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Understanding the Gender Gap in Financial Literacy: Evidence from Australia*

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Using micro-data from the Household, Income and Labour Dynamics in Australia Survey, and the Oaxaca–Blinder decomposition technique, this paper examines the determinants of the gender gap in financial literacy. The analysis suggests that human capital variables, such as age and education, are not important in explaining the gender gap in financial literacy. Labour market variables, such as sector, occupation, industry, union membership and labour market status, are important and explain around 16 per cent of the gap. This finding is dependent on the assumption that these variables are exogenous. There is a large unexplained gap, suggesting that the main determinants are neither human capital nor labour market factors.

I Introduction

Available evidence suggests that in most countries there is a sizeable gender gap in financial literacy, with women, on average, less financially literate than men. Hasler and Lusardi's (2017) study of financial literacy in 143 countries, for example, found that male financial literacy was higher than women's in almost all countries studied. Gender gaps in financial literacy exist for a variety of demographic and socioeconomic groups, including teenagers (Bottazzi & Lusardi, 2016; Driva *et al.*, 2016), university students (Gerrans & Heaney, 2016) and migrants (Karunarathne & Gibson, 2014). Statistically significant male–female financial literacy gaps have been documented in a number of studies (Lusardi & Mitchell, 2008, 2011, 2014; Hung *et al.*, 2009; Bateman *et al.*, 2012; Woodyard & Robb, 2012; Agnew *et al.*, 2013; Lusardi *et al.*, 2014; Agnew & Harrison, 2015; Almenberg & Dreber, 2015; Bannier & Neubert, 2016; Hasler & Lusardi, 2017; Killins, 2017). However, few have specifically examined the determinants of the gap, with the exceptions being Cupák *et al.* (2018), Bucher-Koenen *et al.* (2017), Hsu (2016) and Fonseca *et al.* (2012). Bottazzi and Lusardi (2016) seem to be alone in offering a study of the determinants of the gender gap in financial literacy among young people.

Understanding the gender gap in financial literacy is an important research objective. It is central to the development of interventions to narrow the gender gap, improve the economic and financial security of women and support other social and economic outcomes linked to financial literacy. Australia is an interesting case study since it ranks highly in terms of its overall level of financial literacy. For example, the data collected by Hasler and Lusardi (2017) suggest that Australia ranks in the top 10 countries in

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terms of financial literacy. Within the OECD, however, Australia has one of the largest male–female financial literacy gaps. The Australian puzzle of high financial literacy coupled with a large gender gap should, therefore, be of interest to researchers and policy-makers in other countries.

In this paper micro-data collected in the Household, Income and Labour Dynamics in Australia Survey (HILDA) are used to examine the determinants of the male–female financial literacy gap. Five financial literacy questions were asked in 2016 (wave 16). HILDA is a large, nationally representative survey with detailed demographic, socioeconomic and psychological information about respondents and their households. The Oaxaca–Blinder decomposition technique, which is based on regression analysis, is used to decompose the male–female financial literacy gap into 'explained' and 'unexplained' component. The primary focus is on the importance of human capital and labour market variables in explaining the gap. Additional analysis considers the potential importance of cognition, personality, locus of control and numeracy.

The remainder of this paper is as follows. Section II discusses previous studies that have endeavoured to understand the determinants of the male–female financial literacy gap. Section III describes the data, sample, variables and statistical method. Results of the statistical analysis are presented in Section IV. Conclusions follow in Section V, along with some suggestions for future research.

II Previous Research

In countries such as the USA and the UK, concerns about the perceived low levels of financial literacy in the general population emerged in the early 1990s (see Beal & Delpachtra, 2003). Since then research in the field of financial literacy has expanded, with one strand examining the effectiveness of financial literacy interventions and education programs (e.g. Hastings *et al.*, 2013; Fernandes *et al.*, 2014) and a second examining the determinants or correlates of financial literacy. A third strand examines the effect of financial literacy on financial behaviours such as retirement planning, stock market participation and wealth accumulation. One outcome common across these three research strands is that when the difference in financial literacy between men and women enters the analysis it is almost certainly the case that women are less financially literate than men. For comprehensive reviews of financial literacy research see Lusardi and Mitchell (2014) and Lusardi *et al.* (2017).

From a theoretical perspective there are a number of reasons why women may have lower levels of financially literacy than men. The difference may, for example, reflect a rational choice based on an assessment of the costs versus the benefits of time use and preferences regarding the maximisation of utility (Becker, 1985). Marital status may, therefore, be associated with gender gaps in financial literacy. Empirical studies show that, within households, males are more likely to be the primary decision-makers on saving, investment and borrowing when their female partner is less educated (Fonseca *et al.*, 2012; Johnston *et al.*, 2016). Such divisions of labour or 'household specialisation' may reflect a rational choice by respective partners (on the assumption that households act as single decision-making units; see Ward & Lynch, 2019). Hsu (2016) finds that older women acquire financial literacy as they approach widowhood. Differing roles within households may, however, also reflect gender differences in bargaining power.

The gender gap in financial literacy may also be magnified as a result of specialisation, with the acquisition of financial knowledge thought to be endogenous (Fonseca *et al.*, 2012; Lusardi & Mitchell, 2014; Lusardi *et al.*, 2017; Ward & Lynch, 2019). That is, those making financial decisions further enhance their financial knowledge through feedback effects. This 'learning-by-doing' mechanism is similar to the effect that on-the-job training has on earnings. It is also supported by the observation that there is a gender gap across all points in the age distribution (Lusardi & Mitchell, 2014; Bucher-Koenen *et al.*, 2017) and that the gender gap is particularly large among younger and older persons (Woodyard & Robb, 2012).

Financial literacy may be acquired formally through, for example, school or workplace training. It may also be acquired informally through interaction with workplace colleagues or family members (Lusardi & Mitchell, 2014). Gender differences in financial literacy may, therefore, also arise from gender differences in labour market participation and/or from labour market segregation effects. Across many societies women undertake a disproportionately large share of unpaid household and care work and, as a

result, work fewer hours in paid employment and earn less income over their lifetime. In many countries women spend more time in part-time employment where the conditions of employment, including superannuation entitlements and training opportunities, may be inferior relative to full-time jobs (Jefferson & Preston, 2009/10).

Patterns of full-time and part-time work tend to differ across industries. Part-time work usually occurs in relatively 'feminised industries' such as retail trade, accommodation and food services, health and social assistance. Sectors such as mining, manufacturing, and information media and telecommunications have a disproportionate share of full-time workers and a disproportionate share of men. Such segregation likely differentially impacts on the financial literacy of men and women, particularly where there is a socialisation effect in the form of conscious and unconscious learning (Shim *et al.*, 2010) and/or occupational and industry differences in the incidence of workplace education programs (Agnew *et al.*, 2013). Empirically, occupation and industry of employment have been significantly linked to financial literacy (Bateman *et al.*, 2012), as have work experience and labour market participation (Beal & Delpachtra, 2003). Relative to those in work, persons unemployed or not in the labour force have lower levels of financial literacy (Agnew *et al.*, 2013). There is also a related literature which shows that industry of employment can affect personal finance decisions (Agarwal *et al.*, 2017).

Socialisation effects are, however, not constrained to the workplace, with parents and schools playing an important role in the socialisation process and in the development of financial knowledge of young people (Shim *et al.*, 2010; Agnew & Harrison, 2015; Gerrans & Heaney, 2016). The social context may also affect gender stereotypical beliefs, which in turn may affect levels of investment in financial knowledge. Driva *et al.*'s (2016) study of 13–15-year-olds shows that, for females, financial knowledge deteriorated with stereotype intensity, whereas for males it increased. The gender context has also been linked to female risk-taking attitudes and behaviour (Säve-Söderbergh & Lindquist, 2015; Jetter & Walker, 2017). Alan *et al.* (2017) and Bottazzi and Lusardi (2016) also show that socialisation plays out in the intergenerational transfer process, particularly between mothers and daughters. Using PISA data for Italy, Bottazzi and Lusardi (2016) show that girls who have a mother who works in finance are much less disadvantaged in their finance knowledge. In Alan *et al.* (2017) the focus is on risk preferences, with the observation that the risk preferences of mothers and daughters are correlated.

In addition to the economic and normative determinants, the gender gap in financial literacy may also derive from gender differences in psychological factors and attitudes. Within the finance literature there is body of work showing the link between psychological factors and financial behaviour. Cobb-Clark *et al.* (2016), for example, show that locus of control is linked to savings (those who believe that they can control relevant aspects of life save more). Extroversion has been linked to short-term investing, neuroticism has been linked to risk aversion, openness to experience has been linked to long-term investing, and conscientiousness has been linked to saving (for a review of the personality and finance literature see Killins, 2017).

Studies which have explored the impact of personality or behavioural traits on financial literacy find that extroversion is negatively linked to financial literacy (Gerrans & Heaney, 2016; Killins, 2017). In the Killins (2017) study conscientiousness had a positive effect on financial literacy, whereas in Gerrans and Heaney (2016) it was only significant for advanced financial literacy concepts. From a gender perspective it may be that the observed gender gaps in financial literacy derives from gender differences in psychological characteristics, including characteristics such as confidence (Bucher-Koenen *et al.*, 2017). When financial knowledge is tested in surveys women are not only less likely than men to answer correctly, but also more likely than men to indicate that they do not know the answer (Lusardi & Mitchell, 2011, 2014), particularly when the question pertains to risk diversification (Bucher-Koenen *et al.*, 2017).

