# Breaking Down Barriers

Melbourne Institute research into understanding and overcoming disadvantage

# Prevalence of, and Recovery from, Negative Earnings Shocks: Evidence from Three Decades of Longitudinal Tax Data

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# Executive Summary

There are many reasons one might fall into, or find it challenging to exit from a state of poverty or disadvantage. One of these reasons is financial. For most individuals, having adequate resources to meet basic needs is tied to labour earnings. If one faces financial challenges, the risk of falling into a state of poverty is high and the probability of spiralling into further financial challenges is greater.

This report explores year to year variations in labour earnings for a random set of Australian tax filers, aged 25 to 54. We use the information as reported on one's tax return to assess the share of Australians who experience a significant decrease (shock) in their earnings (voluntary or involuntary). We then explore, for those who experience such a decrease, the time it takes to return to a pre-decrease level of earnings.

The analysis covers a 26-year period, from 1991 to 2017, allowing us to study more than 1.4 million individuals. Over this period, 61 percent of males and 77 percent of females experience at least one major earnings shock. We further document that for most shocks, recovery to a pre-shock earnings level is very slow. As the shock could be due to a voluntary decision (e.g., a reduction of hours as one nears retirement, a change in career, a reduction following the birth of a child) we explore differences based on information about changes in household status and age.

Our key findings can be summarised as follows.

### Earnings shocks and recovery for males

• The share of males reporting a drop in earnings of greater than 40 percent roughly tracks the trends for the male unemployment rate. The earnings shock rates, however, are higher, suggesting that it is important to study more than unemployment when considering the financial factors that can increase the risk of moving into disadvantage.

- The depth of the shock, for example, an 80 percent drop in earnings versus a 40 percent drop, has fallen over the period of our study. Of males experiencing a shock in one 5-year period, 75 percent will not experience a subsequent earnings shock in the next 5-year period.[1]

- The rate of recovery from a shock (returning to one's earnings pre-shock) was highest during the period of the resources boom (2002 to 2007) but lowest in more recent years. Across all years, only 50 percent of male tax filers return to pre-shock earnings within five years.

• Males with low earnings are more likely to experience an earnings shock. Close to 18 percent of males with earnings at the bottom quartile of the earnings distribution experience at least one earnings shock. Males with earnings that fall in the top half of the earnings distribution are less likely to experience an earnings shock (~5 percent experience a shock). Males with low earnings are more likely to experience a shock than females with low earnings.

- The 3-year recovery rate from an earnings shock is higher for males that fall in the bottom half of the earnings distribution. Approximately 50 percent of those in the bottom quartile of earnings recover within three years. Approximately 40 percent of those in the second lowest quartile of pre-shock earnings recover within three years.

1    Recovery from a drop in earnings is measured based on reported earnings that represent the earnings observed in the two years prior to the shock. An individual, however, may experience more than one shock. Our measurement of subsequent shocks is based on the two previous years of reported earnings. For example, if an individual's earnings before an initial shock is $100,000 and that individual's earnings drops to $60,000 and remains at $60,000, the individual could experience a second shock if their earnings drops to less than $36,000 in a subsequent year.

**Earnings shocks and recovery for females**

- The female earnings shock rate is not as highly correlated with the female unemployment rate. Across all years, females experience a higher earnings shock rate than males. The gap between the female and male rates, however, has fallen in more recent years (2014–2017).

  - Over time, the depth of the shock for females has decreased. In addition, of females experiencing a shock in one 5-year period, only 20 percent will experience an earnings shock in subsequent periods (conditioning on observed earnings during that period).

- Compared to males, females earn less and are more likely to experience an earnings shock at higher earnings levels.

  - At younger ages (25–29 and 30–34), females experience high earnings shocks compared to males. This raises questions about the role that family decisions play in workforce participation by females.

  - Recovering from an earnings shock took much longer for females than males until 2014. Prior to 2014, the 3-year recovery rate for females was less than 30 percent, compared to 40 percent (sometimes higher) for males. Between 2012 and 2014, as the recovery rate for males was falling, the recovery rate increased for females.

**Factors that can influence shocks and recovery**

- Family composition of the tax filer plays a bigger role for females than for males. Females with partners and newborn children are much more likely to experience an earnings shock than females with no children or those without partners but with children.

- We find limited evidence that residential location, as defined by living in an urban or rural setting, affects the likelihood of experiencing a shock and/or the period needed to recover from such a shock for males. Females living in a rural area, however, are more likely to experience an earnings shock.

  - Individuals with a university degree are likely to recover more quickly than individuals without a university degree.

  - The age distribution of shocks and recoveries differs for males and females. For females, the highest rate of shock is observed for younger individuals (consistent with the mechanism discussed above), but for males the probability of a shock (conditional on other factors) is relatively flat. The speed of recovery declines with age.

The insights from this report highlight the importance of focusing on more issues than simply unemployment rates and/or leaving the workforce. Regardless of whether a sharp decrease in earnings is for voluntary or involuntary reasons, it increases the risk of not being able to pay bills and other expenses, which can lead to a decline in economic and social wellbeing. While macroeconomic measures such as inflation and unemployment rates are critical for understanding the economic health of a country or state, we should be using more finely tuned measures to better understand the best mechanisms for supporting individual and family level wellbeing.

This report demonstrates that there is an opportunity to increase support for those individuals experiencing low earnings and to also address how best to shorten the recovery period from earnings shocks. In addition, the report emphasises the importance of supporting females, especially those with young families, to minimise the gaps in both the depth and recovery from earnings shocks between males and females.

# 1.
# Introduction

Poverty, or more broadly, economic disadvantage, is multifaceted. A critical component to overcoming or preventing a state of poverty involves having sufficient resources to cover necessities such as housing, food, health, and wellbeing. For most households, these resources are funded by earnings through employment. The ability to maintain employment and to earn a sufficient income to cover one's necessities reflects skills, needs of employers, macroeconomic conditions, and other socio/demographic/cultural issues affecting one's household and the community in which one resides. An individual has, at best, only partial control over many of these factors. For example, in 2020, no one anticipated the drastic and immediate closure of businesses and schools because of the effects of the COVID-19 pandemic. The pandemic led to job losses, increased child care needs when day care centres and schools closed, and other issues that affected economic and social wellbeing. Based on a UK study, Crossley et al. (2021) show that those individuals at the bottom end of the income distribution were hurt the most in terms of reductions in earnings and job losses.

Inchauste et al. (2012) document changes in labour earnings in a sample of 16 countries where poverty rates decreased substantially during the 2000s. In ten of these countries, more than half of the reduction in poverty was explained by increases in earnings. In another four countries, 40 percent of poverty reduction was explained by changes to earnings. In addition to changes in labour income, characteristics such as education and work experience also contributed to poverty reduction. Inchauste et al. (2012) demonstrate, however, that labour earnings continue to be the main asset of the poor and a key factor for moving out of poverty.[2]

Dutta et al. (2011) highlight that to address poverty the focus should be on how to remove or eliminate potential vulnerabilities that can lead to bad outcomes. How might we differentiate between poverty and vulnerability? Chaudhuri (2003) defines the three critical terms that will assist policy-makers when assessing how best to eliminate economic disadvantage: poverty, vulnerability and risk. *Poverty* represents '… an *ex-post* measure of a household's well-being (or lack thereof)' (p. 2). Poverty thus captures the current measurement of deprivation or lack of resources or capabilities to meet current needs. *Vulnerability* can be '… broadly construed as an *ex-ante* measure of well-being …' (p. 2) capturing information on the prospects of a household. *Risk* captures '… the fact that future well-being is uncertain' (p. 3). Uncertainties can capture unexpected events that affect a community or country, such as a bushfire or a pandemic, as well as events that affect a particular household, such as an illness or accident.

As pointed out by Chaudhuri (2003), a household's vulnerability to poverty at any point depends on the evolution of livelihood prospects and wellbeing. And this in turn will depend on income volatility due to macroeconomic and other shocks, behavioural reactions to such shocks, and a set of complex dynamic interlinkages that relate to individual, household, and community factors. As documented elsewhere, there can be long-term, or scarring, effects from just a single year of not working. Von Wachter et al. (2009) demonstrate that, in the United States, workers separating from a stable job after a mass layoff can experience an earnings loss of more than 30 percent and the recovery from such a loss can take more than 15 years. Guvenen et al. (2017) extend these findings by including, in their study, workers who voluntarily separate from their jobs for more than a year. They find longer lasting financial effects from such a separation.

This report focuses on a critical feature that can be used to identify vulnerability, namely, negative shocks to labour earnings. Utilising an extensive dataset that captures a representative 10 percent sample of Australian tax filers from the 1990s to the present, we not only capture major changes in labour earnings, but also explore the depth of these changes for the tax filer and the time it takes to recover from an observed shock.[3] A negative earnings shock in and of itself may not lead to poverty. But this shock increases a risk of vulnerability that can lead to housing and food insecurity, along with several other socio-economic issues that can become the driver that leads one into poverty. As illustrated by Cassidy et al. (2020), the average duration of unemployment ranges from 30 to more than 50 weeks. Based on an analysis using HILDA data, those considered to be long-term unemployed are more likely to report food, housing, and financial insecurity relative to those who are fully employed.

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2    As highlighted by Stephens Jr (2001), although labour income is a critical factor in understanding vulnerability, there is not, in most cases, a dollar-for-dollar reduction in consumption and expenses with a reduction in earnings.

3    Using data on US earners, Pruitt and Turner (2020) illustrate that, regardless of household composition, earnings shocks lead to reduced consumption. Moreover, the repercussions from earnings shocks can be greater for single households than for couple households because in a couple household typically only one earner experiences a shock.

By better understanding the vulnerability created from a decline in earnings, we can better address the risk of entering a state of poverty associated with not recovering from the shock. As illustrated through the COVID-19 pandemic, Brewer and Tasseva (2021) highlight that policy responses to the impact of the pandemic on household incomes affected households differently. They simulate the effects of a job retention scheme, a universal basic income, and automatic stabilisers in the existing UK tax and benefit system. They demonstrate the importance of introducing specific benefits over relying on the existing system. They also illustrate different winners and losers from the various options for supporting earnings shocks. While Brewer and Tasseva focus on a particular emergency affecting an entire country, COVID-19, their work highlights the importance of testing and exploring a range of policies designed to address an earnings shock to better understand the implications of these policies for reducing poverty and disadvantage.

This report explores a series of economic and socio-demographic indicators to better understand the extent to which Australians have experienced negative earnings shocks and to better assess which subpopulations experience more or deeper negative earnings shocks. We explore the following.

1.  The relationship between macroeconomic periods of growth or contraction and earnings (Chapter 3). Given the period of our data, we can explore the following periods as defined by Garnaut (2021) and others: recession (1990–1992); productivity boom (1993–2001); resources boom (2002–2008); global financial crisis and recovery (2009–2012); and the 'dog days' (2013–2017). Much like other countries, we will demonstrate that the greatest volatility in earnings is experienced by those at the lowest end of the earnings percentile. Moreover, the degree of volatility depends on the state of residence and the economic period.

2.  The extent to which Australians experience negative earnings shocks and the persistence of these shocks for males and females separately (Chapters 4 and 5). In Chapters 6 and 7, we explore differences across pre-shock earnings levels and across age groups. Our analysis illustrates that deeper and more persistent negative shocks are experienced by females, by those with lower pre-shock incomes (those at the bottom 25th percentile of the income distribution), and those aged under 35.

3.  In Chapter 8 we explore the role of place, based on living in an urban or rural area, as well as based on measures of community

level poverty rates. We observe almost no differences across our place measures for both the share of tax filers experiencing a shock and for the time to recover from a shock.

4.  Finally, in Chapter 9, we explore the role of education, family status and the reporting of a disability on the likelihood of observing a shock and/or the time to recovery from a shock. We document that the likelihood of experiencing shock across males and females varies based on family type. Females with newborn children are more likely to experience an earnings shock than males with a newborn child. This observation likely contributes to the differences observed in experiencing a shock and recovery from the shock between males and females. We also document that individuals with a university degree are less likely to experience a shock than those without a university degree. We also observe that those with a health condition likely to affect one's ability to work also have a greater likelihood of experiencing a shock than those without a health condition.

In previous *Breaking Down Barriers* reports (Payne and Samarage, 2020; Vera-Toscano and Wilkins, 2022) we explored disadvantage through the lens of total household income, constructed from reported personal incomes of all household members aged 15 and over, using both census and HILDA Survey data. The reports based on census data highlight the high degree of variability in income-based poverty rates at a community level. The reports also document that many households experience fluctuating income over time and that, for many families, this leads to a cycling into and out of poverty. Using five-year data snapshots from the census and annual data from the HILDA Survey we document a range of fluctuations in poverty for many households.

This current report uses tax records data to dig deeper into the understanding of income fluctuation by studying fluctuations in annual earnings over the 27 years from 1990–91 to 2016–17. The insights from this report highlight the importance of understanding the complexities behind an individual experiencing a sharp decline in earnings from one year to the next. Our analysis highlights that when an individual experiences a shock, it likely takes many years before that individual reports earnings reflecting pre-shock earnings. By better understanding the factors that lead to a shock in the first place, be they global events like a pandemic or something that happens at a household level, we can better structure practices and policies to support recovery and reduce the risk of moving into a state of poverty or economic disadvantage.

# 2.
# Data and definitions

**Key information on data used**

- The analysis for this report relies on data extracted from Australian tax returns for the period 1990–91 to 2016–17, which represents 10 percent of individuals who had a tax file number at some point during this period.

- An important advantage of the dataset is that it captures the same individuals over an extended period, allowing for the comparison of their incomes before and after adverse events such as earnings shocks.

- For this study, we focus on individuals aged 25-54 who report positive labour income and whose income is observable for at least three consecutive years.

