

Scarring effects: A review of Australian and international literature

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Abstract

Scarring occurs when an adverse experience for a worker – associated with macroeconomic conditions - has negative long-term impacts on their labour market outcomes. For example, a worker who is entering the labour market during a macroeconomic downturn may experience a spell of unemployment or have to take a job for which they are over-qualified – and those experiences then affect the worker's labour market outcomes in future years. Recent studies find that scarring effects are substantial: for example, the main Australian study on scarring finds that graduates entering the labour market at a time when the youth rate of unemployment rate is 5 ppts above average lowers annual earnings of graduates by about 8 per cent at the time of entry and by 3.5 per cent after five years. This article reviews Australian and international evidence on scarring; and provides an overview of the main channels through which scarring occurs.

JEL Codes: J23, J30, J60

Keywords: Scarring; unemployment; job quality

Acknowledgement

I am grateful for helpful suggestions from Phil Lewis and a co-Editor. This article uses unit record data from the Household, Income and Labour Dynamics in Australia (HILDA) Survey. The HILDA Project was initiated and is funded by the Australian Government Department of Social Services (DSS) and is managed by the Melbourne Institute of Applied Economic and Social Research (Melbourne Institute). The findings and views reported in this paper are those of the author and should not be attributed to either DSS or the Melbourne Institute.

Research in this article has been funded by ARC Discovery Grant DP160102269.

1. Introduction

COVID-19 has caused a decrease in the demand for labour in Australia at a scale and speed never experienced before. Total hours worked decreased by 9.5 per cent in just one month – from March to April. By comparison, in the major recessions of the 1980s and 1990s total hours worked decreased by 6 per cent – but that was after 18 months.¹ While the gradual removal of health-related restrictions on business activity will bring a bounce-back in employment, it is likely to remain below its pre-COVID-19 level for a prolonged period.²

Underlying the immediate effect of COVID-19 on total employment are individual-level impacts. Many workers have lost their jobs and become unemployed or moved out of the labour force. Other workers are still employed only by virtue of JobKeeper. And labour force participants who were already unemployed have almost no chance of finding employment. Obviously, these experiences make those displaced workers and jobseekers worse off today. What is also known is that the experiences will cast a long shadow. For example, having a spell of unemployment today implies worse labour market outcomes in future years.

The link between labour market outcomes today and tomorrow is referred to as scarring: defined to happen when there is a long-term negative impact on a worker due to some adverse labour market experience associated with macroeconomic conditions. The impact of macroeconomic conditions could come:

- i] At the time when a young person is seeking to enter the labour market (making a transition from education); or
- ii] At a later stage of work career after having already spent time in employment.³

Where a macroeconomic downturn (or recession) occurs, this can cause a variety of types of adverse labour market experience at that time. First, new entrants will find it more difficult to find a job; and existing workers face a higher risk of being retrenched. Being unable to find work or losing a job will mean that workers either become unemployed or – where they believe they will not find work – move out of the labour force (known as the discouraged worker effect). Second, it will be more difficult for workers to match to high-quality jobs and jobs where their skills are fully utilised.

The basis of scarring is that these experiences – spending extra time out of employment or accepting a lower-quality job than otherwise – will have negative consequences beyond their immediate impact. That long-term impact could be on labour market outcomes, household income, social outcomes (including family formation) or health and mortality.⁴ In this article I focus on labour market outcomes.

1 See Borland and Charlton (2020).

2 See for example Borland (2020); Reserve Bank of Australia (2020).

3 Some studies combine both types of approach – by examining impact of individual unemployment experience using local labour market conditions as an instrument – for example, Neumark (2002) and Gregg (2001).

4 For examples of studies of long-term impacts of adverse labour market experiences on health outcomes, see Maclean (2013) and Cutler *et al.* (2015).

For thinking about the labour market impacts of COVID-19 in Australia it is relevant to consider both impacts on young people who will be seeking to enter the labour market and on the workforce who were already in jobs. First, it now seems certain that cohorts of students who are (or would have been) leaving school at the end of 2020 (and perhaps also 2021) will face a considerably more difficult time getting into employment. Second, a much larger proportion of the existing workforce will experience a spell out of employment due to COVID-19 than would have happened otherwise.

