Intergenerational Correlation of Labour Market Outcomes*

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Abstract

This paper focuses on the correlation of labour market outcomes of parents and children and investigates whether education is an important factor in this correlation, allowing for its potential endogeneity. Based on the Household, Income and Labour Dynamics in Australia (HILDA) data, the multivariate analyses show that men's labour market outcomes are affected by their fathers' labour market outcomes. The results show no significant intergenerational correlation of labour market outcomes for women when using the proportion of time in unemployment However, there is a significant relationship between the labour market outcomes of the mother and the proportion of time spent out of work by her daughter. Finally, the results show a significant relationship between parents' and children's education levels, indicating that there is an indirect effect of parental education on their children's labour market outcomes through education. Indeed, it is shown that education significantly reduces the proportion of time in unemployment and not in work.

1. Introduction

The overall conclusion from national and international studies is that there appears to be intergenerational correlation across a range of different outcomes (such as labour market outcomes, welfare participation, income or earnings, education and economic status).[1] The predicted correlation is often reduced to some extent after controlling for a range of factors such as endogeneity of the parents' and children's outcomes. This potential correlation between parents' and children's labour market and other outcomes has been discussed in recent years, and concerns have been raised regarding children growing up in long-term jobless families. This paper focuses on the correlation of labour market outcomes of parents and children, and investigates whether education is a major factor in this correlation.

Based on the Household, Income and Labour Dynamics in Australia (HILDA) data, the analysis presented in this paper accounts for the simultaneous correlation of the respondent's and parental education, the correlation of the respondent's and parental labour market outcomes and for the direct effect education may have on labour market outcomes, while allowing for the potential endogeneity of education. This approach extends the New Zealand analysis of Maloney, Maani and Pacheco (2003) by explicitly allowing for correlation between the unobserved factors in the education and labour market outcome equation. The correlation may arise from inherited characteristics and/or from environmental factors (nature versus nurture). The data do not allow us to disentangle the two possible components of correlation.

In addition, we aim to control for the potential effects of the business cycle, the life cycle and cohort differences. Although ideally life-time labour market outcomes should be used in the analysis of intergenerational correlation these are not usually available. Therefore, labour market outcomes may depend on the respondent's and the parent's age at the time of measurement. In addition, the respondent's birth cohort, and the business cycle at the time of measurement and at the time of entering the labour market may affect outcomes.

Another contribution of this paper is to analyse the intergenerational correlation of labour market outcomes and education outcomes for Australia, whilst controlling for a range of other

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[1] See for example, O'Neill and Sweetman (1998) or Farré and Vella (2007) for labour outcomes; Pacheco and Maloney (2003), Maloney, Maani and Pacheco (2003), Pepper (2000), Gottschalk (1992) or Beaulieu *et al.* (2005) for welfare participation; Corak (2006), Peters (1992), Blanden, Gregg and Macmillan (2007), Ermisch, Francesconi, and Siedler (2006) or Raaum *et al.* (2007) for earnings and income; Heineck and Riphahn (2007), Carneiro, Meghir and Parey (2007) or Casey and Dustman (2007) for education; and Björklund, Jäntti and Solon (2007) or Currie and Moretti (2007) for economic status. See Hérault and Kalb (2008) for a summary of these analyses in a brief review of the literature.

factors that may affect these outcomes. Most of the evidence for Australia has been based on cross tabulations and other descriptive analyses (for example: Headey, Warren and Harding, 2006; or Pech and McCoull, 1998; 2000).[2]

The paper is structured in the following way. Section 2 provides a description of the data and a brief overview of summary statistics is included in Section 3. The bivariate regression model and its results are discussed in Section 4. Section 5 concludes.

2. The HILDA Data

We use the first five waves (years 2001 to 2005) of the HILDA Survey, which is a representative sample from the general Australian population. The first dependent variable to be used in the analyses is the proportion of time unemployed since completing full-time education. This is calculated as the ratio of the time spent unemployed (in years) since completing full-time education to the total time (in years) since completing full-time education. The time spent in unemployment is defined as time out of work, but in the labour force (as reported by the respondent).

Unfortunately, the total time (in years) since completing full-time education appears to be subject to significant measurement errors. The evidence from the HILDA suggests that the time since completing full-time education includes in many cases the time spent in tertiary education. Consequently, the measure is overstating the total time since leaving full-time education for individuals with higher qualifications. For a large proportion of respondents, the observed total time since leaving full-time education implies that they would have finished a university degree at 17, 18 or 19 years of age. As a result, the proportion of time unemployed since completing full-time education is underestimated for these individuals. Nevertheless, the consequences of this underestimation are likely to be limited given that the time in unemployment is generally very low anyway for these individuals with higher qualifications.

The implications of this measurement error in total time since leaving full-time education are more serious for the second dependent variable used in the analysis, which is the proportion of time not in work since completing full-time education. The time not in work is defined as all time not in work, either in or out of the labour force. It includes, for example, time spent at home looking after the children. As mentioned above, it appears that the time not in work as reported in the HILDA may include the time spent in tertiary education. Comparing respondents at lower and higher education levels, it shows unlikely high values for individuals

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[2] However, Leigh (2007) examined the intergenerational correlation of earnings for Australia using multivariate analysis and estimated an intergenerational earnings elasticity of about 0.2 to 0.3.

with higher qualifications. Since no additional information is available which would allow us to correct for this bias, the proportion of time not in work over the available waves of the HILDA is used instead of the time not in work since completing full-time education. The time span is thus more limited but the information is more accurate and does not suffer from the upward bias for respondents at higher education levels. Up to five waves can be used when the information is available but if only fewer waves are available, the proportion of time not in work is computed over fewer waves. For example, it is computed over a single year if information about an individual was only collected for one wave. For 90 per cent of the respondents, this information was collected over at least four waves.

The proportion of time unemployed would probably be a better indication of labour market disadvantage than the time not in work, since the latter may include voluntary spells out of the labour force which are in accordance with the person's preferences. However, time not in work could also include discouraged workers who have given up finding a job even though they would prefer to be in employment. Given the potential of missing this important group when solely focussing on time unemployed, it is of interest to investigate the effect of parental labour market and education outcomes on both measures.

To establish the presence of intergenerational correlation, information on labour market outcomes (LMOs) of the respondent's parents is required. Ideally, the best option would be to use lifetime labour market outcomes or, as a second-best option, labour market outcomes up to the same age for all individuals in order to account for variations in labour market outcomes over the life cycle. However, such information is not available in the HILDA. We are able to investigate the intergenerational correlation between the labour market and education outcomes of parents and their children through a limited number of retrospective variables. First, information on the parents' labour force status and occupation when the respondent was 14 is collected. That is, in the HILDA survey, respondents are asked whether their father and their mother were employed when they were 14 years old. This information is used as a proxy for the LMO of the respondents' parents. Additional LMO information is available regarding the father. That is, the survey collects information on the presence of unemployment spells (which when put together were longer than six months in total) for the father during the period the respondent was growing up. Second, in wave five, information on the education level of the respondent's parents is collected. Therefore, the analysis is based on respondents who participated in wave five of the HILDA, since the parental education questions were not asked in any of the previous waves.

Little detail is known about the parents, besides educational attainment, employment when the respondent was aged 14, and whether the father was unemployed for more than 6 months during the respondent's childhood. However, we can control for unemployment rate at the time the respondent was aged 14, since we know the respondent's current age. This allows us to interact the relevant unemployment rate with the labour market outcome of the parents to find out whether the effect of parental labour market outcomes differs depending on the business cycle. The effect of the business cycle is ambiguous, since there are two possible effects. If the parent is not in employment when unemployment is low, then the effect on the child could be higher, since unemployment at such a time is a stronger signal than unemployment during a recession. However, if unemployment rates are high at the time the parent is unemployed, the unemployment spell is likely to be longer than when unemployment rates are low. Therefore, the effect through persisting lower income during childhood could be higher, reinforcing the intergenerational correlation.

We cannot control for the parent's age, but we include the respondent's age to control for the fact that unemployment is more prevalent for younger individuals. In addition, we interact the respondent's birth cohort with the parents' labour market outcome, to control for potential differences in intergenerational correlation for the different cohorts. The age range of the parents is expected to be somewhat limited by the fact that we measure their labour market outcomes while the respondent was a child. To allow for differences in macroeconomic circumstances at the time the respondents enter the labour market, we include the average unemployment rate over the years in which the respondent was aged 18 to 22.