- We define earnings shock as an event in which earnings fall by at least 40 percent accompanied with a comparable drop in total income

## 2.1

# Sample creation

The analysis for this report relies on data extracted from Australian tax returns for the period 1990–91 to 2016–17.[4] The dataset is known as ALife, the ATO Longitudinal Information Files. ALife consists of a random sample of 10 percent of individuals in the ATO client register. The client register is constructed from tax returns lodged since 1980, as well as other means by which the ATO becomes aware of the existence of an individual, such as an employer or Centrelink lodging a payment summary for that individual. Most individuals are longitudinally linked via their tax filer number, a unique individual identifier.

The dataset captures information from lodged tax returns for all years. Information on earnings and government benefits is available for non-lodgers from 2002 onwards.[5] Once a tax filer is selected to be in the sample, we can observe the information from their annual tax returns from the beginning of the sample period or the year in which they first start filing (whichever occurs later) until the last year of data collection or the year in which they stop filing (e.g., due to death or emigration).

The ALife dataset presents several advantages for studying issues related to the entry into or exit from poverty. First, the data permit the exploration of income across several components. For this report we focus on labour earnings, which we define broadly to include self-employment and business income. Second, given the liability associated with failing to report and/or misreporting information on one's income tax return, we assume that information provided on the tax return is reasonably accurate.[6] Third, we are able to track annual earnings for a large group (10 percent of tax filers) of individuals residing in Australia. The depth and extent of the data coverage permits us to undertake analyses that focus on different parts of the income distribution, age groups and other dimensions such as geographic location.

There are, however, some disadvantages in using ALife. Compared to surveys, we observe a limited amount of demographic information. We can observe gender, age and residential location. We can derive some information about marital status (in more recent years) and having children (based on child benefits received and self-reports in the

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4    Hereafter, we refer to tax years by the year in which it ends. For example, 2017 refers to the 2016–17 tax year.

5    Polidano et al. (2020) show that combining lodgers' with non-lodgers' data results in a good representation of the Australian resident population aged 20 and older.

6    In surveys, earnings may be misreported when the payslip is not available to the interviewer, and respondents make mistakes in recollecting annual earnings. Researchers have highlighted that non-response rates for earnings in surveys is higher at the bottom and the top of the earnings distribution (Bollinger et al., 2019) and that there is often an under-reporting of welfare benefits in survey data (Meyer et al., 2015).

tax returns). While we observe annual labour earnings, we cannot observe the number of hours or days worked in that year.

As this report analyses earnings shocks, we have refined the dataset to focus on those individuals in the sample whose tax returns are observed when they are between the ages of 23 and 57. We identify earnings shocks for those aged between 25 and 54. For those aged 25, we compare earnings at age 25 with earnings reported in the two prior years. Those aged 54 are followed for the three subsequent years to capture information on the recovery from an earnings shock experienced at age 54 or earlier. The age range was selected to capture the core years one would be expected to work. Individuals who are under 23 are likely to be engaged in a training program and/or post-high school education. Individuals who are over 57 may be exiting the workforce by retiring completely or by reducing hours. The year-to-year variation in earnings for those under 23 or over 57 are expected to be noisy, which could lead to an overcounting of earnings shocks as one transitions from training to work and from work to retirement. We note that there are a range of issues that could be studied for those under 23 and those over 57, but we leave the study of these other issues to a future report.

In Table 2.1 we report the number of tax filers and/or observations excluded from the dataset used for this report based on a set of rules. We exclude 779,696 individuals from the sample because their tax information is captured only for ages that are outside of the age range used for this report. This leaves a total of 1,769,008 tax filers who could be studied. As explained in more detail below, we identify an individual as experiencing an earnings shock based on the earnings received in the previous two years. Thus, this requires that the individual has reported earnings for three consecutive years. Moreover, we include a requirement that reported earnings are at least 25 percent of the annual earnings of a full-year full-time worker paid the contemporary adult federal minimum wage (approximately $8,900 in 2017).[7] We further exclude individuals as follows.

1.  Individuals who never report earnings that exceed the minimum threshold. This results in the exclusion of 176,813 individuals.

2.  Individuals for whom we do not observe at least three consecutive years of tax information. This results in the exclusion of 76,751 individuals.

3.  Individuals for whom we cannot calculate whether they have experienced an earnings shock because we can never observe pre-shock year earnings that are above the threshold. This results in the exclusion of 102,009 individuals.

Our final sample consists of 1,413,435 individuals, of which 53 percent are males. Of the male tax filers, 82 percent of the possible individuals that could be studied remain in the sample. Of the female tax filers, 78 percent of the possible individuals that could be studied remain in the sample. The primary reason for a greater exclusion of female tax filers is the rule that excludes tax filers whose earnings never exceed the minimum threshold of approximately $8,000.

The resulting dataset captures individuals born between 1938 and 1991. Those born in 1938 would be aged 53 in 1991, the first year of our data. And those born in 1991 would be aged 26 in 2017, the last year of our data. Appendix A provides further detail on the implications of the sample restrictions we implemented for the purposes of this study.

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7    As the focus of the study is earnings shocks, we set a minimum earnings threshold to ensure that tax filers in the sample have a significant attachment to the labour market. Persons who earn less than one quarter of the annual full-time minimum wage for successive years are likely reliant on welfare benefits or other family members and, although a group that deserves attention, are out of the scope of this study.

**Table 2.1. Development of the working dataset. ALife data, 1991—2017**

| | Number of persons | | |
|---|---|---|---|
| **Total number of persons in the dataset** | 2,548,704 | | |
| Persons with gender/age not reported | 191,735 | | |
| Persons that are observed before the age of 25 or after 54 and not in between | 587,961 | | |
| Starting sample for analysis | 1,769,008 | | |
| | Males (1) | Females (2) | Total (3) |
| **Starting sample for analysis** | 919,891 | 849,117 | 1,769,008 |
| Persons whose earnings never exceeded the minimum threshold for measuring an earnings shock (~$8,900 in 2017) | 72,683 | 104,130 | 176,813 |
| Persons who are never observed for at least three consecutive years | 44,144 | 32,607 | 76,751 |
| Persons whose earnings for the two consecutive years used to identify an earnings shock are always less than the minimum threshold (~$8,900 in 2017) | 50,638 | 51,371 | 102,009 |
| Number of persons studied | 752,426 | 661,009 | 1,413,435 |

*Notes:* See Polidano et al. (2020) for more information on ALife data. For the definition of earnings shock see chapter 2, section 2.

### *Earnings distributions for lodgers and non-lodgers*

ALife contains data from all tax returns lodged by tax filers and, from 2002, data for non-lodgers. Correspondingly, earnings and incomes of individuals who lodge a tax return are observed in every year, while for individuals who do not lodge a return, information is only available from 2002 onwards, and even then the income data are restricted to earnings and taxable government benefits (thus excluding business and investment income). Prior to 2002, whenever a tax return was not lodged[8] our analysis assumes that earnings and income of the individual were zero in that year.[9] While the pre-2002 data give us no option other than to take this approach, is this a reasonable assumption? A second related question in respect of non-lodgers is whether we should be concerned about potential bias when studying individuals with low earnings if these individuals do not lodge tax returns.

To explore these questions, we focus on the information for lodgers and non-lodgers in the most recent year, 2017. For this year we can capture earnings for both groups. Figure 2.1 depicts the distribution of reported earnings for males. The earnings are broken into eight groups. The first group captures individuals whose reported earnings are zero or negative. One can have negative earnings if self-employment or business income is negative—that is, the business reports a loss.[10] The second group captures individuals with earnings that range between $1 and $25,000. Less than 15 percent of the sample falls into each of these lower threshold groups. Most males (Figure 2.1) report earnings ranging between $25,000 and $125,000.

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8    After 2002, information on earnings and income is missing if the individual does not work and does not receive taxable government benefits and/or if the individual is not residing in Australia. Although this may raise concerns about ALife's representativeness, Polidano et al. (2020) show that lodgers and non-lodgers approximate the Australian resident population aged 20 and older.
9    We impute zero earnings and income only if we observe earnings and income of those individuals in successive years.
10   Given the uptake of "gig economy" jobs, such as Uber driving, which are treated as self-employment, we wanted to include this type of income in our measure of earnings.

**Figure 2.1. Share of persons by earnings bracket, 2017—Males**
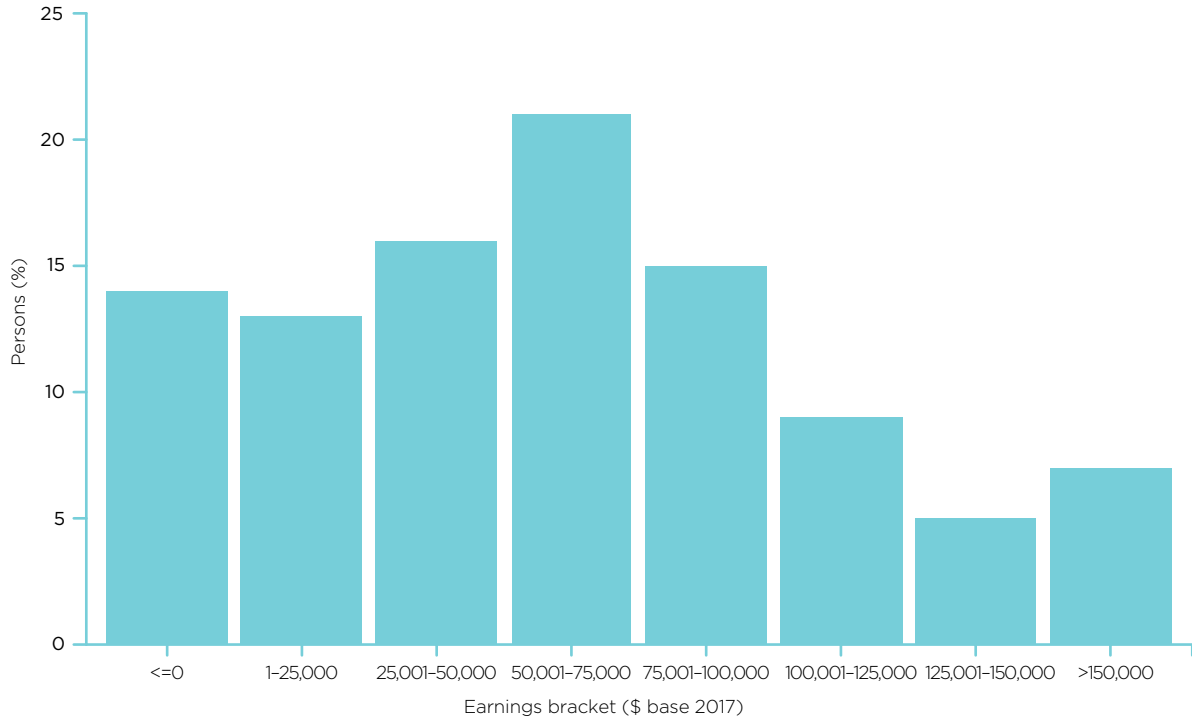


*Notes:* Captures persons who file a tax return (lodgers) or for who we have non-lodger information. For definition of lodger and non-lodger see chapter 2, section2. All dollars used in this report are converted to nominal dollars, with 2017 as the base year.

**Figure 2.2. Proportions of lodgers and non-lodgers, by earnings bracket, 2017—Males**
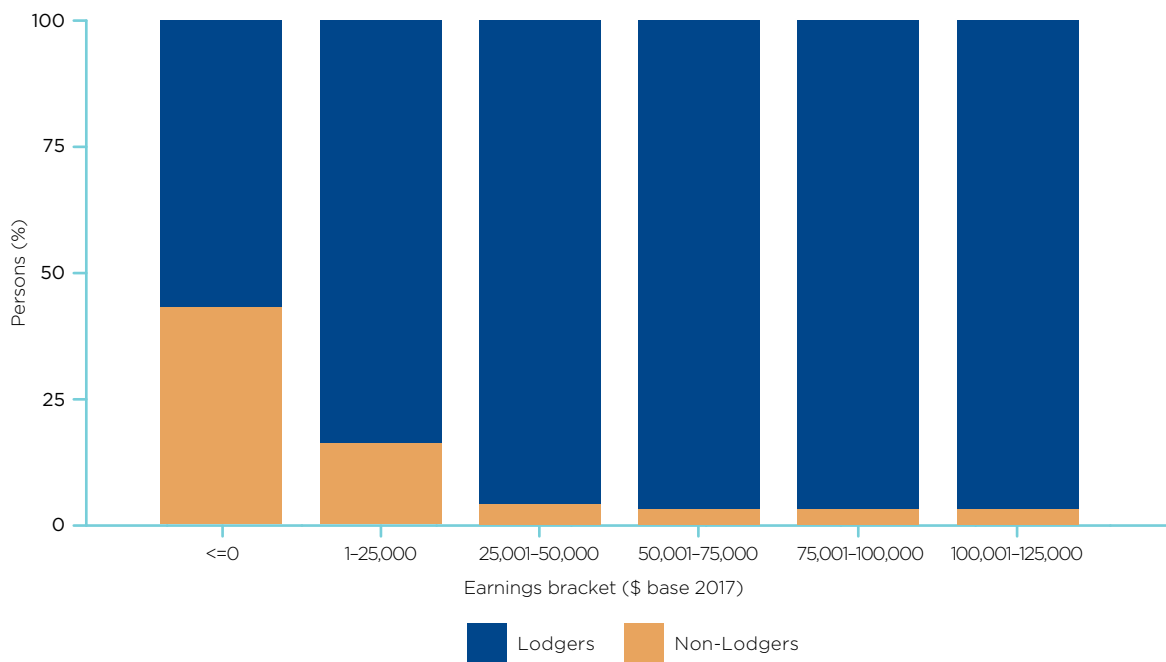


*Notes:* For definition of lodger and non-lodger see chapter 2, section2.

