlated with participation in employment. The estimates with financial literacy as an endogenous determinant are in Columns (5) and (10). Column (5) shows that each additional question correctly answered increases the likelihood of being employed (vs. not employed) by 14 percentage points.

Tables 5 and 6 report the marginal effects from multinomial logit (MNL) regressions with financial literacy treated as an endogenous determinant and the dependent variable *EmpStat* (one if not employed; two if employee; three if self-employed). In Table 5, the focus is on financial literacy measured using the count measure (*NumCorrect*). In Table 6, the binary variable (*AllCorrect*) is used to measure financial literacy. In both tables, the marginal effects with financial literacy treated as an exogenous determinant are re-stated, for convenience, in Columns (1) and (2). The first stage results are the same as those reported in Table 4 [Columns (2) and (7)] and are also reported, again, for convenience [Column (3) of Tables 5 and 6]. In other words, the first stage estimates with the dependent variable *NumCorrect* are the same regardless of whether the outcome variable is *Emp* (0 if not

Table 4. *Financial Literacy and Employment Status, Marginal Effects, Persons, Aged 20–64, Australia (Financial Literacy Endogenous)*

	(1) NumCorrect	(2)	(3)	(4)	(5)	(6)	(7) AllCorrect	(8)	(9)	(10)
	Structural	First stage	Reduced form	Hausman	IV	Structural	First stage	Reduced form	Hausman	IV
Estimator	Logit	Ordered logit	Logit	Logit	Logit	Logit	Logit	Logit	Logit	Logit
Outcome variable	Emp	NumCorrect	Emp	Emp	Emp	Emp	AllCorrect	Emp	Emp	Emp
NumCorrect	0.037***	—	—	0.035***	—	—	—	—	—	—
	(0.004)			(0.004)						
NumCorrectHat	—	—	—	0.105***	0.140***	—	—	—	—	—
				(0.035)	(0.034)					
AllCorrect	—	—	—	—	—	0.054***	—	—	0.051***	—
						(0.008)			(0.008)	
AllCorrectHat	—	—	—	—	—	—	—	—	0.225***	0.273***
									(0.077)	(0.077)
MotherSch	—	0.047***	0.002	—	—	—	0.012***	0.002	—	—
		(0.010)	(0.002)				(0.003)	(0.002)		
FatherSch	—	0.065***	0.001	—	—	—	0.016***	0.001	—	—
		(0.010)	(0.002)				(0.003)	(0.002)		
Male	0.099***	0.808***	0.109***	0.068***	0.067***	0.101***	0.194***	0.109***	0.064***	0.064***
	(0.007)	(0.038)	(0.007)	(0.013)	(0.013)	(0.007)	(0.010)	(0.007)	(0.015)	(0.015)
School	0.024***	0.257***	0.027***	0.014***	0.014***	0.025***	0.059***	0.027***	0.013***	0.013***
	(0.002)	(0.011)	(0.002)	(0.004)	(0.004)	(0.002)	(0.003)	(0.002)	(0.004)	(0.004)
Age	0.026***	0.096***	0.027***	0.021***	0.021***	0.026***	0.026***	0.027***	0.020***	0.020***
	(0.002)	(0.012)	(0.002)	(0.003)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.003)
Age^2	−0.000***	−0.001***	−0.000***	−0.000***	−0.000***	−0.000***	−0.000***	−0.000***	−0.000***	−0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
NonLabInc	−0.016***	0.016*	−0.016***	−0.016***	−0.016***	−0.016***	0.004*	−0.016***	−0.016***	−0.016***
	(0.002)	(0.009)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Married	0.130***	0.223***	0.135***	0.120***	0.121***	0.132***	0.049***	0.135***	0.127***	0.128***
	(0.012)	(0.050)	(0.012)	(0.012)	(0.012)	(0.012)	(0.013)	(0.012)	(0.012)	(0.012)
SepWidDiv	0.064***	0.191**	0.067***	0.057***	0.058***	0.065***	0.045**	0.067***	0.061***	0.063***
	(0.012)	(0.079)	(0.011)	(0.012)	(0.012)	(0.012)	(0.019)	(0.011)	(0.012)	(0.012)
Child <5	−0.130***	0.117*	−0.128***	−0.137***	−0.137***	−0.129***	0.030*	−0.128***	−0.139***	−0.139***
	(0.015)	(0.062)	(0.015)	(0.016)	(0.016)	(0.015)	(0.016)	(0.015)	(0.016)	(0.016)

Table 4. (*Continued*)