Understanding the phenomenon of scarring is of considerable importance for forecasting future impacts of COVID-19 on labour market outcomes in Australia; and for policy-makers in seeking to address those impacts. Most studies for Australia have been on impacts deriving from a spell (or spells) of unemployment. Section 2 provides a review of that literature. Internationally, a decent-sized literature on scarring due to entering the labour market at a time of macroeconomic downturn also exists. Since that literature is likely to offer important insights into prospects for cohorts of students in Australia about to complete their education, it is reviewed in Section 3.⁵ Section 4 complements the review of international literature with a summary of the study of scarring for labour market entrants that has been undertaken in Australia. Section 5 provides concluding remarks.

2. Australian evidence on the long-term effects of unemployment

There is an extensive history of research in Australia on the long-term effects of unemployment. However, probably reflecting the Australian experience of low unemployment in recent years, this research was mainly undertaken in the 1980s and 1990s, with just a few studies in the 2000s. This has the consequence that the studies mainly use data from the 1980s to early 2000s.

There are two main approaches taken in this research. First, estimating hazard models for the determinants of exiting unemployment: where the probability of exit is made conditional on past labour market history (such as number of spells of unemployment). Second, estimating panel models of the determinants of current labour force status: where current status can be made conditional on past labour market history.

Early studies mainly used the hazard model approach. In a previous review (Borland 2000) I surveyed studies undertaken prior to 2000. Some evidence comes from these studies that the chances of exiting from unemployment to employment are worse (better) where a jobseeker has a labour market history with more time unemployed (in a job). In a later study, Carroll (2006) estimates a hazard model using calendar data on labour force states for 2001 and 2002 using the HILDA survey. He finds that a jobseeker with a previous experience of unemployment (prior to the current spell) reduces the probability of exiting unemployment by 27 per cent.

5 There is also a large international literature on the second type of scarring – beginning with Heckman and Borjas (1980).

Panel data models were the main approach used to study the determinants of labour force status in the 2000s. Knights *et al.* (2002), Le and Miller (2001), and Buddelmeyer *et al.* (2010) estimate dynamic models for the determinants of current labour force status with alternative sets of variables to proxy for labour market history.⁶

All these studies find evidence of state-dependence: that being unemployed (or the total amount of time spent unemployed) in a time period increases the likelihood of being unemployed in the next time period (where the time periods are usually year-to-year).

Knights *et al.* (2002) use four annual waves of data from the Australian Longitudinal Survey. They find that for high-education workers, being unemployed at a survey date caused a 5.3 per cent increase in the likelihood of being unemployed a year later, with smaller but significant effects for 4 years. For low-education workers the effect in the year after being unemployed was to raise the probability of unemployment by 9 per cent, but after that the effect disappeared.

Buddelmeyer *et al.* (2010) use annual data from the HILDA survey from 2001 to 2007. They find that being unemployed at a survey date increases the likelihood of unemployment at the next survey date for both males and females. Being unemployed for two consecutive survey dates has an even larger negative effect on the probability of employment. There is still scarring, but it is reduced in size for a survey respondent who was unemployed two years ago but then employed one year ago.

The most sophisticated analysis is undertaken by Doiron and Gorgens (2008). They estimate a dynamic event history model using data for 1989-94 from the Australian Longitudinal Youth Survey for young Australians with no post-school education. With this empirical method it is possible, for example, to recover transition intensities which describe patterns of transition between labour force states by elapsed time in the current labour force state.

In examining the scarring effect of unemployment experience, Doiron and Gorgens distinguish between duration dependence (the effect of the length of previous spells of unemployment) and occurrence dependence (the effect of the number of spells of unemployment). They find evidence for the former but not the latter in determining labour market outcomes for young Australians. That is, they find that an extra spell of unemployment raises the probability of being unemployed in the future (by about 15 ppts); but that the duration of those spells does not affect the likelihood of future unemployment.

3. International evidence on starting in the labour market in a macroeconomic downturn

There are two main strands of literature on the impact of macroeconomic conditions at the time of beginning one's work-life – studies encompassing all young labour market entrants; and studies that focus on college (university) graduates. Summaries of these studies are in (respectively) Tables 1 and 2.

6 For a related descriptive analysis, see Marks *et al.* (2002).

a) All young labour market entrants

All studies find large negative effects on earnings and employment in the years immediately after entry for workers who join the labour market in a downturn. The studies differ, however, in their estimates of the speeds at which those negative effects fade. Hence, estimates of the total long-run magnitude of scarring vary between studies.