Figure 2.2 depicts the proportion of males within each earnings group based on whether the individual is a lodger or non-lodger. Most of the non-lodgers fall into the group of individuals with zero or negative earnings. The second largest group of non-lodgers has earnings that are less than $25,000. These figures illustrate that a challenge for the period before 2002 (when no non-lodger data are available) is that an individual could be classified as experiencing a negative earnings shock if they did not lodge a return and we assume zero earnings for the year of the shock. This will mean that for the period before 2002 we likely are overstating the share of tax filers with an earnings shock. As explored further in Appendix C however, we believe that any overstatements will be slight given the methods used to identify a shock and the fact that most of the non-lodgers for whom we can observe earnings report zero earnings.

Figures 2.3 and 2.4 depict the earnings distribution and the proportion of non-lodgers by earnings group for females. A higher share of females report earnings that are less than $25,000, and the majority earn between $25,000 and $100,000. Like males, most non-lodgers have earnings that are equal to zero or less. Compared to males, however, a lower proportion of female non-lodgers report earnings that are between $1 and $25,000.

In sum, not having information for non-lodgers leads to a loss of information on earnings for a tax filer for the period before 2002. Our assumption that these non-lodgers have earned zero earnings in the year for which a tax return was not lodged, however, will understate earnings for a small proportion of the tax filers that are studied.

**Figure 2.3. Share of persons by earnings bracket, 2017—Females**
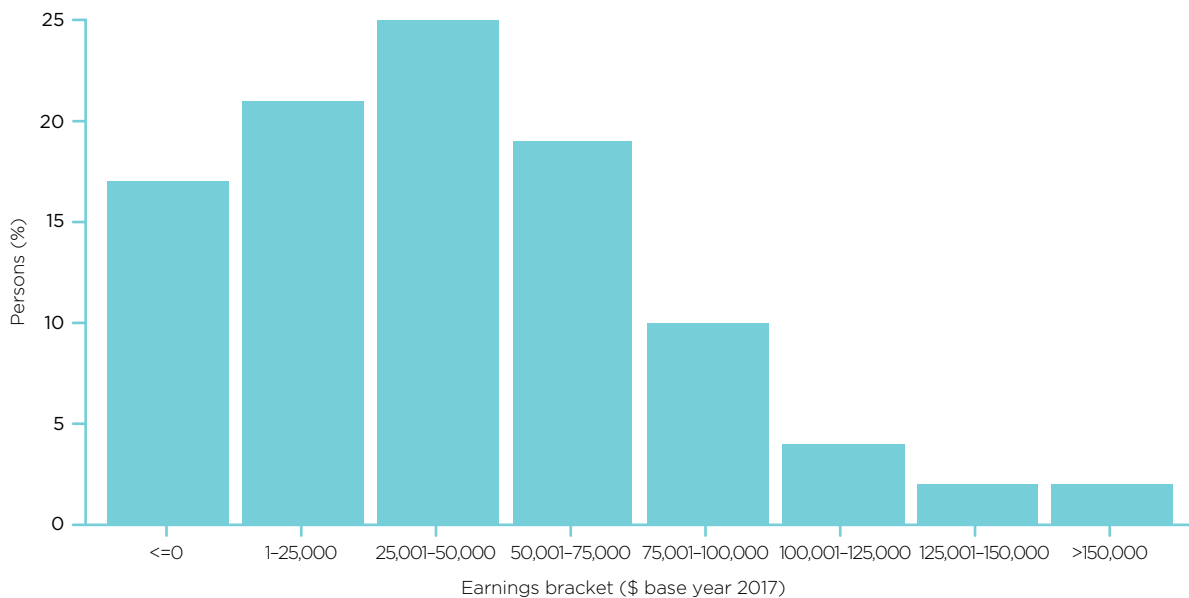


*Notes:* Captures persons who file a tax return (lodgers) or for who we have non-lodger information. For definition of lodger and non-lodger see chapter 2, section 2. All dollars used in this report are converted to real dollars, with 2017 as the base year.

**Figure 2.4. Proportions of lodgers and non-lodgers, by earnings bracket, 2017—Females**
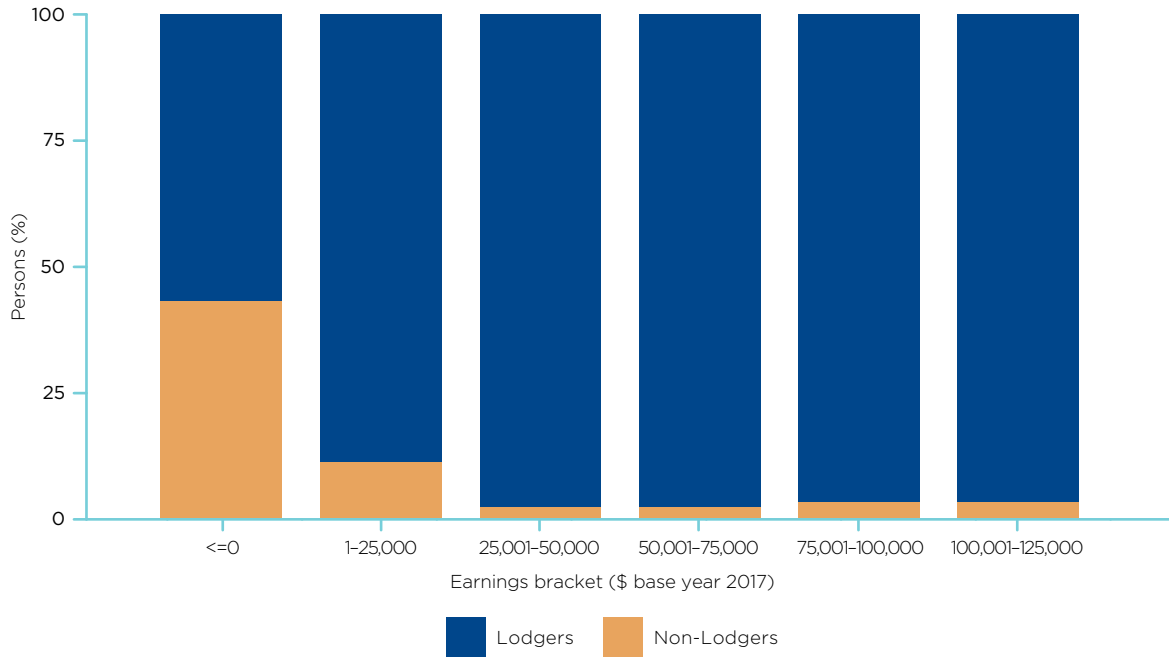


*Notes:* For definition of lodger and non-lodger see chapter 2, section 2.

## 2.2

# Defining earnings shocks



What constitutes a relevant drop in earnings to constitute a negative shock? Our definition relies on three key features: (a) the definition of earnings; (b) the period used to identify a shock; and (c) the minimum percentage loss in earnings used to identify a shock, which includes a consideration of the change in overall income (excluding government benefits) relative to the change in earnings. We address each of these features separately.

### Definition of an earnings shock

To be classified as having experienced an earnings shock we compare current earnings against the minimum earnings in the previous two years. If current earnings have fallen by more than 40 percent, then an individual is identified as experiencing a shock. We define earnings as: the sum of wages, gross business income and gross self-employment income.

### Defining earnings

Critical to this report is to explore significant changes in one's finances, especially for those individuals who are at the lower end of the income distribution and/or those who are at risk of falling into the lower end of the income distribution if they are unable to recover from the decline in their finances.

The Australian tax return captures the following income components:

- salaries/wages;

- additional payments from one's employers (lump sum payments,[11] termination payments,[12] allowances,[13] tips and gratuities, consultation fees);

- business income including personal services income;

- Australian government pensions and allowances such as Newstart Allowance, Parenting Payment Single and the Disability Support Pension;

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11    Lump sum payments for unused annual leave and unused long service leave.
12    Lump sum payments given to employees when they resign, retire or paid to an estate in the event of an employee's death.
13    Allowances are expenses reimbursed by the employer.

- Australian annuities and superannuation income streams;

- interest, dividends and other capital gains; and

- foreign income (and other revenue sources).

We concentrate on the core earnings that are associated with working, either as an employee or as a business owner. The measures used to capture earnings are salaries/wages and earnings from self-employment and business income. We focus on this measure of earnings on the assumption that most individuals will cover necessities from sources of income tied to wages or self-employment income.

### Period used to measure a negative earnings shock

The richness of the data permits us to capture year to year variations in earnings. One might, however, experience a temporary increase in earnings in one year that is representative of an anomaly rather than a trend for that individual. For example, one might work overtime due to a crisis at work that would temporarily increase one's earnings during the period of the crisis. And if this were the case, an individual who reports the same level of earnings for the first and third year over a 3-year period, but experiences an increase in earnings in the middle year, could be incorrectly classified as experiencing a negative shock when, in fact, the individual has simply returned to a level of earnings approximately the same as they were receiving previously. For this reason, we adopt a 3-year period for capturing a negative shock to earnings. To assess whether earnings for the year under study have declined sufficiently to be classified as a negative shock, we compare the earnings reported for the year under study relative to the minimum earnings reported in each of the two previous years.[14]

### Minimum percentage loss in earnings and income to be classified as experiencing a negative earnings shock

An individual is classified as having experienced negative earnings shock each year if:

(a) their earnings in each of the previous two years exceeded 25 percent of the annualised earnings if one worked full-time and earned the minimum wage (approximately $8,900 in 2017);

(b) their earnings that year are less than 40 percent of the minimum earnings received in each of the previous two years; and

(c) their total income, net of taxable government benefits, has also declined by 40 percent.[15]

We include this latter requirement to ensure that we exclude individuals with other sources of income that would exceed earnings in a way that the non-earnings-related income offsets any substantial earnings decline.



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**Table 2.2. Relation between changes in earnings and changes in total income**

| | | Change in total income | | |
|---|---|---|---|---|
| | Number of observations (1) | Decrease 40—100% (2) | Decrease <40% (3) | Increase or no change (4) |
| **Panel A: Males** | | | | |
| A. Decrease in earnings of 40–100% | 677,914 | 78.01% | 11.91% | 10.08% |
| B. Decrease in earnings of <40% | 1,825,117 | 2.12% | 80.66% | 17.22% |
| C. Increase or no decrease in earnings | 5,420,766 | 0.29% | 5.18% | 94.53% |
| **Panel B: Females** | | | | |
| A. Decrease in earnings of 40–100% | 662,589 | 82.40% | 9.71% | 7.90% |
| B. Decrease in earnings of <40% | 1,417,024 | 2.50% | 80.54% | 16.96% |
| C. Increase or no decrease in earnings | 4,304,724 | 0.38% | 5.15% | 94.47% |

*Notes:* Changes are calculated as the percentage change between the current year and the minimum value in the two previous years. Government benefits are excluded from total income.

In Table 2.2, we present statistics that depict the correlation between observed changes in earnings versus changes in total income. Panel A captures the information for males and Panel B captures the information for females. In the first column we report the number of observations based on a classification of the change in earnings. The first column reports the number of observations in each of three categories for earnings changes: a decrease in earnings of at least 40 percent; a decrease in earnings that is less than 40 percent; and no decrease in earnings. The following three columns then report the percentage of observations for each of these groups in analogous categories for changes in total income.

Focusing on the group that could be classified as experiencing a negative earnings shock (fall of more than 40 percent of earnings), 78 percent of males and 80 percent of females will be classified as experiencing a shock under our definition. Close to 12 percent of males and 10 percent of females experience a drop in total income, but the net drop is less than 40 percent. For both genders, a further 10 percent experience no change or an overall increase in income.

For this latter group, intuitively we likely would not want to classify these individuals as experiencing an earnings shock given it appears that they are drawing income from other sources to cover any drop in earnings. The more challenging issue, however, is whether to classify an individual whose earnings drop by more than 40 percent but whose total income drops by less than 40 percent as experiencing an earnings shock. Our analysis will not treat these individuals as experiencing a shock.[16]

We explore the robustness of the analysis in the Appendices by testing the sensitivity of our judgement calls on sample development and classification as experiencing an earnings shock. Appendix B shows that our analysis is robust to changes in the definition of total income. Appendix C tests the sensitivity of the analysis to the exclusion of non-lodger data and the zero-earnings assumption for missing values. Appendix D shows the robustness of the analysis to changes in the thresholds of the definition of earnings shock. While there will be differences in the shares of those identified as experiencing a shock, the trends over time and across age and other characteristics follow similar patterns as those discussed in this report.

16    It is worth pointing out that individuals with high spousal incomes are not over-represented among those who experience shock according to this definition. Median spousal income of those who experience a shock is close to the median income in the full sample, and the share of people with spouses in the top 1 percent of total annual income among those who experience shock is less than 0.5 percent.

Breaking
Down
Barriers

# 3.
# Economic fluctuations

**Economic Periods in Australia**

- Over the course of the last 30 years Australia experienced several economic periods in which the economy has grown and contracted. These include:

  - the productivity boom (from 1993 to 2001), noting there was an economic downturn in 2001;

  - the resources boom (from 2002 to 2007) (economic growth);

  - the global financial crisis and recovery (spanning 2008 to 2011);

  - the period of low growth from 2012 (termed the 'dog days').

- Our subsequent analysis confirms that the rates of economic shocks and recoveries vary substantially between these periods.

Studying negative earnings shocks is important as households may face financial hardship if they lose a large share of their earnings and hence income. The consequences of earnings shocks should be expected to vary with the business cycle. In expansion periods, there are more employment opportunities and employers are more willing to offer pay rises. In recessions, there are fewer job opportunities, wages may fall and people may experience long periods of unemployment. Using US data, Guvenen et al. (2014) find a strong countercyclical relationship between business cycles and earnings shocks: periods of economic growth decrease the probability of a shock and periods of economic decline increase the probability. A second crucial point is that the consequences of recessions are unequal. Guvenen et al. (2014) show that during the Great Recession in the US, the fall in earnings for those at the bottom of the earnings distribution was 18 percent worse than experienced by those at the top.