	(1) NumCorrect	(2)	(3)	(4)	(5)	(6)	(7) AllCorrect	(8)	(9)	(10)
	Structural	First stage	Reduced form	Hausman	IV	Structural	First stage	Reduced form	Hausman	IV
Estimator	Logit	Ordered logit	Logit	Logit	Logit	Logit	Logit	Logit	Logit	Logit
Outcome variable	Emp	NumCorrect	Emp	Emp	Emp	Emp	AllCorrect	Emp	Emp	Emp
NumChild	−0.036***	−0.067***	−0.037***	−0.032***	−0.032***	−0.036***	−0.018***	−0.037***	−0.033***	−0.034***
	(0.005)	(0.025)	(0.005)	(0.005)	(0.005)	(0.005)	(0.006)	(0.005)	(0.005)	(0.005)
ForBornEng	0.013	0.072	0.012	0.010	0.010	0.013	0.007	0.012	0.011	0.011
	(0.014)	(0.071)	(0.014)	(0.014)	(0.014)	(0.013)	(0.018)	(0.014)	(0.013)	(0.014)
ForBornNonEng	−0.045***	−0.589***	−0.056***	−0.021	−0.022	−0.050***	−0.118***	−0.056***	−0.027*	−0.027*
	(0.014)	(0.065)	(0.014)	(0.015)	(0.015)	(0.014)	(0.017)	(0.014)	(0.015)	(0.015)
NoMortgage	0.057***	0.421***	0.062***	0.044***	0.045***	0.058***	0.089***	0.062***	0.045***	0.046***
	(0.010)	(0.068)	(0.010)	(0.011)	(0.011)	(0.010)	(0.016)	(0.010)	(0.011)	(0.011)
Mortgaged	0.136***	0.186***	0.139***	0.129***	0.129***	0.137***	0.037***	0.139***	0.133***	0.134***
	(0.008)	(0.041)	(0.008)	(0.008)	(0.008)	(0.008)	(0.010)	(0.008)	(0.008)	(0.008)
PoorNeigh	−0.101***	−0.266***	−0.106***	−0.085***	−0.085***	−0.102***	−0.069***	−0.106***	−0.089***	−0.090***
	(0.011)	(0.048)	(0.011)	(0.012)	(0.012)	(0.011)	(0.013)	(0.011)	(0.012)	(0.012)
RichNeigh	0.023**	0.234***	0.024**	0.014	0.014	0.023**	0.049***	0.024**	0.014	0.014
	(0.010)	(0.053)	(0.010)	(0.011)	(0.011)	(0.010)	(0.013)	(0.010)	(0.011)	(0.011)
Urban	0.017**	0.028	0.017**	0.015*	0.015*	0.017**	0.012	0.017**	0.012	0.012
	(0.008)	(0.040)	(0.008)	(0.008)	(0.008)	(0.008)	(0.010)	(0.008)	(0.008)	(0.008)
VIC	0.010	−0.155***	0.007	0.016	0.016	0.009	−0.028**	0.007	0.014	0.014
	(0.010)	(0.050)	(0.010)	(0.010)	(0.010)	(0.010)	(0.013)	(0.010)	(0.010)	(0.010)
QLD	−0.028***	0.007	−0.027**	−0.028***	−0.028***	−0.027**	−0.003	−0.027**	−0.024**	−0.024**
	(0.011)	(0.051)	(0.011)	(0.011)	(0.011)	(0.011)	(0.013)	(0.011)	(0.011)	(0.011)
SA	−0.025*	0.021	−0.024*	−0.025*	−0.025*	−0.025*	0.009	−0.024*	−0.025*	−0.024
	(0.015)	(0.072)	(0.015)	(0.015)	(0.015)	(0.015)	(0.018)	(0.015)	(0.015)	(0.015)
WA	−0.006	0.288***	−0.001	−0.017	−0.017	−0.003	0.058***	−0.001	−0.011	−0.010
	(0.015)	(0.073)	(0.015)	(0.016)	(0.016)	(0.015)	(0.018)	(0.015)	(0.015)	(0.015)
TAS	−0.011	0.015	−0.010	−0.009	−0.008	−0.011	−0.005	−0.010	−0.009	−0.009
	(0.022)	(0.103)	(0.022)	(0.022)	(0.022)	(0.022)	(0.028)	(0.022)	(0.022)	(0.022)
NT	0.087***	0.240	0.088***	0.080**	0.080**	0.087***	0.043	0.088***	0.080**	0.080**
	(0.031)	(0.198)	(0.031)	(0.032)	(0.032)	(0.031)	(0.050)	(0.031)	(0.032)	(0.032)

Table 4. (*Continued*)