At the high end is the recent study for the United States by Schwandt and van Wachter (2019). They find that an increase in the unemployment rate by 3 ppts at the time of labour market entry reduces total earnings for an average worker by 6 per cent per year for 10 years post-entry. At the low-end are studies, also for the United States, which find effects mainly concentrated in the year of entry to labour market. In between are studies for the United Kingdom and Austria which find an average negative effect on total earnings of about 3-4 per cent per year from an increase in the unemployment rate of 3-4 ppts.

The decrease in total labour market earnings can derive from workers spending less time in employment and/or from lower earnings when employed. Both appear to be important – but the timing of impact differs. The effect of spending time out of employment is concentrated in the initial years after labour market entry. It is caused both by taking longer to find a job at the time of entry; and being less likely to obtain full-time work. The effect on earnings when employed tends to be more prolonged and spread evenly over time. Hence, in the initial years after labour market entry the impact of the decrease in time in employment tends to be the dominant influence on scarring; whereas in later years it is reduced earnings when employed that primarily accounts for scarring.

Most studies find larger scarring effects for entrants with low education than high education – usually by quite a large magnitude. For example, Schwandt and van Wachter (2019) find effects that are four times larger for workers who have not completed high school than for college graduates.⁷

Studies for the United States and United Kingdom have examined how the impact of scarring on labour market earnings translates into household market income. Both find a direct flow-through. However, that does not imply a decrease in consumption or living standards. First, the impact of the decrease in labour market earnings is at least partly offset by operation of the tax/transfer system. Second, in the United Kingdom it is found that for many young people the impact of scarring on income is cushioned by living at home.

⁷ The exception is two US studies which find for low education workers large negative effects in the year of entry to the labour market that disappear thereafter; compared to more persistent small effects for workers with high education. The authors of both studies (Genda *et al.* 2010; and Speer 2016) suggest that the result may be due to the US market for low-skill labour operating as a spot market. However, another possible explanation is the data source. Both these studies use NLSY79. Whereas other US studies using alternative data sets find inverse relation between education attainment and impact of entering labour market in a downturn.

b) Graduates

All studies of college graduates find negative effects of graduating in a downturn.⁸ Within this group, there is also evidence of an ordering of earnings losses by skill level – with larger average earnings losses for college graduates with lower expected earnings.

Most of the studies assess the roles of decreased job quality and worker/job match quality as mechanisms through which scarring occurs. It is found that these mechanisms can explain from one-quarter to one-half of the negative impact on total earnings from graduating in a downturn.

c) Why do downturns cause scarring?

The first explanation is that downturns cause a delayed entry to employment – and that delay has long-term effects on the probability of employment or on earnings when employed. The long-term effect might result from skill atrophy, negative effects on motivation or stigma effects from employers.

The second explanation is that downturns cause a decrease in the quality of first job and/or quality of job match obtained by new entrants. First, a relative shortage of high-quality jobs in a downturn can cause workers (on average) to be forced to shift down the job quality ladder (for example, Oreopoulos *et al.* 2012). Second, workers may need to take jobs to which they are less well matched during a downturn (for example, Liu *et al.* 2016). The incidence of mismatch is likely to be exacerbated where macroeconomic downturns become periods of accelerated structural change in the composition of employment (for example, Fahrner and Heath 1992).

Needing to accept a job that is lower quality or to which a worker is less well matched will cause workers' earnings to be lower than otherwise. This effect can be undone where workers are able to move to better jobs. But since it will take time for this to happen, the initial job quality or match becomes a source of long-term negative effects.

d) Interpreting estimates of scarring effects

The standard empirical method for estimating scarring effects is via a regression model for the association between the rate of unemployment at the time a graduate enters the labour market (usually relating to the geographic region where they reside) and their labour market outcomes in later years. In interpreting estimates of scarring effects it is important to take into account that an above-average rate of unemployment at the time when a graduate enters the labour market is likely to be correlated with above-average rates in later years. That is, estimates of the scarring effect of entering the labour market in a year with an above-average rate of unemployment are in fact capturing the joint impact of the rate of unemployment being elevated at their time of entry and in later years.

⁸ In addition to the studies reviewed in Table 2, Oyer (2006, 2008) examines the specific experiences of economists and finance professionals.