Studies which explicitly explore the determinants or sources of the gender gap in financial literacy are sparse and include Cupák *et al.* (2018), Bucher-Koenen *et al.* (2017), Hsu (2016), Fonseca *et al.* (2012) and, for teenagers, Bottazzi and Lusardi (2016). Cupák *et al.* (2018) study the determinants of the gender gap in 12 countries using data from the 2015 OECD/INFE International Survey of Adult Financial Literacy Competencies, while Bucher-Koenen *et al.* (2017) use nationally representative adult data for the USA, the Netherlands and Germany for 2009/10. Both studies show that across countries

there are striking similarities in the nature of the gender gap and that the gap decreases only slightly after controlling for characteristics such as age, education and marital status. Hsu (2016) and Fonseca *et al.* (2012) use US data from 2008 and 2009, respectively. These two studies have a particular focus on couples and both show that household specialisation is a factor giving rise to gender gaps. Fonseca *et al.* also show that men and women acquire financial literacy differently and that the 'pay-offs' (coefficients) differ by sex. Men, for example, benefit more from education than do women.

III Method

(i) Data

The data employed in this study are from the HILDA Survey. Our analysis is cross-sectional and makes particular use of the Responding Person File (RPF) and the financial literacy questions asked in wave 16 (2016). The 2016 RPF consists of 17,694 persons, all of whom are aged 15 or older. After restricting the sample to adults aged 18 or older there are 16,886 persons, of whom 51.1 per cent are women. Compared to most studies of financial literacy this is a very large sample and the first large-sample study for Australia. For example, Cupák *et al.*'s (2018) analysis for the Netherlands is based on 852 observations, and the corresponding samples for the UK and Canada are 896 and 948, respectively. Fonseca *et al.* (2012) and Bucher-Koenen *et al.* (2017) in the USA had samples of 1,504 and 1,488 observations, respectively. For Australia, Agnew *et al.* (2013) and Bateman *et al.* (2012) had 1,199 and 871 observations, respectively. HILDA is also very rich in potential covariates, with questions collecting information on a wide-range of socioeconomic, demographic and psychological characteristics.

(ii) Dependent Variable

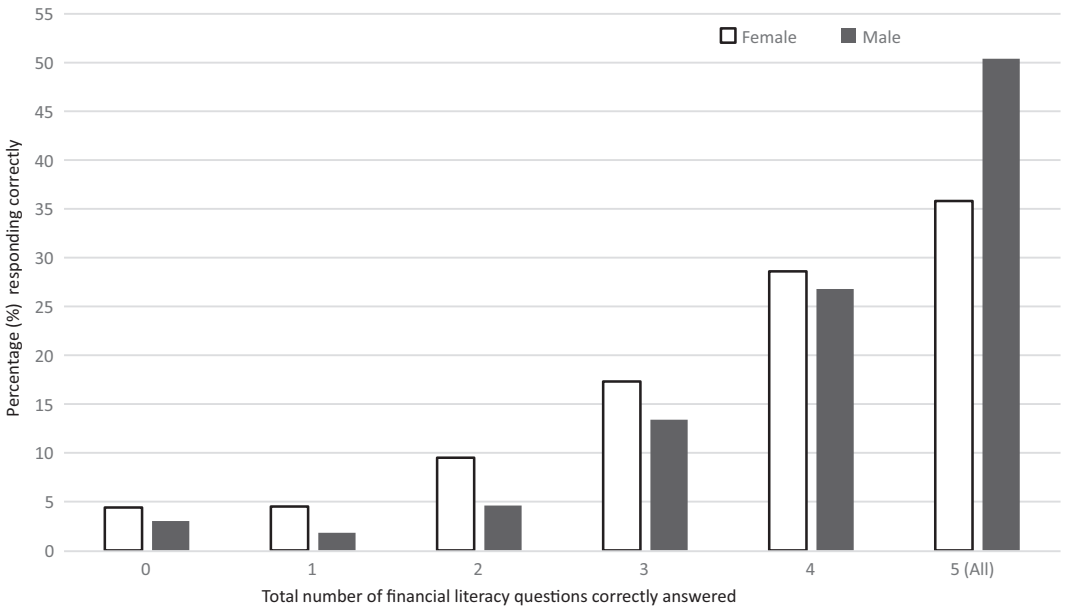
The dependent variable is constructed from information collected in a financial literacy module administered for the first time in HILDA wave 16. The OECD, through the International Network on Financial Education, has set out best practice guidelines for national surveys aimed at testing financial knowledge through surveys (Atkinson & Messy, 2012). These include the testing of at least three key financial literacy concepts: (i) an understanding of interest rates, especially compound interest; (ii) an understanding of inflation; and (iii) an understanding of risk diversification. Commonly referred to as the 'Big Three' financial literacy questions, they were developed by Lusardi and Mitchell (see Lusardi & Mitchell, 2011), and are widely used in financial literacy surveys. These three concepts (set out below as Q1, Q2, and Q3), along with a further two concepts (Q4 and Q5), were included on HILDA. The specific questions were:

> 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]
>
> Q4. *Risk*. An investment with a high return is likely to be high risk. [True, False]
>
> Q5. *Money illusion*. Suppose that by the year 2020 your income has doubled, but the prices of all of the things you buy have also doubled. In 2020, will you be able to buy more than today, exactly the same as today, or less than today with your income?

For all questions respondents also had the option of a 'don't know' response or a 'refuse to answer' response.

Following convention, the dependent variable in our analysis is the number of correct responses, which ranges from 0 to 5. Figure 1 shows the distribution of correct responses for male and females, while Table 1 shows the distribution of correct responses for males and females on a question-by-question basis. The mean number of correct responses is 4.1 for men and 3.7 for women, which is a 'raw' gender gap of 11.4 per cent. Assuming answering all five questions correctly implies a 'high' level of financial literacy, about half of male respondents (50.4 per cent) and only around one-third of female respondents (35.8 per cent) achieve this standard, suggesting an even

FIGURE 1
Distribution of Correct Responses to Financial Literacy Questions, Adult Males and Females, Australia, 2016



Source: HILDA wave 16 (2016). Weighted estimates.

higher gender gap of 40.8 per cent. The proportion of respondents answering each of the questions individually was higher for men than for women for all questions, with the gender gap ranging from 6.6 per cent for Q3 (diversification) to 20.7 per cent for Q2 (inflation).

(iii) Independent Variables

In the regressions estimated below the focus is on two main specifications, although a series of robustness checks are carried out. The first is a 'human capital' specification, which includes variables describing demographic characteristics (age, sibling details, marital status, time in current cohabiting relationship, dependent children, birthplace and dummies capturing city and state of residence) and education (highest qualification, field of study and whether or not still studying). This specification includes variables typically included in wages equations which are modelled within a human capital framework. The underlying hypothesis is that if financial literacy is a form of human capital these factors will be important in explaining variation in financial literacy across individuals. In addition, and more importantly, because the focus of this paper is on explaining the gender gap in financial literacy, if financial literacy is a form of human capital, then gender differences in these factors, together with gender differences in the 'returns' to these factors, should be important in explaining the gender gap in financial literacy.

The second specification is a 'human capital plus labour market' specification that augments the human capital specification with variables describing current labour market status, union membership, sector, occupation and industry. For those not in employment or not in the workforce (e.g. retired), their most recent employment history is utilised to capture labour market effects on financial literacy. Given the large sample, the majority of variables in the first and second specifications are measured as dummy variables. Variable definitions and descriptive statistics may be found in Table A1 in the Appendix.

As indicated above, few studies have examined in detail how labour market activity impacts on financial literacy. It seems reasonable to

TABLE 1
Percentage Distribution of Correct Responses to Individual Financial Literacy Questions, Adult Males and Females, Australia, 2016

	(1) Q1. Interest rate	(2) Q2. Inflation	(3) Q3. Diversification	(4) Q4. Risk	(5) Q5. Money illusion	(6) All 5 questions correct
Male	90.7%	77.0%	77.4%	87.8%	77.5%	50.4%
Female	79.5%	63.8%	72.6%	79.4%	73.3%	35.8%
Persons	85.0%	70.3%	75.0%	83.5%	75.4%	43.0%
Gap (% points)	11.0	13.2	4.8	8.4	4.2	14.6
Gap (%)	14.1%	20.7%	6.6%	10.6%	5.7%	40.8%

Source: HILDA wave 16 (2016); weighted estimates.
Note: N = 16,886 (N_M = 7,972; N_F = 8,914).

hypothesise, for example, that some occupations are characterised by higher levels of financial literacy than others, and that the attainment of financial literacy 'on the job' varies by occupation. It is, however, important to recognise that these labour market variables are potentially endogenous. For example, financial literacy may be a factor determining occupation choice, so the causal direction would be opposite to that assumed in the human capital and labour market specification. If this is the case, then the human capital specification is more appropriate since labour market variables are not included.

In order to address the potential endogeneity problem one could adopt an instrumental variables (IV) approach. To do this successfully one requires a large number of variables (instruments) that exhibit high correlations with the chosen labour market variables, yet at the same time exhibit no correlation with financial literacy (or at a minimum exhibit a lower correlation). Given the large number of labour market variables controlled for in this paper, the IV approach is not a feasible option for this study. One could also use variation from some policy change that affected, for example, occupation choice but not financial literacy. We know of no such policy change in Australia that could be exploited with HILDA data.

