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# Job Mismatches and Labour Market Outcomes<sup>1</sup>

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### *Abstract*

Interpretation of the phenomenon of graduate overeducation remains problematical. In an attempt to resolve at least some of the issues this paper makes use of the panel element of the HILDA survey, distinguishing between four possible combinations of education/skills mismatch. For men we find a significant pay penalty only for those who are both overskilled and overeducated, while for women there is a smaller but significant pay penalty in all cases of mismatch. Overeducation has a weak negative effect on the job satisfaction of women and no effect on the job satisfaction of men. Overskilling either on its own or jointly with overeducation does so. Finally, overeducation has no significant effect on the job mobility of either men or women, though there is a significant positive effect on both voluntary and involuntary job loss in men who are both overskilled and overeducated, with the results again differing for women. At least for a substantial number of workers it appears, therefore, that overeducation represents a matter of choice (or is possibly a consequence of low ability for that level of education), while overskilling imposes real costs on the individuals concerned.

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## 1. Introduction

Skill mismatch has become an issue of particular policy concern. Thus, the European Union has increasingly focused on it, because it is seen as damaging to competitiveness<sup>2</sup>. Since the concept of overeducation among university graduates was first introduced by Richard Freeman in 1976 the literature on overeducation has mushroomed, with up to forty percent of the working population identified as falling into this category and often suffering sizeable wage penalties compared to properly matched workers. Research has concentrated on university graduates for a number of reasons. University graduates have been the largest and fastest growing single education group in Western labour markets for at least three decades and the trend is not abating, making the presence of overeducation a continuing puzzle, given the fact that rates of return to degrees have been stable or increasing. Further, investment in higher education continues to be the highest per person amongst all education categories. This makes the decision to become a graduate or not a crucial one for all labour market participants, with efficiency implications arising from the presence of overeducation. Despite the considerable research attention that the overeducation phenomenon has received, its interpretation continues to be far from straightforward. First, there continues to be measurement issues arising from whether the information is derived from subjective responses to questions directed at workers, 'objective' estimates obtained from job analysis, or estimates derived using the empirical method in the absence of a direct question on the topic. Second, some jobs may merely specify a minimum educational requirement rather than a specific level of education, while in many cases educational requirements may be rising over time. Third, an individual may be overeducated simply because he or she is of low ability for that level of qualifications. For these reasons some authors have begun to utilize data on overskilling, questions on which have only recently become available and avoid some of the ambiguities described above.

Some authors have attempted to make progress by disaggregating the overeducation variable. Thus, Chevalier (2003) considered job satisfaction as a possible way of showing

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<sup>2</sup> See, for instance, European Commission, *New Skills for New Jobs; Anticipating and Matching Labour Market and Skills Needs*, Director-General for Education and Culture, April, 2009.

the degree of match between workers and jobs. He distinguished between genuine and apparent mismatch. Genuine mismatch represents a situation in which a worker indicates possession of more education than is required to perform the job and also a low level of job satisfaction. Apparent mismatch represents a situation in which a worker has more than the required level of education, but is satisfied with the job. This is consistent either with a recognition that the job requirements are adequate for the level of skills possessed by the worker (ie. the worker has low ability relative to that particular level of education) or alternatively that the worker prefers that level of job because it is less demanding or fits in better with leisure-work choices. Adopting a slightly different approach Green and Zhu (2008) distinguished between 'real' and 'formal' overeducation according to whether or not this was accompanied by skills under-utilisation. It was found that those in the real overeducation category suffered from higher wage penalties than those in the formal overeducation group and only the former exhibited significantly lower job satisfaction. An alternative approach is to treat overeducation and overskilling separately. Thus, Allen and van der Velden (2001) examined the relationship between educational mismatches and skill mismatches and found that while the former had a strong negative effect on wages the latter did not. Skill mismatches, in contrast, predicted the level of job satisfaction and that of on-the-job search much better than did overeducation. Green and McIntosh (2007) found a correlation between overeducation and overskilling of only 0.2, suggesting that they were measuring different things. In a recent study, Mavromaras, et al. (2009) looked at the extent of overskilling in Australia and its impact on wage levels, using HILDA data. They also argue that overskilling is a better measure of under-utilisation of labour than overeducation, since it is less likely to be contaminated by unobserved individual heterogeneity than the latter.

This paper extends earlier analyses on labour market mismatches by differentiating between overeducation and overskilling. It examines the individual and joint impact of overeducation and overskilling on a number of pertinent labour market outcomes starting with wages and job satisfaction and concluding with job mobility among individual employees. We define four possible categories of worker-job matching:

(a) *Matched* in both education and skills: the individual is neither overskilled nor overeducated.

- (b) *Only overskilled*: the individual is matched in education, but overskilled
- (c) *Only overeducated*: the individual is matched in skills but is overeducated.
- (d) *Overeducated and overskilled*: The individual is overskilled *and* overeducated.

Chevalier (2003) does not distinguish between the last two possibilities, but instead makes a distinction between apparent and genuine overeducation on the basis of job satisfaction scores. We distinguish ourselves from existing research by examining each of these cases separately and finding that this produces divergent results. The paper which comes closest to our own is that of Allen and van der Velden (2001), who examine a cohort of Dutch graduates from 1990-91 some seven years after graduation and also identify wage, job satisfaction and mobility outcomes. Apart from the fact that our data are much more recent we have a richer set of controls which enables our model to explain twice as much of the variation in wages. We also disaggregate by gender as well as identifying the effects of overeducation and overskilling both separately and jointly.