4. Do we see scarring associated with labour market entry during a macroeconomic downturn in Australia?

This section reviews evidence on scarring associated with entering the labour market during a macroeconomic downturn in Australia. First, I present descriptive evidence on how the employment/population (EMP/POP) rate of young people has varied with macroeconomic conditions at their time of entry to the labour market. Second, I review Andrews *et al.*'s (2020) study of how entry conditions affect long-term labour market outcomes. Both exercises suggest that labour market conditions at the time when young people have been entering the labour market in Australia have an appreciable and persistent impact on their employment outcomes.

The descriptive evidence uses data from the HILDA survey for young people in Australia who left full-time (FT) education from 2005 to 2015 (aged 15 to 24 years at the time they left education). Chart 1a shows the relation between the EMP/POP rate for young people in the first year after they FT education and the unemployment rate at the end of the year in which they left FT education.⁹ An inverse relation exists between the rate of unemployment at the time of leaving FT education and a cohort's EMP/POP rate in the first year after leaving education. A simple regression model estimates that a 1 ppt increase in the rate of unemployment is associated with a decrease in the EMP/POP rate by 3.3 ppts (significant at the 1 per cent level).

Looking at the first year after leaving FT education reveals the immediate impact of economic conditions on labour market outcomes of the young. What about longer-run effects? I have also calculated EMP/POP rates two and three years after leaving FT education. After two years a 1ppt increase in the rate of unemployment at the time of leaving FT education is associated with a decrease in the EMP/POP rate of 2.9 ppts. After three years the size of decrease is smaller, 1.8 ppts, although the association still retains a high level of significant (significant at 5 per cent level). Chart 1b displays the relation between the rate of unemployment at the time of leaving FT education and the EMP/POP rate after three years.

The only detailed analysis undertaken thus far of how entry conditions affect long-term labour market outcomes in Australia is by Andrews *et al.* (2020). The study uses Australian Taxation Office data to examine the effect of macroeconomic conditions on annual incomes of individuals who graduated between 1988-89 and 2012-13. Entry conditions are proxied by the youth rate of unemployment by state in the year of graduation. The study finds a large initial impact on annual income, that fades over time. At one and five years after entry, a one per cent increase in the rate of unemployment is associated with respectively annual earnings that are 1.6 per cent and 0.7 per cent lower. By ten years, however, there is no significant effect. The negative impact on annual earnings is shown to derive both from a decrease in the proportion of young people employed and from lower weekly earnings (with both effects being significant for 6 years after graduation). Scarring effects are larger for post-2000 than pre-2000 graduates; for 3-year course graduates than Honours graduates; and for non-G8 university graduates than G-8 graduates.

9 The Data Appendix provides full details of this analysis.

The analysis establishes that one channel through which scarring operates is that young people entering the labour market in a downturn are forced to take lower wage jobs (at lower productivity firms). Their mobility out of those jobs is then initially slower than at other times, a source of scarring. Eventually, however, mobility of young people who graduate during a downturn comes to be faster than other cohorts, which contributes to the fading of scarring. The importance of mobility to undoing scarring – together with the decrease in job mobility in Australia since the mid-2000s – provides a potential explanation for why scarring is found to be more severe for post-2000 graduates.¹⁰

5. Conclusion

What lessons can be drawn from this review of literature on scarring for the labour market impact of COVID-19 in Australia? A first lesson is that it must be taken seriously. Empirical studies uniformly find evidence of scarring effects associated with having a spell of unemployment and/or entering the labour market during a macroeconomic downturn. A second lesson is about the likely magnitude of scarring effects. The evidence is that the magnitude of scarring depends on both the size and duration of macroeconomic downturn. In this regard, a note of caution about drawing inferences for the current situation in Australia from existing evidence on scarring is necessary. On the one hand, the scale of decrease in employment thus far in the COVID-19 recession would indicate potentially substantial scarring effects. On the other hand, that a large fraction of the decrease in employment may be fairly rapidly reversed as health-related restrictions on business activity are removed suggests that scarring effects may be less than the initial decrease in employment might suggest.¹¹ A third lesson is for policy-making. Scarring is directly related to macroeconomic conditions. As with so many other labour market outcomes, the best policy to avoid or minimise scarring will be effective use of fiscal policy to promote employment creation. Beyond that, having policies that prevent spillover effects from unemployment (such as skill atrophy or reduced motivation), or which overcome stigma effects (for example, via wage subsidy programme to increase incentives for hiring young unemployed jobseekers), can reduce the size of scarring effects.