	(1) NumCorrect	(2)	(3)	(4)	(5)	(6)	(7) AllCorrect	(8)	(9)	(10)
	Structural	First stage	Reduced form	Hausman	IV	Structural	First stage	Reduced form	Hausman	IV
Estimator	Logit	Ordered logit	Logit	Logit	Logit	Logit	Logit	Logit	Logit	Logit
Outcome variable	Emp	NumCorrect	Emp	Emp	Emp	Emp	AllCorrect	Emp	Emp	Emp
ACT	−0.045	0.365**	−0.041	−0.060*	−0.061*	−0.046	0.102***	−0.041	−0.074**	−0.074**
	(0.031)	(0.153)	(0.031)	(0.033)	(0.033)	(0.031)	(0.033)	(0.031)	(0.035)	(0.035)
Pseudo R^2 (%)	14.7%	9.8%	14.2%	14.7%	14.3%	14.5%	13.5%	14.2%	14.5%	14.2%
χ^2	—	82.0***	1.64	9.1***	—	—	76.2***	1.64	8.4***	—

Notes: Persons, aged 20–64 years.

N = 12,858.

Robust standard errors in parentheses.

Statistical significance levels: ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$.

Estimates weighted.

Source: Household, Income and Labour Dynamics in Australia (HILDA) survey, 2016.

Table 5. *Multinomial Logit Regressions: Financial Literacy and Employment Status, Marginal Effects, Financial Literacy Variable: NumCorrect Persons, Aged 20–64, Australia*

Outcome variable: *EmpStat*	(1) Structural	(2) Structural	(3) First stage	(4) Reduced form	(5) Reduced form	(6) Hausman	(7) Hausman	(8) IV	(9) IV
	Outcome 2: employee	Outcome 3: self-employed	NumCorrect	Outcome 2: employee	Outcome 3: self-employed	Outcome 2: employee	Outcome 3: self-employed	Outcome 2: employee	Outcome 3: self-employed
NumCorrect	0.026***	0.011***	—	—	—	0.025***	0.011***	—	—
	(0.005)	(0.004)				(0.005)	(0.004)		
NumCorrectHat	—	—	—	—	—	0.080*	0.044*	0.105**	0.054**
						(0.041)	(0.026)	(0.041)	(0.026)
MotherSch	—	—	0.047***	−0.001	0.003*	—	—	—	—
			(0.010)	(0.002)	(0.001)				
FatherSch	—	—	0.065***	0.001	−0.001	—	—	—	—
			(0.010)	(0.002)	(0.001)				
Male	0.019**	0.074***	0.808***	0.027***	0.077***	−0.005	0.062***	−0.005	0.062***
	(0.009)	(0.006)	(0.038)	(0.009)	(0.006)	(0.015)	(0.009)	(0.015)	(0.009)
School	0.028***	−0.003**	0.257***	0.031***	−0.003**	0.020***	−0.007***	0.020***	−0.007***
	(0.002)	(0.001)	(0.011)	(0.002)	(0.001)	(0.004)	(0.002)	(0.004)	(0.002)
Age	0.014***	0.013***	0.096***	0.015***	0.014***	0.010***	0.011***	0.010***	0.011***
	(0.003)	(0.002)	(0.012)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)
Age^2	−0.000***	−0.000***	−0.001***	−0.000***	−0.000***	−0.000***	−0.000***	−0.000***	−0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
NonLabInc	−0.045***	0.016***	0.016*	−0.045***	0.016***	−0.046***	0.015***	−0.046***	0.016***
	(0.005)	(0.002)	(0.009)	(0.005)	(0.002)	(0.005)	(0.002)	(0.005)	(0.002)
Married	0.120***	0.021***	0.223***	0.124***	0.022***	0.112***	0.017**	0.113***	0.018**
	(0.014)	(0.008)	(0.050)	(0.014)	(0.008)	(0.014)	(0.008)	(0.014)	(0.008)
SepWidDiv	0.051***	0.013	0.191**	0.053***	0.015	0.046***	0.010	0.046***	0.011
	(0.017)	(0.013)	(0.079)	(0.017)	(0.013)	(0.017)	(0.013)	(0.017)	(0.013)
Child <5	−0.133***	−0.002	0.117*	−0.131***	−0.001	−0.139***	−0.004	−0.139***	−0.004
	(0.016)	(0.009)	(0.062)	(0.016)	(0.009)	(0.016)	(0.009)	(0.016)	(0.009)
NumChild	−0.041***	0.004	−0.067***	−0.042***	0.003	−0.038***	0.005	−0.038***	0.005
	(0.006)	(0.003)	(0.025)	(0.006)	(0.003)	(0.006)	(0.003)	(0.006)	(0.003)
ForBornEng	−0.001	0.011	0.072	−0.000	0.011	−0.003	0.010	−0.003	0.010
	(0.016)	(0.009)	(0.071)	(0.016)	(0.009)	(0.016)	(0.009)	(0.016)	(0.009)