We use the Household Income and Labour Dynamics in Australia (HILDA) survey for our analysis. HILDA does not contain any questions on overeducation, but by using the so-called empirical method it is possible to derive such a measure. Consequently we use the one standard deviation above the mode estimate to derive an overeducation measure. Overskilling is derived from HILDA by using the response scored on a seven point scale to the statement 'I use many of my skills and abilities in my current job', with a response of 1 corresponding to strongly disagree up to 7 strongly agree. Individuals selecting 1, 2, 3 or 4 on the scale are classified as overskilled and those selecting 5 or higher as skills-matched. There is no scope for utilising this HILDA question to examine the phenomenon of underskilling and so we do not address this further here.<sup>3</sup> The HILDA

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<sup>3</sup> This paper differs from previous research where overskilling has been classified as severe or moderate, against the well-matched reference category. In this paper, our reference category for matched in the case of skills are responses 5, 6, and 7 respectively in the HILDA data. The rationale for not including 4 in the moderately overskilled category has been based on the weak empirical differences that have been traced by our previous research (Mavromaras et al. 2008 and 2009) between those defined as moderately overskilled and well matched in their skills. This choice regarding skills matching is consistent with the matching case in relation to education as the empirical method ignores those whose overeducation is less than one standard deviation over the mode. Those with more than one standard deviation over the mode are called "substantially overeducated" and are a category akin to the "severely overskilled" in the overskilling literature. Our use of these two categories introduces some consistence between the two strands of the empirical mismatch literature.

survey contains a question in the person questionnaire on how satisfied or dissatisfied individuals are with different aspects of their job, using a scale between 0 and 10. This includes questions on overall satisfaction and five facets of job satisfaction (total pay, job security, the nature of work itself, hours of work and flexibility). The HILDA data set uniquely provides contemporary panel information on both overskilling and the job satisfaction aspects that concern our analysis on the impact of job-worker mismatch on some core labour market outcomes such as wages, job satisfaction and job mobility.

Kler (2005) has already used the first wave of HILDA to examine the impact of overeducation on higher education graduates, using bivariate probit models to account for possible unobserved heterogeneity, though he does not consider overskilling. He calculates overeducation by using job analysis to determine the educational requirements of particular occupations using ASCO codes, whereas we derive an overeducation measure using the empirical method as outlined above. Kler finds that overeducated graduates suffer from lower levels of satisfaction than their matched peers, with the exception of satisfaction with hours worked and job security. We extend the analysis by making use of the panel element of HILDA and distinguishing between overskilling and overeducation.<sup>4</sup> Only panel information and estimation are capable of controlling for unobservables and none of the above studies used panel data. A potential problem with cross-sectional studies is that they may be biased due to unobserved individual heterogeneity, which may be the case if the probability of educational mismatch is correlated with innate ability. Bauer (2002), making use of the German Socio-Economic Panel for the years 1984-1998 found that compared to pooled OLS, the estimated wage effects of overeducation became smaller, or in some cases disappeared altogether, when controlling for unobserved heterogeneity. A recent attempt to use the panel element of the British Household Panel Survey (BHPS) is that of Lindley and McIntosh (2008). As there are no overeducation or overskilling questions in the BHPS, they use the one standard

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<sup>4</sup> Kler (2007) has used the Australian Longitudinal Survey of Immigrants (LSIA) to examine the extent of overeducation (based on the objective definition) among tertiary educated immigrants. English speaking immigrants are found to have similar rates of overeducation compared to the native born, but higher rates are found among non-English speaking Asian immigrants. For immigrants in general, the earnings penalty for overeducation was found to be large relative to the native born.

deviation over the mode approach to measure overeducation. There is some evidence that unobserved ability explains some of the overeducation and that, for some, overeducation is a temporary phenomenon, but for a sizeable minority there is evidence of duration dependence and this is particularly so for the more highly educated.

This paper is structured as follows. Section 2 describes the data and provides an overview of the various estimation methods we use. Section 3 present estimation results on the relationship between mismatches and (i) wages, (ii) job mobility and (iii) job satisfaction and its facets in three separate subsections. Section 4 concludes. Appendix I contains descriptive statistics and core estimation results. An extended Appendix II contains all estimation results which can be made available by the authors.

## **2. Data and Methods**

### **2.1 The HILDA data**

The data used is the confidentialised unit record file from the Household Income and Labour Dynamics in Australia (HILDA) survey. In this study we make use of data from the first six waves of the HILDA survey. Modeled on household panel surveys undertaken in other countries, the HILDA survey began in 2001 (wave 1) with a large national probability sample of Australian households and their members<sup>5</sup>. The sample used here is restricted to all working-age employees (16-64 for males and 16-59 for females) holding a university degree or equivalent qualification in full-time wage employment and who provide complete information on the variables of interest. Summary statistics of the variables used in this study are provided in Appendix I. The sample size we retain is approximately 1,200 observations per wave.

#### *Wages of graduates by match type*

Table 1 reports the unadjusted average gross weekly wage levels for each combination of mismatch by gender. Perhaps not surprisingly, earnings were higher for males for each category of mismatch. Irrespective of gender, workers who were either overeducated and

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<sup>5</sup> See Watson & Wooden (2004) for a detailed description of the HILDA data

\ or overskilled earned substantially less than matched employees. Within both the male and female labour markets, average earnings were lowest for graduates who were both overeducated and overskilled. The next highest raw differential related to graduates who were overeducated only while overskilled only graduates appeared to incur the lowest wage penalty.

**Table 1: Wages of graduates by type of job match**

	<i>Male</i>	<i>Female</i>
Overeducated Only	1481.1	1074.8
Overskilled Only	1277.9	961.4
Overeducated & Overskilled Only	1120.7	801.1
Matched	800.7	686.5

Note: the figures refer to gross weekly wages measured in Australian dollars for full-time employees; HILDA 2001-2006

*Job Satisfaction of graduates by match type*

Table 2 looks at the extent to which rates of overall job satisfaction vary according to the type of observed labour market match. The highest rates of job satisfaction were found among well-matched workers (a mean of 7.6 for both males and females). Employees who were overeducated only reported almost identical levels of overall job satisfaction.