10 The interaction of weak macroeconomic conditions and decreased job mobility is also explored – and found to be important for explaining a long-run decline in incomes of young graduates following the Global Financial Crisis – by de Fontenay *et al.* (2020).

11 Another consideration may be the extent of structural change in the labour market that occurs due to the impact of COVID-19. Greater structural change may cause higher scarring costs due to mismatch – that is, workers being able to find jobs that match with their qualifications and/or skills.

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Table 1: Studies of impact of macroeconomic conditions at time of labour market entry on subsequent labour market outcomes – All workers

<i>Study</i>	<i>Sample</i>	<i>Data</i>	<i>Macroeconomic conditions variable</i>	<i>Main Results</i>
Burgess <i>et al.</i> (2003)	UK; Persons aged 16 to 51 years during sample period; 1981-97; Grouped into 3-year cohorts	[Cross-section] Labour Force Survey	Rate of UE (national) at time when cohorts were aged 16-18 years	A 1 SD increase (about 2 ppts) in ue rate at age 16-18 affects ue rate at ages 28-30: i) Males - Increase of 1 ppt for group with no qualifications; and decrease of -0.46 with mid-level qualifications; ii) Females – Increase of 1.36 ppt and decrease of 1.74 ppt respectively.
Raam and Roed (2006)	Norway; Persons born 1961-74 – Labour market outcomes at 25 to 36 years; 1993-2000	[Longitudinal] Administrative data	Rate of UE (Municipal-level) at time when cohorts were aged 16 and 19 years	1) Elasticity of non-employment wrt ue rate at time of labour market entry: i) Equals 0.057 in initial year; and ii) Equals 0.039 in subsequent years (for shift from EMP to non-EMP). 2) Increase in ue rate from 1 ppt to 6 ppts increases time spent in ue by 2.2 months over 12 years.
Genda <i>et al.</i> (2010)	US and Japan; White males; Completed education in 1983 or later and have 1-12 years of potential experience; 1986-2005	[Cross-section] Japan – Labour Force Survey (Special Survey + Detailed Supplement); US – CPS (March supplement)	Rate of UE by region in year of labour market entry [Number of regions: Japan = 210; US = 1071]	Japan: i) Less than college edn - A 1 ppt rise in the ue rate at entry reduces the likelihood of being employed by 3-4 percentage points over 12 years; and imposes earning losses of 5-7%. Negative impact on earnings is due to a continuous decline in the probability of fulltime, regular employment; ii) College edn – Initial earnings loss of 4.6% decreasing to 2.3%. No significant effect on employment. US: i) Less than college edn – Initial earnings loss of 3.1% but disappears after 3 years; ii) College edn – Earnings loss of 1-1.5% which persists for 9 years. No significant effects on employment.
Hershbein (2012)	US; Graduate high school at ages 17-19 between 1975 and 1983; 1975-1998	[Longitudinal] NLSY79	Rate of UE (national) in year of graduation from high school	1) A 1 ppt increase in ue rate: i) Females - Increases non-employment by 2.5ppts in year after graduation. Thereafter effect gradually diminishes and is not significant after 5 years; ii) Males – No significant effect on non-employment. 2) Reduces real hourly wage by 1-2% for both males and females for 4 years. 3) Female non-employment adjusted to by increase in NLF; Some evidence of increase in college enrolment for males.
Brunner and Kuhn (2013)	Austria; Males in private sector in low and medium skill jobs; Aged 16 to 21 years at time of first entry into labour market and who start first regular employment between 1978 and 2000; 1978-2005	[Longitudinal] Austrian Social Security Database	Rate of UE by state (9) for males aged 16-65 years at time of labour market entry	1) A 1 ppt increase in the ue rate decreases the real daily wage at time of labour market entry by 0.9%. Effect appears to persist for up to 20 years. Lifetime loss in wages from 1 to 1.6%. 2) Lifetime wage loss is 1.6% for blue-collar and 0.3% for white collar. (Similar initial effect on wages, but divergence thereafter.) 3) Mechanisms – Entering labour market at time of downturn is associated with: a) Higher likelihood of spell of ue prior to getting job; and b) Getting a job with a firm that is smaller, younger, pays lower average compensation and is more likely to fail in the future. Initial employer explains about 2/3rds of lifetime wage loss.