It is also important to recognise that there is significant variation in the levels of financial literacy by occupation, industry, trade union membership, sector and labour market status. Tables 2–4 show the mean levels of financial literacy broken down for each of these labour market factors separately for males and females. Table 2 is for occupation and shows clear differences in the level of financial literacy across the eight occupational groups summarised. Moreover, for each occupational group, the mean level of financial literacy is lower for females than for males, with the difference highly statistically significant ($p < 0.01$). Table 3 is for industry. For all of the 19 industries summarised the level of financial literacy is lower for females than for males, with the difference statistically significant in 17 industries ($p < 0.05$). Table 4 is for sector, trade union membership and labour market status. In all comparisons shown within this table the average level of financial literacy is lower for females than for males, and these differences are all highly statistically significant ($p < 0.01$).

Given the large gender gaps in financial literacy within Tables 2–4, we believe there is value in exploring how labour market factors relate to the gender gap in financial literacy, even if we cannot state with conviction that the relationship we are estimating is causal. It is also worth stressing that our main focus is the identification of the determinants the gender gap in financial literacy (i.e. on understanding what gives rise to *differences* in the financial literacy of men and women). In other words, this is not a study of the determinants of financial literacy *per se*. These two concepts are not the same. The potential endogeneity of these labour market variables would only be especially problematic if the degree, extent or seriousness of endogeneity were different for males and females. *A priori*, we have no reason to believe that this is the case, and know of no research that has focused on this issue. In the analysis below the estimates for both specifications (with and without labour market characteristics), along with robustness checks, are reported and used to qualify the discussion.

(iv) Statistical Decomposition

A statistical decomposition technique, suggested by Oaxaca (1973) and Blinder (1973), may be used to decompose the observed financial literacy gap between males and females into 'explained' and 'unexplained' components. Applying this Oaxaca–Blinder technique requires first fitting two regressions using ordinary least squares (OLS), where the subscripts M and F denote males and females, respectively:

$$\ln(FL_{\mathrm{M}}) = \alpha_{\mathrm{M}} + \boldsymbol{\beta}_{\mathrm{M}}\mathbf{X}_{\mathrm{M}} + \varepsilon_{\mathrm{M}}, \tag{1}$$

$$\ln(FL_{\mathrm{F}}) = \alpha_{\mathrm{F}} + \boldsymbol{\beta}_{\mathrm{F}}\mathbf{X}_{\mathrm{F}} + \varepsilon_{\mathrm{F}}. \tag{2}$$

here ln denotes the natural logarithm; *FL* is a measure of financial literacy; **X** is a vector of characteristics thought to impact on financial literacy; ε is an error term; α is a constant to be estimated; and $\boldsymbol{\beta}$ is a vector of coefficients to be estimated.

The standard Oaxaca–Blinder decomposition used here is, as noted, based on two OLS regressions. If any of the assumptions of OLS are violated (such as linearity, normality, no collinearity and homoscedasticity) then the results of the decomposition could be biased and the relative shares of the 'explained' and 'unexplained' components inaccurate (see Fortin *et al.*, 2011). Standard regression diagnostic tests suggest no major violations of these assumptions.

After estimation, subtracting Equation (2) from Equation (1) and rearranging terms gives:

$$\begin{aligned}\ln(Gap) &= \overline{\ln(FL_{\mathrm{M}})} - \overline{\ln(FL_{\mathrm{F}})} \\ &= \hat{\boldsymbol{\beta}}_{\mathrm{M}}(\overline{\mathbf{X}}_{\mathrm{M}} - \overline{\mathbf{X}}_{\mathrm{F}}) + (\hat{\boldsymbol{\beta}}_{\mathrm{M}} - \hat{\boldsymbol{\beta}}_{\mathrm{F}})\overline{\mathbf{X}}_{\mathrm{F}} \\ &\quad + (\hat{\alpha}_{\mathrm{M}} - \hat{\alpha}_{\mathrm{F}}).\end{aligned} \tag{3}$$

here ln(*Gap*) is the (natural) logarithm of the difference between male and female financial literacy. The first term on the right-hand side, $\hat{\boldsymbol{\beta}}_{\mathrm{M}}(\overline{\mathbf{X}}_{\mathrm{M}} - \overline{\mathbf{X}}_{\mathrm{F}})$, is the amount of the gap that may be attributed to differences in the values of **X** between males and females. It is common to refer to this as the 'explained' component since this is the component of the gap that may be attributed to differences in the characteristics of males and females. The second component, $(\hat{\boldsymbol{\beta}}_{\mathrm{M}} - \hat{\boldsymbol{\beta}}_{\mathrm{F}})\overline{\mathbf{X}}_{\mathrm{F}}$, is the amount that may be attributed to differences in the regression coefficients, $\boldsymbol{\beta}$, between males and females. The third term, $(\hat{\alpha}_{\mathrm{M}} - \hat{\alpha}_{\mathrm{F}})$, is the amount of the gap that can be attributed to

TABLE 2
Mean Financial Literacy by Current or Last Occupation, Adult Males and Females, Australia, 2016

	Managers	Professionals	Technicians and trades workers	Community and personal service workers	Clerical and administrative workers	Sales Workers	Machinery operators and drivers	Labourers
Male	4.43 (0.03)	4.60 (0.02)	4.10 (0.03)	4.20 (0.05)	4.42 (0.04)	4.07 (0.06)	3.95 (0.04)	3.56 (0.04)
Female	4.09 (0.04)	4.23 (0.02)	3.58 (0.07)	3.55 (0.04)	3.95 (0.03)	3.47 (0.05)	3.27 (0.13)	3.00 (0.05)
Gap	0.3*** (0.05)	0.37*** (0.03)	0.52*** (0.07)	0.65*** (0.06)	0.47*** (0.06)	0.60*** (0.08)	0.68*** (0.11)	0.56*** (0.07)
Gap(%)	8.3%	8.7%	14.5%	18.3%	11.9%	17.3%	20.8%	18.7%

Source: HILDA wave 16 (2016); weighted estimates.
Note: N = 16,886. Standard errors in parentheses. Statistical significance levels: ***$p < 0.01$.

TABLE 3
Financial Literacy by Current or Last Industry of Employment, Adult Males and Females, Australia, 2016

	agff	mining	manuf	egw	construc	wt	rt	accfs	transp	media	fin	realest	profsci	adminss	pubad	edtrain	health	arts	oserv
Male	4.00	4.37	4.05	4.25	4.04	4.37	4.09	3.90	4.14	4.55	4.68	4.37	4.61	4.00	4.51	4.57	4.35	4.28	4.06
	(0.07)	(0.06)	(0.04)	(0.10)	(0.04)	(0.05)	(0.05)	(0.07)	(0.05)	(0.07)	(0.04)	(0.09)	(0.30)	(0.08)	(0.04)	(0.04)	(0.05)	(0.09)	(0.06)
Female	3.58	4.07	3.77	4.09	3.96	3.95	3.58	3.32	3.83	4.16	4.27	3.93	4.32	3.48	4.27	4.22	3.83	3.87	3.82
	(0.11)	(0.16)	(0.07)	(0.20)	(0.09)	(0.09)	(0.04)	(0.05)	(0.09)	(0.10)	(0.06)	(0.10)	(0.04)	(0.08)	(0.06)	(0.03)	(0.03)	(0.10)	(0.07)
Gap	0.42***	0.30**	0.28***	0.16	0.08	0.43***	0.51***	0.57***	0.31***	0.39***	0.41***	0.44***	0.29***	0.52***	0.24***	0.35***	0.52***	0.41***	0.24**
	(0.12)	(0.16)	(0.08)	(0.21)	(0.10)	(0.09)	(0.07)	(0.09)	(0.10)	(0.12)	(0.08)	(0.14)	(0.05)	(0.11)	(0.06)	(0.05)	(0.07)	(0.14)	(0.10)
Gap (%)	11.7%	7.4%	7.4%	3.9%	2.0%	10.6%	14.2%	17.5%	8.1%	9.4%	9.6%	11.2%	6.7%	14.9%	5.6%	8.3%	13.6%	10.6%	6.3%

Source: HILDA wave 16 (2016); weighted estimates.
Notes: N = 16,886. Standard errors in parentheses. Statistical significance levels: $^{**}p < 0.05$, $^{***}p < 0.01$. See Table A1 for mnemonic definitions.

TABLE 4
Financial Literacy by Sector, Labour Market Status and Union Status, Adult Males and Females, Australia, 2016

	Current or last sector of employment				Labour market status					
	Private	Government	Not for profit	Is or was a trade union member	Employed FT	Employed PT	Unemp. look FT work	Unemp. look PT work	NILF – marginally	NILF – not marginally
Male	4.22 (0.01)	4.44 (0.02)	4.30 (0.04)	4.31 (0.02)	4.32 (0.02)	4.14 (0.04)	3.56 (0.08)	3.63 (0.21)	3.86 (0.07)	3.97 (0.03)
Female	3.86 (0.02)	4.13 (0.02)	3.99 (0.03)	4.07 (0.03)	4.02 (0.02)	3.88 (0.02)	3.23 (0.11)	3.02 (0.14)	3.46 (0.06)	3.50 (0.03)
Gap	0.36*** (0.02)	0.30*** (0.03)	0.31*** (0.05)	0.24*** (0.04)	0.30*** 0.02)	0.25*** (0.04)	0.33*** (0.13)	0.61*** (0.25)	0.40*** (0.09)	0.47*** (0.04)
Gap (%)	9.3%	7.5%	7.8%	5.9%	7.5%	6.7%	10.2%	22.0%	11.6%	13.4%

Source: HILDA wave 16 (2016); weighted estimates.
Notes: N = 16,886. Standard errors in parentheses. Statistical significance levels: $^{***}p < 0.01$.

differences in the constant terms, α, of males and females. Taken together, the second and third terms are typically referred to as the 'unexplained' component. It is important to note that each of these components may be expressed as percentage shares of the raw gap. It is usually the case that the relative shares of explained and unexplained components are of considerable substantive interest. A convenient summary measure based on the unexplained component is

$$Gap_{\text{adjusted}} = 100 * \exp[(\hat{\alpha}_{\text{M}} - \hat{\alpha}_{\text{F}}) + (\hat{\boldsymbol{\beta}}_{\text{M}} - \hat{\boldsymbol{\beta}}_{\text{F}})\overline{\mathbf{X}}_{\text{F}}]. \quad (4)$$

which is effectively an 'adjusted gender gap' expressed as a percentage. This measure has a straightforward interpretation, which is policy relevant. In percentage terms, it indicates how much female financial literacy would need to increase to equal male financial literacy.