**Table 2: Job satisfaction of graduates by type of job match**

<i>Job satisfaction</i>	<i>Well matched</i>		<i>Overskilled only</i>		<i>Overeducated only</i>		<i>Overskilled and overeducated</i>	
	M	F	M	F	M	F	M	F
0	0.1	0.2	0.5	1.2	0.0	0.0	0.6	0.7
1	0.2	0.4	0.5	0.8	0.3	0.7	1.8	2.1
2	0.4	0.4	3.0	0.8	2.0	0.7	3.6	5.6
3	1.3	1.7	4.3	3.9	1.7	0.7	1.8	1.4
4	2.0	1.4	4.6	4.6	1.1	1.1	8.5	10.6
5	4.3	5.4	11.1	13.9	2.3	5.2	12.7	12.7
6	8.1	8.8	17.3	14.7	7.9	11.2	15.2	28.2
7	23.9	22.5	26.2	26.6	22.2	18.5	30.3	23.9
8	36.0	32.6	22.6	22.8	32.9	35.0	17.6	12.0
9	19.6	21.2	7.8	8.1	21.1	18.5	6.1	2.8
10	4.2	5.5	2.2	2.7	8.7	8.4	1.8	2.0
Total	100	100	100	100	100	100	100	100
Mean job satisfaction	7.6	7.6	6.5	6.6	7.7	7.6	6.3	6.8
Cases	2796	2581	371	259	356	286	165	142

Note: Working age full time employees; HILDA 2001-2006.

Thus, Table 2 suggests that overeducation alone, at least as defined here through the empirical method, is not associated with lower levels of job satisfaction. With means at 6.4 and 6.5 per cent for males and females respectively, the average job satisfaction levels among workers who were overskilled only were well below those of well-matched and overeducated only workers. The lowest levels of overall job satisfaction were reported by employees who were both overeducated and overskilled, (with a mean of 6.3 for males and 6.8 for females).

*Job Mobility of graduates by match type*

Table 3 examines the extent of labour market mobility among our population. HILDA records the degree to which respondents left their job since the last interview and the reasons underlying the job separation.

**Table 3: Job mobility of graduates**

	<i>Graduates</i>	
	<i>Male %</i>	<i>Female %</i>
Did not change job	89.3	88.4
Layoff (involuntary)	1.5	1.0
Quits (voluntary)	7.6	8.4
Other	1.6	2.2
Number of cases	5,027	3,938

Note: figures relate to job movement from main job between two interviews

Based on their responses, we follow McGuinness and Wooden (2009) to categorize job separations into the voluntary (quits), involuntary and other categories.<sup>6</sup> Approximately 11 per cent of males and 12 per cent of females per annum were found to have left their jobs. Annual rates of voluntary separation averaged approximately 8 per cent, while layoffs and separations for other reasons were relatively infrequent averaging 1 and 2 per cent respectively. However, these patterns varied considerably when the data was broken down by each category of mismatch. Table 4 reveals that the incidence of voluntary

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<sup>6</sup> Individuals were classified as having voluntarily separated if they gave any of the following as their main reason for leaving their previous employer: (i) not satisfied with job; (ii) to obtain a better job / just wanted a change / to start a new business; (iii) retired / did not want to work any longer; (iv) to stay at home to look after children, house or someone else; (v) travel / have a holiday; (vi) returned to study / started study / needed more time for study; (vii) too much travel time / too far from public transport; (viii) change of lifestyle; or (ix) immigration.

separations was substantially higher among workers who were overskilled only and both overeducated and overskilled.

**Table 4: Job mobility of graduates by type of job match**

<i>Males</i>				
	<i>Matched</i>	<i>Overeducated</i>	<i>Overskilled</i>	<i>Both</i>
Did not change job	89.3	87.8	82.5	75.9
Layoff (involuntary)	1.45	2.2	4.6	4.5
Quits (Voluntary)	7.8	8.3	11	15
Other	1.4	1.7	1.8	4.5
<i>Females</i>				
	<i>Matched</i>	<i>Overeducated</i>	<i>Overskilled</i>	<i>Both</i>
Did not change job	89.2	88.4	79.9	84.4
Layoff (involuntary)	1.3	0.5	2.6	0
Quits (Voluntary)	8.2	9.7	12.9	10.6
Other	1.3	1.4	4.6	5.3

See notes to Table 3.

The pattern of job separations among workers who were overeducated only was broadly similar to that of matched workers suggesting, at a descriptive level at least, that overskilling is again a more substantial cause of concern among graduates.

## 2.2 Estimation Methodology

This paper reports results based on a number of estimation methods. Their comparison is informative. For the relationship between satisfaction and mismatch we begin with the simplest pooled probit estimates generated using propensity score matching (PSM) which are then compared with a Random Effects (RE) probit model augmented with Mundlak (1978) corrections. The dependent variable takes the value 1 if the respondent reports a job satisfaction level of 7 or above and zero otherwise. For clarity of interpretation we have converted ordered variables into binary variables, but only after carrying out considerable sensitivity analyses regarding the cut off points we use. For the relationship between wages and mismatch we use FE and RE regressions. Finally, for the relationship between job mobility and matching we use a RE probit within which the incidence of having moved job since the previous wave is modeled as a function of the level of mismatch experienced in the previous wave. We initially model all job separations before estimating separate models for voluntary and involuntary separations.

The use of pooled regression is a good starting point and benchmark for the analysis. It provides us with an overview of the relationships we examine in terms of the cross sectional differences in the sample. Although largely informative in a descriptive sense, pooled regression estimates are always subject to biases due to unobserved systematic individual differences in the sample.

The principal advantage from the introduction of the Random Effects estimation approach is that it introduces controls for time invariant unobserved effects. Therefore, some of the unobserved differences between mismatched workers and their matched counterparts will be accounted for in the model. The inclusion of the Mundlak corrections will help towards accounting for possible correlations between the model covariates and the individual specific component of the error term.