Table 5. (*Continued*)

Outcome variable: *EmpStat*	(1) Structural Outcome 2: employee	(2) Structural Outcome 3: self-employed	(3) First stage NumCorrect	(4) Reduced form Outcome 2: employee	(5) Reduced form Outcome 3: self-employed	(6) Hausman Outcome 2: employee	(7) Hausman Outcome 3: self-employed	(8) IV Outcome 2: employee	(9) IV Outcome 3: self-employed
ForBornNonEng	−0.060***	0.012	−0.589***	−0.068***	0.009	−0.040**	0.022**	−0.041**	0.021**
	(0.015)	(0.009)	(0.065)	(0.015)	(0.009)	(0.017)	(0.011)	(0.017)	(0.011)
NoMortgage	0.070***	−0.003	0.421***	0.074***	−0.001	0.061***	−0.008	0.061***	−0.008
	(0.013)	(0.008)	(0.068)	(0.013)	(0.008)	(0.014)	(0.008)	(0.014)	(0.008)
Mortgaged	0.151***	−0.004	0.186***	0.153***	−0.003	0.145***	−0.007	0.146***	−0.007
	(0.009)	(0.006)	(0.041)	(0.009)	(0.006)	(0.010)	(0.006)	(0.010)	(0.006)
PoorNeigh	−0.082***	−0.023***	−0.266***	−0.086***	−0.024***	−0.069***	−0.018**	−0.068***	−0.019**
	(0.012)	(0.007)	(0.048)	(0.012)	(0.007)	(0.013)	(0.007)	(0.013)	(0.008)
RichNeigh	0.004	0.024***	0.234***	0.006	0.024***	−0.002	0.020***	−0.002	0.020***
	(0.012)	(0.007)	(0.053)	(0.012)	(0.007)	(0.013)	(0.008)	(0.013)	(0.008)
Urban	0.047***	−0.028***	0.028	0.047***	−0.028***	0.045***	−0.029***	0.045***	−0.029***
	(0.009)	(0.006)	(0.040)	(0.009)	(0.006)	(0.009)	(0.006)	(0.009)	(0.006)
VIC	0.013	−0.003	−0.155***	0.011	−0.003	0.018	−0.000	0.017	−0.001
	(0.011)	(0.007)	(0.050)	(0.011)	(0.007)	(0.012)	(0.007)	(0.012)	(0.007)
QLD	−0.027**	−0.004	0.007	−0.027**	−0.003	−0.027**	−0.004	−0.027**	−0.004
	(0.012)	(0.007)	(0.051)	(0.012)	(0.007)	(0.012)	(0.007)	(0.012)	(0.007)
SA	−0.025	−0.002	0.021	−0.024	−0.002	−0.025	−0.002	−0.025	−0.002
	(0.016)	(0.010)	(0.072)	(0.016)	(0.010)	(0.016)	(0.010)	(0.017)	(0.010)
WA	−0.005	0.001	0.288***	−0.001	0.002	−0.015	−0.003	−0.014	−0.003
	(0.017)	(0.010)	(0.073)	(0.017)	(0.010)	(0.018)	(0.010)	(0.018)	(0.010)
TAS	−0.001	−0.014	0.015	0.000	−0.013	0.001	−0.013	0.002	−0.013
	(0.025)	(0.014)	(0.103)	(0.025)	(0.014)	(0.025)	(0.014)	(0.025)	(0.014)
NT	0.124***	−0.034*	0.240	0.126***	−0.035*	0.119***	−0.036*	0.118***	−0.036*
	(0.038)	(0.020)	(0.198)	(0.037)	(0.020)	(0.039)	(0.020)	(0.039)	(0.020)
ACT	−0.017	−0.027*	0.365**	−0.014	−0.027*	−0.031	−0.030**	−0.032	−0.030**
	(0.031)	(0.015)	(0.153)	(0.031)	(0.015)	(0.033)	(0.014)	(0.033)	(0.014)

Table 5. (*Continued*)

Outcome variable: *EmpStat*	(1) Structural Outcome 2: employee	(2) Structural Outcome 3: self-employed	(3) First stage NumCorrect	(4) Reduced form Outcome 2: employee	(5) Reduced form Outcome 3: self-employed	(6) Hausman Outcome 2: employee	(7) Hausman Outcome 3: self-employed	(8) IV Outcome 2: employee	(9) IV Outcome 3: self-employed
Pseudo R^2 (%)	12.3%	—	9.8%	12.7%	—	13.1%	—	12.8%	—
χ^2	—	—	82.0***	4.64	—	13.3***	—	—	—

Notes: Persons, aged 20–64 years.