Finally, it is possible to get zero financial literacy questions correct. It is, however, not possible to take the natural logarithm of 0. As the dependent variable is expressed in natural logarithms, respondents who scored zero were allocated a value of 0.35, which is similar to that proposed by von Gaudecker (2015). Although the allocation of 0.35 is somewhat arbitrary, it has little influence on the estimates since only a small share of respondents in our sample (3 per cent of males and 4.4 per cent of females) were unable to correctly answer any of the five financial literacy questions (see Figure 1). (Robustness checks concerned with this assumption were carried out and are available from the authors upon request.)

IV Results

(i) Main Regression Estimates

The main regression results are presented in Table 5. Before turning to the regression estimates for males and females separately, consider columns (1) and (2). Column (1) reports the estimates for the human capital specification with males and females pooled together and includes a dummy variable for sex (male = 1). Column (2) does the same for the human capital and labour market specification. In both specifications most of the variables included are statistically significant at the 10 per cent level or below. The R^2 values indicate that 17 per cent of the variance in financial literacy may be explained by the variables included in the 'human capital specification'. The R^2 value increases to 22 per cent in the 'human capital and labour market specification'. An F-test indicates that this increase in the variance explained is highly statistically significant ($p < 0.01$). Under the assumption that these labour market variables are exogenous, including them in a financial literacy regression leads to a much better-fitting model.

In both regressions, the coefficient on the sex variable is positive, large in magnitude, and highly statistically significant. In percentage terms, after holding constant a large number of human capital variables, financial literacy is 14.5 per cent higher for males than for females. When labour market variables are added to the specification the effect is smaller: financial literacy is 12.2 per cent higher for males than for females. It is important to note that this measure of the gender gap is estimated under the assumption that the regression coefficients are the same for males and females.

Lusardi and Mitchell (2011) conclude that, in additional to sex, most studies find age, education and unemployment to be key correlates of financial literacy. With respect to age, the coefficients on the age dummies, shown in columns (1) and (2) of Table 5, suggest an increasing then decreasing pattern of financial literacy by age. In regressions (which are available on request) the age dummies were replaced by a quadratic specification consisting of Age and Age^2. In both specifications (human capital and human capital plus labour market variables) the coefficient for Age was positive and the coefficient for Age^2 was negative, with both being highly statistically significant ($p < 0.01$). This suggests an inverted U-shaped relationship between age and financial literacy, which confirms the pattern implied by the age dummies. Solving these quadratics for their turning points suggests that financial literacy starts to decline after 50 years of age. This increasing then decreasing pattern of age and financial literacy has been found in most other studies of financial literacy, and Australia is no different in this respect.

The pooled regressions suggest that there are large differences in financial literacy by education. Education is measured as a series of dummy variables combining information on educational qualifications and field of study and whether or not the respondent is currently studying. It is clear that there are large differentials across the categories, with the coefficients on almost all the dummy variables being statistical significant at the 10 per

TABLE 5
Financial Literacy Regression Estimates, Adult Males and Females, Australia, 2016

	(1)	(2)	(3)	(4)	(5)	(6)
			Human capital		Human capital & labour market	
	Human capital	Human capital & labour market	Males	Females	Males	Females
male	0.135***	0.115***				
	(0.016)	(0.017)				
age2024	0.061	0.003	0.054	0.064	−0.048	0.039
	(0.045)	(0.041)	(0.071)	(0.058)	(0.058)	(0.058)
age2529	0.116**	0.038	0.047	0.193***	−0.065	0.135**
	(0.047)	(0.046)	(0.079)	(0.055)	(0.066)	(0.057)
age3034	0.143**	0.061	0.048	0.235***	−0.051	0.170***
	(0.061)	(0.058)	(0.108)	(0.056)	(0.079)	(0.058)
age3539	0.168***	0.075	0.095	0.238***	−0.026	0.167***
	(0.052)	(0.049)	(0.085)	(0.059)	(0.070)	(0.059)
age4044	0.205***	0.116**	0.121	0.284***	0.002	0.220***
	(0.052)	(0.050)	(0.085)	(0.059)	(0.069)	(0.060)
age4549	0.200***	0.108**	0.131	0.266***	0.008	0.203***
	(0.052)	(0.050)	(0.086)	(0.057)	(0.071)	(0.058)
age5054	0.214***	0.134***	0.174**	0.250***	0.061	0.204***
	(0.054)	(0.051)	(0.085)	(0.065)	(0.068)	(0.066)
age5559	0.197***	0.131**	0.123	0.273***	0.013	0.249***
	(0.057)	(0.052)	(0.097)	(0.061)	(0.076)	(0.060)
age6064	0.181***	0.132**	0.117	0.248***	0.030	0.238***
	(0.057)	(0.054)	(0.094)	(0.068)	(0.078)	(0.065)
age6569	0.135**	0.109*	0.131	0.143*	0.060	0.161**
	(0.063)	(0.059)	(0.095)	(0.081)	(0.080)	(0.078)
age7074	0.098	0.115*	0.049	0.150**	0.024	0.209***
	(0.069)	(0.064)	(0.114)	(0.074)	(0.099)	(0.073)
age75p	0.024	0.108*	0.049	0.010	0.075	0.147*
	(0.060)	(0.060)	(0.095)	(0.074)	(0.087)	(0.077)
oldest	−0.067**	−0.061**	−0.115***	−0.024	−0.118***	−0.014
	(0.027)	(0.026)	(0.034)	(0.040)	(0.031)	(0.039)
younger	−0.091***	−0.080***	−0.112***	−0.077*	−0.110***	−0.060
	(0.027)	(0.026)	(0.034)	(0.041)	(0.030)	(0.040)
married	0.082***	0.050*	0.110**	0.055	0.056	0.043
	(0.031)	(0.028)	(0.048)	(0.039)	(0.039)	(0.038)

TABLE 5
(continued)

	(1)	(2)	(3)	(4)	(5)	(6)
			Human capital		Human capital & labour market	
	Human capital	Human capital & labour market	Males	Females	Males	Females
defacto	0.079***	0.053***	0.123***	0.037	0.087***	0.021
	(0.022)	(0.020)	(0.034)	(0.028)	(0.027)	(0.028)
separated	0.093**	0.081**	0.120**	0.076	0.084*	0.081
	(0.041)	(0.037)	(0.048)	(0.059)	(0.044)	(0.055)
widowed	0.077*	0.088**	0.117*	0.090	0.102*	0.109*
	(0.046)	(0.044)	(0.067)	(0.059)	(0.061)	(0.057)
divorced	0.115***	0.088***	0.096*	0.118***	0.059	0.101***
	(0.031)	(0.028)	(0.049)	(0.038)	(0.045)	(0.035)
timerel	0.002**	0.002**	0.000	0.004***	0.000	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
depkid	−0.039**	−0.030*	−0.005	−0.067***	−0.011	−0.041
	(0.017)	(0.017)	(0.022)	(0.024)	(0.021)	(0.025)
besb	0.023*	0.027**	0.049***	−0.003	0.051***	0.003
	(0.013)	(0.013)	(0.014)	(0.021)	(0.015)	(0.021)
bnesb	−0.315***	−0.254***	−0.255***	−0.371***	−0.201***	−0.304***
	(0.028)	(0.025)	(0.044)	(0.036)	(0.034)	(0.034)
postgrad	0.377***	0.272***	0.363***	0.383***	0.270***	0.281***
	(0.029)	(0.032)	(0.042)	(0.040)	(0.047)	(0.043)
degree	0.332***	0.238***	0.320***	0.339***	0.236***	0.252***
	(0.033)	(0.037)	(0.053)	(0.038)	(0.059)	(0.041)
diploma	0.239***	0.178***	0.275***	0.213***	0.230***	0.147***
	(0.028)	(0.027)	(0.040)	(0.037)	(0.040)	(0.037)
cert	0.150***	0.114***	0.181***	0.112***	0.166***	0.071**
	(0.028)	(0.026)	(0.044)	(0.033)	(0.035)	(0.032)
year12	0.239***	0.183***	0.271***	0.208***	0.230***	0.144***
	(0.026)	(0.026)	(0.039)	(0.037)	(0.037)	(0.036)
studying	0.116***	0.141***	0.095*	0.138***	0.128***	0.164***
	(0.027)	(0.021)	(0.053)	(0.026)	(0.026)	(0.028)
science	0.164***	0.133***	0.131**	0.201***	0.105*	0.159***
	(0.042)	(0.038)	(0.067)	(0.046)	(0.055)	(0.048)
infot	0.182***	0.121***	0.156***	0.223***	0.111***	0.134**
	(0.036)	(0.033)	(0.050)	(0.058)	(0.040)	(0.057)

TABLE 5
(continued)