The principal advantage of the PSM results is that they control for selection based on observed characteristics. We have gone a step further in our application of the PSM method by balancing the data on all observable characteristics, including past labour market mismatch. The availability of panel data makes this technique particularly useful given that the evidence has consistently shown that the strongest single indicator of future mismatch is past mismatch (McGuinness, 2008 and Mavromaras et al. 2009). Thus, for each definition of mismatch, we are able to construct a treatment group of mismatched individuals and compare their job satisfaction levels with those of a control group of previously mismatched workers who are presently well-matched. This approach ensures that we are comparing like with like. More specifically, to the extent that any unobserved ability bias is present in the treatment group, it will also be present in the control group, thus ensuring a robust estimate of the effect of labour market mismatch on job satisfaction. These robustness checks are useful given the suggestion in the literature that mismatched workers may have lower unobserved ability levels and that consequently observed lower returns in the labour market may reflect these ability differences (see Sloane, 2003, McGuinness, 2006, for reviews of the literature and discussions). If these arguments have an empirical basis and job satisfaction is indeed correlated with (unobserved) ability, then failure to control for unobserved ability and other such

differences will generate biased results. The comparison of estimation results derived using different methods will give us an idea of the extent of such biases.<sup>7</sup>

### 3. Estimations and Results

#### 3.1 Wage Effects of Job Mismatch

Probably the most important and definitely the most well-researched consequence of mismatch is the effect it may have on wages. A common result in the literature is that mismatch is associated with lower pay, which reflects the lower productivity of a sub-optimal worker-job match, though overeducated workers do receive higher pay than their educationally appropriately matched co-workers, suggestive of some productivity advantage to being overeducated (see Sicherman, 1991). To assess the impact of the various forms of job mismatch on earnings we employ a range of estimation strategies. We begin with an OLS model before moving to panel estimation, using both fixed and random effects specification. We also estimate a random effects (RE) model with a Mundlak correction to demonstrate that this approach approximates to that of a standard fixed effects model, a factor that becomes relevant later when we attempt to estimate binary choice panel models for which no fixed effects procedure is available. As before, the sample used to produce Table 5 relates to working age full-time graduate employees, controlling for both supply of and demand for labour covariates. The regression specification included controls for gender, age, marital status, number of children, socioeconomic background, unemployment history, country of origin, employment and occupational tenure, union membership, firm size and industry. Not surprisingly, Table 5 suggests that OLS estimation generates the highest wage impacts. However, irrespective of gender, the estimated wage penalties of overeducation on its own are only a fraction of those associated with the other two forms of job mismatch. When we move to the RE model, for males, overeducation only no longer has a significant impact on wages while overskilled only and both overeducated and overskilled have associated wage costs of 10.1% and 22.8% respectively.

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<sup>7</sup> Reference category is well-matched. We did not include the wage variable in our models due to concerns relating to potential collinearity bias; however, when it is included in the specification the results remain almost identical

**Table 5: Graduate Wage Effects of Job Mismatch**

	<i>Relative to Well-Matched:</i>		
	<i>Overeducated only</i>	<i>Overskilled only</i>	<i>Overskilled and overeducated</i>
<i>Full-time males</i>			
OLS	-0.061** (-2.25)	-0.243*** (-8.81)	-0.410*** (-9.74)
Random Effects	-0.020 (-1.00)	-0.101*** (-3.70)	-0.228*** (-7.12)
Random Effects with Mundlak	-0.005 (-0.23)	-0.038 (-1.21)	-0.153*** (-4.24)
Fixed Effects	0.008 (0.034)	-0.026 (-0.79)	-0.117*** (-0.307)
<i>Full-time females</i>			
OLS	-0.057** (2.32)	-0.232*** (-9.26)	-0.338*** (-10.31)
Random Effects	-0.050** (-2.47)	-0.172*** (-6.19)	-0.197*** (-6.14)
Random Effects with Mundlak	-0.031 (-0.58)	-0.087** (-2.21)	-0.103*** (-3.16)
Fixed Effects	-0.032 ((-1.31)	-0.075 (-1.62)	-0.110*** (-3.31)

Notes: Marginal effects with t-stats in parenthesis; \* \*\* \*\*\* denotes significance at the 10%/5%/1% level; Random Effects regression with Mundlak correction.

The random effects estimates are somewhat higher for females with overeducated only workers earning 5.0 per cent below their well matched counterparts, with the penalties for overskilled only and both overskilled and overeducated graduates standing at -17.2 and -19.7 per cent respectively. When we move to fixed effects estimation (both standard fixed effects and random effects with a Mundlak correction) the impacts of mismatch on earnings decline further. Within the male equation, only employees who are both overeducated and overskilled experience a substantial pay penalty while, for females, the consistent evidence relates to workers who are overskilled only. Working on the generally accepted assumption that the fixed effects estimators generate the least biased estimates, the results suggest that, once account is taken of individual unobserved heterogeneity, graduates who are overeducated only do not experience any wage disadvantage relative to their well matched counterparts.

However, there is some recent evidence to suggest that fixed effects estimators may themselves be biased by under-estimating the true impact of some covariates in a model. Buddelmeyer et al. (2008) state that fixed effects can soak up a good deal of the explanatory power of relatively time- invariant variables. This is potentially a concern for studies of skill mismatch, given that existing evidence suggests that both overeducation and overskilling are relatively time persistent states (McGuinness 2005, McGuinness and Wooden 2008). To investigate the matter further we estimate a two-stage model whereby we extract the individual level fixed effects in the first stage and include these as the

dependant variable in a second stage regression containing the time varying means of each of our original explanatory variables. The thinking here is that including the Mundlak controls as right-hand-side variables will give us an indication of the relative contribution of each variable to the overall fixed effect.

**Table 6: Impact of Job Mismatch on Individual Fixed Effects**

	<i>Relative to Well-Matched:</i>		
	<i>Overeducated only</i>	<i>Overskilled only</i>	<i>Overskilled and overeducated</i>
<i>Full-time male</i>			
Fixed Effect – OLS	-0.131*** (-3.81)	-0.331*** (-10.41)	-0.408*** (-8.16)
Adjusted R <sup>2</sup>	0.68	0.68	0.68
<i>Full-time female</i>			
Fixed Effect – OLS	-0.044 (-1.47)	-0.183*** (-6.49)	-0.338*** (-9.51)
Adjusted R <sup>2</sup>	0.792	0.792	0.792

Notes: Marginal effects with t-stats in parenthesis; \*/\*\*/\*\* denotes significance at the 10%/5%/1% level; Random Effects regression with Mundlak correction.