N = 12,858.

Robust standard errors in parentheses.

Statistical significance levels: ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$.

Estimates weighted.

Source: Household, Income and Labour Dynamics in Australia (HILDA) survey, 2016.

Table 6. *Multinomial Logit Regressions: Financial Literacy and Employment Status Financial Literacy Variable: AllCorrect Persons, Aged 20–64, Australia*

Outcome variable: *EmpStat*	(1) Structural	(2) Structural	(3) First stage	(4) Reduced form	(5) Reduced form	(6) Hausman	(7) Hausman	(8) IV	(9) IV
	Outcome 2: employee	Outcome 3: self-employed	AllCorrect	Outcome 2: employee	Outcome 3: self-employed	Outcome 2: employee	Outcome 3: self-employed	Outcome 2: employee	Outcome 3: self-employed
AllCorrect	0.033***	0.021***	—	—	—	0.030***	0.020***	—	—
	(0.009)	(0.006)				(0.009)	(0.006)		
AllCorrectHat	—	—	—	—	—	0.171*	0.069	0.200**	0.087*
						(0.090)	(0.051)	(0.089)	(0.051)
MotherSch	—	—	0.012***	−0.001	0.003*	—	—	—	—
			(0.003)	(0.002)	(0.001)				
FatherSch	—	—	0.016***	0.001	−0.001	—	—	—	—
			(0.003)	(0.002)	(0.001)				
Male	0.022**	0.074***	0.194***	0.027***	0.077***	−0.005	0.062***	−0.006	0.063***
	(0.009)	(0.006)	(0.010)	(0.009)	(0.006)	(0.017)	(0.010)	(0.017)	(0.010)
School	0.029***	−0.003***	0.059***	0.031***	−0.003**	0.020***	−0.007**	0.020***	−0.006**
	(0.002)	(0.001)	(0.003)	(0.002)	(0.001)	(0.005)	(0.003)	(0.005)	(0.003)
Age	0.014***	0.013***	0.026***	0.015***	0.014***	0.010***	0.011***	0.010***	0.011***
	(0.003)	(0.002)	(0.003)	(0.003)	(0.002)	(0.004)	(0.002)	(0.004)	(0.002)
Age^2	−0.000***	−0.000***	−0.000***	−0.000***	−0.000***	−0.000***	−0.000***	−0.000***	−0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
NonLabInc	−0.045***	0.016***	0.004*	−0.045***	0.016***	−0.045***	0.015***	−0.046***	0.016***
	(0.005)	(0.002)	(0.002)	(0.005)	(0.002)	(0.005)	(0.002)	(0.005)	(0.002)
Married	0.121***	0.021***	0.049***	0.124***	0.022***	0.117***	0.020**	0.119***	0.020**
	(0.014)	(0.008)	(0.013)	(0.014)	(0.008)	(0.014)	(0.008)	(0.014)	(0.008)
SepWidDiv	0.051***	0.014	0.045**	0.053***	0.015	0.049***	0.012	0.050***	0.013
	(0.017)	(0.013)	(0.019)	(0.017)	(0.013)	(0.017)	(0.013)	(0.017)	(0.013)
Child <5	−0.132***	−0.002	0.030*	−0.131***	−0.001	−0.139***	−0.004	−0.140***	−0.004
	(0.016)	(0.009)	(0.016)	(0.016)	(0.009)	(0.017)	(0.009)	(0.017)	(0.009)
NumChild	−0.041***	0.004	−0.018***	−0.042***	0.003	−0.039***	0.004	−0.040***	0.004
	(0.006)	(0.003)	(0.006)	(0.006)	(0.003)	(0.006)	(0.003)	(0.006)	(0.003)
ForBornEng	−0.000	0.011	0.007	−0.000	0.011	−0.002	0.010	−0.002	0.011
	(0.016)	(0.009)	(0.018)	(0.016)	(0.009)	(0.016)	(0.009)	(0.016)	(0.009)

Table 6. (*Continued*)