	(1)	(2)	(3)	(4)	(5)	(6)
			Human capital		Human capital & labour market	
	Human capital	Human capital & labour market	Males	Females	Males	Females
engrt	0.124***	0.098***	0.111**	0.254***	0.090**	0.164**
	(0.033)	(0.029)	(0.046)	(0.071)	(0.037)	(0.071)
archit	0.117***	0.073**	0.116***	−0.013	0.083**	−0.114
	(0.036)	(0.033)	(0.043)	(0.140)	(0.034)	(0.139)
agenv	0.113***	0.088***	0.099**	0.151**	0.088**	0.113*
	(0.032)	(0.030)	(0.039)	(0.067)	(0.036)	(0.063)
med	0.186***	0.164***	0.116	0.263***	0.117	0.212***
	(0.048)	(0.048)	(0.080)	(0.057)	(0.079)	(0.057)
nur	0.074**	0.058*	0.074	0.079**	0.073	0.056
	(0.032)	(0.033)	(0.058)	(0.035)	(0.057)	(0.036)
ohealth	0.096***	0.070**	0.157***	0.079*	0.125***	0.051
	(0.034)	(0.033)	(0.048)	(0.041)	(0.041)	(0.042)
edu	0.077***	0.045	0.084*	0.071**	0.063	0.034
	(0.029)	(0.030)	(0.048)	(0.034)	(0.051)	(0.034)
commerce	0.155***	0.093***	0.132***	0.177***	0.092**	0.089***
	(0.029)	(0.025)	(0.050)	(0.031)	(0.039)	(0.029)
law	0.183***	0.144***	0.128**	0.271***	0.092**	0.189***
	(0.042)	(0.049)	(0.051)	(0.060)	(0.045)	(0.063)
socecon	0.088***	0.071**	0.062	0.103***	0.060	0.071**
	(0.032)	(0.029)	(0.046)	(0.038)	(0.041)	(0.036)
creativeart	0.143***	0.105***	0.098*	0.185***	0.075*	0.124***
	(0.032)	(0.029)	(0.050)	(0.040)	(0.041)	(0.037)
hospitality	0.036	0.044	0.094*	0.010	0.092**	0.002
	(0.038)	(0.040)	(0.050)	(0.050)	(0.044)	(0.053)
other	0.097**	0.082**	0.114**	0.094*	0.090*	0.073
	(0.040)	(0.041)	(0.050)	(0.056)	(0.046)	(0.061)
balnsw	0.025	0.037	0.036	0.017	0.056	0.024
	(0.026)	(0.025)	(0.037)	(0.035)	(0.034)	(0.033)
melb	−0.023	−0.033	−0.011	−0.034	−0.010	−0.053
	(0.029)	(0.027)	(0.042)	(0.038)	(0.038)	(0.035)
balvic	0.067**	0.074***	0.064	0.068*	0.079**	0.072**
	(0.027)	(0.025)	(0.040)	(0.035)	(0.037)	(0.033)

TABLE 5
(continued)

	(1)	(2)	(3)	(4)	(5)	(6)
			Human capital		Human capital & labour market	
	Human capital	Human capital & labour market	Males	Females	Males	Females
bris	0.108***	0.112***	0.074*	0.140***	0.099***	0.123***
	(0.027)	(0.025)	(0.039)	(0.035)	(0.035)	(0.031)
balqld	0.071***	0.088***	0.078**	0.062*	0.100***	0.073**
	(0.024)	(0.023)	(0.036)	(0.032)	(0.032)	(0.030)
adel	0.067**	0.078***	0.079**	0.056	0.107***	0.050
	(0.028)	(0.028)	(0.037)	(0.040)	(0.034)	(0.039)
balsa	0.041	0.048	0.053	0.024	0.074	0.021
	(0.040)	(0.037)	(0.053)	(0.058)	(0.049)	(0.055)
perth	0.111***	0.104***	0.088**	0.137***	0.089***	0.120***
	(0.026)	(0.025)	(0.035)	(0.037)	(0.033)	(0.036)
balwa	0.160***	0.158***	0.133***	0.190***	0.151***	0.178***
	(0.035)	(0.033)	(0.050)	(0.048)	(0.047)	(0.046)
tasmania	0.133***	0.157***	0.140***	0.125***	0.183***	0.135***
	(0.028)	(0.028)	(0.040)	(0.040)	(0.039)	(0.039)
northernt	0.012	0.004	0.093	−0.072	0.096	−0.094
	(0.072)	(0.072)	(0.061)	(0.126)	(0.061)	(0.123)
acapter	0.039	0.026	0.074*	0.009	0.075*	−0.013
	(0.040)	(0.041)	(0.044)	(0.064)	(0.044)	(0.068)
empft		0.058**			0.050	0.068**
		(0.027)			(0.050)	(0.032)
emppt		0.039			0.037	0.034
		(0.026)			(0.045)	(0.031)
unempft		−0.015			−0.068	0.053
		(0.055)			(0.070)	(0.100)
unemppt		−0.236			−0.542	−0.019
		(0.197)			(0.349)	(0.106)
nilfm		0.081***			0.084*	0.083**
		(0.031)			(0.049)	(0.041)
evertumem		−0.007			0.001	−0.016
		(0.016)			(0.025)	(0.019)
everprivate		0.042**			0.051*	0.034
		(0.020)			(0.029)	(0.023)

TABLE 5
(continued)

	(1)	(2)	(3)	(4)	(5)	(6)
			Human capital		Human capital & labour market	
	Human capital	Human capital & labour market	Males	Females	Males	Females
evergovt		−0.000			0.004	−0.002
		(0.015)			(0.020)	(0.020)
evernotfp		−0.018			−0.024	−0.013
		(0.015)			(0.025)	(0.018)
mgr		0.179***			0.182***	0.184***
		(0.032)			(0.036)	(0.055)
prof		0.178***			0.198***	0.169***
		(0.031)			(0.038)	(0.046)
trade		0.105***			0.102**	0.112**
		(0.039)			(0.046)	(0.056)
service		0.120***			0.145***	0.118***
		(0.030)			(0.041)	(0.041)
clerical		0.214***			0.214***	0.208***
		(0.030)			(0.042)	(0.040)
sales		0.083*			0.012	0.158***
		(0.047)			(0.069)	(0.050)
operator		0.133***			0.121***	0.196***
		(0.035)			(0.040)	(0.075)
agff		0.194***			0.202***	0.174**
		(0.048)			(0.077)	(0.072)
mining		0.215***			0.222***	0.284***
		(0.050)			(0.082)	(0.059)
manuf		0.220***			0.205**	0.241***
		(0.047)			(0.081)	(0.060)
egw		0.274***			0.282***	0.214**
		(0.052)			(0.080)	(0.107)
construc		0.274***			0.258***	0.278***
		(0.048)			(0.081)	(0.059)
wt		0.294***			0.304***	0.290***
		(0.045)			(0.077)	(0.060)
rt		0.241***			0.285***	0.195***
		(0.047)			(0.078)	(0.058)
accfs		0.144**			0.149	0.160**

TABLE 5
(continued)

	(1)	(2)	(3)	(4)	(5)	(6)
			Human capital		Human capital & labour market	
	Human capital	Human capital & labour market	Males	Females	Males	Females
		(0.063)			(0.093)	(0.074)
transp		0.216***			0.215**	0.218***
		(0.055)			(0.088)	(0.075)
media		0.352***			0.302***	0.407***
		(0.053)			(0.084)	(0.074)
fin		0.313***			0.293***	0.343***
		(0.047)			(0.078)	(0.059)
realest		0.191**			0.124	0.249***
		(0.093)			(0.167)	(0.073)
profsci		0.265***			0.232***	0.315***
		(0.043)			(0.076)	(0.050)
adminss		0.233***			0.242***	0.231***
		(0.050)			(0.082)	(0.066)
pubad		0.296***			0.270***	0.317***
		(0.042)			(0.076)	(0.051)
edtrain		0.277***			0.256***	0.283***
		(0.044)			(0.078)	(0.052)
health		0.223***			0.186**	0.238***
		(0.045)			(0.084)	(0.051)
arts		0.253***			0.293***	0.203***
		(0.053)			(0.081)	(0.076)
oserv		0.186***			0.146	0.244***
		(0.053)			(0.090)	(0.063)
constant	0.777***	0.501***	0.970***	0.725***	0.710***	0.401***
	(0.052)	(0.066)	(0.076)	(0.070)	(0.095)	(0.087)
N	16,886	16,886	7,972	8,914	7,972	8,914
R^2 (%)	17.2%	21.6%	14.7%	18.2%	20.6%	22.3%
Mean ln(*FL*)	1.254	1.254	1.331	1.182	1.331	1.182
Mean *FL*	3.903	3.904	4.115	3.700	4.115	3.700

Source: HILDA wave 16 (2016); weighted estimates.
Notes: The dependent variable is the natural logarithm of the number of correct responses. Standard errors are reported in parentheses. Statistical significance levels: *$p < 0.1$, **$p < 0.05$ and ***$p < 0.01$. See Table A1 in the appendix for description of regression variables and means.

cent level or lower (most are in fact statistically significant at the 1 per cent level or lower). As expected, the coefficients are generally smaller in the specification where labour market characteristics are also controlled for. Using such a large number of dummy variables makes the interpretation of relative differences complicated. In regression results (available on request) these education variables were replaced by a single variable measuring years of schooling completed. The coefficient on this variable was highly statistically significant ($p < 0.01$), with a magnitude indicating that an additional year of schooling is associated with a 6.6 per cent increase in financial literacy. Overall the estimates indicate that education is a key correlate of financial literacy in Australia.