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<i>Study</i>	<i>Sample</i>	<i>Data</i>	<i>Macroeconomic conditions variable</i>	<i>Main Results</i>
Speer (2006)	US; Males with between 9-12 years of education; Left school after 1978; Obtained FT job in first 4 years after leaving school; Must be out of school for 2 consecutive years to count as having left school; 1979-2000	NLSY (1979)	Rate of UE (national) at time of entry to labour market	1] A 1 ppt increase in the ue rate at time of entry to the labour market: i] Reduces starting wage by 6% (about half due to industry/occupation downgrading); ii] Lowers probability of first job being FT by 2.2 ppt; iii] Reduces weeks worked in first year by 1.5 and total hours worked by 7% (from two-thirds to all of this is explained by increased time to find first job); and iv] Reduces annual earnings by 11.6%. 2] Effects on annual earnings and hours of work disappear after year of entry to labour market.
Cribb <i>et al.</i> (2017)	UK; Left education after 1971 and between ages 17 and 25 years; Examine outcomes within 10 years of leaving education; 1994-95 to 2015-16	[Cross-section] Family Expenditure Survey; Family Resources Survey	Rate of UE (national) at time of labour market entry	1] Increase of 4 ppts in the ue rate at time of entry: a] Decreases the probability of being in paid work in year of entry by 10.4 ppts; by 3.2 ppts after 2 years; and by about 1-2ppts through to 10 years; b] Decreases weekly earnings by 10.4 ppts in year of entry; 5.8% after 2 years; 2.2% after 5 years; thereafter not significant. 2] Effects on individual labour market income flow through to household income from labour market activity.
Schwandt and van Wachter (2019)	US; Aged 16 to 40 years; Graduated after 1960 and with less than 15 years of experience (potential or actual); 1976 to 2005;	[Cross-section] Current Population Survey (March); Decennial Census; ACS	Rate of UE (state-level) at time of labour market entry	1] An increase in the ue rate of 3 ppts: Decreases annual earnings in year of labour market entry by 11%; and by 2.6% after a decade (thereafter not significant). Cumulates to an average decrease of 6% per year over decade after entry. Effect on family income is about half the size. 2] Negative effect on hourly wage that persists for a decade. Initially very large effect on weeks worked, that disappears after 5-6 years. Smaller, but persistent, effect on usual weekly hours. 3] Strong negative correlation between size of impact and education attainment. Mainly due to differences in impact of starting ue rate on employment outcomes.

Table 2: Studies of impact of macroeconomic conditions at time of labour market entry on subsequent labour market outcomes – Graduates

<i>Study</i>	<i>Sample</i>	<i>Data</i>	<i>Macroeconomic conditions variable</i>	<i>Main Results</i>
Oreopoulos <i>et al.</i> (2012)	Canada; Males; Exclude workers who obtain a higher degree; 1982-99	[Longitudinal] Administrative data – Linked employer-employee	Rate of UE (province-level) at time of graduation	1) An increase in the ue rate of 5 ppts: i) Annual earnings are 9% at year of labour market entry, 4% after 5 years and 2% after 9 years. Majority of persistent effect is from decrease in weekly earnings. 2) Negative impact of higher ue rate at time of entry to labour market is inversely related to predicted labour market earnings. Lifetime costs are 4 to 5 times larger for lowest than highest quintile of predicted earnings. 3) Mechanism: New graduates in downturns are more likely to work at smaller and lower-paying firms. First 3-5 years after labour market entry sees a period of above-average job mobility. Extent of mobility and catch-up varies substantially by predicted earnings of graduates. Overall, reductions in firm quality and persistence of high ue rate post-entry appear to explain most of the lifetime earnings loss.
Liu <i>et al.</i> (2016)	Norway; Graduate between ages 20 to 30 years and from 1988 to 2003; 1988-2007	[Longitudinal] Administrative data	Rate of UE (Municipal-level) at time when cohorts were aged 16 and 19 years	1) A 1 ppt increase in ue rate: i) Decreases annual earnings by 6% in first 2 years post-graduation; Losses are 2.5% by fourth year and not significant thereafter. 2) Difference in negative impacts between public and private sector degrees – Only materialise several years after graduation. 3) A 1 ppt increase in ue rate causes a 2.1 ppt increase in proportion of mismatched workers in year of graduation. Effect persists for a decade. Appears to explain about one-half of overall negative effect on annual earnings.
Altonji <i>et al.</i> (2016)	US; Graduated from 1974-2011; Aged 22 to 35 and 0 to 13 years post-graduation; 1977-2012	[Longitudinal + Cross-section] NLSY79 + NLSY97; Current Population Survey (March); Other associated data sources	Rate of UE (Census division) by year of graduation	1) An increase of 4 ppts in ue rate at time of entry to labour market: i) Loss of earnings averages 1.8% per year over first 10 years; 2) Negative effect on probability of working FT for about 5 years; ii) Effect on wages that persists – although reduces in size over time. 3) Mechanisms: i) Occupation quality: In initial year post-graduation a decrease in occupation quality explains about one-quarter of effect on earnings. Effect of occupation quality disappears quickly; and ii) Little evidence of effect of match quality. 4) Largest negative effects for graduates with lowest predicted earnings – A 1 SD increase/decrease above mean earnings decreases/increases earnings loss by 50%.