Outcome variable: *EmpStat*	(1) Structural	(2) Structural	(3) First stage	(4) Reduced form	(5) Reduced form	(6) Hausman	(7) Hausman	(8) IV	(9) IV
	Outcome 2: employee	Outcome 3: self-employed	AllCorrect	Outcome 2: employee	Outcome 3: self-employed	Outcome 2: employee	Outcome 3: self-employed	Outcome 2: employee	Outcome 3: self-employed
ForBornNonEng	−0.064***	0.012	−0.118***	−0.068***	0.009	−0.046***	0.019*	−0.046***	0.018*
	(0.015)	(0.009)	(0.017)	(0.015)	(0.009)	(0.017)	(0.010)	(0.017)	(0.010)
NoMortgage	0.072***	−0.003	0.089***	0.074***	−0.001	0.062***	−0.007	0.062***	−0.007
	(0.013)	(0.008)	(0.016)	(0.013)	(0.008)	(0.014)	(0.008)	(0.014)	(0.009)
Mortgaged	0.152***	−0.004	0.037***	0.153***	−0.003	0.149***	−0.005	0.150***	−0.005
	(0.009)	(0.006)	(0.010)	(0.009)	(0.006)	(0.010)	(0.006)	(0.010)	(0.006)
PoorNeigh	−0.084***	−0.023***	−0.069***	−0.086***	−0.024***	−0.073***	−0.020***	−0.073***	−0.020***
	(0.012)	(0.007)	(0.013)	(0.012)	(0.007)	(0.013)	(0.007)	(0.013)	(0.007)
RichNeigh	0.005	0.024***	0.049***	0.006	0.024***	−0.002	0.021***	−0.002	0.021***
	(0.012)	(0.007)	(0.013)	(0.012)	(0.007)	(0.013)	(0.008)	(0.013)	(0.008)
Urban	0.047***	−0.028***	0.012	0.047***	−0.028***	0.043***	−0.030***	0.043***	−0.030***
	(0.009)	(0.006)	(0.010)	(0.009)	(0.006)	(0.009)	(0.006)	(0.009)	(0.006)
VIC	0.012	−0.003	−0.028**	0.011	−0.003	0.016	−0.001	0.015	−0.001
	(0.011)	(0.007)	(0.013)	(0.011)	(0.007)	(0.012)	(0.007)	(0.012)	(0.007)
QLD	−0.026**	−0.004	−0.003	−0.027**	−0.003	−0.024*	−0.003	−0.024*	−0.002
	(0.012)	(0.007)	(0.013)	(0.012)	(0.007)	(0.012)	(0.007)	(0.012)	(0.007)
SA	−0.025	−0.002	0.009	−0.024	−0.002	−0.025	−0.002	−0.024	−0.002
	(0.016)	(0.010)	(0.018)	(0.016)	(0.010)	(0.016)	(0.010)	(0.016)	(0.010)
WA	−0.003	0.001	0.058***	−0.001	0.002	−0.009	−0.001	−0.008	−0.001
	(0.017)	(0.010)	(0.018)	(0.017)	(0.010)	(0.017)	(0.010)	(0.017)	(0.010)
TAS	−0.000	−0.014	−0.005	0.000	−0.013	0.001	−0.013	0.001	−0.013
	(0.025)	(0.014)	(0.028)	(0.025)	(0.014)	(0.025)	(0.014)	(0.025)	(0.014)
NT	0.125***	−0.034*	0.043	0.126***	−0.035*	0.119***	−0.036*	0.119***	−0.036*
	(0.038)	(0.021)	(0.050)	(0.037)	(0.020)	(0.039)	(0.020)	(0.039)	(0.020)
ACT	−0.018	−0.027*	0.102***	−0.014	−0.027*	−0.042	−0.032**	−0.042	−0.032**
	(0.031)	(0.014)	(0.033)	(0.031)	(0.015)	(0.035)	(0.014)	(0.035)	(0.014)

Table 6. (*Continued*)

Outcome variable: *EmpStat*	(1) Structural Outcome 2: employee	(2) Structural Outcome 3: self-employed	(3) First stage AllCorrect	(4) Reduced form Outcome 2: employee	(5) Reduced form Outcome 3: self-employed	(6) Hausman Outcome 2: employee	(7) Hausman Outcome 3: self-employed	(8) IV Outcome 2: employee	(9) IV Outcome 3: self-employed
Pseudo R^2 (%)	13.5%	—	13.5%	12.7%	—	12.9%	—	12.7%	—
χ^2	—	—	76.2***	4.64	—	9.94***	—	—	—

Notes: Persons, aged 20–64 years.

N = 12,858.

Robust standard errors in parentheses.

Statistical significance levels: ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$.

Estimates weighted.

Source: Household, Income and Labour Dynamics in Australia (HILDA) survey, 2016.

employed; 1 if employed) or three category variable *EmpStat* (1 if not employed; 2 if employee; 3 if self-employed).

Focusing on Table 5, the Hausman test for endogeneity [Columns (6) and (7)] shows that the chi-square test is highly significant, which means we cannot reject the null hypothesis that financial literacy is exogenous. A comparison of Columns (1) and (8) in Table 5 shows the effect of financial literacy on the decision to work as an employee when treated as an exogenous determinant [Column (1)] and an endogenous determinant [Column (8)]. In the former, each additional question correctly answered increases the likelihood of being employed as an employee by 2.6 per cent. Column (8) shows that this effect increases to 10.5 per cent when treated endogenously.