Table 6 reports the coefficients and standard errors of the mismatch controls along with the adjusted R<sup>2</sup> of each regression. The time varying averages explain a high proportion of the individual level fixed effects, particularly for females. The results confirm that the variables relating to overskilling only and both overskilled and overeducated account for a proportion of the fixed effect, suggesting that both the fixed effect and Mundlak corrected models reported in Table 4 may be under-estimating the true impact of these variables on wages. With respect to overeducation only, no effect was found for females suggesting that the fixed effects estimates from Table 4 are robust. However, the overeducated only control did account for some of the fixed effect within the male equation. Nevertheless, given that the standard RE estimator did not generate a significant result for this variable our general findings regarding overeducation only remain unchanged. Thus, for both males and females we find no evidence of a significant wage impact from being overeducated only, when full account is taken of unobserved individual heterogeneity. The wage costs associated with overskilling and overskilling only and both overeducated and overskilled are substantial, with the true impact lying between the random and fixed effects estimates.

## 3.2 Job Satisfaction and mismatch

### *Overall Job Satisfaction*

We treat job satisfaction as an outcome of mismatch by observing the effect that each type of mismatch has on resulting job satisfaction levels after we have controlled for other factors that may also affect job satisfaction. The interpretation of our results is based on the thought that where a mismatch does not appear to reduce job satisfaction it is more likely that this mismatch reflects voluntary under-utilisation of skills or qualifications (or, at least if not voluntary, not harmful according to the worker). By contrast, a mismatch that reduces job satisfaction is more likely to reflect involuntary under-utilisation.

Table 7 presents the difference in job satisfaction between the well matched (i.e. those that are neither overeducated nor overskilled) and those that belong to one of the three categories of mismatch using the alternative estimation methods explained above.

**Table 7: Marginal Effects from Alternative Estimation Strategies by Gender of Overall Job Satisfaction for Graduates**

	<i>relative to Well-Matched:</i>		
	Overskilled only	Overeducated only	Overskilled and overeducated
<i>Full-time male</i>			
Pooled probit	-0.252*** (-9.30)	-0.008 (-0.33)	-0.235*** (-5.93)
Nearest neighbour matching	-0.199*** (-5.51)	0.007 (0.27)	-0.252*** (-3.75)
Radius matching	-0.192*** (-6.26)	0.014 (0.61)	-0.280*** (-4.74)
Kernel matching	-0.192*** (-6.22)	0.013 (0.55)	-0.268*** (-4.45)
RE probit (without Mundlak)	-0.191*** (-7.92)	-0.012 (-0.60)	-0.274*** (-6.62)
RE probit (with Mundlak)	-0.092*** (-3.78)	-0.030 (-1.12)	-0.187*** (-3.88)
<i>Full-time female</i>			
Pooled probit	-0.167*** (-4.79)	0.014 (0.49)	-0.160*** (-3.72)
Nearest neighbour matching	-0.145*** (-3.29)	0.033 (0.84)	-0.185** (-2.47)
Radius matching	-0.170*** (-4.40)	0.012 (0.41)	-0.200*** (-3.21)
Kernel matching	-0.164*** (-4.19)	0.019 (0.62)	-0.204*** (-3.17)
RE probit (without Mundlak)	-0.216*** (-6.84)	-0.029 (-0.98)	-0.180*** (-4.01)
RE probit (with Mundlak)	-0.180*** (-4.69)	-0.084* (-1.84)	-0.219*** (-3.19)

*Notes:* marginal t-stats in parenthesis; \*/\*\*/\*\* denotes significance at the 10%/5%/1% level; satisfaction cut-off point at 7.

We report results for males and females separately. Estimates on overeducation only (Table 7, Column 2) suggest that, once we have controlled for mismatch that is attributable to overskilling, mismatch attributable to overeducation alone has no

discernible effect on the job satisfaction of males. This result is in agreement with Green and Zhu's finding that education mismatch in itself does not lower the level of job satisfaction. Generally speaking the results of the pooled probit correspond well with those generated by both the PSM techniques and the RE probit with Mundlak correction suggesting that, on the whole, unobserved heterogeneity bias is not an issue here. The one exception relates to the RE probit with Mundlak correction, which suggests that overeducation lowers job satisfaction for females by 8.4 per cent, however, this effect is only weakly significant.

Estimates on overskilling only (Table 7, Column 1) suggest that overskilling can be a prime cause of lower job satisfaction, but more so for females than for males. For males controlling for unobserved heterogeneity in the estimation leads to considerable reduction in the job satisfaction negative effect (from a maximum of 25.2 percent in the pooled probit, to a minimum of 9.2 percent when unobserved effects are controlled for using RE estimation). The drop in the magnitude of our estimates is also large relative to those generated by the PSM techniques. This could be taken as evidence that our PSM approach is ineffective as a control for unobserved individual heterogeneity. However, given that the analysis presented here also raises some questions with respect to the accuracy of fixed effects estimators, we cannot be certain as to the underlying cause of the differing marginal effects. For females controlling for unobserved heterogeneity and selection effects makes no statistically discernible difference with overskilled only workers experiencing job satisfaction levels that were, on average, approximately 17 per cent below those of their matched counterparts. Thus our results confirm that being overskilled only significantly reduces overall job satisfaction, although, in the case of females, there is some uncertainty surrounding the magnitude of the effect.

Estimates of the comparison between those who are well-matched with those who happen to be both overskilled and overeducated (Table 7, Column 3) suggest that job satisfaction can be seriously damaged by this type of mismatch. It is notable that in this case the pooled, PSM and the RE estimates are much more similar for both genders. Taken as a whole the marginal effects appear slightly higher than those reported for overskilled only females while the penalties are substantially higher in the case of males. Our results

clearly do not contradict those of Green and Zhu regarding the importance of combined overskilling and overeducation.