Hoynes et al. (2012) find that the Great Recession in the US had greater negative impacts on males, ethnic minorities, young people and less educated workers. In a more recent study of the consequences of the COVID-19 pandemic, Adams-Prassl et al. (2020) use survey data for the US, UK and Germany to show that females and less educated workers were the most adversely affected and that employees with fixed-term contracts were more likely to lose their job.

In light of the 2020 pandemic recession in Australia, should we expect there to be unequal patterns in the effects of the recession on lower income workers? Over the last several decades, does the variability in earnings during periods of booms, busts and other periods of slow or rapid economic growth mirror what is observed in other countries?

In this chapter we provide a brief overview of the Australian economic cycle over the last 30 years to assist in an understanding of how macroeconomic cycles may affect the likelihood and the duration of the effects of a negative earnings shock as explored in future chapters. We explore further the role of macroeconomic cycles as outlined in Ananyev et al. 2023.

Using Garnaut's (2021) characterisation of macroeconomic periods, we classify the years from 1990 to 2020 into five periods:

- the early 90s recession (spanning 1990 to 1992);

- the productivity boom (spanning 1993 to 2001), noting there was an economic downturn in 2001;

- the resources boom (spanning 2002 to 2007);

- the global financial crisis and recovery (spanning 2008 to 2011);

- and what has been termed the 'dog days' or low growth period (2012 onwards, up to the pandemic).

**Figure 3.1. GDP growth, GDP growth per capita, Real Net Disposable Income per capita, 1990–2022**
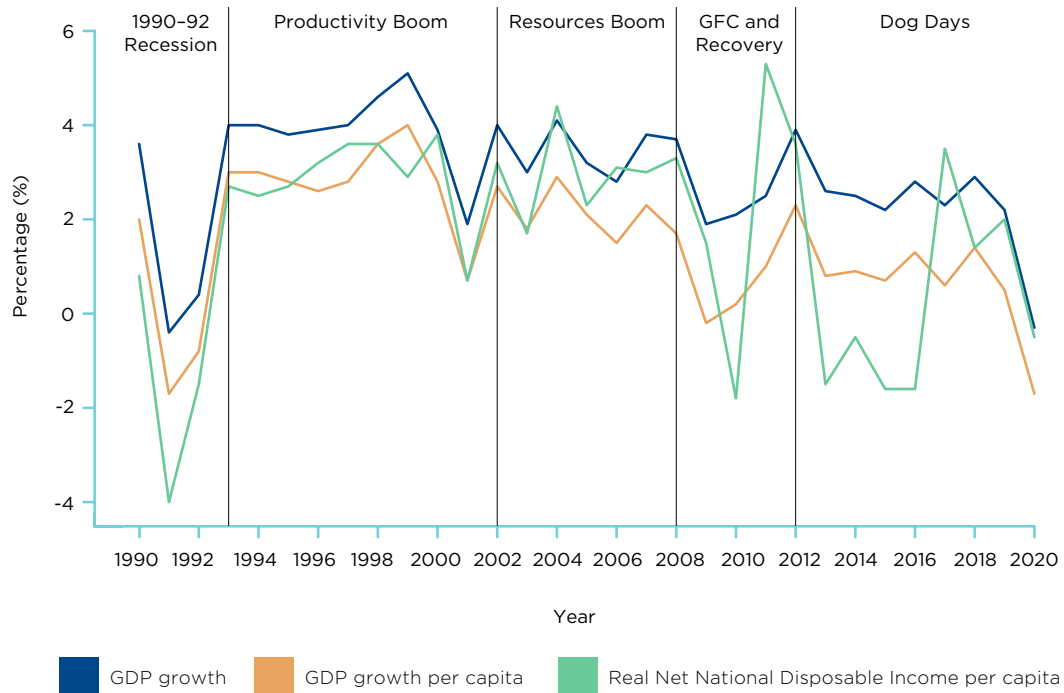


*Notes:* Data are taken from the Australian National Accounts (ABS series 5206).

**Definitions of GDP, GDP growth, GDP per capita, Real Net Disposable Income and the unemployment rate**

Gross Domestic Product (GDP) is a measure of the market value of the goods and services produced in a country in a given period. The GDP annual growth rate (see Figure 3.1) is defined as the percentage change of the chain volume measure of GDP. Applying the chain volume measure to GDP we account for prices changes across the years.

Gross Domestic Product (GDP) per capita is calculated by dividing GDP by the number of residents in Australia. Compared to GDP, GDP per capita adjusts for changes in the resident population. This is relevant for Australia, which has experienced a growth in population in the last 30 years.

The Real Net Disposable Income adjusts GDP for changes in export and import prices (terms of trade effect), depreciation of assets (consumption of fixed capital) and incomes payable to and receivable from the rest of the world.

The unemployment rate is the proportion of the labour force who is unemployed. The labour force is composed of employed and unemployed and excludes non-employed people not actively seeking employment. The unemployment rate of the Australian population aged 25 to 54 (see Figure 3.2) is calculated by dividing the number of unemployed aged 25 to 54 by the labour force aged 25 to 54.

**Figure 3.2. Unemployment rate, 1990–2020—Australian population aged 25 to 54**
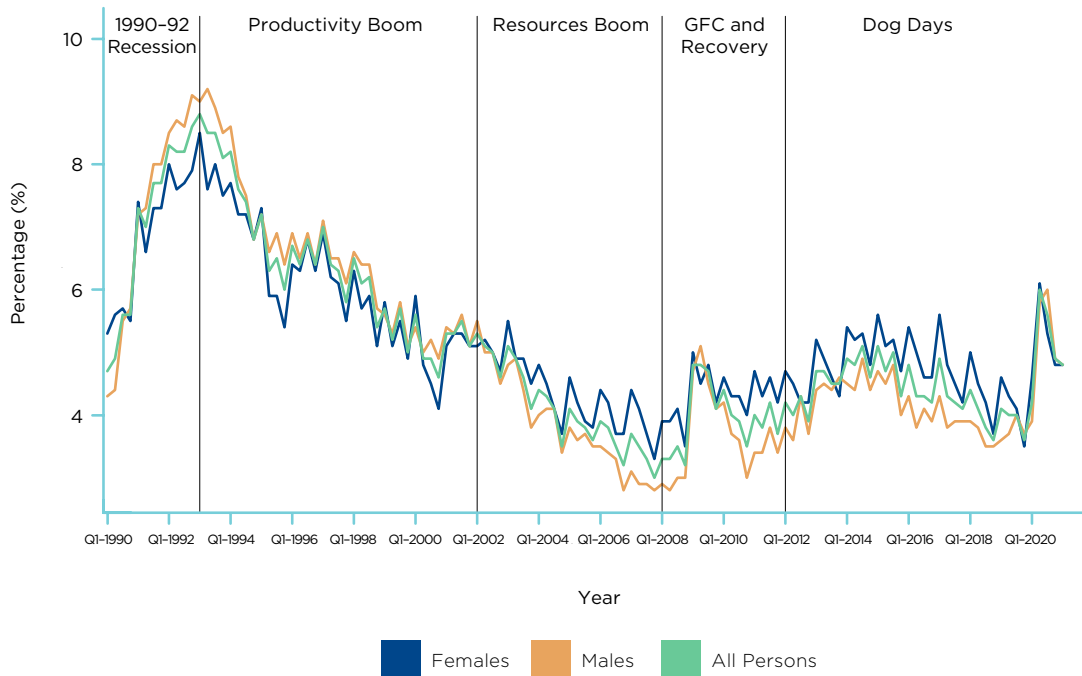


*Notes:* Data are taken from the ABS Labour Force (ABS series 6202). Q1 corresponds to the unemployment rate in March, Q2 in June, Q3 in September, Q4 in December.

In Figures 3.1 and 3.2, we depict standard macroeconomic indicators for the period under study. Figure 3.1 presents Gross Domestic Product (GDP) growth per capita, GDP growth and Real Net National Disposable Income per capita. Figure 3.2 depicts unemployment rates, overall and by gender, for individuals aged 25 to 54. At the beginning of the 1990s the Australian economy was hit by a recession. In 1991 GDP fell by 0.4 percent and GDP per capita decreased by 1.7 percent. The unemployment rate among people aged 25 to 54 grew from 4.7 percent in 1990 to 7.7 percent in 1991, peaking at 8.8 percent in the first quarter of 1993.

Notably, at the peak of the early 1990s recession, the unemployment rate for females (8.5 percent) was lower than the rate for males (9.3 percent). After that recession, Australia experienced a strong increase in productivity that led to seven years of sustained growth—the productivity boom period.

From 1993 to 2000, GDP and GDP per capita grew on average respectively by 4.2 percent and 3.1 percent per year and the unemployment rate decreased year by year to reach 4.6 percent in the last quarter of 2000. The productivity boom ended in 2001 when GDP growth slowed to 1.9 percent and the unemployment rate bounced back to 5.5 percent.

After 2001, Australia experienced a second period of expansion from 2002 to 2011 and included the period of the global financial crisis ('GFC', 2008–2009). This period is named the 'resources boom' as the growth in the economy was largely sustained by the demand for Australian resources from China, which drove prices of materials such as iron ore, coal and metallic minerals to record levels. Between 2001 and 2008, the unemployment rate fell from over 5 percent to less than 4 percent. Australia only experienced a modest change in macroeconomic indicators during the GFC, largely attributable to the demand for resources by China. GDP grew by 1.9 percent, GDP per capita fell by 0.2 percent and the unemployment rate rose to 6 percent.

The resources boom continued until 2012 when the 'Dog Days' period started. 'Dog Days' covers the period from 2013 to 2020, in which GDP growth was mainly driven by population growth and productivity growth was low. As we see in Figure 3.1, although GDP continued to increase at a pace faster than 2 percent, GDP per capita grew on average by only 0.9 percent and the unemployment rate of Australians aged 25 to 54 remained stable between 4 percent and 5 percent. Effectively the 'Dog Days' period ended with the onset of the pandemic. By the end of 2020, Australia's unemployment rate had increased and GDP growth fell.

# 4.
# Earnings shocks and recoveries, males
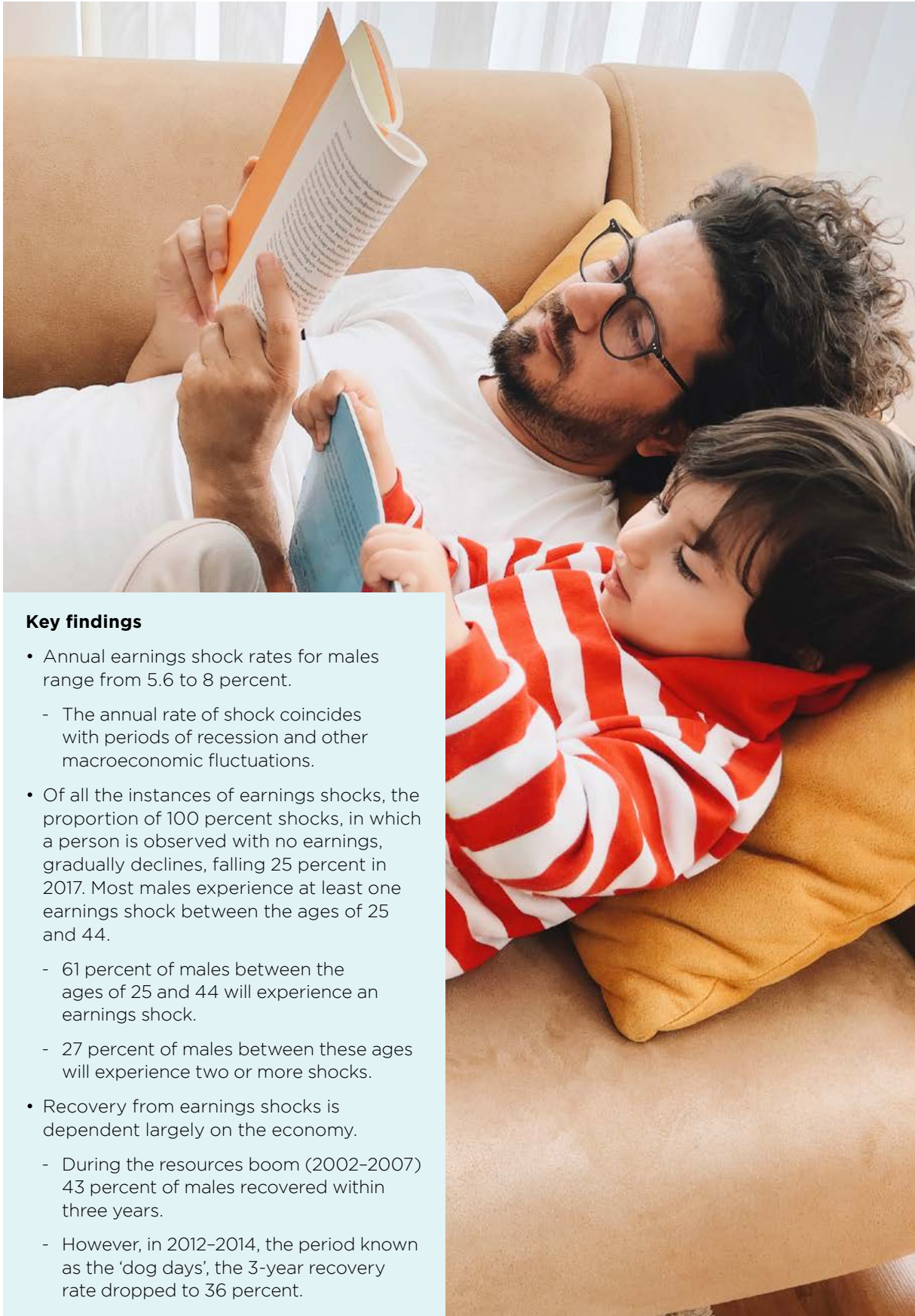
## Key findings

- Annual earnings shock rates for males range from 5.6 to 8 percent.