The results in Columns (2) and (9) for the self-employed may be similarly compared. They show that when treated as an exogenous determinant, each additional financial literacy question correctly answered increases the likelihood of being self-employed by 1.1 per cent (*vis-a-vis* not being employed) [Column (2)]. When treated as an endogenous determinant, this rises to 5.4 per cent [Column (9)]. In Table 6, where financial literacy is measured using a dummy variable, the likelihood of selecting into self-employment increases by 2.1 per cent [Column (1)] if financial literacy is exogenous and by 8.7 per cent when financial literacy is instrumented [Column (9)].

To summarise, our interest is in understanding whether financial literacy has a causal effect on the likelihood of being employed, in particular, self-employed. The MNL results in Tables 5 and 6 show that financial literacy is an endogenous determinant of employment (either as an employee or self-employed). The results also show that when treated as an endogenous determinant the "kick" that comes from being financially literate (or more financially literate) is larger than when financial literacy is not instrumented and the relationship is assumed to be exogenous. This larger coefficient on the instrumented variable is not unusual in financial literacy studies where IVs are used (Pesando, 2018). The key finding is that there is a positive relationship between financial literacy and employment, with the likely causal direction running from financial literacy to employment. Within the employment relationship, financial literacy affects both the decision to engage as an employee and the decision to be self-employed. We do not see any evidence of it working on one aspect of employment, but not the other. The other key finding is that financial literacy is an endogenous determinant and failure to account for this endogenous relationship may bias the results and understate the effects of financial literacy on employment (both types).

5.2. Robustness Checks

Table 7 summarises the findings from robustness checks conducted using the financial literacy variable "*NumCorrect*." All estimates are undertaken using MNL and marginal effects are reported. We only report the coefficients associated with the financial literacy variable. For convenience, row (1) summarises the findings from Table 5 (baseline estimates).

Several robustness checks are conducted. The first pertains to the measurement of non-labour income. Following Killingsworth (1983), non-labour income is the total income from all sources in the household that the individual lives in minus their labour earnings. This variable has consistently been shown in empirical work to be a key determinant of labour supply decisions such as employment and hours worked. If we exclude this variable from the employment equations, then we have a specification error. However, we recognise that financial literacy has a positive association with wealth (Lusardi & Mitchell, 2014) and, therefore, can be expected to be positively correlated with non-labour income. If non-labour income is highly correlated with financial literacy, then non-labour income is endogenous with respect to financial literacy and should, therefore, not be included as a first stage variable in the IV approach. We, therefore, have a dilemma. Excluding it means misspecifying the employment equation; including it means we have an endogenous specification.

In the baseline estimates reported earlier, we include non-labour income in the analysis. Our view is that if financial literacy is driving wealth accumulation, then it will do so through investment income. Investment as a share of total household income is equal to 3 per cent. As a share of non-labour income, it is equal to 4.5 per cent. Labour earnings as a share of household income is equal to 76 per cent. Only 45 per cent of households report having some investment income, with the average

Table 7. *Robustness Checks, Financial Literacy Variable: NumCorrect Persons, Aged 20–64, Australia*

		(1) Structural: outcome 2 (employee)	(2) Structural: outcome 3 (self-employed)	(3) IV: outcome 2 (employee)	(4) IV: outcome 3 (self-employed)
(1)	Baseline: full-sample (N = 12,858)	0.026*** (0.005)	0.011*** (0.004)	0.105** (0.041)	0.054** (0.026)
(2)	Dropping non-labour income from the regression (N = 12,858)	0.024*** (0.005)	0.013*** (0.004)	0.094** (0.040)	0.061** (0.026)
(3)	Dropping observations missing information on both parent's education (N = 11,346)	0.022*** (0.006)	0.010** (0.004)	0.073 (0.054)	0.040 (0.033)
(4)	Dropping observations with missing risk and cognition information (N = 10,230)	0.012* (0.007)	0.014*** (0.005)	0.081* (0.045)	0.065** (0.029)
(5)	Baseline from row (4) plus controls for cognition and risk (N = 10,230)	0.004 (0.007)	0.010** (0.005)	0.150*** (0.044)	0.011 (0.027)

Notes: Persons, aged 20–64 years.
Robust standard errors in parentheses.
Statistical significance levels: ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$.
Estimates weighted.
Source: Household, Income and Labour Dynamics in Australia (HILDA) survey, 2016.

amount equal to AUD13,280 in 2016. For most individuals, investment income is not a large component of household income and hence not a large component of non-labour income. It is therefore unlikely to bias our estimates.