*Facets of Job Satisfaction and Job Mismatch*

Having established that under-utilisation in the form of overskilling always reduces overall job satisfaction, suggesting an involuntary situation, but that overeducation does not, we examine the facets of job satisfaction to see if there are any specific negative job aspects that are more frequently found across under-utilised workers. Given that the results of the pooled and PSM models broadly align with those of the Mundlak corrected RE probit, although some notable exceptions do exist, for the purposes of simplicity we report the results from the RE probit models only<sup>8</sup>. The facets available in the data are: pay, job security, work, hours and flexibility. We estimated all these facets separately and by gender with the expectation that we would trace some facet effects and gender differences. Results in Table 8 tell a different story to the one we expected.

**Table 8: Job Satisfaction and its Facets for Graduates**

	<i>Relative to Well-Matched:</i>		
	<i>Column 1: Overeducated only</i>	<i>Column 2: Overskilled only</i>	<i>Column 3: Overskilled and overeducated</i>
<i>Full-time male</i>			
Overall job satisfaction	-0.030 (-1.12)	-0.092*** (-3.78)	-0.187*** (-3.88)
Pay satisfaction	0.020 (0.55)	0.044 (1.44)	-0.073 (-1.29)
Job security satisfaction	-0.007 (-0.30)	-0.025 (-1.23)	0.006 (0.21)
Work satisfaction	-0.024 (-0.86)	-0.120*** (-4.52)	-0.261*** (-4.93)
Hours satisfaction	-0.006 (-0.13)	-0.040 (-1.01)	-0.068 (-1.01)
Flexibility satisfaction	0.014 (0.37)	0.008 (0.26)	-0.039 (-0.68)
<i>Full-time female</i>			
Overall job satisfaction	-0.084* (-1.84)	-0.180*** (-4.69)	-0.219*** (-3.19)
Pay satisfaction	0.020 (0.38)	-0.039 (-0.85)	-0.049 (-0.63)
Job security satisfaction	-0.024 (-0.91)	-0.020 (-0.94)	-0.006 (-0.18)
Work satisfaction	-0.092** (-2.13)	-0.256*** (-6.66)	-0.453*** (-5.88)
Hours satisfaction	-0.066 (-1.02)	-0.037 (-0.75)	-0.123 (-1.38)
Flexibility satisfaction	-0.127** (-1.99)	-0.014 (-0.28)	-0.081 (-0.93)

Notes: Marginal effects with t-stats in parenthesis; \*/\*\*/\*\* denotes significance at the 10%/5%/1% level; satisfaction cut-off point at 7. Random Effects Probit with Mundlak correction.

<sup>8</sup> Results from the pooled and PSM estimations are available from the authors.

The first row reported in Table 8 is the estimate of overall job satisfaction (already reported in Table 7) and the following rows report its constituents, the facets of job satisfaction. The only facet that comes up as generally statistically significant is that of work satisfaction, which is by far the closest in interpretation to the overall satisfaction variable. It appears that, empirically, these two variables are not clearly distinguishable from one another. Almost counter-intuitively, pay satisfaction remains statistically insignificant for all categories of mismatch, despite the sizeable pay penalty that we know exists in the case of those who are both overskilled and overeducated. The same applies to satisfaction regarding job security and hours. It is only the flexibility facet that appears to be significant and this only for overeducated females and at the margins of the 5 percent significance level. This would imply that overeducated females are less satisfied than their well-matched counterparts, as the result of lower than desired job flexibility.

It is also worth noting that female dis-satisfaction with the tasks they have to perform as either overskilled or overeducated or both (the work satisfaction facet), is considerably higher than that of their male counterparts. The presence of job dissatisfaction due to lack of flexibility for overeducated females sheds some light in the (hitherto poorly explained) RE estimate of overeducated females in Table 8.

### **3.3 Job mobility and Job Mismatch**

Another important adverse effect of a job mismatch is the degree to which it may influence job mobility as clearly job separation is a strong indicator of an inadequate match. Furthermore, it is not sufficient to assume that all separations will be voluntary in nature as firms may also choose to fire under-utilised workers who are perhaps poorly motivated. Thus, voluntary mobility is more likely to reflect dissatisfaction expressed by the worker, while involuntary mobility is more likely to reflect dissatisfaction expressed by the firm. To estimate this we examine the behaviour of those who have moved jobs between the last and the present interviews and then estimate the degree to which the type of mobility may be associated with the level of mismatch using a random effects probit model estimated under a number of informative specifications. In each regression the comparison case is restricted to individuals who did not change job since the last wave.

Table 9 presents four specifications under the following heads. The *reduced specification* contains the lagged mismatch variables only; the *demographics specification* contains the lagged mismatch variables plus a number of core time invariant demographic individual characteristics; the *sector specification* contains lagged sectoral dummy variables plus the lagged mismatch variables; the *full specification* contains all of the above.<sup>9</sup>