The relevant unemployment rates are obtained by using national data on unemployment rates between 1969 and 2005, as published by the International Labour Office (ILO, 2008). Yearly unemployment rates by gender at the time the respondent was 14 and the average when they were aged between 18 and 22 are used. More detailed information by region is not useful since no information is available on where respondents lived in childhood, or when they were aged between 18 and 22.

3. Summary statistics for the sample of analysis

The sample of analysis is restricted to wave five respondents between 25 and 54 years old, from which we further excluded the following groups:

- 193 respondents with either no information about the time since completing full-time education, the time in paid work since completing full-time education or the time spent unemployed since completing full-time education

- 24 respondents without information about the number of siblings

- 104 full-time students

- 601 respondents with no information about at least one of their parents' labour market outcomes

After the above exclusions, the sample of analysis consists of 2,652 men and 3,084 women.

3.1 Labour market outcomes

Table 1 summarises the proportion of time spent in unemployment since completing full-time education depending on the parents' LMOs. The numbers in the table are weighted using the population weights provided in the HILDA data.[3] Some of the subgroups contain very few observations (reported on the third row for each group), so caution should be taken when drawing conclusions. For example, most respondents' fathers spent less than 6 months being unemployed while the respondent was growing up. As a result, the other categories are relatively small. Standard errors are reported on the second row so that the significance of differences between groups can be assessed.

The proportion of time in unemployment for women appears to be independent of the LMO of these women's mothers, whereas for men having had an employed mother at age 14 is slightly positively correlated with the time in unemployment, although the difference between the two groups is insignificant. This counterintuitive effect can be explained by the fact that the mother's employment is less an indication of potential advantage for their children than the father's employment is, especially for respondents who grew up a few decades ago. A bad LMO of the father is likely to increase their sons' and daughters' time spent in unemployment since completing full-time education. The fact that men spend on average a larger proportion of their time being unemployed than women reflects the fact that a larger proportion of their time is spent in the labour force.

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[3] All tables are based on weighted numbers unless otherwise specified.

Table 1 Average proportion of time unemployed since completing full-time education (in %) by mothers' employment at age 14 and fathers' unemployment during childhood

	Mother was employed	Mother was not employed	Mother was deceased	ALL
Men				
Father was unemployed for 6 months or more	8.3	6.2	5.7	7.4
Standard error	*1.7*	*1.2*	*2.4*	*1.1*
Number of observations	*154*	*117*	*3*	*274*
Father was not unemployed	3.8	3.2	0.8	3.5
Standard error	*0.4*	*0.3*	*0.6*	*0.2*
Number of observations	*1,285*	*1,067*	*26*	*2,378*
ALL MEN	4.3	3.6	1.4	3.9
Standard error	*0.4*	*0.3*	*0.7*	*0.2*
Number of observations	*1,439*	*1,184*	*29*	*2,652*
Women				
Father was unemployed for 6 months or more	4.6	4.3	8.9	4.5
Standard error	*0.9*	*0.7*	*6.0*	*0.6*
Number of observations	*212*	*174*	*3*	*389*
Father was not unemployed	3.0	3.1	3.1	3.1
Standard error	*0.3*	*0.3*	*1.6*	*0.2*
Number of observations	*1,456*	*1,210*	*29*	*2,695*
ALL WOMEN	3.2	3.3	3.6	3.2
Standard error	*0.3*	*0.3*	*1.6*	*0.2*
Number of observations	*1,668*	*1,384*	*32*	*3,084*

Table 2 examines the correlation of the proportion of time not in work over the available waves and the LMO of the respondents' parents. Similar to Table 1, caution is required when interpreting the results with regard to the number of observations in each cell. The standard errors give an indication of the significance of the differences across cells.

Table 2 Proportion of time not in work (in %) over the available waves by mothers' employment at age 14 and fathers' unemployment during childhood

	Mother was employed	Mother was not employed	Mother was deceased	ALL
Men				
Father was unemployed for 6 months or more	16.8	16.3	0.5	16.4
Standard error	*11.3*	*18.5*	*0.2*	*6.9*
Father was not unemployed	9.9	8.9	1.8	9.3
Standard error	*0.8*	*0.7*	*1.4*	*0.4*
ALL	10.7	9.7	1.6	10.1
Standard error	*0.8*	*0.8*	*1.1*	*0.4*
Women				
Father was unemployed for 6 months or more	35.1	40.0	22.8	37.3
Standard error	*10.3*	*14.5*	*336.5*	*5.9*
Father was not unemployed	25.9	30.3	38.8	28.0
Standard error	*1.3*	*1.8*	*76.1*	*0.7*
ALL	27.1	31.6	37.5	29.3
Standard error	*1.2*	*1.6*	*66.8*	*0.7*

Not surprisingly, the proportion of time spent not in work is on average three times higher for women than for men. Both male and female respondents spend more time not in work if their father was unemployed for more than 6 months when they were growing up. The time not in work slightly varies with the mother's LMO for female respondents but hardly changes for men. Women spend on average less time out of work if their mother was employed when they were 14. This may be an indication that female labour force participation is influenced by their mothers' labour force participation while they were growing up. In addition, it is likely to be a generational issue with younger respondents being more likely to have had employed mothers than the older generation of respondents, and also, younger female respondents being more likely to be in work.

Tables 1 and 2 show that the father's labour market status is more important than the mother's employment in determining the time spent in unemployment and out of work by their children. The effect of the mother's employment is counterintuitive for men, with the mother's employment increasing the average time spent in unemployment. Whereas for women this effect is as expected (although very small) if their father did not have unemployment spells totalling over 6 months. Another counterintuitive relationship is that, if the father had unemployment spells over 6 months, the mother's employment on average increases the average proportion of time spent in unemployment by the respondent. The mother's employment reduces the average time not in work for women, but not for men.

3.2 Education

Table 3 presents results on the proportion of time in unemployment and not in work by the father's LMO and the mother's employment at age 14 for men and women for each education level of the respondents. As in the previous tables, caution is required regarding the sample size in some of the cells, particularly those relating to households where the mother is deceased.

There are no general patterns that emerge but two observations can be made. First, men with low education and a father who was not unemployed for more than 6 months in their childhood tend to spend more time in unemployment if their mother was employed. However, this relationship is reversed for men with education levels of Year 12 and above, who spend less time in unemployment if their mother was employed (and their father was not unemployed for more than 6 months). Second, for women whose father was not unemployed, the proportion of time not in work is clearly higher if the mother was not employed at age 14,

Table 3 Proportion of time unemployed since completing full-time education and not in work over the available waves (in %) by education and parents' labour market outcomes