As noted earlier, previous studies have shown that individuals who are classified as unemployed have lower levels of financial literacy. This is a difficult finding to interpret since labour market status is measured at the time of interview and there are, therefore, several possible explanations. In order to understand this finding more clearly a set of dummy variables describing the respondent's occupation, industry, sector and union status are included in addition to controls capturing current labour market status. Unlike most previous studies, these variables are also measured for people who are not currently employed by focusing on the respondent's 'last job'. In order to compare with previous studies, regressions were fitted with the labour market variables being replaced by a single dummy variable measuring if the respondent was unemployed or not at the time of the survey. The coefficient associated with this 'unemployed' variable (available on request) had a negative sign and was highly statistically significant ($p < 0.01$), suggesting that unemployed individuals have a level of financial literacy which is around 17 per cent lower than those employed. This is a large effect, but it is important to remember that it is based on the assumption that this variable is exogenous. As with the other labour market variables considered in this paper, this assumption is questionable.

The regression estimates for males and females are shown separately in columns (3)–(6) in Table 5. The Oaxaca–Blinder decompositions for both the human capital and the human capital and labour market specifications are summarised in Table 6. It is critical at this stage to point out that the main purpose of the regression estimates in columns (1) and (2) of Table 5 is to provide information about the determinants of financial literacy in Australia, with sex being assumed to be a determinant. The estimates confirm what others have found for Australia and elsewhere. However, the main purpose of the separate male and female estimates is to see how gender *differences* in the regression estimates (coefficients) and mean values of the covariates explain the male–female financial literacy gap.

Columns (1) and (2) in Table 6 report the results of the Oaxaca–Blinder decomposition for the human capital specification. The (ln) gap between males and female is +0.149. Of this total, only 5.4 per cent is 'explained' by differences between males and females in the mean values of the variables included in the regressions. This leaves 94.6 per cent of the gap 'unexplained'. However, given that the 'explained' component is not statistically significant (even at the 10 per cent level), in a strict statistical sense this component is effectively zero. This implies that nothing is explained by differences in the set of human capital variables controlled for. Although the 'unexplained' component suggests that almost all of the gap is due to differences in the coefficients, almost all of this may be attributed to the difference in the constant terms. As is shown in Table 5, the constant term is +0.970 for males and +0.725 for females. In other words, very little of the gap may be attributed to differences in the returns or 'pay-offs' associated with the variables included in the regressions. In summary, the decomposition indicates that neither male–female differences in the mean values of the included variables nor male–female differences in the values of the estimated coefficients of these variables explain the male–female financial literacy gap. More generally, it suggests that the adult male–female financial literacy gap is not likely caused by differences in human capital between men and women.

Columns (3) and (4) of Table 6 report the results of the Oaxaca–Blinder decomposition for the human capital and labour market variables specification. In this specification 21.5 per cent is 'explained' by differences between males and females in the mean values of the variables included in the regressions. This 'explained' component is statistically significant at the 5 per cent level. This leaves about 78.5 per cent of the gap 'unexplained'. This is an encouraging finding since it implies that around 16 per cent of the gap is explained by differences in the labour market variables (i.e. 21.5–5.4 per cent). More generally,

it suggests that a sizeable part of the male–female financial literacy gap may be due to gender differences in the characteristics of work that men and women engage in. This said, the 'unexplained' component is again largely an outcome of the difference in the constant terms of the regressions (see Table 5). This finding is, however, dependent on the labour market variables included being exogenous. If this is not the case and, for example, occupation choice is an outcome of financial literacy, then no firm conclusions about the role played by these labour market variables may be drawn. Nonetheless, these findings do suggest that a more thorough understanding of the relationship between labour market factors and financial literacy may help better understand why there is a gender gap in financial literacy.

(ii) Additional Regression Estimates

The regression results reported above are estimated under the assumption that the selected human capital and labour market variables play an important role in explaining variation in financial literacy across individuals and in explaining the difference in financial literacy between males and females. As previously discussed, research has pointed to the importance of other factors such as cognitive ability (cognition), personally traits (openness, conscientiousness, extraversion, agreeableness and neuroticism) and locus of control (self-efficacy). In addition, research has shown mathematical ability or 'numeracy' (both self-reported and actual) to be a factor related to financial literacy.

Such variables are available in HILDA. However, not all these questions were asked of all sample members. For example, in wave 16, a total of 1,458 adult respondents completed the HILDA Survey by telephone and so were unable to participate in two of the three cognitive tests (the 'symbol digit modality test' (sds) and the 'short word pronunciation test' (NART-25)) as both tests required interviewers to administer visuals. In total, 2,963 respondents were either not asked the cognitive tests or had incomplete scores and thus missing information. Similarly, 2,454 adult respondents had missing information on personality traits (the so-called 'Big Five' personality traits) and 2,858 respondents had missing information on 'locus of control'. Taken together, these three sets of factors (cognition, personality and locus of control) resulted in a total loss of 5,570 respondents, with an additional five excluded because of missing information on self-assessed mathematical knowledge. (The latter was used to measure numeracy skills, noting that a test of actual numeracy would have been preferred but was not available.) The resultant sample of 11,311 observations is only two-thirds the size used in the estimation of the 'human capital' and 'human capital and labour market' specifications reported above (i.e. the sample fell from 16,886 to 11,311 respondents). It is highly unlikely that this reduced sample is representative of the Australian population as whole. Any

TABLE 6
Oaxaca–Blinder Decomposition of the Gender Gap in Financial Literacy, Adults, Australia, 2016

	(1)	(2)	(3)	(4)
	Human capital		Human capital and labour market	
	Component	% of gap	Component	% of gap
Explained	0.008	5.4%	0.032**	21.5%
	(0.009)		(0.013)	
Unexplained	0.141	94.6%	0.117***	78.5%
	(0.015)***		(0.018)	
Gender gap (ln)	0.149	100%	0.149	100%
	(0.015)***		(0.015)***	
Adjusted gender gap	0.141		0.117	
% gender gap	15.1%		12.4%	

Source: HILDA wave 16 (2016); weighted estimates.
Notes: N = 16,886. Standard errors in parentheses. Statistical significance levels: $^{**}p < 0.05$, $^{***}p < 0.01$.

TABLE 7

Oaxaca–Blinder Decomposition of the Gender Gap in Financial Literacy, Restricted Sample, Adults, Australia, 2016

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	M1: Human capital		M2: M1 + Labour market		M3: M2 + cognition and traits		M4: M3 + numeracy	
	Component	% of gap	Component	% of gap	Component	% of gap	Component	% of gap
Explained	0.010** (0.005)	7.5%	0.021*** (0.008)	15.7%	0.028*** (0.008)	20.6%	0.034*** (0.009)	25.3%
Unexplained	0.124*** (0.094)	92.5%	0.112*** (0.011)	84.3%	0.106*** (0.011)	79.4%	0.100*** (0.012)	74.7%
Gender gap (ln)	0.134*** (0.009)	100%	0.134*** (0.009)	100%	0.134*** (0.009)	100%	0.134*** (0.009)	100%
Adjusted gender gap	0.124		0.112		0.106		0.100	
% gender gap	13.2%		11.9%		11.2%		10.5%	

Source: HILDA wave 16 (2016); weighted estimates.
Notes: $N = 11{,}311$; $N_M = 5{,}274$; $N_F = 6{,}037$. Statistical significance levels: $p < 0.10$, $^{**}p < 0.05$ and $^{***}p < 0.01$. The descriptive statistics are available in the Table A1. The regression results are contained in a supplementary appendix, available upon request from the authors.

findings based on this reduced sample are, therefore, clearly tentative. Noting the deficiency in terms of representativeness, four additional sets of regressions were nevertheless estimated: human capital; human capital and labour market; human capital, labour market and cognition/personality/self-efficacy; and human capital, labour market cognition/personality/self-efficacy and numeracy. The details of these additional variables, along with their descriptive statistics, are given in Table A1.

The results of the Oaxaca–Blinder decomposition for these four specifications on the reduced sample are shown in Table 7. With this smaller sample, in the human capital specification the 'explained' component is 7.5 per cent and the 'unexplained' component is 92.5 per cent (see columns (1) and (2) of Table 7). In the human capital and labour market specification, the explained component increases to 15.7 per cent and the 'unexplained' components decreases to 84.3 per cent (see columns (3) and (4) of Table 7). While both specifications point to the majority of the gender gap being 'unexplained', the decompositions are quite different than what is found using the full sample (see Table 6). When the cognition/personality/self-efficacy variables are added to the human capital and labour market specification the 'explained' component increases to 20.6 per cent and the 'unexplained' component decreases to 79.4 per cent (see Columns (5) and (6) of Table 7). Finally, when dummy variables for numeracy are added, the 'explained' component increases to 25.3 per cent and the 'unexplained' component decreases to 74.7 per cent (see Columns (7) and (8)). As noted, given the nature of the sample, it is not likely that these findings are representative of the Australian population as a whole, so their generalisability is in doubt. They are, however, encouraging in the sense that they indicate that cognition, personality and self-efficacy, along with numeracy, are potentially important in the explanation of the male–female gap in financial literacy in Australia.

V Conclusion

As financial products become more complex and individuals more vulnerable to misleading or deceptive practices by bankers and other financial institutions (Grant, 2018), policy-makers are beginning to question whether individuals have the requisite financial knowledge to adequately navigate financial markets and manage their

personal finance. Globally levels of financial literacy are low, with women typically having lower levels of financial literacy than men (Hasler & Lusardi, 2017; Cupák *et al.*, 2018). The gender gap in financial literacy is large in high-income countries, even though these countries have considerably higher overall levels of financial literacy than low-income countries. Within the OECD Australia has one of the largest gender gaps in financial literacy yet, in terms of overall levels of financial literacy, Australia ranks high – in the top 10 globally (Hasler & Lusardi, 2017).