**Table 9: Graduate Job Mobility Effects of Job Mismatch - Marginal Effects**

Type of Job Loss	<i>relative to Well-Matched::</i>		
	Overeducated Only (Lagged)	Overskilled Only (Lagged)	Overskilled and overeducated (Lagged)
<i>Full-time male</i>			
<i>Job Loss</i>			
<i>Reduced specification</i>	0.014 (0.095)	0.051*** (2.83)	0.092** *(3.07)
<i>Demographics specification</i>	0.009 (0.054)	0.035** (1.98)	0.078*** (2.58)
<i>Sector specification</i>	0.005 (0.27)	0.045** (2.50)	0.073** (2.48)
<i>Full specification</i>	0.004 (0.25)	0.030* (1.69)	0.069** (2.30)
<i>Lay offs (Exogenous Job Loss)</i>			
<i>Reduced specification</i>	0.008 (0.99)	0.030*** (3.29)	0.033** (2.28)
<i>Demographics specification</i>	0.003 (0.40)	0.029*** (2.92)	0.025* (1.66)
<i>Sector specification</i>	0.003 (0.35)	0.026*** (2.88)	0.023* (1.64)
<i>Full specification</i>	-0.000 (-0.10)	0.026*** (2.61)	0.018 (1.19)
<i>Quits (Voluntary Job Loss)</i>			
<i>Reduced specification</i>	0.009 (0.63)	0.022 (1.48)	0.064** (2.54)
<i>Demographics specification</i>	0.006 (0.37)	0.009 (0.61)	0.059** (2.29)
<i>Sector specification</i>	0.004 (0.25)	0.019 (1.24)	0.054** (2.15)
<i>Full specification</i>	0.004 (0.29)	0.007 (0.42)	0.057** (2.17)
<i>Full-time female</i>			
<i>Job Loss</i>			
<i>Reduced specification</i>	-0.012 (-0.08)	0.060*** (2.59)	0.018 (0.57)
<i>Demographics specification</i>	-0.007 (0.35)	0.053** (2.31)	-0.021 (-0.71)
<i>Sector specification</i>	-0.016 (-0.81)	0.047** (2.05)	-0.004 (-0.13)
<i>Full specification</i>	-0.012 (-0.55)	0.049** (2.11)	-0.028 (-0.92)
<i>Lay offs (Exogenous Job Loss)</i>			
<i>Reduced specification</i>	-0.007 (-1.06)	0.012 (1.48)	*
<i>Demographics specification</i>	-0.008 (-0.90)	0.013 (1.31)	*
<i>Sector specification</i>	-0.014* (-1.68)	0.007 (0.81)	*
<i>Full specification</i>	-0.013 (-1.47)	0.008 (0.81)	*
<i>Quits (Voluntary Job Loss)</i>			
<i>Reduced specification</i>	0.006 (0.32)	0.039* (1.93)	0.023 (0.81)
<i>Demographics specification</i>	0.000 (0.02)	0.033*(1.65)	-0.013 (-0.47)
<i>Sector specification</i>	-0.005 (-0.28)	0.031 (1.54)	0.009 (0.31)
<i>Full specification</i>	-0.001 (-0.06)	0.032 (1.59)	-0.014 (-0.61)

Note: Random Effects Dynamic Probit coefficients with t-ratio in brackets. Full Specification includes immigration status, age, marital status and father's professional status.\* Insufficient observations to support estimation.

<sup>9</sup> Some of the effects that we trace are statistically too weak. This is usually interpreted as lack of evidence of the relationship in question. Note that in this occasion this could also be because of low levels of change recorded in the data, indicating the need for further work when more waves of the HILDA survey and a larger sample become available.

Generally speaking the size and significance of the marginal effects in Table 9 reduce as the model becomes more detailed and we will consider the full-specification as representing the most reliable estimate. The results suggest that, with respect to overall job separations, male and female employees who are overskilled only and males who are both overskilled and overeducated are more likely to have separated from their jobs by the following year. There is no evidence whatsoever to suggest that workers who are overeducated only are more likely to job separate and this is confirmed when separate models are estimated for voluntary and involuntary separation. This also held for females who were both overeducated and overskilled. Furthermore, although females who are overskilled only were more likely to job separate at the aggregate level, there was only weak evidence to support the view that such separations will relate predominantly to quits. There are not enough observations to estimate the layoffs of females who have been both overeducated and overskilled. With respect to males, employees who were overskilled only were more likely to be laid off while those who were both overeducated and overskilled were more likely to quit their jobs by the following year. Thus, in summary, while there is evidence that various combinations of overskilling result in higher levels of job mobility, the results suggest that workers who are overeducated only are no more likely to experience either involuntary or voluntary separations than their well matched counterparts.

### **3.4 Discussion**

The earlier literature on graduate mismatch found that there were both pay and job satisfaction penalties to being overqualified, but this literature was constrained by the unavailability of data on overskilling and also by the absence of panel data which would have allowed for controls on unobserved individual heterogeneity, such as variations in innate ability or employability. Our data relate to only one country, namely Australia, but the use of the panel element of HILDA and the presence of a question on overskilling enables us to put a new perspective on earlier results from a variety of countries. We use panel estimation to identify separately the effects of overeducation and overskilling, either singly or jointly, on three types of labour market outcomes- wages, job satisfaction and job change. The results differ in a number of respects across gender, emphasizing the need to split the data across this domain. For men, the negative wage effects observed in

the case of overeducation or overskilling on their own when using OLS estimation disappear when random effects or fixed effects estimation is used, but the negative wage effects remain significant when men are both overeducated and overskilled. In the case of male job satisfaction no significant difference is observed, compared to those who are matched, for men who are overeducated only, but there are significant negative effects for overskilling and more strongly so for men who are both overeducated and overskilled. When we turn to job mobility there is no significant effect on movement for men who are overeducated only, or in the case of quits for those who are only overskilled. However, overskilled men are more likely to suffer from exogenous job loss and where men are both overeducated and overskilled from both involuntary and voluntary job loss. For men at least the conclusion to be drawn, therefore, is that overeducation is less of a problem than it has previously been perceived to be. It is on overskilling and particularly its combination with overeducation that policy attention should be focused. For women too there are no wage effects for the overeducated only compared to those who are matched, and relatively weak effects on job satisfaction. Only those who are overskilled only are more liable to job loss, mainly relating to voluntary quits. Thus, it appears that for many overeducation is a matter of choice, whereas overskilling is a matter of regret. Employers could improve the morale of their workforces if they were to redesign jobs to ensure that the skills and abilities of their workers were fully utilized or alternatively if overskilled workers were promoted to more demanding jobs.

#### **4. Conclusion**

In this paper we have introduced a more detailed definition of worker-job mismatch than contained in the earlier literature with a mismatched worker being analysed according to whether he or she is either overeducated, overskilled or a combination of the two. In the case of job satisfaction each case is compared to matched equivalents after the application of propensity score matching and the use of a random effects probit model augmented with Mundlak corrections. We estimated a large number of models to establish the repercussions of labour market mismatch in terms of individual wages, job satisfaction and job mobility. We carried out the analysis separately for males and females. In general the data support the empirical distinction between 'some' mismatch

(being overeducated or overskilled only) and ‘serious’ mismatch (being both overeducated and overskilled).