MEN	Father unempl. for ≥6 months						Father not unempl. for ≥ 6 months						ALL MEN	
	Mother employed		Mother not empl.		Mother deceased		Mother employed		Mother not empl.		Mother deceased			
	Ave.	S.E.	Ave.	S.E.	Ave.	S.E.	Ave.	S.E.	Ave.	S.E.	Ave.	S.E.	Ave.	S.E.
< Year 10 (column %)	*3*		*4*		*0*		*4*		*5*		*0*		*5*	
Time unemployed	6.3	2.7	33.1	10.2	-	-	8.8	2.7	4.4	1.1	-	-	7.6	1.6
Time not in work	56.1	18.7	37.1	17.1	-	-	32.7	6.7	34.5	6.7	-	-	34.3	4.5
Year 10 or 11 (column %)	*20*		*14*		*0*		*14*		*17*		*12*		*16*	
Time unemployed	17.8	5.6	13.6	5.5	-	-	8.3	1.3	4.4	0.6	1.3	1.0	7.6	0.9
Time not in work	30.4	9.6	33.4	14.3	-	-	17.3	2.9	11.4	2.1	0.5	0.3	16.3	1.9
Year 12 (column %)	*17*		*13*		*33*		*10*		*9*		*8*		*10*	
Time unemployed	5.7	1.9	7.2	2.8	9.0	0.0	3.3	0.7	4.3	1.2	1.2	1.1	4.1	0.6
Time not in work	13.0	9.9	14.9	9.7	0.0	0.0	5.6	1.7	6.7	2.8	15.3	7.1	7.1	1.7
Certificate (column %)	*27*		*31*		*33*		*33*		*33*		*50*		*33*	
Time unemployed	8.7	2.8	4.9	1.4	0.3	0.0	3.0	0.4	3.1	0.5	1.3	1.1	3.4	0.3
Time not in work	14.1	4.7	11.3	5.4	2.8	0.0	7.6	1.2	6.7	1.0	2.0	1.8	7.6	0.8
Diploma (column %)	*9*		*10*		*33*		*10*		*9*		*15*		*10*	
Time unemployed	4.2	1.9	5.1	1.7	1.3	0.0	2.1	0.4	2.4	0.7	0.0	0.0	2.5	0.4
Time not in work	12.8	7.3	9.8	4.5	0.0	0.0	7.3	1.7	5.7	2.0	0.0	0.0	7.1	1.3
University (column %)	*23*		*28*		*0*		*28*		*26*		*15*		*27*	
Time unemployed	3.1	1.1	1.9	0.6	-	-	2.1	0.9	2.2	0.5	0.1	0.1	2.2	0.5
Time not in work	8.2	2.7	15.8	10.3	-	-	7.3	1.9	6.4	1.4	0.0	0.0	7.5	1.3
ALL (column %)	*100*		*100*		*100*		*100*		*100*		*100*		*100*	
Time unemployed	8.3	1.7	6.2	1.2	5.7	2.4	3.8	0.4	3.2	0.3	0.8	0.6	3.9	0.2
Time not in work	16.8	3.4	16.3	4.3	0.5	0.5	9.9	0.9	8.9	0.8	1.8	1.2	10.1	0.6
Number of observations	154		117		3		1,285		1,067		26		2,652	
WOMEN													**ALL WOMEN**	
< Year 10 (column %)	*7*		*13*		*0*		*4*		*6*		*10*		*5*	
Time unemployed	2.8	2.4	5.1	2.6	-	-	5.1	1.6	5.5	1.7	3.0	7.2	5.0	1.0
Time not in work	50.7	10.0	57.3	9.2	-	-	34.7	5.6	57.6	6.1	24.4	434.5	49.3	3.8
Year 10 or 11 (column %)	*23*		*23*		*33*		*22*		*24*		*41*		*23*	
Time unemployed	6.6	2.1	4.9	1.7	12.6	0.0	3.6	0.6	2.8	0.6	2.5	1.3	3.5	0.4
Time not in work	48.5	6.9	46.4	6.9	3.9	0.0	34.3	2.7	35.2	2.9	58.7	14.2	36.6	1.8
Year 12 (column %)	*15*		*16*		*0*		*16*		*14*		*7*		*15*	
Time unemployed	4.6	1.8	5.9	2.2	-	-	3.9	1.3	2.6	0.5	2.9	2.2	3.7	0.8
Time not in work	47.0	8.9	56.5	8.6	-	-	30.0	3.1	32.4	3.5	30.5	23.1	33.8	2.2
Certificate (column %)	*18*		*21*		*33*		*15*		*17*		*10*		*16*	
Time unemployed	6.4	3.5	5.1	1.2	19.8	0.0	2.7	0.4	5.1	1.1	0.0	0.0	4.2	0.6
Time not in work	30.8	6.8	29.6	6.6	61.9	0.0	29.4	2.9	32.1	3.2	50.6	30.8	30.8	2.0
Diploma (column %)	*8*		*7*		*33*		*13*		*11*		*14*		*11*	
Time unemployed	4.5	2.4	1.9	1.3	0.0	0.0	3.1	0.6	2.1	0.5	8.9	6.6	2.8	0.4
Time not in work	35.8	12.3	38.2	14.8	0.0	0.0	21.8	2.7	25.1	3.7	23.3	14.5	24.4	2.2
University (column %)	*29*		*20*		*0*		*30*		*29*		*17*		*29*	
Time unemployed	2.4	0.6	1.9	0.7	-	-	1.7	0.3	2.3	0.3	0.0	0.0	2.0	0.2
Time not in work	15.6	4.0	17.7	6.0	-	-	14.6	1.5	17.8	1.8	14.2	13.4	16.1	1.1
ALL (column %)	*100*		*100*		*100*		*100*		*100*		*100*		*100*	
Time unemployed	4.6	0.9	4.3	0.7	8.9	6.0	3.0	0.3	3.1	0.3	3.1	1.6	3.2	0.2
Time not in work	35.1	3.2	40.0	3.8	22.8	18.3	25.9	1.1	30.3	1.3	38.8	8.7	29.3	0.8
Number of observations	212		174		3		1,456		1,210		29		3,084	

independent of the level of education (although the difference is only significant at the lowest education level).

Regarding the relationship between the mother's employment status and the respondent's education level, Table 3 shows that men and women whose fathers were not unemployed for 6 months or more during childhood tended to attain higher education levels if their mothers were employed when they were aged 14. A similar pattern emerges for women (but not for men) whose father was unemployed for 6 months or more, but a few more exceptions appear for this subgroup, possibly due to small numbers of respondents in some of the cells.

3.3 Control Variables

The summary statistics of the variables used in the multivariate analyses in Section 4 are presented in Appendix Table A1. All variables are binary variables except for age, number of children, number of waves with preschool-age children present in the household, number of waves with school-age children and the health index. The latter is an index ranging from 0 for very poor health to 100 for excellent health. The sample has been restricted to respondents for whom information on parental education was available. As a result, 573 respondents for whom no information was available on the education level of at least one of their parents were excluded. In addition, 76 respondents were excluded because no information was available regarding their health index in either of the HILDA waves.[4]

4. The modelling approach and results

4.1 The model

The model used to investigate the intergenerational correlation of labour market outcomes consists of a system of two equations. A Tobit equation for the proportion of time unemployed (or not in work) and an ordered Probit equation for the education level are estimated simultaneously. The model allows for the endogeneity of education of the respondent, given that education is likely to be to some extent determined by the same (observed and unobserved) factors as later labour market outcomes.

The central question is whether the parents' labour market outcomes are affecting the respondent's labour market outcome directly and/or indirectly through education. Although this system of equations is formally identified through functional form, the identification is strengthened if there are some explanatory variables that can be argued to affect education but

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[4] The number of missing values is higher for the health index than for the other variables because it is derived from a self-completed questionnaire. In order to limit the number of missing values, we used the health index derived from previous HILDA waves, if available, whenever the information was missing in wave five.

not the labour market outcome. Regressions not included in this paper confirm that the parents' education does not directly affect the labour market outcomes of their children but is expected to influence the children's education level. Therefore, the education level of the respondent's parents is included in the education equation of the respondent but not in the labour market outcome equation. Similarly, the number of siblings affects the education level but does not have a direct significant effect on the labour market outcomes in adulthood. This indicates that the parents' education and number of siblings are appropriate instruments for the education level of the respondent.

The model can be described as follows:

$$LMO = X_1.\beta_1 + \beta_{1lp}LMO_{parents} + \gamma EDU + \varepsilon_1 \tag{1}$$

$$EDU = X_2\beta_2 + \beta_{2lp}LMO_{parents} + \beta_{2ep}EDU_{parents} + \varepsilon_2 \tag{2}$$

where equation (1) explains labour market outcomes (*LMO*). The variable used for labour market outcomes is either the proportion of time in unemployment since leaving full-time education or the proportion of time not in work over the available waves of the survey. Both variables are censored at the lower and the upper bound, since no matter how bad someone's chances are in the labour market, they cannot be for more than 100 per cent of the time in unemployment, and no matter how good someone's labour market situation they cannot be unemployed for less than 0 per cent of their time. Both latent variables are represented by *LMO** where the minimum value of *LMO** is 0 and the maximum value is 100, although the underlying variable *LMO* representing labour market success could attain different values for individuals who all have *LMO** equal to 0 or to 100. Equation (1) is estimated using a Tobit specification based on the censored *LMO** outcomes. Equation (2) explains education outcomes (*EDU*), where *EDU* is a latent variable, which is not observed directly. Instead, we observe discrete education outcomes *EDU** which can take the following six values: less than Year 10, Year 10 or 11, Year 12, certificate, diploma or university degree. Equation (2) is estimated using an ordered Probit specification based on the censored *EDU** outcomes.