  - The annual rate of shock coincides with periods of recession and other macroeconomic fluctuations.

- Of all the instances of earnings shocks, the proportion of 100 percent shocks, in which a person is observed with no earnings, gradually declines, falling 25 percent in 2017. Most males experience at least one earnings shock between the ages of 25 and 44.

  - 61 percent of males between the ages of 25 and 44 will experience an earnings shock.

  - 27 percent of males between these ages will experience two or more shocks.

- Recovery from earnings shocks is dependent largely on the economy.

  - During the resources boom (2002–2007) 43 percent of males recovered within three years.

  - However, in 2012–2014, the period known as the 'dog days', the 3-year recovery rate dropped to 36 percent.

# 4.1

# Introduction



In this chapter, we explore negative earnings shocks and the time it takes to recover from those shocks for males. Given a negative earnings shock can lead to a range of repercussions, such as housing or food insecurity, increased debt, mental distress and the forgoing of opportunities such as training or education, understanding the magnitude of earnings shocks and the amount of time it takes to recover is a critical first step towards identifying mechanisms to prevent a shock and/or to encourage faster and better recovery from such shocks.

We explore earnings shocks for individuals for the period from financial year 1990–91 to 2015–16. Critical to this report is not simply to identify what we know about those who have experienced an earnings shock but what we observe about the recovery from these shocks, both as a function of the depth and the number of years it takes to recover.

We provided a detailed discussion of how we define an earnings shock in Chapter 2. Briefly, an individual is defined as experiencing a shock if his or her reported earnings in the year under study when compared to the earnings reported in the previous two years falls by more than 40 percent. We define recovery as returning to a point where earnings (in real terms) are at least as much as those earned just prior to the earnings shock.

## 4.2

# Experiencing an earnings shock



We first explore the annual rates of earnings shocks over the sample period. In Figure 4.1 we depict the share of tax filers identified as having experienced an earnings shock between 1994 and 2017. The years have been grouped into the four macroeconomic periods. Over time, the annual earnings shock rate is as high as 8 percent and as low as 5.6 percent. Peaks coincide with periods of recession, namely the end of the early 1990s recession, in 2001, and near the period of the GFC.

Is the share of males experiencing shocks high or low? There is no obvious benchmark. On the one hand, we could use statistics on job mobility, namely reports of changing or leaving an employer in a recent year. This information could be derived from the Australian Bureau of Statistics (ABS) *Participation, Job Search and Mobility* supplement survey undertaken in February of each year as part of the ABS Labour Force Survey. Statistics from the ABS

Survey suggest that, for the period under study, between 8 percent and 13 percent of those in the workforce have changed jobs and/or left a job and left the workforce. The mobility from changing employers was highest in the 1990s and lowest in more recent years. These statistics suggest earnings shocks represent a lower proportion of those observed moving jobs in the earlier years than in the later years.

Another comparison would be to explore the correlation between unemployment rates and earnings shocks. In Figure 4.1, we portray the unemployment rate for the year using the rates as computed in Quarter 3 for the year under study. During the 1990s, the share of those identified with an earnings shock mirrors the unemployment rate. There is no reason, however, why we might expect the unemployment rate and the rate of earnings shocks to follow similar patterns. Yet, apart from 2001 (a recession year) and the two years prior to 2001 there are similarities between the trends in these two rates.

**Figure 4.1. Persons experiencing an earnings shock and unemployment rate—Males**
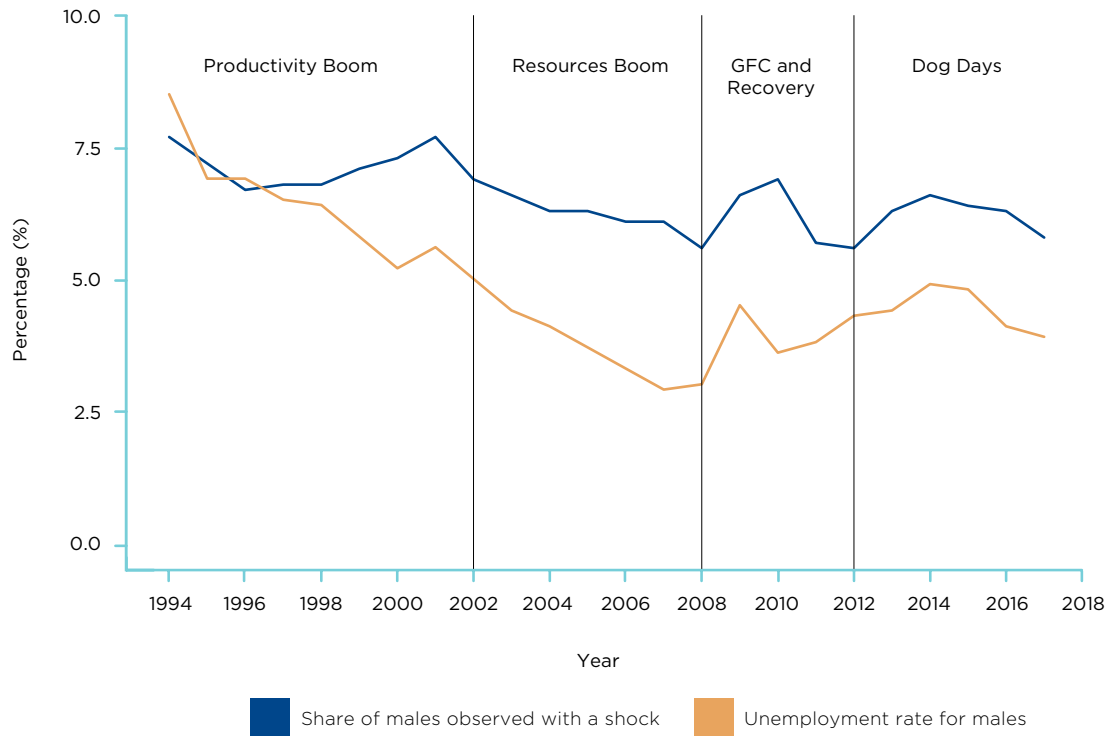


In Figure 4.2, we further investigate the level of shocks based on the depth of the shock experienced. We group the shocks into three groups: males who experience a full earnings shock (100 percent drop in earnings); males who suffer an earnings shock that ranges from 60 percent to 100 percent; and males who suffer an earnings shock that ranges between 40 percent and 60 percent. Over the period, the share of the shocks that represent a 100 percent drop in earnings declines, from just over 50 percent in 1994 to closer to 25 percent in 2017. A caveat to this figure, however, is to note that prior to 2001 we do not have non-lodger information and assume zero earnings if we observe earnings before and after the period of not lodging a return. Thus, the proportions of shocks identified as complete (100 percent) drop in earnings will be overstated prior to 2001.[17]

Over time, 30 percent of those who experience an earnings shock (~2 percent of all tax filers) experience a shock that ranges from 40 to 60 percent. Approximately 40 percent (~2.5 percent of all tax filers) experience a shock that ranges from 60 percent to just shy of 100 percent.

Thus far we have focused on the year-to-year variation in earnings shocks. Next, we explore the extent to which tax filers experience more than one earnings shock. Given, however, the sample is unbalanced in that we do not observe all individuals across all years, we created a subsample of individuals who we can observe every tax year between the ages of 25 and 44. This sample captures 99,334 tax filers.

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17    In Appendix B we explore the degree to which we may be overstating the share of shocks that would be identified as a complete shock due to our not having the non-lodger earnings information for the first part of the sample period.

**Figure 4.2. Depth of earnings shocks—Males**
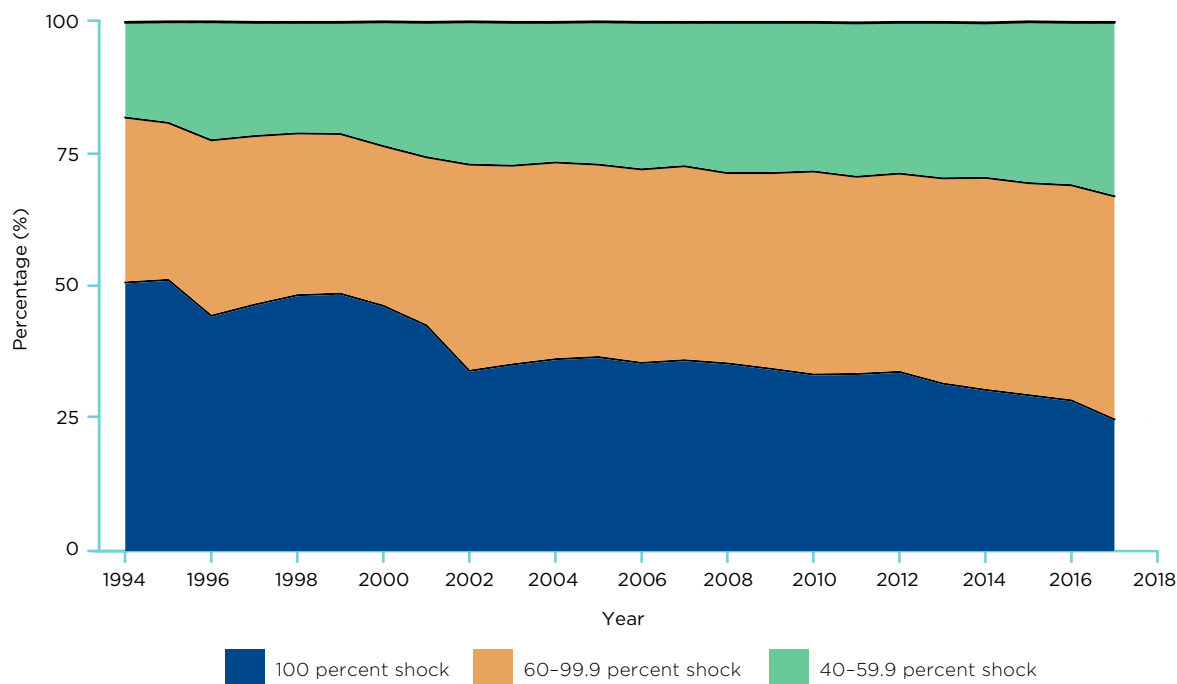


*Notes:* The share is based on a denominator that equals the number of males observed with an earnings shock of 40 percent or greater. The numerator is equal to the number of males in shock based on the magnitude of the shock observed.

We grouped the tax returns into four periods based on the age of the tax filer: 25 to 29; 30 to 34; 35 to 39; and 40 to 44. For each period, we identified whether the tax filer is observed experiencing at least one earnings shock. In Figure 4.3, we depict the flow of 'shock' or 'no shock' across the four age periods using a tree diagram. Each branch of the tree flows from the previous period, allowing one to see the extent to which individuals experience multiple shocks across the four periods. This tree depicts shocks as defined as a drop in earnings relative to the two previous years. If one experiences an earnings shock in one period, a shock in the second period is based on observed earnings for the two years prior to the shock. For any given person that experiences an earnings shock in one period, that person may or may not have fully recovered from the first shock when we identify an earnings shock in a subsequent period.[18]

Starting first with the tax filers when they are aged between 25 and 29, approximately one-quarter (27 percent) experience an earnings shock. Of those, close to three-quarters (73 percent) do not experience a second shock when aged between 30 and 34. In fact, of those males with an observed shock between 25 and 29 but no shock between 30 and 34, more than half (59 percent) are not observed experiencing a shock between 35 and 44.

One quarter of individuals (27 percent) experience a shock in the second period (30–34) after experiencing a shock in the first period. Of this group, 9 percent experience at least two shocks in subsequent periods (35–44) and 40 percent experience a third shock in either the third (35–39) or fourth (40–44) periods.

Of tax filers not observed experiencing an earnings shock between 25 and 29, 53 percent are never observed experiencing an earnings shock. Approximately 34 percent experience one earnings shock and more than 10 percent experience two earnings shocks between the ages of 30 and 44.

Across the entire sample, only 39 percent of those we observe between 25 and 44 experience no earnings shocks. Thus, most of our sample experience at least one earnings shock. One quarter of the sample are observed experiencing two or more shocks. These statistics are quite striking as they convey that most Australians experience at least one year of income instability. For some Australians the fall in income may not imply a substantial change in lifestyle as they can draw down their wealth. Many other Australians, however, fall into financial hardship as a result of an earnings shock.

18    Note that we restrict shocks to those at least two years apart as we assume that substantial falls in earnings in two consecutive years are one long-lasting shock.

**Figure 4.3. Experiencing shocks over the life cycle—Males**



**Age Group**

25-29 years old     30-34 years old     35-39 years old     40-44 years old

**No shock**

**73%** n=72,510

**76%** n=55,469

**82%** n=45,569

**85%** n=38,708

**15%** n=6,861

**18%** n=9,900

**77%** n=7,603

**23%** n=2,297

**24%** n=17,041

**76%** n=12,978

**77%** n=9,951

**23%** n=3,027

**24%** n=4,063

**72%** n=2,921

**28%** n=1,142

**Shock**

**27%** n=26,824

**73%** n=19,617

**75%** n=14,677

**79%** n=11,530

**21%** n=3,147

**25%** n=4,940

**72%** n=3,558

**28%** n=1,382

**27%** n=7,207

**71%** n=5,151

**72%** n=3,690

**28%** n=1,461

**29%** n=2,056

**68%** n=1,398

**32%** n=658

Legend:
- Individuals moving into shock
- Individuals moving out of shock
- Individuals staying in shock
- Individuals staying outside of shock

*Notes:* The tree diagram represents the sequence of shock / non-shock events experienced by males over the life-cycle. To construct the tree diagram we take all males with reported earnings and total income in all years from age 25 to age 44. The 20 years of data are split into 4 periods of 5 years each to represent different stages of life (age 25 to 29, age 30 to 34, age 35 to 39, age 40 to 44). In each stage of life the event "shock" occurs if a male experiences one or more shocks. A shock is defined as a drop of both earnings and total income of more than 40 percent based on the minimum value of the two previous years. 'n' denotes the number of individuals.