The analysis carried out in this paper suggests that human capital variables, such as age and education, are not important in explaining the male–female gap in financial literacy. Labour market variables, such as sector, occupation, industry, union membership and labour market status, are important, explaining about 16 per cent of the gap. This finding is dependent on the assumption that these variables are exogenous. This is a questionable assumption, given, for example, the likelihood that financial literacy impacts on choice of occupation. The results, however, suggest that gender differences in the characteristics of male and female jobs may be important in understanding the gender gap in financial literacy. We believe that examining the relationship between financial literacy and labour market factors, paying careful attention to the potential endogeneity of this relationship, is a priority area for future research.

Further research is also required to better understand the factors giving rise to the gender gap in financial literacy among young people, as the evidence in this paper suggests very little convergence in the gender gap in adulthood. In other words, the observed gender gap in adulthood stems from the teen and pre-teen years. Household transmission effects are potentially an important channel, particularly between mothers and daughters (Bottazzi & Lusardi, 2016).

Future research might also fruitfully examine the link between the set of assets in a wealth portfolio and financial literacy. For example, within Australia property assets play a dominant role in the wealth portfolios of women (Austen *et al.*, 2014). It may be the case that beyond investing in the primary home women have little incentive or exposure to other investment options and that this, in turn, affects their financial literacy. There is, of course, a potential reverse causation effect, which will be difficult to model empirically given available datasets.

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APPENDIX

TABLE A1
Variable Definition and Variable Means (% share for binary variables)

Description	HILDA variable	Mnemonic	Regression variables	Full sample			Sub-sample	
				Persons (N = 16,886)	Male (N = 7,972)	Female (N = 8,914)	Male (N = 5,274)	Female (N = 6,037)
Sex of respondent	hgsex	male	=0 if female; 1 if male	48.9%				
Age at time of survey	hgage	age18–19	=1 if aged 18–19 years (excluded category)	3.4%	3.5%	3.4%	3.4%	3.3%
		age20–24	=1 if aged 20–24 years	8.6%	8.9%	8.4%	7.5%	7.9%
		age25–29	=1 if aged 25–29 years	9.7%	10.1%	9.4%	8.1%	8.0%
		age30–34	=1 if aged 30–34 years	9.6%	9.5%	9.7%	8.5%	8.9%
		age35–39	=1 if aged 35–39 years	8.3%	8.5%	8.1%	8.4%	8.6%
		age40–44	=1 if aged40–44 years	9.3%	9.3%	9.2%	9.8%	9.7%
		age45–49	=1 if aged 45–49 years	8.5%	8.3%	8.6%	9.2%	9.3%
		age50–54	=1 if aged 50–54 years	8.7%	8.7%	8.6%	9.5%	9.6%
		age55–59	=1 if aged 55–59 years	8.2%	8.3%	8.0%	8.8%	8.1%
		age60–64	=1 if aged 60–64 years	7.0%	6.9%	7.1%	7.5%	7.7%
		age65–70	=1 if aged 65–70 years	6.2%	6.0%	6.4%	6.7%	6.7%
		age70–74	=1 if aged 70–74 years	4.9%	5.1%	4.7%	5.3%	4.6%
		age75+	=1 if aged 75+ years	7.7%	7.1%	8.3%	7.3%	7.7%
Sibling status	fmeldst	nosibs	=1 was only child (excluded category)	5.4%	5.4%	5.4%	6.5%	5.3%
		oldest	=1 if has/had sibling and is/was eldest	32.1%	32.0%	32.1%	31.9%	33.1%
		younger	=1 if has/had sibling and is/was not eldest	62.6%	62.6%	62.5%	61.5%	61.6%
Marital status	mrcurr	single	=1 if never married (excluded category)	23.4%	26.4%	20.5%	22.9%	19.1%
		married	=1 if married	51.3%	52.3%	50.3%	57.5%	53.8%
		defacto	=1 if in a de facto relationship	12.2%	12.5%	11.9%	11.3%	11.2%
		separated	=1 if separated	2.7%	2.3%	3.2%	2.2%	2.4%
		divorced	=1 if divorced	5.9%	4.4%	7.4%	4.3%	7.8%
		widowed	=1 if widowed	4.5%	2.1%	6.8%	1.9%	5.8%
Marital/ cohabitation duration	mrplvt &mrcdur	timerel	continuous: years of cohabitation in current marriage or de facto relationship	13.6 (16.9)	13.8 (16.9)	13.3 (16.8)	15.5 (17.1)	14.6 (16.9)

TABLE A1
(continued)

Description	HILDA variable	Mnemonic	Regression variables	Full sample			Sub-sample	
				Persons (N = 16,886)	Male (N = 7,972)	Female (N = 8,914)	Male (N = 5,274)	Female (N = 6,037)
Presence of children in household	tcr04 tcr514	depkid	=1 if has a resident dependent child under age 15; =0 if otherwise	25.4%	23.3%	27.4%	24.9%	28.3%
Country of birth	anbcob	bornoz	=1 if born in Australia (excluded category)	68.8%	69.1%	68.6%	70.8%	73.1%
		besb	=1 if born main English speaking country	10.4%	11.2%	9.7%	11.9%	10.5%
		bnesb	=1 if born non-English speaking country	20.7%	19.7%	21.7%	17.4%	16.4%
Educational qualifications	edhigh1	year11	=1 if highest qualification Year 11 or qualification unable to be determined (excluded category)	22.6%	19.4%	25.6%	16.8%	23.7%
		year12	=1 if highest qualification was Year 12 high school	16.4%	16.8%	15.9%	16.2%	16.2%
		cert	=1 if highest qualification a Cert III or Cert IV	23.0%	28.4%	17.8%	28.5%	17.5%
		diploma	=1 if highest qualification a diploma or advanced diploma	10.1%	8.9%	11.2%	9.8%	11.2%
		degree	=1 if highest qualification a bachelor's or honours degree	15.9%	14.5%	17.1%	14.5%	18.1%
		postgrad	=1 if highest qualification a postgraduate degree	12.1%	11.9%	12.3%	14.1%	13.3%
Currently studying	edcqtyp	studying	=1 if currently studying; = 0 if not	11.9%	10.6%	13.0%	10.8%	12.4%
Field of study	edpsqfd	nopgq	=1 if has no post-school qualification (excluded category)	34.1%	34.4%	34.0%	30.8%	31.5%
		science	=1 if field of highest post-school qualification is natural and physical science	1.9%	2.2%	1.6%	2.5%	1.9%
		infot	=1 if field of highest post-school qualification is info technology	2.9%	3.8%	2.0%	4.0%	2.1%
		engrt	=1 if field of highest post-school qualification is engineering and related technology	9.3%	18.0%	1.0%	18.8%	1.0%
		archit	=1 if field of highest post-school qualification is architecture and building	3.4%	6.3%	0.6%	6.3%	0.5%

TABLE A1
(continued)

Description	HILDA variable	Mnemonic	Regression variables	Full sample			Sub-sample	
				Persons (N = 16,886)	Male (N = 7,972)	Female (N = 8,914)	Male (N = 5,274)	Female (N = 6,037)
		agenv	=1 if field of highest post-school qualification is agriculture, environment and related fields	1.9%	3.0%	0.9%	3.1%	1.0%
		med	=1 if field of highest post-school qualification is medicine	1.0%	1.0%	1.0%	1.0%	1.1%
		nur	=1 if field of highest post-school qualification is nursing	4.4%	0.8%	7.9%	0.9%	8.4%
		ohealth	=1 if field of highest post-school qualification is other health	3.8%	2.0%	5.5%	2.5%	6.2%
		edu	=1 if field of highest post-school qualification is education	7.1%	3.6%	10.5%	4.0%	10.9%
		commerce	=1 if field of highest post-school qualification is management and commerce (e.g. accounting)	14.0%	12.4%	15.5%	13.9%	15.5%
		law	=1 if field of highest post-school qualification is law	1.4%	1.6%	1.2%	1.6%	1.0%
		socecon	=1 if field of highest post-school qualification is society and culture (e.g. economics)	5.6%	3.6%	7.6%	3.8%	8.1%
		creativeart	=1 if field of highest post-school qualification is creative arts	2.8%	2.3%	3.2%	2.2%	3.4%
		hospitality	=1 if field of highest post-school qualification is food and hospitality	4.3%	3.2%	5.3%	3.0%	5.1%
		other	=1 if field of highest post-school qualification is other	2.0%	1.7%	2.3%	1.7%	2.2%
State/territory of residence	hhstate	sydney	=1 if resides in Sydney (excluded category)	21.3%	21.7%	20.9%	19.5%	18.4%
		balnsw	=1 if resides NSW (not Sydney)	11.1%	11.0%	11.2%	11.3%	11.3%
		melb	=1 if resides Melbourne	19.8%	19.6%	20.1%	19.1%	19.3%
		balvic	=1 if resides Victoria (not Melbourne)	6.2%	6.0%	6.3%	5.8%	6.3%
		bris	=1 if resides Brisbane	9.7%	9.5%	9.9%	10.3%	11.1%
		balqld	=1 if resides Queensland (not Brisbane)	10.0%	10.2%	9.9%	9.6%	9.9%

TABLE A1
(continued)