X_1 and X_2 are two sets of individual characteristics which partly overlap in the variables that they include. While X_2 includes the number of siblings, X_1 does not, and in addition the parents' education is included in equation 2 and not in 1. The coefficient β_{1lp} represents the direct effect of parents' labour market outcomes on those of their children while the indirect effect of the parents' labour market outcomes through the children's education level is captured through combining the relevant coefficient β_{2lp} with γ. In addition, the direct effects

of parents' labour market outcomes on the education level of their children are estimated through the coefficient β_{2lp}, while controlling for the respondent's characteristics, parents' education and number of siblings.

Replacing *EDU* in (1) leads to:

$$\text{LMO} = X_1\beta_1 + \beta_{1lp}LMO_{\text{parents}} + \gamma\left(X_2\beta_2 + \beta_{2lp}LMO_{\text{parents}} + \beta_{2ep}EDU_{\text{parents}}\right) + \gamma\varepsilon_2 + \varepsilon_1 \qquad (3)$$

Equations (1) and (2) are estimated jointly, taking into account the correlation between ε_1 and ε_2.

As mentioned before, labour market outcomes may depend on the business cycle at the time of measurement and at the time of entering the labour market. Therefore we considered the effect of the unemployment rate at the time the respondent was aged 14 (using the respondent's current age). This rate of unemployment is interacted with the labour market outcome of the parents. This enables us to explore whether the effect of parental labour market outcomes differs depending on the business cycle at the time of measurement.

By including the respondent's age as a set of dummy variables, the effect of age on the proportion of time spent in unemployment is taken out so it does not affect the intergenerational correlation coefficient. In addition, we interact the respondent's birth cohort with the parents' labour market outcome, to control for potential differences in intergenerational correlation for the different cohorts. The age range of the parents at the time of measurement is expected to be around 15 to 20 years since we measure their labour market outcomes while the respondent was a child. Therefore, although we cannot include the parents' age in the analysis, the impact on the intergenerational correlation coefficient is expected to be reasonably limited.

To allow for differences in macroeconomic circumstances at the time the respondents enter the labour market, we include the average unemployment rate over the years in which the respondent was aged 18 to 22. This is motivated by findings in the literature showing that poor starts in the labour market such as unemployment have deleterious effects on subsequent labour market outcomes (see OECD, 1998).

4.2 Estimation results

The general sample described in Section 3.1 is used to estimate the parameters in the joint model presented in equations (1) and (2). The estimated parameters of the model where the proportion of time spent unemployed since completing full-time education is used as an

indicator of labour market outcomes are presented in Table 4. To indicate the significance of the parameters and marginal effects, z-values are presented.

Before discussing the estimation results, the choice of labour market outcome variables to be used in the regression analyses has to be explained. For the mother there is no choice; the only variable available is whether she was employed when the respondent was aged 14. From the raw data, it is evident that, for the father, the more than 6 months unemployed variable was more important than the employment status at age 14 and that interaction of the two variables leads to an odd result for a small group of women (see Appendix tables B.1 and B.2).[5] For these reasons, the multivariate analyses only use whether or not the father was unemployed for more than 6 months during the respondent's childhood as an explanatory variable.

The results in Table 4 show that the labour market outcomes of the father have a direct effect on the time in unemployment of their sons and to a much lesser (and insignificant) extent on the time in unemployment of their daughters. After controlling for education and a range of other individual characteristics, men are still more likely to have spent more time in unemployment if their father was unemployed for more than six months while they were growing up. This is in line with the UK study by O'Neill and Sweetman (1998) who find that the father's unemployment increases the incidence of the son's unemployment. In addition, the results show that the labour market outcomes of the mother have a direct effect on the unemployment of women belonging to the youngest cohort (25-34). The effect however is not significant for other cohorts nor are there any significant cohort effects for men.

The employment status of the mother when the respondent was aged 14 is the only available measure of the mother's labour market outcome. This is only a snapshot of the mother's labour market outcome at that specific time and is less likely to distinguish between mothers with good or bad labour market histories. This could partly explain why there appears to be no significant relationship between the labour market outcomes of mothers and the time spent in unemployment by their children. However, a crosscheck carried out on a subsample of young respondents for whom more comprehensive parental information is available, indicated that, overall, the parents' employment status when the respondent was aged 14 appears to be a

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[5] Regarding the interaction, the last column in Appendix Table B.2 shows that if the father was not employed when the respondent was aged 14, unemployment for more than 6 months of the father would lead to a lower average proportion in unemployment for women. However, note that the two groups compared only contain 41 and 63 individuals. We do not want the results to be affected by this small subgroup. Overall, both men and women with fathers who were more than 6 months unemployed during their childhood experienced a relatively large proportion of time not in work and in unemployment compared to the other men and women.

fairly reasonable proxy to distinguish between parents with bad and good labour market histories.[6]

Table 4 Results for the simultaneous model of the proportion of time spent unemployed since completing full-time education and education level (unweighted)

	MEN						WOMEN					
	Proportion of time unemployed (equation 1)		Education (equation 2)		Marginal effects		Proportion of time unemployed (equation 1)		Education (equation 2)		Marginal effects	
	Coef.	z-value	Coef.	z-value	Est.	z-value	Coef.	z-value	Coef.	z-value	Est.	z-value
Father was unemployed for more than 6 months	7.15	4.88	-0.02	-0.21	1.89	3.90	0.76	0.61	-0.13	-2.05	0.17	0.74
Mother was not employed at 14	0.01	0.01			-0.10	-0.43	-0.72	-0.63			-0.18	-0.70
Mother was not employed at 14 interacted with cohort 25-34							4.44	2.73			1.01	2.30
Mother was not employed at 14 interacted with cohort 35-44							0.44	0.29			0.10	0.30
Father unemployed for more than 6 months AND mother not employed at 14	-1.98	-0.88			-0.59	-0.84	-0.70	-0.37			-0.16	-0.36
Father absent at 14	1.22	0.92	-0.15	-1.83	0.52	1.26	0.65	0.64	-0.06	-0.86	0.18	0.74
Father deceased at 14	3.83	1.67			1.13	1.56	-2.17	-0.89			-0.49	-0.85
Mother absent at 14	2.74	1.39	-0.42	-3.45	1.25	1.96	2.29	1.28	-0.27	-2.18	0.66	1.47
Mother deceased at 14	-5.65	-1.39			-1.68	-1.31	-3.54	-0.91			-0.80	-0.89
Age (25-29 is the reference group)												
30-34	0.44	0.32	0.14	1.62	-0.01	-0.03	-2.87	-2.49	0.12	1.54	-0.71	-2.72
35-39	-0.88	-0.62	0.09	1.03	-0.35	-0.81	-3.95	-3.00	-0.04	-0.50	-0.88	-3.15
40-44	-1.30	-0.93	0.16	1.91	-0.55	-1.31	-3.19	-2.44	-0.02	-0.27	-0.71	-2.55
45-49	-4.40	-3.01	0.20	2.35	-1.51	-3.63	-6.37	-4.52	-0.03	-0.38	-1.43	-4.77
50-54	-7.31	-4.63	0.26	2.94	-2.44	-5.46	-7.56	-4.99	-0.20	-2.39	-1.61	-4.79
English speaking migrant	1.92	1.39	0.09	1.11	0.47	1.09	0.83	0.68	0.11	1.39	0.13	0.46
Non-English speaking migrant	4.37	3.22	0.35	4.56	0.93	2.28	0.16	0.14	0.16	2.45	-0.05	-0.18
Education completed abroad	3.70	1.68			1.10	1.61	4.87	2.83			1.10	2.59
Ever had a child	-1.45	-1.17			-0.43	-1.14	1.62	1.47			0.37	1.41
Number of children	-0.06	-0.16			-0.02	-0.15	-1.24	-3.57			-0.28	-3.29
Single	5.20	5.69			1.54	3.86	3.52	4.75			0.80	3.44
Partner not employed	1.26	1.09			0.37	1.06	4.76	2.42			1.08	2.22
Health index (SF36)	-0.09	-4.77			-0.03	-6.72	-0.09	-6.30			-0.02	-7.99
Constant	2.97	1.50					4.82	3.07				
Mother's education (none is reference group)												
High school			0.06	0.66	-0.06	-0.67			0.00	0.00	0.00	0.00
Year 12			0.00	0.02	0.00	-0.02			0.16	1.65	-0.08	-1.37
Employer			0.02	0.20	-0.02	-0.20			0.34	3.82	-0.18	-2.31
Technical college			0.24	2.18	-0.25	-1.84			0.46	5.07	-0.23	-2.57
Teachers College			0.49	3.67	-0.51	-2.35			0.65	5.27	-0.33	-2.49
University			0.44	3.37	-0.46	-2.50			0.79	7.15	-0.41	-2.75

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[6] This is just an indication, given that for this subsample their childhood was a more recent event. There may be more measurement error for older cohorts given the long time since they were children.