## 4.3

# Recovery from earnings shocks



How long does it take to recover from an earnings shock? Does everyone recover? For the purposes of recovery, we classify an individual as having recovered if they report earnings that are equal to or exceed the minimum of earnings observed in the two years prior to the earnings shock. As our earnings are captured in real terms, returning to pre-shock earnings is roughly representative of what we would expect one to earn if there had been no shock and we controlled for inflation. We do not, however, try to capture how earnings might increase for factors such as increased experience or through promotion.

In Figure 4.4, we depict the proportion of those identified as experiencing a shock who have 'recovered' within three years based on the year the shock is observed. Over time, the 3-year recovery rate varies from 37 percent to as much as 43 percent. For the period reflecting the productivity boom (1993 to 2001), approximately 38 to 39 percent recover within three years. During the resources boom (2002 to 2007), the recovery rate increases to as much as 43 percent. During the remaining two periods, except for those most affected during the primary year of the GFC, 3-year recovery rates fall. For the last period where we can observe at least three years of

recovery, 2014, the recovery rate fell to 36 percent.

In Table 4.1, we report by economic period the 3 and 5-year recovery rates as well as the average number of shocks per tax filer within each period. We do not report the 5-year rate for the last period because we can only observe five years post-earnings shock only for 2012. For the earlier periods, the average number of shocks experienced by those observed with a shock is slightly more than one shock per economic period during the productivity and resources boom years. The average number of shocks during the GFC and the 'dog days', drops to closer to one per period.[19] As we depicted in the figure, recovery within three years has fallen in the most recent period. The 5-year recovery rate is near 57 percent during the boom periods, but closer to 51 percent during the period of the GFC.

In future chapters we will explore models that predict the time it takes to recover from a shock by starting earnings level (Chapter 6), by age group (Chapter 7), by geography (Chapter 8), and by having a spouse, childbirth, education and health (Chapter 9). The above figures, however, demonstrate that recovery from an earnings shock is not rapid for most earners.

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19    The GFC and the 'dog days' periods are relatively shorter than the productivity and resources boom periods.

**Figure 4.4. Recoveries from an earnings shock—Males**
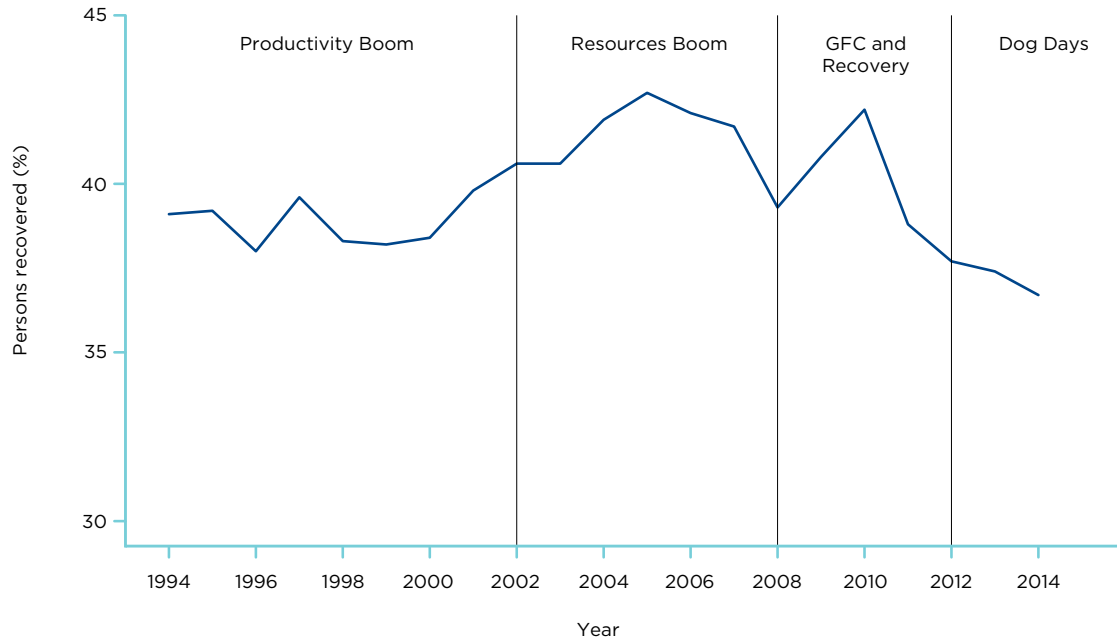


*Notes:* Numerator is number of recoveries within 3 years for males who experienced an earnings shock in a given year. Denominator is number of males experiencing shock.

**Table 4.1. Recoveries from an earnings shock—Males**

|  | Productivity boom | Resources boom | GFC and recovery | Dog Days |
|---|---|---|---|---|
| Number of tax filers with an earnings shock | 160,078 | 126,210 | 84,419 | 67,485 |
| Average number of shocks per tax filer with at least one shock | 1.15 | 1.09 | 1.03 | 1.03 |
| Share recovering within 3 years | 39.2% | 41.3% | 40.0% | 37.2% |
| Share recovering within 5 years | 50.1% | 52.3% | 49.7% | |

*Notes:* This table shows the number of males experiencing earnings shocks and recoveries. 'Productivity boom' refers to years 1993—2001. 'Resources boom' refers to years 2002—2007. 'GFC and recovery' refers to years 2008—2011, and 'Dog Days' refers to years 2012—2014.

## 4.4

## Summary



Reporting a drop in labour earnings of more than 40 percent can reflect a voluntary decision made by the tax filer or a change in employment circumstances. Our analysis, however, has focused on the key ages most adults would be expected to be employed, from 25 to 54. In any given year, we have observed that between 6 and 8 percent of male tax filers report a drop in earnings that exceeds 40 percent of previously reported earnings. Moreover, of those that experience a significant drop in earnings, most do not report earnings that have recovered to previous levels within a 3-year time frame.

We have also documented most males experience at least one earnings shock between the ages of 25 and 44. As income instability affects most Australians, this chapter demonstrates the importance of understanding what explains these shocks and exploring what is needed to promote recovery from these shocks. In future chapters, we will explore differences in shocks and recoveries across age groups, income groups, community poverty rates and along other determinants such as family composition, education and disability.

5.
Earnings shocks
and recoveries,
females

# 5.1

# Introduction



**Key findings**

- The share of females entering earnings shocks is at least 2 percent higher than the percentage for males: it varies from 7 percent to 10 percent throughout the period. Similar to males, the percentage of females experiencing a drop of 100 percent of their income also declines from 1994 to 2017.

- More females than males experience at least one earnings shock: 77 percent of females between the ages of 25 and 44 will experience an earnings shock, but fewer females experience a repeated earnings shock: 17 percent.

- Recovery from earnings shocks takes longer for females than for males. The 3-year recovery rate fluctuates between 33 and 36 percent.

In Chapter 4 we demonstrated that most males experience at least one earnings shock during their working life and that recovery from these shocks is typically slow for the majority. In this chapter we explore earnings and shocks for females. We explore whether the findings for males are similar for females. Given earnings shocks may be involuntary (e.g., losing a job) or voluntary (e.g., cutting back on hours worked, switching careers), we might expect the reasons for observing an earnings shock will vary across genders. Moreover, given differences in occupational choices and/or differences in the treatment of male and female workers, shocks and recovery from shocks differ based on these reasons as well.

## 5.2

# Experiencing an earnings shock

We begin by depicting the annual earnings shock rate for females in Figure 5.1. There are two striking differences between females and males. First, the earnings shock rates for females are much higher than those reported for males. To highlight the differences, we have included the male earnings shock rates in Figure 5.1. While the trend for males and females is similar, in most years, the rate for females is higher than for males by approximately 2 percentage points. Near the end of the period, however, the gap between females and males narrows to just less than 1 percentage point.

The second striking difference is the gap between the rates of female earnings shocks and the female unemployment rate. As discussed previously, there is no reason to expect these two rates to be equal or to follow similar trends. The differences as depicted in Figure 5.1, however, highlight the importance of utilising more than an unemployment rate to understand disadvantage.

**Figure 5.1. Females experiencing an earnings shock**



*Legend:*
- Female unemployment rate
- Percent of females entering shock
- Percent of males entering shock
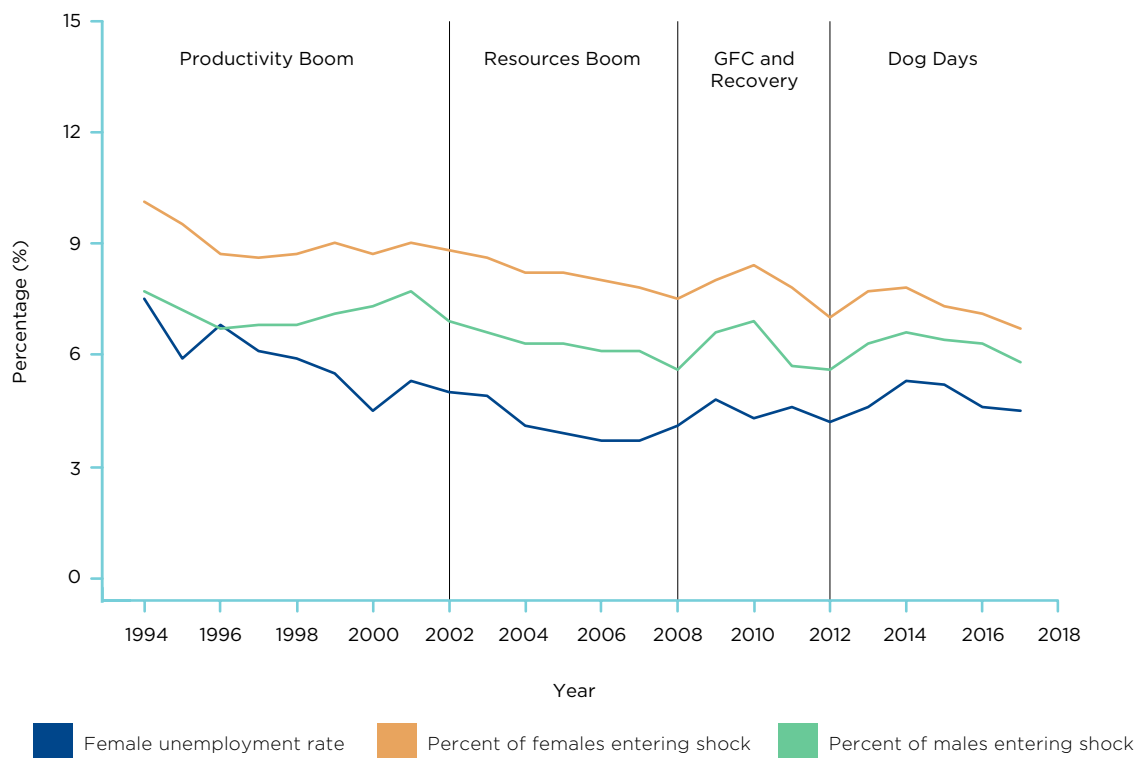
To what extent are the earnings shocks experienced by females closer to a change in earnings of 40 percent or closer to a change of 100 percent? In Figure 5.2, we depict the shocks in three groups: a complete or 100 percent shock; a shock that equals a drop of 60 to 100 percent in pre-shock earnings; and a shock that ranges from 40 to 60 percent of pre-shock earnings. Except for the first two years, the earnings shock for most females ranges between 60 and 100 percent.

In more recent years, the second largest group is represented by females with an earnings shock that ranges between 40 and 60 percent. While we might expect more females to voluntarily reduce their labour earnings by 100 percent, especially those who are in their childbearing years, this does not seem to be the case. This will be investigated further in Chapter 7.