Description	HILDA variable	Mnemonic	Regression variables	Full sample			Sub-sample	
				Persons (N = 16,886)	Male (N = 7,972)	Female (N = 8,914)	Male (N = 5,274)	Female (N = 6,037)
		adel	=1 if resides Adelaide	5.5%	5.4%	5.6%	6.2%	6.0%
		balsa	=1 if resides South Australia (not Adelaide)	1.7%	1.7%	1.7%	1.6%	1.6%
		perth	=1 if resides Perth	7.7%	7.8%	7.6%	9.1%	8.7%
		balwa	=1 if resides Western Australia (not Perth)	2.5%	2.4%	2.5%	2.7%	2.6%
		tasmania	=1 if resides Tasmania	2.1%	2.2%	2.1%	2.3%	2.5%
		northernt	=1 if resides Northern Territory	0.7%	0.7%	0.7%	0.7%	0.8%
		acapter	=1 if resides Australian Capital Territory	1.6%	1.7%	1.6%	1.8%	1.6%
Labour market status	esdtl	nilfnm	=1 if not in labour force – not marginally (excluded category)	27.8%	22.4%	33.0%	22.2%	30.9%
		empft	=1 if employed full-time or hours unstated	43.7%	56.3%	31.7%	57.2%	32.0%
		emppt	=1 if employed part-time (<35 hours per week)	19.8%	13.1%	26.2%	13.8%	28.8%
		unempft	=1 if unemployed and looking for FT work	2.4%	2.9%	1.9%	2.2%	1.2%
		unemppt	=1 if unemployed and looking for PT work	0.9%	0.8%	1.0%	0.6%	0.8%
		nilfm	=1 if not in labour force - marginally	5.4%	4.6%	6.2%	3.9%	6.2%
Trade union membership (derived from waves 1 –16)	jbtu	evertumem	=1 if currently or ever a trade union member	19.8%	20.4%	19.3%	22.2%	20.9%
Sector (derived from waves 1 –16)	jbmmply; jbmmpl; jbmmplr	everprivate	=1 if currently or previously work (ed) in the private sector	70.4%	77.2%	63.8%	79.1%	66.8%
		evernotfp	=1 if currently or previously work (ed) in the not-for-profit sector	14.0%	9.1%	18.7%	10.1%	20.1%
		evergovt	=1 if currently or previously work (ed) in the government sector	25.3%	21.4%	29.0%	24.3%	32.0%

TABLE A1
(continued)

Description	HILDA variable	Mnemonic	Regression variables	Full sample			Sub-sample	
				Persons (N = 16,886)	Male (N = 7,972)	Female (N = 8,914)	Male (N = 5,274)	Female (N = 6,037)
Occupation (derived from waves 1–16)	jbmo61; ujljo61; pjoto61	labourer*	=1 if currently or previously work(ed) as a labourer or related worker or if missing information on current or previous occupation (excluded category)	14.3%	14.4%	14.2%	12.8%	11.2%
		mgr	=1 if currently or previously work(ed) as a manager	12.6%	15.7%	9.7%	16.2%	9.8%
		prof	=1 if currently or previously work(ed) as a professional	21.1%	19.0%	23.0%	21.3%	24.6%
		trade	=1 if currently or previously work(ed) as a technician or tradesperson	11.7%	19.3%	4.4%	18.8%	4.3%
		service	=1 if currently or previously work(ed) as a community and personal service worker	11.3%	6.7%	15.8%	5.9%	15.8%
		clerical	=1 if currently or previously work(ed) as a clerical and administrative worker	14.4%	7.1%	21.3%	8.3%	23.2%
		sales	=1 if currently or previously work(ed) as a sales worker	7.7%	5.5%	9.8%	5.4%	9.7%
		operator	=1 if currently or previously work(ed) as a machinery operator and driver	6.9%	12.2%	1.8%	11.1%	1.5%
Industry (derived from waves 1–16)	jbmi61, ujlji61, pjoti61	missind	=1 if missing current or last industry information (excluded category)	11.3%	7.8%	14.8%	6.0%	11.5%
		agff	=1 if currently or previously work(ed) in agriculture, forestry and fishing	2.6%	3.5%	1.8%	3.0%	1.8%
		mining	=1 if currently or previously work(ed) in mining	1.6%	2.8%	0.4%	2.5%	0.4%
		manuf	=1 if currently or previously work(ed) in manufacturing	7.5%	11.0%	4.2%	11.0%	4.1%
		egw	=1 if currently or previously work(ed) in electricity, gas, water and waste services	0.8%	1.3%	0.3%	1.4%	0.3%

TABLE A1
(continued)

Description	HILDA variable	Mnemonic	Regression variables	Full sample			Sub-sample	
				Persons (N = 16,886)	Male (N = 7,972)	Female (N = 8,914)	Male (N = 5,274)	Female (N = 6,037)
		construc	=1 if currently or previously work (ed) in construction	7.1%	12.8%	1.6%	12.5%	1.7%
		wt	=1 if currently or previously work (ed) in wholesale trade	2.7%	3.7%	1.7%	4.1%	1.7%
		rt	=1 if currently or previously work (ed) in retail trade	8.2%	6.9%	9.5%	7.3%	9.7%
		accfs	=1 if currently or previously work (ed) in accommodation and food services	5.6%	4.6%	6.6%	4.0%	5.9%
		transp	=1 if currently or previously work (ed) in transport, postal and warehousing	4.7%	7.2%	2.3%	6.5%	2.2%
		media	=1 if currently or previously work (ed) in information media and telecommunications	1.5%	1.7%	1.4%	1.8%	1.1%
		fin	=1 if currently or previously work (ed) in financial and insurance services	3.2%	3.0%	3.4%	3.2%	4.1%
		realest	=1 if currently or previously work (ed) in rental, hiring and real estate services	1.4%	1.3%	1.5%	1.4%	1.4%
		profsci	=1 if currently or previously work (ed) in professional, scientific and technical	6.4%	7.3%	5.4%	7.8%	6.2%
		adminss	=1 if currently or previously work (ed) in administrative and support service	3.2%	3.1%	3.4%	3.2%	3.1%
		pubad	=1 if currently or previously work (ed) in public administration and safety	4.4%	5.4%	3.5%	6.1%	3.8%
		edtrain	=1 if currently or previously work (ed) in education and training	8.9%	5.6%	12.0%	6.7%	13.5%
		health	=1 if currently or previously work (ed) in health care and social assistance	13.3%	5.1%	21.2%	5.7%	22.5%
		arts	=1 if currently or previously work (ed) in arts and recreation services	1.8%	2.0%	1.7%	1.7%	1.5%
		oserv	=1 if currently or previously work (ed) in other services	3.6%	3.9%	3.3%	4.1%	3.3%

TABLE A1
(continued)

Description	HILDA variable	Mnemonic	Regression variables	Full sample: Persons (N = 16,886)	Full sample: Male (N = 7,972)	Full sample: Female (N = 8,914)	Sub-sample: Male (N = 5,274)	Sub-sample: Female (N = 6,037)
Cognition measures	ctbds	nctbds	backwards digit score (maximum number of digits successfully repeated in backwards order)				5.07 (1.46)	5.07 (1.44)
	ctsds	nctsds	symbol digit modalities score (number of correct responses)				48.4 (12.88)	51.2 (12.75)
	ctwps	nctwps	pronunciation (short NART) score (number of correctly pronounced words (interviewer assessed, maximum 25))				14.13 (5.41)	14.05 (5.13)
Personality measures (from wave 17)			Respondents were questioned on their personality character traits using a 36-item inventory. These data are then used by the HILDA team to derive five scales summarising the five personality factors as follows:					
	pnextrv	perextrv	extroversion score				4.29 (1.03)	4.49 (1.12)
	pnagree	peragree	agreeableness score				5.20 (0.91)	5.66 (0.86)
	pnconsc	perconsc	conscientiousness score				5.08 (0.97)	5.66 (1.12)
	pnemote	peremote	emotional stability score				5.21 (1.04)	5.23 (1.00)
	pnopene	peropen	openness to experience score				4.27 (1.04)	4.17 (1.07)
Locus of control measure (from wave 15)	lssecd, lsseci, lssefd, lssefh, lsselc, lssepa, lssesp	zselfef	Following Cobb-Clark *et al.* (2016), factor analysis is used to construct an index measuring self-efficacy (locus of control). The index is then standardised. Seven-item scale from 1 (strongly disagree) to 7 (strongly agree): lssecd: Can do just about anything lsseci: Cannot change important things in life lssefd: Future depends on me lssefh: Feel helpless				-0.03 (0.96)	0.01 (0.98)

TABLE A1
(continued)

Description	HILDA variable	Mnemonic	Regression variables	Full sample: Persons (*N* = 16,886)	Full sample: Male (*N* = 7,972)	Full sample: Female (*N* = 8,914)	Sub-sample: Male (*N* = 5,274)	Sub-sample: Female (*N* = 6,037)
			lsselc: Little control lssepa: Pushed around lssesp: No way to solve problems					
Numeracy measure	sktamat		Self-assessed mathematical skills: compared to a typical Australian: your mathematical skills are on a scale of 0–10 with 0 = very poor; 5 = about average and 10 = very good.					
		math012*	=1 if self-assessed math score is in bottom two deciles (excluded category)				1.0%	1.7%
		math345	=1 if self-assessed math score is in 3rd, 4th or 5th decile				16.7%	27.8%
		math678	=1 if self-assessed math score is in 6th, 7th or 8th decile				53.6%	52.5%
		math910	=1 if self-assessed math score is in 9th or 10th decile				28.7%	18.0%

Notes: Data weighted. All data are from wave 16 (2016) unless otherwise stated. Dummy variables are reported as a percentage. For continuous variables the mean and standard deviation are reported. *indicates the base group.