Table 4 Continued

	MEN						WOMEN					
	Proportion of time unemployed (equation 1)		Education (equation 2)		Marginal effects		Proportion of time unemployed (equation 1)		Education (equation 2)		Marginal effects	
	Coef.	z-value	Coef.	z-value	Est.	z-value	Coef.	z-value	Coef.	z-value	Est.	z-value
Father's education (none is reference group)												
High school			0.26	2.97	-0.27	-2.17			0.10	1.35	-0.05	-1.22
Year 12			0.46	3.49	-0.48	-2.33			0.41	3.61	-0.21	-2.37
Employer			0.25	2.77	-0.26	-2.17			0.11	1.54	-0.06	-1.31
Technical college			0.55	6.01	-0.58	-2.93			0.35	4.36	-0.18	-2.50
Teachers College			0.73	4.52	-0.77	-2.62			0.61	3.67	-0.31	-2.27
University			0.93	8.64	-0.97	-3.10			0.72	7.82	-0.37	-2.82
Number of siblings			-0.06	-4.95	0.06	2.60			-0.05	-4.91	0.03	2.44
Bound 0	-1.43	-12.32					-1.65	-15.78				
Bound 1	-0.48	-4.36					-0.47	-4.78				
Bound 2	-0.10	-0.94					0.00	-0.03				
Bound 3	0.78	7.09					0.44	4.49				
Bound 4	1.08	9.80					0.79	8.00				
Gamma (coef. on education in equation 1)	-3.52	-3.33					-2.26	-2.99				
Sigma	14.93	40.18					13.55	41.01				
Rho	0.02	0.23					0.05	0.87				

Note: A z-value above 2.58 indicates significance below the 1% level, a value above 1.96 indicates significance below the 5% level, and a value above 1.64 indicates significance below the 10% level. Marginal effects are in percentage points.

Analysis based on this subsample revealed that the employment status of the parents when the respondent was aged 14 is a good indicator of the proportion of time they have spent in unemployment since completing full-time education and the proportion of time they have spent not in work over the available waves (see Appendix C). This indicates that, although some detail is lost, the quality of the mother's labour market outcome measure should still be sufficient to identify differences between mothers in outcomes.

In an alternative version of the model we include controls for the potential effects of the business cycle (see Appendix D). However, we cannot distinguish between short-term and longer-term effects, since the timing of unemployment is unknown. The results in Table D.1 indicate that for men the average unemployment rate when the respondent was aged between 18 and 22 (at the time of transition from education to the labour market) has a positive effect on the proportion of time spent in unemployment since completing full-time education. However, the results do not allow us to distinguish the effects of unemployment rate on the respondent when he was aged between 18 and 22, and later in life. Therefore, at least part of the effect is likely to be the direct effect of high unemployment rates on employment when

the respondent was aged between 18 and 22. How much of the effect is due to continued higher unemployment probabilities after the unemployment rate has decreased is unknown.

Results in Table D.1 also include the interaction of the parents' LMOs with the unemployment rate around the time their LMOs were observed; that is, when the respondent was 14 years of age. The results show that the effects of poor parental LMOs are reinforced by high unemployment rates at the time these LMOs were measured.

The effects of other characteristics do not change much when including these additional variables, except for the age dummies for the oldest respondents which have a much smaller negative effect compared to Table 4. This indicates that the large age effect may be driven by differences in unemployment rates over time, since it disappears when the average unemployment rate at the time the respondent was 18 to 22 is included. Indeed, older age cohorts may tend to exhibit a relatively small proportion of time spent in unemployment since leaving full-time education not only because they are older (and unemployment spells are more likely to occur early in life) but also because they experienced relatively low levels of unemployment early in their working life.

Returning to Table 4, the presence of the parents in childhood does not appear to affect the children's labour market outcomes directly, although the absence of the father through death is significant at the 10 per cent level for men. Men spend more time in unemployment if their father was deceased when they were aged 14. Having had a child has no significant effect on the time in unemployment for men, while the effect is insignificant positive for women but it becomes significant and negative after the second child. Older respondents (men and women) are less likely to spend a large proportion of their time in unemployment than younger respondents, as are respondents who have a higher score on the health index (that is those who are healthier).

Turning to the education equation in Table 4, it is shown that the education level of each of the parents of the respondent has a positive and significant effect on the respondent's education level. Positive, significant effects were also found by Checchi, Fiorio and Leonardi (2008) and Holmlund, Lindahl and Plug (2008), although it should be noted that with our data we cannot distinguish between ability and income effects of parental education as they do.[7] Ability is likely to be very important in the educational correlation as Black, Devereux and Salvanes (2008) find in their study examining intergenerational correlation of IQ.

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[7] Holmlund, Lindahl, and Plug (2008) provide a literature review and apply three alternative methods to answer the question of whether there is intergenerational correlation of education.

Interestingly the effect of the mother's education on their children's education becomes significant only at the level of technical college or above for sons while the completion of Year 12 by the mother already has a significant impact on their daughter's education. More generally, the impact of the father's education is higher than the mother's education for men while for women, the mother's education appears slightly more important than the father's education. Heineck and Riphahn (2007) also found that, for daughters, the mother's education was more important than the father's education, although in their case the father's education was also more important for daughters than for sons. Blau *et al.* (2008) also report that parental education is important for the educational attainment of daughters in immigrant families who were born in the US. However, they found that the father's education had a larger effect than the mother's education.

The absence of the mother when the respondent was 14 has a negative effect on the education of both male and female respondents, but the mother's employment status appeared irrelevant again (and was therefore not included in the regression). Although the fathers' labour market outcomes have no significant effect on the education level of their sons, these outcomes appear to have an impact on their daughters' education. This is similar to the negative effect found by Maloney, Maani and Pacheco (2003) of the parents' welfare participation on the daughter's education. Daughters are more likely to achieve a higher level of education if their father was not unemployed for more than 6 months, while for the sons it is the presence of the father rather than his labour market outcomes that matters. The absence of the father has a negative effect on the level of education for men. A final family background variable, which is significant for men and women, is the number of siblings. More siblings result in lower education outcomes for the respondent.

Being a migrant from a non-English speaking country is associated with a higher level of education, but at the same time, it has a direct positive effect on the proportion of time spent in unemployment for men. For women, only the effect on education is significant (and, similar to the effect for men, positive). This effect on education contradicts Casey and Dustmann's (2007) expectation that immigrant's children would be worse off in terms of education accumulation. The net effect of being a migrant on labour market outcomes can be determined by combining these two counteracting effects, which is computed when the marginal effects are calculated.

As expected, the direct effect of education on the time spent in unemployment, as measured through the coefficient gamma, is negative and significant for both men and women with the

effect being larger for men than for women. Rather than being unemployed, women are perhaps more likely to leave the labour force if unsuccessful.

The error terms in the two equations appear to be uncorrelated (that is, $\rho=0$).[8] This indicates that we could have used the same specification as Maloney, Maani and Pacheco (2003), ignoring the correlation between the two equations. The coefficients in this alternative specification of the model are quite similar to the coefficients presented in this section.[9]

The marginal effects reported in Table 4 combine the direct and indirect effects of characteristics on the proportion of time in unemployment. For men, significant positive effects are found for those whose father was unemployed for more than 6 months, those whose mother was not present in the household at age 14, those who are from a non-English speaking migrant background, and those who are single. Significant negative effects are found for those who are older and in better health. For women, significant positive effects are found for those who completed their education abroad, those who are single and those whose partner was not employed. Significant negative effects are found for those who are older (the proportion of time in unemployment decreases steadily with age), those with more children and those in better health.[10] Parental education has a significant negative indirect effect on the proportion of time spent in unemployment for both men and women. The effect works through the positive impact on the respondents' education. Although for men, the father's education has a stronger effect than the mother's education, both effects have a similar size for women. For women, the indirect effect of parental education on labour market outcome appears larger than the direct effect of parental labour market outcomes.