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<i>Study</i>	<i>Sample</i>	<i>Data</i>	<i>Macroeconomic conditions variable</i>	<i>Main Results</i>
Rothstein (2019)	US; Aged 22 to 40 years; 1978-2017	[Cross-section] Current Population Survey (March)	Rate of UE (State-level) in year of graduation	1] College graduates who entered the labour market in 2010-11 have employment rates and annual earnings about 2% lower than pre-recession cohorts. 2] Evidence that need to incorporate cohort effects into calculation of overall effect of downturn – As cohort effects on employment vary pro-cyclically.

Chart 1a: Relation between rate of unemployment at time of leaving full-time education and EMP/POP rate in first year after leaving full-time education, Australia, 2005-15

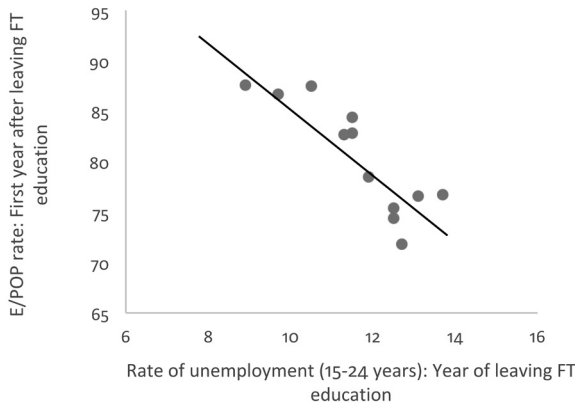
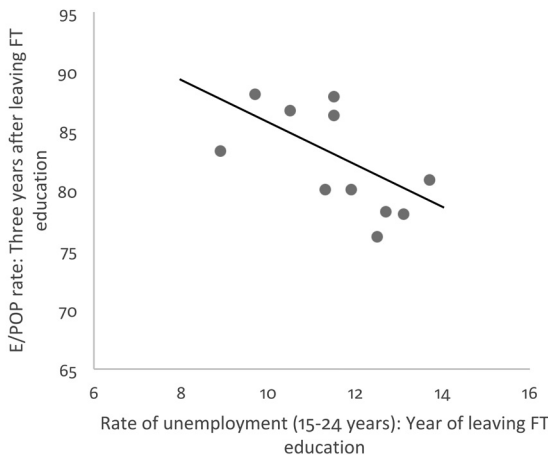


Chart 1b: Relation between rate of unemployment at time of leaving full-time education and EMP/POP rate three years after leaving full-time education, Australia, 2005-15



Data Appendix

- EMP/POP rate in the years after leaving FT education (HILDA): For each wave of the HILDA survey from 2005 to 2015 I identify persons aged 17 to 25 years who were observed to be in FT education in that year and not in FT education in both of the next two years. I then calculate the EMP/POP rate for that cohort in each wave for one, two and three years after.
- Rate of unemployment (ABS, Labour Force, Australia, 6202.0, Table 13): Average rate of unemployment for July-December (sa) in the year in which a cohort completed its FT education.

Table A1: Regression model for EMP/POP rate after leaving FT education, Australia, 2005-15

	<i>Years after leaving FT education</i>		
	<i>1 year</i>	<i>2 years</i>	<i>3 years</i>
Rate of ue in year of leaving FT education	-3.33** (0.60)	-2.96** (0.60)	-1.85* (0.80)
Constant	119.1 (7.5)	116.5 (7.2)	103.8 (9.0)
NOBs	11	11	11
Adjusted R-squared	0.714	0.687	0.320

Note: Standard errors are in parentheses. Asteriks: ** = significant at 1% level; * = significant at 5% level.