Our results differ from the earlier literature in a number of respects. First, for men we find there to be a significant pay penalty only for those who are both overskilled and overeducated, while for women there is a smaller, but significant pay penalty in all cases of mismatch involving overskilling. Thus, for both genders the evidence points to no substantial wage costs associated with being overeducated only. Second, for both genders job satisfaction is not influenced by overeducation, but it is so by overskilling either on its own or jointly with overeducation. Thus overskilling appears to be more welfare reducing than overeducation. Third, overeducation, as the above would suggest, has no significant effect on the job mobility of either gender, though there is a significant positive effect on both voluntary and involuntary job turnover for men who are both overskilled and overeducated, with the results again differing for women. Clearly, the consequences of the simultaneous presence of both forms of mismatch are more serious for men than they are for women, especially given evidence from elsewhere (see McGuinness and Wooden, 2009) that mismatch can have long term scarring effects on men.

The results suggest that overeducation is for many workers a consequence of choice, perhaps because the jobs concerned have compensating differences in terms of locational advantages or absence of job pressures. For some, such jobs may reflect an inability to obtain a job which matches the workers’ own level of education on account of low levels of ability or employability. Overskilling, in contrast seems to impose real costs on individuals subject to it and represents one form of market failure.

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## Appendix I

Table A1 presents the incidence of the various categories of mismatch across each of the six waves of HILDA. There is little evidence of any consistent pattern in the data in terms of rising or falling rates of mismatch.

**Table A1: Graduate overeducation and overskilling by wave and gender**

	Wave 1		Wave 2		Wave 3		Wave 4		Wave 5		Wave 6	
	M	F	M	F	M	F	M	F	M	F	M	F
<i>Well matched</i>												
Percent	76.1	81.0	73.4	79.7	75.4	76.7	76.0	78.9	76.0	80.1	77.9	77.7
Cases	471	444	438	400	451	408	468	411	482	450	486	469
<i>Only Overskilled</i>												
Percent	8.9	7.3	12.6	7.2	9.5	9.8	9.7	8.6	10.4	6.2	9.3	8.4
Cases	55	40	62	36	57	52	60	45	66	35	58	51
<i>Only Overeducated</i>												
Percent	10.3	8.4	8.5	8.2	10.2	10.2	9.3	7.9	10.4	9.3	9.1	8.6
Cases	64	46	105	41	61	54	57	41	66	52	57	52
<i>Overskilled and Overeducated</i>												
Percent	4.7	3.3	5.5	5.0	4.9	3.4	5.0	4.6	3.2	4.5	3.7	5.3
Cases	29	18	33	25	29	18	31	24	20	25	23	32
<i>Complete sample</i>												
Total	100	100	100	100	100	100	100	100	100	100	100	100
Cases	619	548	597	502	598	532	616	521	634	562	624	604

Note: Working age full time employees; HILDA 2001-2006.

Table A2 presents the distribution of the job satisfaction, by gender and wave.

**Table A2: Job satisfaction of graduates by wave and gender**

	Wave 1		Wave 2		Wave 3		Wave 4		Wave 5		Wave 6	
<i>JS (job satisfaction)</i>	M	F	M	F	M	F	M	F	M	F	M	F
0	0.2	0.5	0.3	0.2	0.2	0.4	0.0	0.2	0.3	0.2	0.1	0.3
1	0.3	0.7	0.3	0.5	0.6	0.4	0.3	0.7	0.3	0.5	0.6	0.8
2	0.7	0.7	1.4	0.5	0.9	0.7	1.4	0.5	0.9	0.8	0.3	0.2
3	2.5	2.1	1.5	2.1	1.7	1.9	1.7	2.3	1.3	1.6	1.2	1.4
4	2.2	2.1	2.7	2.1	2.8	1.9	2.6	1.8	2.4	1.8	2.5	0.9
5	4.7	7.9	6.3	6.5	6.5	5.9	6.4	6.4	3.4	5.0	3.6	5.2
6	10.5	9.3	9.9	9.8	9.1	9.0	6.7	8.9	9.3	9.6	9.9	10.2
7	25.2	20.2	27.4	23.3	23.4	25.4	23.2	24.1	24.2	24.4	24.9	22.4
8	29.7	28.8	28.1	29.8	32.8	29.7	37.9	30.5	36.0	34.1	35.4	35.2
9	18.2	20.7	18.4	18.0	17.9	20.5	16.1	20.0	17.0	17.8	18.7	18.1
10	5.8	6.9	3.8	7.2	4.3	4.3	3.9	4.6	5.0	4.2	2.9	5.5
<i>Total</i>	100	100	100	100	100	100	100	100	100	100	100	100
<i>Mean JS</i>	7.4	7.4	7.3	7.4	7.3	7.4	7.4	7.4	7.5	7.4	7.5	7.5
<i>Cases</i>	676	579	665	571	650	576	660	564	702	618	690	657

Note: Working age full time employees; HILDA 2001-2006.

**Non-technical summary:**

Skill mismatch has become an issue of particular policy concern in Europe and a problem of overeducation has been identified, particularly in the case of university graduates who, as their supply has increased, have seemingly found it more difficult to gain employment in graduate level jobs. A number of empirical studies have also found that overeducated graduates earn less than well matched graduates and report lower levels of job satisfaction. However, interpretation of these outcomes is problematical in the absence of controls for ability and where jobs do not have specific educational requirements. This paper uses Australian panel data and controls for skill mismatch as well as educational mismatch. Four separate cases are identified - those who are matched both in terms of education and skill utilisation, those who are mismatched on both measures, those who are mismatched only in relation to overeducation and those who are mismatched only in relation to skill underutilisation. This procedure turns out to be very illuminating when the analysis is conducted using panel estimation with controls for unobserved heterogeneity and using propensity score matching techniques. It is found, at least for men, that there is no pay penalty for being just overeducated, no negative effect on job satisfaction and no effect on job mobility. However, in each case negative effects remain for those who are overskilled (either only or jointly with overeducation). Thus previous concerns about overeducation seem misplaced, as being overeducated may reflect choice of jobs with compensating advantages, rather than a mismatch. Our paper concludes that policy attention should be focused on overskilling.