The same model is also estimated using the proportion of time not in work over the available waves. We do not discuss the results for the education equation, since the estimated parameters in Table 5 are very similar to those in Table 4. The results in Table 5 for the first equation show that the proportion of time not in work over the available waves is directly affected by the labour market outcomes of the father for men; for women this effect is not significant. Men are likely to spend more time not in work if their father spent more than 6 months unemployed.

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[8] In a specification excluding the direct effect of education on the time spent in unemployment, ρ is negative and significant (as expected) indicating a negative correlation between unobserved factors affecting the level of education and the time spent in unemployment. Inclusion of the direct effect replaces this negative correlation.

[9] Hérault and Kalb (2008) present the results for the labour market outcome equation assuming exogeneity of education.

[10] Dummy age variables performed better than the linear and quadratic age terms tried in an alternative specification. The linear and quadratic terms were insignificant in several of the models, while at least some of the dummy variables were significant, indicating they provide a better description of the effects of age.

Table 5 Results for the simultaneous model of the proportion of time not in work over the available waves and education (unweighted)

	MEN						WOMEN					
	Proportion of time not in work (equation 1)		Education (equation 2)		Marginal effects on time not in work		Proportion of time not in work (equation 1)		Education (equation 2)		Marginal effects on time not in work	
	Coef.	z-value	Coef.	z-value	Est.	z-value	Coef.	z-value	Coef.	z-value	Est.	z-value
Father unemployed for more than 6 months	17.57	3.63	-0.02	-0.22	2.21	2.70	4.41	0.88	-0.13	-2.06	1.76	1.34
Mother not employed at 14	-0.89	-0.33			-0.42	-0.99	5.30	1.96			1.68	1.89
Father unempl. > 6 months AND mother not empl. at 14	-9.66	-1.27			-1.58	-1.21	-1.98	-0.27			-0.66	-0.27
Father absent at 14	5.29	1.21	-0.15	-1.86	1.03	1.33	1.79	0.45	-0.06	-0.87	0.88	0.65
Father deceased at 14	4.55	0.59			0.74	0.55	-19.62	-1.92			-6.54	-1.86
Mother absent at 14			-0.43	-3.49	0.46	1.58			-0.27	-2.18	1.24	2.06
Mother deceased at 14	-41.79	-2.54			-6.83	-2.29	16.02	1.12			5.34	1.11
Age (25-29 is the reference group)												
30-34	-5.98	-1.31	0.14	1.60	-1.13	-1.54	-6.54	-1.39	0.13	1.59	-2.77	-1.76
35-39	-5.04	-1.08	0.09	1.07	-0.92	-1.21	-13.28	-2.77	-0.03	-0.40	-4.28	-2.75
40-44	-5.03	-1.07	0.16	1.96	-1.00	-1.28	-16.67	-3.37	-0.01	-0.16	-5.50	-3.43
45-49	-9.08	-1.82	0.20	2.38	-1.70	-2.16	-24.03	-4.57	-0.02	-0.30	-7.89	-4.75
50-54	-6.68	-1.27	0.27	2.97	-1.38	-1.65	-26.19	-4.60	-0.19	-2.31	-7.84	-4.38
English speaking migrant	7.95	1.76	0.10	1.17	1.20	1.54	6.83	1.43	0.11	1.34	1.78	1.11
Non-Engl. speaking migrant	18.65	4.19	0.35	4.58	2.67	3.08	19.13	4.36	0.17	2.49	5.60	3.58
Education completed abroad	9.95	1.41			1.63	1.34	15.03	2.16			5.01	2.14
Ever had a child	-8.80	-2.03			-1.44	-1.92	-4.73	-0.99			-1.57	-0.99
Number of children	3.74	2.66			0.61	2.36	9.86	6.80			3.28	5.99
Number of waves with preschool-age children	0.13	0.14			0.02	0.14	9.67	10.55			3.22	7.91
Number of waves with school-age children	-2.87	-3.69			-0.47	-3.18	0.34	0.45			0.11	0.46
Single	16.31	5.29			2.67	3.35	11.98	3.95			3.99	3.54
Partner not employed	6.77	1.72			1.11	1.55	29.45	3.65			9.81	3.40
Health index (SF36)	-0.63	-9.97			-0.10	-7.81	-0.54	-8.89			-0.18	-12.30
Constant	21.95	3.47					28.93	4.57				
Mother's education (none is reference group)												
High school			0.05	0.57	-0.05	-0.50			0.00	-0.01	0.00	0.01
Year 12			0.00	-0.01	0.00	0.01			0.17	1.70	-0.79	-1.56
Employer			0.01	0.13	-0.02	-0.11			0.34	3.77	-1.59	-2.99
Technical college			0.24	2.16	-0.26	-1.39			0.46	5.05	-2.13	-3.46
Teachers College			0.47	3.53	-0.51	-1.71			0.64	5.20	-3.01	-3.52
University			0.43	3.18	-0.46	-1.75			0.80	7.20	-3.73	-4.05
Father's education (none is reference group)												
High school			0.26	3.01	-0.28	-1.42			0.10	1.39	-0.47	-1.26
Year 12			0.47	3.58	-0.51	-1.51			0.40	3.60	-1.89	-2.79
Employer			0.26	2.86	-0.28	-1.45			0.12	1.59	-0.55	-1.51
Technical college			0.57	6.05	-0.61	-1.67			0.35	4.41	-1.65	-3.05
Teachers College			0.74	4.56	-0.80	-1.70			0.59	3.60	-2.78	-2.95
University			0.94	8.62	-1.01	-1.74			0.72	7.83	-3.38	-4.06
Number of siblings			-0.06	-4.94	0.06	1.64			-0.05	-4.89	0.24	3.32
Bound 0	-1.43	-12.29					-1.64	-15.74				
Bound 1	-0.47	-4.31					-0.46	-4.68				
Bound 2	-0.10	-0.90					0.01	0.07				
Bound 3	0.78	7.12					0.45	4.60				
Bound 4	1.08	9.82					0.80	8.10				
Gamma (coef. on education)	-6.62	-1.88					-14.05	-4.67				
Sigma	47.04	32.49					57.82	44.47				
Rho	0.01	0.12					0.02	0.32				

Note: A z-value above 2.58 indicates significance below the 1% level, a value above 1.96 indicates significance below the 5% level, and a value above 1.64 indicates significance below the 10% level. Marginal effects are in percentage points.

The employment status of the mother when the female respondent was 14 has a significant effect, very close to the five per cent level, on the proportion of time not in work. Women tend to spend more time not in work if their mother was not employed. This seems to indicate that the mother's labour force status sets an example for her daughters, who appear to follow her behaviour. A similar effect was found in the US by Farré and Vella (2007) and by Blau *et al.* (2008) who find that for daughters born in the US to immigrant families the labour supply of their mother is more important than the labour supply of women in their father's birth country. The mother's labour market status when the respondent is aged 14 appears irrelevant for men. Women whose father was deceased when they were 14 and men whose mother was deceased spend less time not in work. However, the number of respondents whose mother or father was deceased when they were 14 is very small (see Table A.1 in Appendix A).[11]

The effect of age on the proportion of time not in work is particularly important for women. As women become older, they become more likely to join (or rejoin) the labour force and thus spend less time not in work. This age effect is partly counteracted by the effects of the number of children. As expected, women with children spend more time not in work, and the effect increases with the number of children and the number of waves with preschool-age children, whereas the number of waves with school-age children does not appear important. A woman's age is likely to be correlated with her children's ages, which are known to affect female labour force participation. That is, women with young children (who are also younger themselves) are less likely to be in the labour force than women with older children.

Male and female respondents who score low on the health index are likely to spend more time not in work compared to healthier respondents. Similarly, single respondents and respondents from a non-English speaking background are more likely to spend a larger proportion of their time not in work. Women whose partner is not employed are also more likely to spend a larger proportion of their time not in work. A similar but smaller effect significant at the 10 per cent level is observed for men.