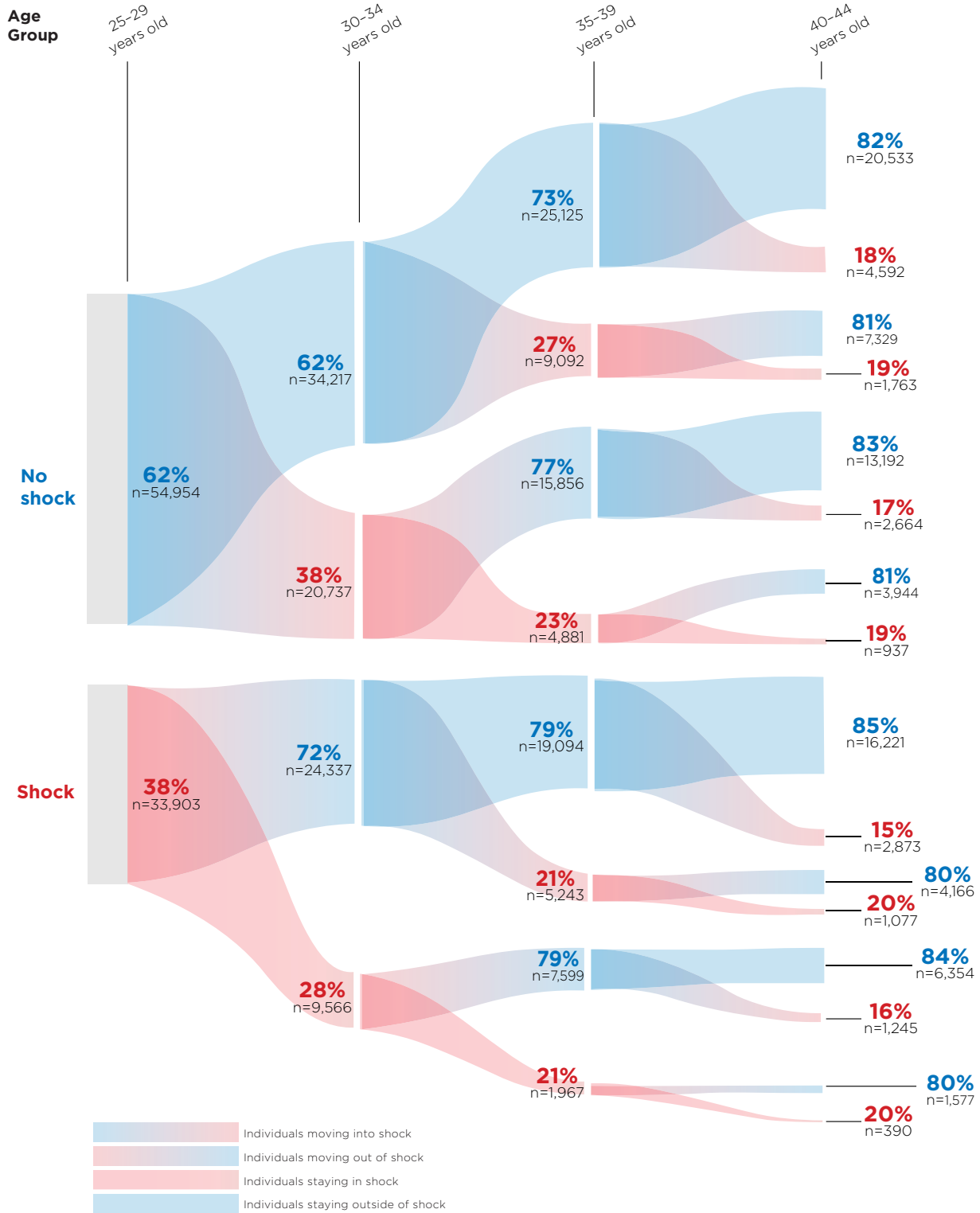## Figure 5.2. Depth of earnings shocks—Females
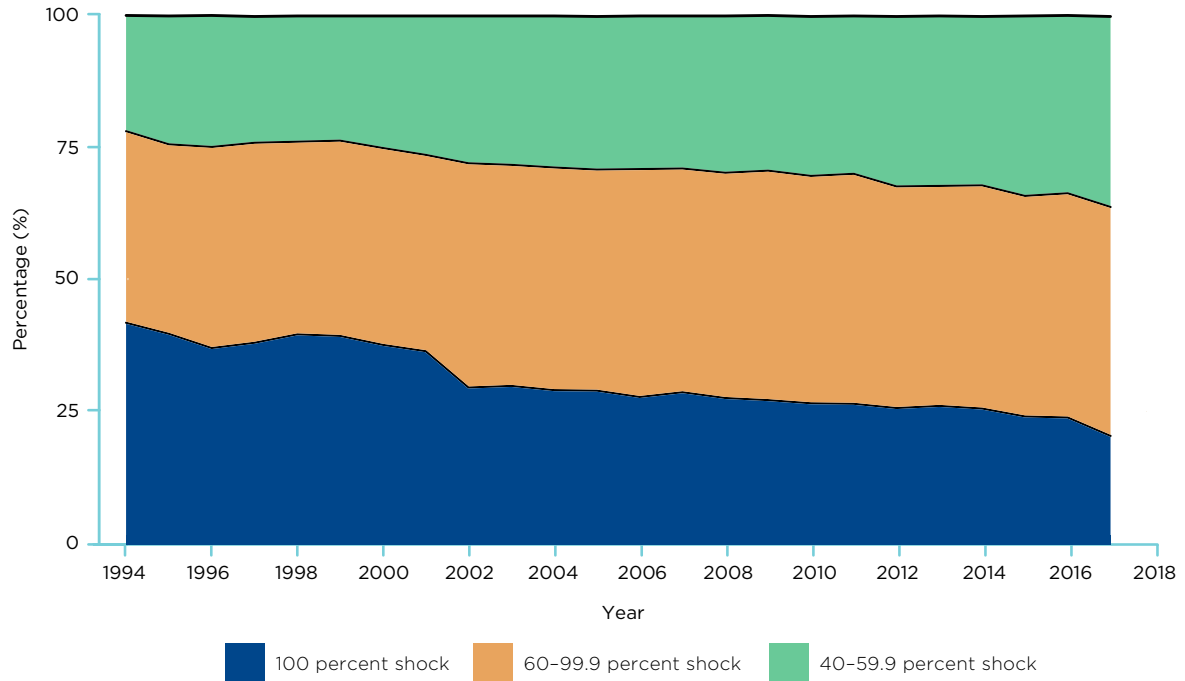


*Notes:* The share is based on a denominator that equals the number of females observed with an earnings shock of 40 percent or greater. The numerator is equal to the number of females in shock based on the magnitude of the shock observed.

For Figure 5.3, we depict female tax filers who we can follow from ages 25 to 44 to explore in greater depth the likelihood of experiencing one or more earnings shocks across four 5-year periods (25–29, 30–34, 35–39, 40–44). Starting first with the youngest ages (25 to 29), we observe 38 percent of the tax filers as experiencing an earnings shock. This is 11 percentage points greater than is observed for the male tax filers. Of those who experience an earnings shock between the age of 25 and 29, however, 48 percent never experience an earnings shock as they age. Moreover, only 1 percent of those with a shock in the first period are observed experiencing a shock in the remaining three periods. These rates suggest that, conditioning on a shock in the first period, females do not experience as many shocks as males.

Of the 62 percent of females who do not experience an earnings shock in the first period, 37 percent also do not experience a shock in future periods. This is a lower share than is observed for males. Across most periods, there is a higher rate of females experiencing an earnings shock than observed for males.

Across the females tracked for Figure 5.3, 23 percent never experience an earnings shock and 47 percent experience an earnings shock in only one period. Thus, most females are observed with at least one earnings shock (77 percent). But more experience only one shock versus two or more shocks.

**Figure 5.3. Experiencing shocks over the life cycle—Females**



Age Group

25-29 years old | 30-34 years old | 35-39 years old | 40-44 years old

**No shock**
62% n=54,954

**Shock**
38% n=33,903

62% n=34,217
38% n=20,737

72% n=24,337
28% n=9,566

73% n=25,125
27% n=9,092

77% n=15,856
23% n=4,881

79% n=19,094
21% n=5,243

79% n=7,599
21% n=1,967

82% n=20,533
18% n=4,592

81% n=7,329
19% n=1,763

83% n=13,192
17% n=2,664

81% n=3,944
19% n=937

85% n=16,221
15% n=2,873

80% n=4,166
20% n=1,077

84% n=6,354
16% n=1,245

80% n=1,577
20% n=390

Individuals moving into shock
Individuals moving out of shock
Individuals staying in shock
Individuals staying outside of shock

*Notes:* The tree diagram represents the sequence of shock / non-shock events experienced by females over the life-cycle. To construct the tree diagram we take all females with reported earnings and total income in all years from age 25 to age 44. The 20 years of data are split into 4 periods of 5 years to represent different stages of life (age 25 to 29, age 30 to 34, age 35 to 39, age 40 to 44). In each stage of life the event "shock" occurs if a female experiences one or more shocks. A shock is defined as a drop of both earnings and total income of more than 40 percent based on the minimum value of the two previous years. 'n' denotes the number of individuals.

## 5.3

# Recovery from earnings shocks

In the previous section, we illustrated that a higher rate of females than males are observed experiencing an earnings shock. Do female recovery rates also differ from male recovery rates? The simple answer is yes. In Figure 5.4 we depict the 3-year recovery rate for females. We also depict the male recovery rate to use as a comparator. In the 1990s and before the 2001 recession, the recovery rate hovered around 33 percent. For those who experienced an earnings shock in 2001, a recession year, the recovery rate dipped to 31 percent. When comparing this rate to males, females experience lower recovery rates, by more than 6 percentage points.

Throughout the 2000s there has been a relative increase in the recovery rate. There was a dip in 2008 and 2012 but by 2014, the recovery rate increased to 36 percent for females. Compared to males, however, the 5-year recovery rates are lower for the three periods.

**Figure 5.4. Recoveries from an earnings shock—Females**
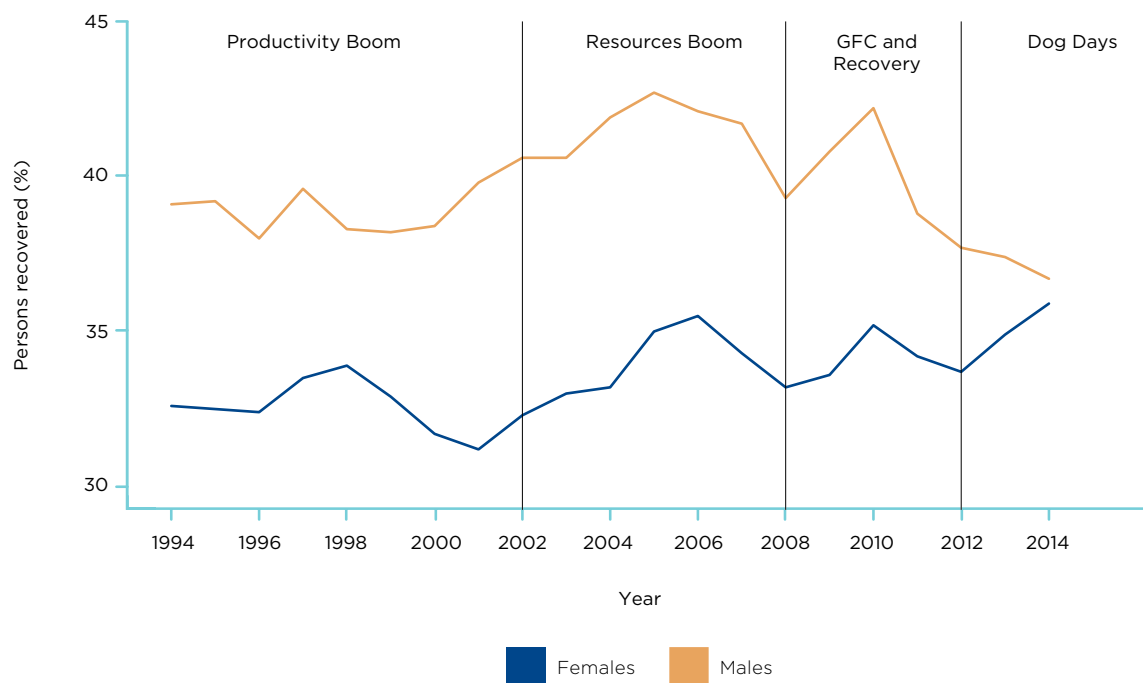


*Notes:* Numerator is number of recoveries within 3 years for females who experienced an earnings shock in a given year. Denominator is number of females experiencing shock.

**Table 5.1: Recoveries from an earnings shock—Females**

|  | Productivity boom | Resources boom | GFC and recovery | Dog Days |
|---|---|---|---|---|
| Number of tax filers with an earnings shock | 173,272 | 123,113 | 88,656 | 67,576 |
| Average number of shocks per tax filer with at least one shock | 1.14 | 1.10 | 1.03 | 1.03 |
| Share recovering within 3 years | 32.7% | 33.8% | 34.2% | 34.9% |
| Share recovering within 5 years | 42.4% | 44.0% | 44.1% |  |

*Notes:* This table shows the number of females experiencing earnings shocks and recoveries. 'Productivity boom' refers to years 1993—2001. 'Resources boom' refers to years 2002—2007. 'GFC and recovery' refers to years 2008—2011, and 'Dog Days' refers to years 2012—2014.

## 5.4

## Summary
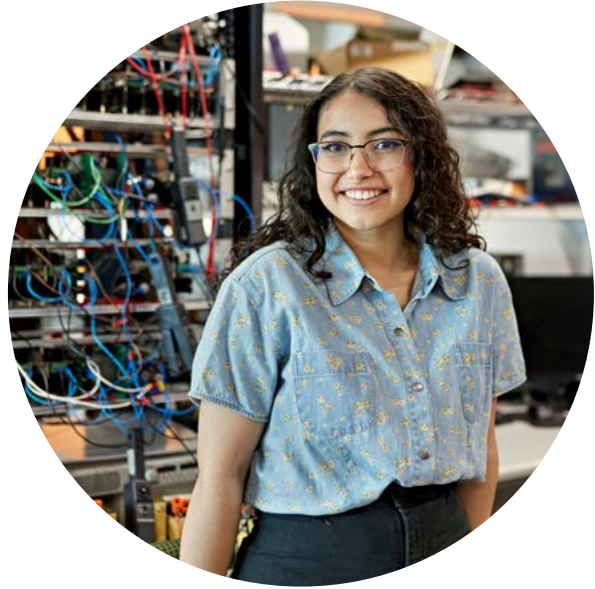
Females are more likely to experience an earnings shock and more likely to experience a longer recovery period than males. The potential silver lining is that females are less likely to experience multiple earnings shocks. Moreover, in recent years, the 3-year recovery rates have been improving.

Higher earnings shocks and lower recovery rates may be due to voluntary decisions, such as long maternity leave or attitudes tied to pursuing or acting on employment opportunities. Or it may also point to potential differences in opportunities to minimise experiencing a shock in the first place and/or support for recovery. We will explore these differences further in the upcoming chapters and will provide a more comprehensive discussion of gender differences.