In order to explore this further, we conducted a robustness check, where the non-labour income variable was excluded from the specification. This is reported in row (2) of Table 7. A comparison with the baseline marginal effects in row (1) suggests there is little difference in the marginal effects of financial literacy on employment after non-labour income is excluded. This is the case for both employees and the self-employed. This is surprising since excluding non-labour income is a clear specification error. Because of this, you would not expect to find such robustness. However, this robustness does provide strong evidence that not only is financial literacy positively related to employment but also the likely causal direction is from financial literacy to employment.

The second robustness check that we undertook concerns the IV. Our IV approach uses information on parental (maternal and paternal) education. As described in the text, we impute schooling information for a small portion of the sample. Imputing information is not unusual in studies of this nature, but it can result in measurement error. The alternative is to exclude those with missing information and work with a less representative sample. We believe the latter to be more problematic. For example, a two-tailed t test (not reported but available on request) for the mean difference in financial literacy between those where parental schooling is observed and those where it is missing shows that there is a significant difference between the two groups. Both financial literacy and employment are higher where parental schooling is observed. This suggests that the group to be excluded is different. It also implies that imputing schooling may be problematic. The results shown in Row (3) of Table 7 indicate that when financial literacy is assumed to be exogenous [Columns (1) and (2)], the

marginal effects of financial literacy are only slightly smaller than the baseline marginal effects. When financial literacy is assumed to be endogenous [Columns (3) and (4)], the marginal effects of financial literacy are smaller and less well-determined. However, it is not possible to conclude if these differences are due to the imputation method or the non-representative of the sample of individuals who do not report their parents schooling.

The third check relates to two variables that have been shown in the literature to be important determinants of self-employment—namely cognitive ability and risk taking. Although HILDA has information that permits us to control for both these characteristics, the information is not available for all sample members. When selecting on observations with data on these two variables, we lose just over 20 per cent of the sample. The smaller, non-representative sample comprised 10,265 observations. We begin by estimating the baseline regression. The results are reported in row (4). Row (5) extends row (4) by including cognition and risk measures. The IV estimates for this non-representative sample suggests that when treated as an exogenous determinant, financial literacy has no effect on the likelihood of being an employee and a significant effect on the likelihood of being self-employed. When the relationship is modelled using an IV approach, financial literacy is shown to be an important predictor of employee employment, but not self-employment. As noted, these results should be treated with caution given the non-representative nature of the sample.

6. Conclusion

Self-employment is on the decline in many high-income countries including Australia, Germany and the United States (OECD, 2017). This is somewhat of a concern as self-employment or entrepreneurship is seen as an important source of employment creation and economic growth. There is, therefore, considerable interest in the determinants of self-employment, particularly among researchers and policymakers. The growing literature on this topic shows that important correlates include education and field of study (Ahn & Winters, 2021; Leoni & Faulk, 2010) as well as personality and attitudes to risk (Parker, 2009; Simoes *et al*., 2016).

Financial literacy has also been identified as important factor, though the evidence on this is limited and the relationship poorly understood. Of the three published articles exploring the link between financial literacy and self-employment, only one uses an approach that recognises the potential endogenous relationship between financial literacy and self-employment. Additionally, none deals directly with the issue of "self-selection into employment."

In this article, we build on this emerging literature and address these two important gaps in the literature (causality and self-selection). Data from the HILDA survey for a sample aged twenty to sixty-four in 2016 are used to examine, empirically, the relationship between financial literacy and two employment types (employee employment and self-employment). Our analysis points to a positive effect of financial literacy on both types of employment.

When financial literacy is measured using a count measure (*NumCorrect*) and assumed to be exogenous, we show that each additional financial literacy question correctly answered increases the likelihood of being employed as an employee by 2.6 per cent and self-employed by 1.1 per cent (the base category is not employed). When financial literacy (*NumCorrect*) is treated as an endogenous determinant, the likelihood of being an employee increases to 10.5 per cent and the likelihood of being self-employed increases to 5.4 per cent. Aside from confirming that there is a positive and significant causal relationship, the results also suggest that a failure to account for endogeneity when exploring the relationship between financial literacy and employment may produce biased estimates.

The results in this article should be of interest to policymakers. Unlike many other individual characteristics that correlate with self-employment and where interventions are not able to change the characteristic (e.g. personality), financial literacy is one area where interventions may make a difference. The results suggest that improving financial literacy could enhance employment among employees and, importantly, the self-employed. Future research should consider the relationship between financial literacy and survival in self-employment and whether the relationship between financial literacy and self-employment is the same for men and women.

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