As was the case for the time unemployed, there is a significant and negative effect of education on the proportion of time not in work, but here the effect is much higher for women. In addition, the effect is significant for men only at the 10 per cent level. Similar to the result in Table 4, there is no evidence of correlation between the two equations, with ρ

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[11] Unlike the model for the time in unemployment, there are no different effects of parents' labour market outcomes by the respondent's age cohort in the model for time not in work.

being far from significant and very small.[12] Assuming exogeneity of education, the coefficients are comparable in direction and size to those in Table 5.[13]

The marginal effects reported in Table 5 combine the direct and indirect effects (through education) of characteristics on the proportion of time not in work over the available waves. For men, significant positive effects are found for those whose father was unemployed for more than 6 months, those who are from a non-English speaking migrant background, those who had more children and those who are single. Significant negative effects are found for those whose mother was deceased at age 14, those who are older, those who have ever had children, those who had school-age children during a larger proportion of the available waves and those who are in better health. For women, significant positive effects are found for those whose mother was not employed at age 14 (just below the 5 per cent level), those whose mother was absent at 14, those who are from a non-English speaking migrant background, those who completed their education abroad, those who have children, particularly of pre-school age, those who are single and those whose partner was not employed. Significant negative effects are found for those whose father was deceased at age 14 (significant just below the 5 per cent level), for those who are older (the proportion of time not in work decreases steadily with age) and those in better health. As observed for the proportion of time in unemployment, the marginal effects of parental education on the proportion of time not in work are negative for both men and women. Although these effects are fairly small and significant at the 10 per cent level at most for men, they are much larger and highly significant for women.

5. Conclusion

This paper focuses on the correlation of labour market outcomes of parents and children and investigates whether education is a major factor in this correlation. The labour market outcomes of the children are measured by the proportion of time unemployed since completing full-time education and the proportion of time not in work over the available waves of the HILDA. The labour market outcomes of the father are measured by the presence of unemployment spells longer than six months while the child was growing up, and the labour market outcomes of the mother are measured by their employment status when the respondent was 14 years of age.

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[12] In a specification excluding the direct effect of education on the proportion of the time not in work, ρ is negative and significant (as expected) indicating a negative correlation between unobserved factors affecting the level of education and the time not in work. Inclusion of the direct effect replaces this negative correlation.

[13] See Hérault and Kalb (2008) for the results of the proportion of time not in work equation alone.

The descriptive analyses based on the general sample, using simple cross tabulations, all show that there is a relationship between the education and labour market outcomes of individuals with the education and labour market outcomes of their parents. The relationship between parental labour market outcomes and time not in work is only significant for women. Only the father's labour market outcomes are significantly related to the time in unemployment of their sons and daughters.

The multivariate analyses, based on the general sample, show that the labour market outcomes of men are affected by the labour market outcomes of their father. Even after controlling for education and other individual characteristics, there is a positive intergenerational correlation of labour market outcomes. This conclusion holds for the proportion of time spent unemployed and for the proportion of time spent not in work by the male respondents.

The results do not show any significant intergenerational correlation between the labour market outcomes of the father and those of their daughters. However, there is a significant relationship between the labour market outcomes of the mother and the proportion of time spent out of work by their daughters. Moreover, there is an effect of the labour market outcomes of the mother on the proportion of time spent in unemployment by their daughters, although the effect is significant only for the youngest cohort of respondents (those aged between 25 and 34 in 2005). Controlling for business cycle and cohort effects does not change the results much, except that part of the negative effect of age on the time spent in unemployment by men appears to be due to a business cycle effect, where the older cohorts experienced lower unemployment rates when starting their working lives compared to the younger cohorts.

The results also show a significant intergenerational relationship between parents' and children's education levels, indicating that there is a direct effect of parents' labour market outcomes on their children's labour market outcomes but also an indirect effect through education. For women, the indirect effect of parental education on labour market outcome appears larger than the direct effect of parental labour market outcomes. In addition, the presence of the mother in the household when the respondents were 14 has a significant and positive effect on the education level of both men and women. The analysis reveals a positive and significant effect of education on good labour market outcomes (through a reduction in the proportion of time in unemployment and not in work).

Finally, the analysis fails to show any significant correlation between the unobserved determinants of education and the unobserved determinants of labour market outcomes, once

the effect of the respondent's education on labour market outcomes is included. This result suggests that the unobserved determinants of education and those of labour market outcomes are different.

Appendix A Summary statistics for the regression sample

Table A.1: Summary statistics (unweighted results)

	MEN		WOMEN	
	Mean	Std. Err.	Mean	Std. Err.
Number of observations	*2,377*		*2,798*	
Father not unemployed for more than 6 months	0.90	0.01	0.88	0.01
Father employed at 14	0.95	0.00	0.95	0.00
Father present at 14	0.89	0.01	0.88	0.01
Father deceased at 14	0.02	0.00	0.02	0.00
Mother present at 14	0.95	0.00	0.96	0.00
Mother deceased at 14	0.01	0.00	0.01	0.00
Mother employed at 14	0.55	0.01	0.55	0.01
Mother not employed at 14 and father unemployed for 6+ months	0.04	0.00	0.05	0.00
Both parents not employed at 14	0.01	0.00	0.02	0.00
Both parents absent at 14	0.02	0.00	0.02	0.00
< Year 10	0.04	0.00	0.04	0.00
Year 10 or 11	0.14	0.01	0.22	0.01
Year 12	0.11	0.01	0.15	0.01
Certificate	0.32	0.01	0.16	0.01
Diploma	0.10	0.01	0.12	0.01
University	0.29	0.01	0.31	0.01
Age	40.3	0.2	40.2	0.2
English speaking migrant	0.08	0.01	0.08	0.01
Non-English speaking migrant	0.11	0.01	0.12	0.01
Health index (SF36)	70	0	71	0
Education completed abroad	0.03	0.00	0.05	0.00
Single	0.22	0.01	0.23	0.01
Ever had a child	0.71	0.01	0.78	0.01
Number of children	1.64	0.03	1.84	0.03
Number of waves with preschool-age children	1.06	0.03	1.12	0.03
Number of waves with school-age children	1.64	0.04	2.11	0.04
Mother's education: None	0.11	0.01	0.14	0.01
High school	0.48	0.01	0.43	0.01
Year 12	0.10	0.01	0.08	0.01
Employer	0.10	0.01	0.11	0.01
Technical college	0.09	0.01	0.12	0.01
Teachers College	0.05	0.00	0.04	0.00
University	0.07	0.01	0.08	0.01
Father's education: None	0.12	0.01	0.15	0.01
High school	0.29	0.01	0.28	0.01
Year 12	0.05	0.00	0.05	0.00
Employer	0.20	0.01	0.20	0.01
Technical college	0.19	0.01	0.17	0.01
Teachers College	0.03	0.00	0.02	0.00
University	0.12	0.01	0.13	0.01
Number of siblings	2.68	0.04	2.83	0.04

Appendix B Fathers' and children's labour market outcomes

Appendix Table B.1 Average proportion of time not in work over the available waves by the father's labour market outcomes (unweighted)

	MEN			WOMEN		
	Number of observations	Average TNIW	Std error	Number of observations	Average TNIW	Std error
Father not unemployed for more than 6 months AND employed at 14	2050	7.6	0.5	2367	25.2	0.7
Father not unemployed for more than 6 months BUT not employed at 14	79	7.9	2.2	86	26.8	4.0
Father unemployed for more than 6 months BUT employed at 14	213	14.8	2.0	278	29.3	2.3
Father unemployed for more than 6 months AND not employed at 14	35	15.7	5.0	67	39.4	5.0

Note: TNIW = proportion of time not in work over the available waves

Appendix Table B.2 Average proportion of time unemployed since completing full-time education by the father's labour market outcomes (unweighted)

	MEN		WOMEN	
	Father was employed at 14	Father was not employed at 14	Father was employed at 14	Father was not employed at 14
Father was not unemployed for more than 6 months	3.1	1.5	2.6	4.5
Number of observations	*2107*	*26*	*2416*	*41*
Father was unemployed for more than 6 months	6.7	9.2	3.1	3.8
Number of observations	*213*	*31*	*278*	*63*

Appendix C Assessment of the parents' labour market outcome variables

Using an extended subsample of young individuals who were still living with their parents at the time when the HILDA survey started, it is possible to assess the quality of the variables used as proxy for the parents' labour market outcomes in the general sample. These young respondents were asked whether their parents were employed or not when they were 14 years old and whether their father spent more than six months unemployed when they were growing up. This information is similar to the information used to estimate the intergenerational correlation of labour market outcomes for the general sample. In the subsample of young individuals who were still living with their parents, there is also extensive information about the parents since they are also part of the HILDA survey. The proportion of time spent in unemployment since completing full-time education and the proportion of time not in work over the available waves can be computed for the parents. Table C.1 presents the means of

these two variables depending on the labour market status of the parents when their child was 14 as reported by their child.

Appendix Table C.1 Proportion of time spent unemployed since completing full-time education and proportion of time not in work over the available waves of the parents by reported labour market outcomes when their child was 14 – as reported by their children (unweighted)

	Number of observations	Proportion of time unemployed since completing full time education		Proportion of time not in work over the available waves	
		Mean	Standard error	Mean	Standard error
Father was unemployed for more than 6 months	143	8.9	1.3	31.9	10.6
Father was not unemployed for more than 6 months	815	1.3	0.0	2.3	0.1
Missing	812	2.8	0.1	6.1	0.4
Father was not employed at 14	80	7.4	0.9	50.2	22.7
Father was employed at 14	1470	2.2	0.1	3.5	0.1
Missing	220	3.1	0.5	10.4	2.8
Mother was not employed at 14	424	3.1	0.1	70.6	3.2
Mother was employed at 14	1318	1.4	0.0	8.3	0.3
Missing	329	1.3	0.0	23.8	3.8

The table shows that although the employment status of the respondent's parents when the respondent was 14 is only a snapshot, it is highly correlated with their parents' labour market outcomes over a longer period of time. The parents' employment status when their child was 14 seems to be a reasonable indicator to distinguish between bad and good labour market outcomes. Although the presence of unemployment spells longer than 6 months in total appears highly correlated with the total time spent in unemployment by the father, particular caution should be taken regarding this variable because of the large number of missing values.

Appendix D Alternative specification of the time in unemployment models, controlling for macroeconomic conditions

Table D.1 Results for the simultaneous model of the proportion of time spent unemployed since completing full-time education and education level, with controls for macroeconomic conditions (unweighted)

	MEN						WOMEN					
	Proportion of time unemployed (equation 1)		Education (equation 2)		Marginal effects		Proportion of time unemployed (equation 1)		Education (equation 2)		Marginal effects	
	Coef.	z-value	Coef.	z-value	Est.	z-value	Coef.	z-value	Coef.	z-value	Est.	z-value
Av. unemployment rate (18-22)	1.14	1.75			0.60	1.20	0.94	1.49			0.35	0.92
Father was unemployed for more than 6 months	2.68	1.03	0.18	1.21	0.71	0.53	-0.17	-0.08	-0.14	-1.08	-0.04	-0.04
Father was unemployed for more than 6 months interacted with unemployment rate at 14	0.74	2.09	-0.03	-1.50	0.45	1.95	0.17	0.54	0.00	0.11	0.06	0.46
Mother was not employed at 14	1.01	0.53			0.42	0.39	-3.06	-1.91			-1.18	-1.52
Mother was not employed at 14 interacted with unemployment rate at 14	-0.16	-0.60			-0.08	-0.57	0.58	2.57			0.22	1.81
Father unemployed for more than 6 months AND mother not employed at 14	-1.57	-0.69			-0.82	-0.64	-0.52	-0.28			-0.20	-0.26
Father absent at 14	1.13	0.85	-0.15	-1.78	0.86	1.11	0.66	0.64	-0.06	-0.87	0.30	0.71
Father deceased at 14	3.84	1.68			2.01	1.49	-2.30	-0.94			-0.86	-0.82
Mother absent at 14	2.60	1.32	-0.42	-3.43	2.15	1.74	2.37	1.33	-0.27	-2.18	1.11	1.41
Mother deceased at 14	-6.12	-1.50			-3.21	-1.32	-3.36	-0.87			-1.26	-0.72
Age (25-29 is the reference group)												
30-34	-1.08	-0.59	0.12	1.35	-0.79	-0.72	-3.86	-2.68	0.12	1.54	-1.55	-1.62
35-39	0.14	0.10	0.07	0.77	-0.05	-0.06	-6.13	-4.82	-0.04	-0.49	-2.27	-2.26
40-44	-0.06	-0.04	0.13	1.53	-0.28	-0.35	-5.72	-3.80	-0.02	-0.24	-2.13	-1.89
45-49	-0.29	-0.11	0.16	1.86	-0.46	-0.34	-6.70	-4.92	-0.03	-0.35	-2.49	-2.71
50-54	-0.56	-0.14	0.23	2.47	-0.72	-0.34	-4.42	-1.81	-0.19	-2.30	-1.50	-2.02
English speaking migrant	2.05	1.49	0.09	1.07	0.91	1.14	0.88	0.73	0.11	1.40	0.24	0.49
Non-English speaking migrant	4.50	3.33	0.35	4.53	1.71	2.04	0.17	0.16	0.16	2.46	-0.07	-0.15
Education completed abroad	3.68	1.68			1.93	1.52	4.98	2.90			1.87	1.94
Ever had a child	-1.55	-1.25			-0.81	-1.16	1.58	1.43			0.59	1.16
Number of children	-0.03	-0.07			-0.01	-0.06	-1.23	-3.52			-0.46	-2.14
Single	5.26	5.75			2.76	2.98	3.54	4.76			1.33	2.28
Partner not employed	1.18	1.01			0.62	0.94	4.74	2.41			1.78	1.84
Health index (SF36)	-0.09	-4.74			-0.05	-3.52	-0.10	-6.31			-0.04	-2.94
Constant	-6.63	-1.20					-1.66	-0.34				
Mother's education (none is reference group)												
High school			0.06	0.73	-0.12	-0.66			0.00	0.00	0.00	0.00
Year 12			0.01	0.08	-0.02	-0.07			0.16	1.64	-0.14	-1.17
Employer			0.03	0.24	-0.05	-0.23			0.34	3.82	-0.29	-1.84
Technical college			0.25	2.22	-0.47	-1.68			0.46	5.07	-0.38	-1.93
Teachers College			0.49	3.70	-0.92	-2.00			0.65	5.26	-0.55	-1.91
University			0.44	3.37	-0.82	-2.11			0.79	7.15	-0.66	-2.06

Table D1 continued

	MEN						WOMEN					
	Proportion of time unemployed (equation 1)		Education (equation 2)		Marginal effects		Proportion of time unemployed (equation 1)		Education (equation 2)		Marginal effects	
	Coef.	z-value	Coef.	z-value	Est.	z-value	Coef.	z-value	Coef.	z-value	Est.	z-value
Father's education (none is reference group)												
High school			0.26	2.97	-0.48	-1.88			0.10	1.35	-0.08	-1.04
Year 12			0.46	3.49	-0.86	-2.09			0.41	3.61	-0.34	-1.85
Employer			0.25	2.78	-0.46	-1.84			0.11	1.55	-0.10	-1.22
Technical college			0.56	6.02	-1.04	-2.31			0.35	4.35	-0.29	-1.91
Teachers College			0.73	4.49	-1.37	-2.23			0.61	3.67	-0.51	-1.79
University			0.93	8.63	-1.75	-2.39			0.72	7.82	-0.61	-2.07
Number of siblings			-0.06	-5.00	0.11	2.10			-0.05	-4.91	0.04	1.88
Bound 0	-1.45	-12.41					-1.65	-15.71				
Bound 1	-0.50	-4.53					-0.47	-4.74				
Bound 2	-0.13	-1.14					0.00	-0.02				
Bound 3	0.75	6.83					0.44	4.48				
Bound 4	1.06	9.51					0.79	7.97				
Gamma (coef. on education in equation 1)	-3.58	-3.38					-2.23	-2.95				
Sigma	14.88	40.14					13.54	41.03				
Rho	0.02	0.31					0.05	0.84				

Note: A z-value above 2.58 indicates significance below the 1% level, a value above 1.96 indicates significance below the 5% level, and a value above 1.64 indicates significance below the 10% level. Marginal effects are in percentage points.

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