# 6.
# Earnings shocks across income groups
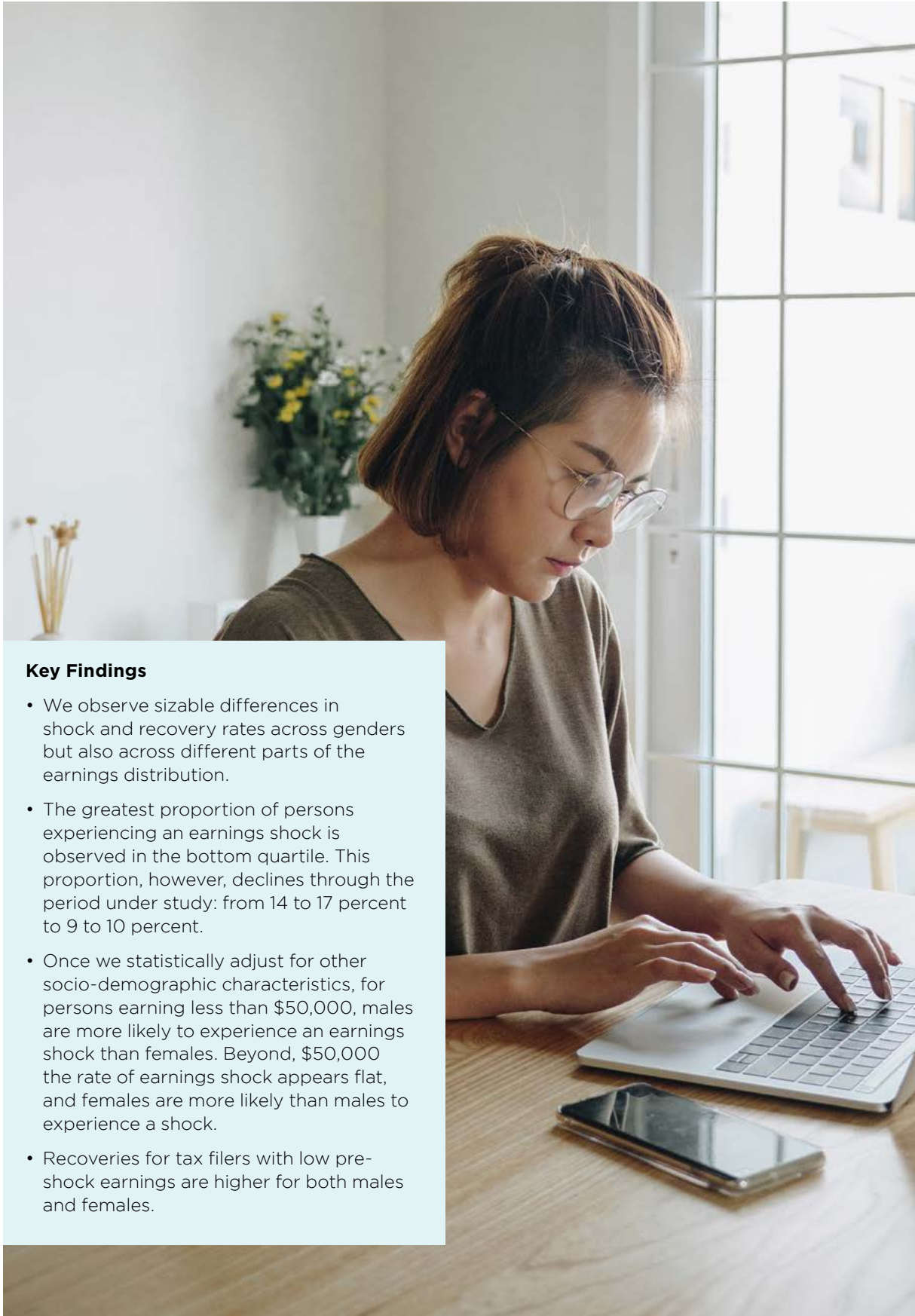
**Key Findings**

- We observe sizable differences in shock and recovery rates across genders but also across different parts of the earnings distribution.

- The greatest proportion of persons experiencing an earnings shock is observed in the bottom quartile. This proportion, however, declines through the period under study: from 14 to 17 percent to 9 to 10 percent.

- Once we statistically adjust for other socio-demographic characteristics, for persons earning less than $50,000, males are more likely to experience an earnings shock than females. Beyond, $50,000 the rate of earnings shock appears flat, and females are more likely than males to experience a shock.

- Recoveries for tax filers with low pre-shock earnings are higher for both males and females.

# 6.1

# Introduction



In Chapters 4 and 5 we documented earnings shocks and recovery rates for males and females, respectively, regardless of age or pre-shock earnings. In this chapter, we explore shocks and recoveries after grouping the tax filers based on their pre-shock earnings.

Pre-shock socio-economic status may have a sizeable influence over the distribution of shocks and recoveries, as well as inform the policy implications for identifying ways to minimise experiencing a shock and/or addressing the repercussions from a shock. If shocks tend to be concentrated among low-income earners, the policies proposed to deal with these events may be different from those if most of the shocks happen among individuals earning higher incomes. To the extent that we view income shocks as undesirable events and aim to propose better ways to both reduce their incidence and facilitate recovery, understanding who is most affected and their length of recovery is crucial.

We find large differences in shocks and recoveries by earnings quartile for each gender. The group with the highest shock rates is males in the bottom 25 percent of the earnings distribution, followed by females in the bottom 25 percent of the earnings distribution. The correlation between earnings and susceptibility to shocks remains high after we control for age, macroeconomic period and other factors. Recovery from these shocks is more rapid for people of lower earnings as well. Because our definition of recovery relies on achieving pre-shock earnings, low-earners recover at lower levels of earnings than high-earners.

# 6.2

# Shocks based on initial earnings quartile

To explore earnings shocks across the earnings distribution, for each year under study, tax filers are grouped into quartiles based on the minimum earnings received in the previous two years before a shock is measured. Given the earnings distribution, even after adjusting for inflation, the cut-offs for each quartile will vary over time. The approximate cut-off is as follows:

- bottom-earners: < $31,500;

- middle-low earners: $31,500 to $50,000;

- middle-high earners: $50,000 to $73,000;

- top earners: > $73,000.

In Table 6.1, we report the distribution by gender across the four quartiles. During the period under study, males are more likely to report earnings in the top quartiles and females are more likely to report earnings in the lower quartiles. The differences in the distribution of male and female earners are substantial. In the most recent period, 34 percent of males and only 15 percent of females were in the top quartile. The distribution is reversed at the lowest quartile: 34 percent of females and 18 percent of males were in the bottom quartile.

In Figures 6.1A to 6.1D we depict the share of tax filers who experience an earnings shock in the given year. For each figure, we separate the shock rates by gender. Across the four quartiles, the rates for any given year are the highest for the bottom earners, those with the lowest earnings (Figure 6.1A). The rates for males and females follow similar trends. The rates, however, are higher for males than for females. In the mid-1990s, the earnings shock rate for males ranged between 15 and 16 percent. The rate for this same period for females, was approximately 12 percent. For both genders, the rate of shock falls over time, ending at approximately 10 percent for males and 9 percent for females by 2017. During the period of the GFC, the shock rate jumped more for males than for females.

The second highest shock rates are for those tax filers whose earnings fall into the second quartile. Over the period of study, the rates for males and females are very similar. In the mid-1990s the rates are approximately 10 percent and by 2017, the rates fell by approximately three percentage points. Like those who fall into the first quartile of earnings, males experienced higher rates of shock than females around the period of the GFC.

## Table 6.1. Earnings distribution, by gender and period (%)

|  | Bottom earners | Low-Middle earners | Middle-High earners | Top earners |
|---|---|---|---|---|
| **Males** | | | | |
| Productivity boom | 16.8 | 21.1 | 27.7 | 34.5 |
| Resources boom | 17.7 | 21.5 | 27.2 | 33.6 |
| GFC and recovery | 17.6 | 21.5 | 27.2 | 33.8 |
| Dog Days | 17.7 | 21.4 | 27.0 | 33.9 |
| **Females** | | | | |
| Productivity boom | 35.9 | 30.2 | 21.5 | 12.5 |
| Resources boom | 34.0 | 29.4 | 22.3 | 14.3 |
| GFC and recovery | 34.0 | 29.3 | 22.4 | 14.3 |
| Dog Days | 33.6 | 29.3 | 22.6 | 14.5 |

*Notes:* The table shows the share of males and females by earnings quartile and period. Quartlies are calculated seperately for every year for males and females combined. 'Productivity boom' refers to years 1993-2001. 'Resources boom' refers to years 2002—2007. 'GFC and recovery' refers to years 2008—2011, and 'Dog Days' refers to years 2012—2014.

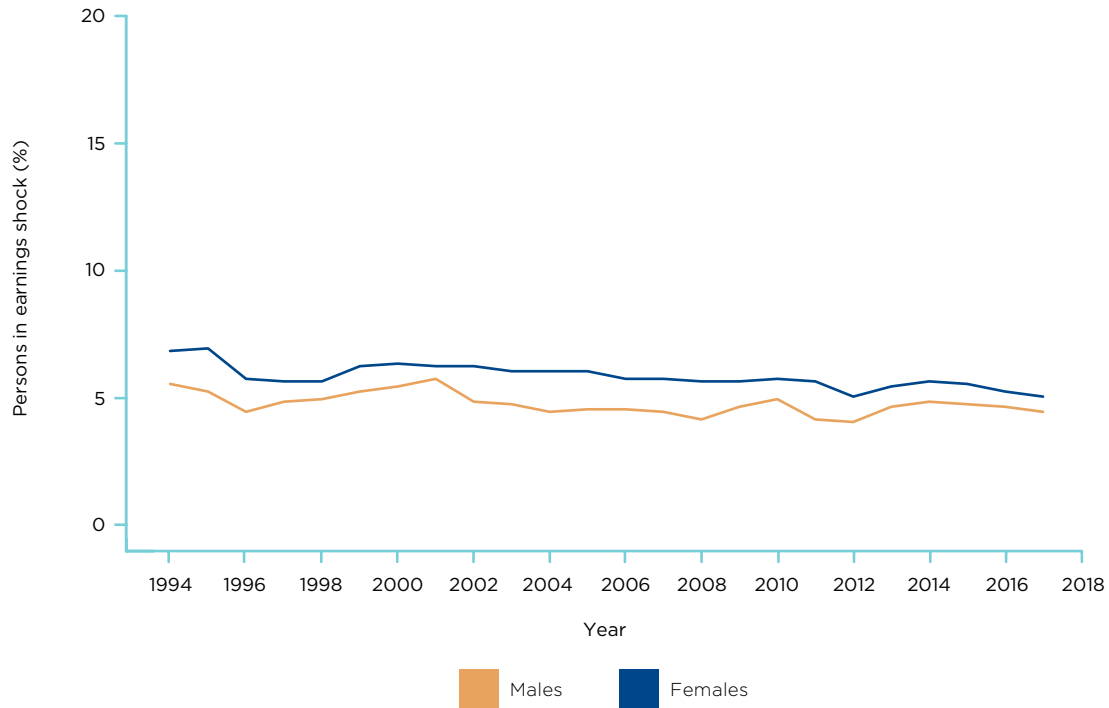## Figure 6.1A. Persons experiencing an earnings shock, by gender—Bottom earners
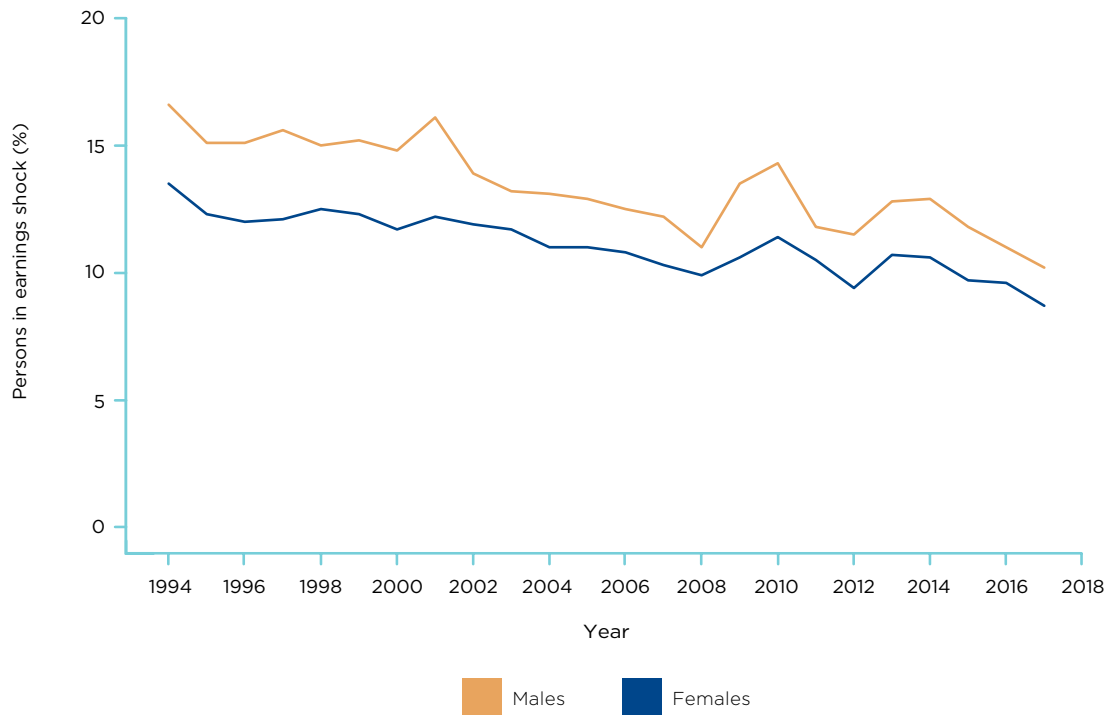


*Notes:* Numerator is number of persons entering an earnings shock, denominator is number of persons who are at risk of experiencing shock.

**Figure 6.1B. Persons experiencing an earnings shock, by gender—Low-Middle earners**
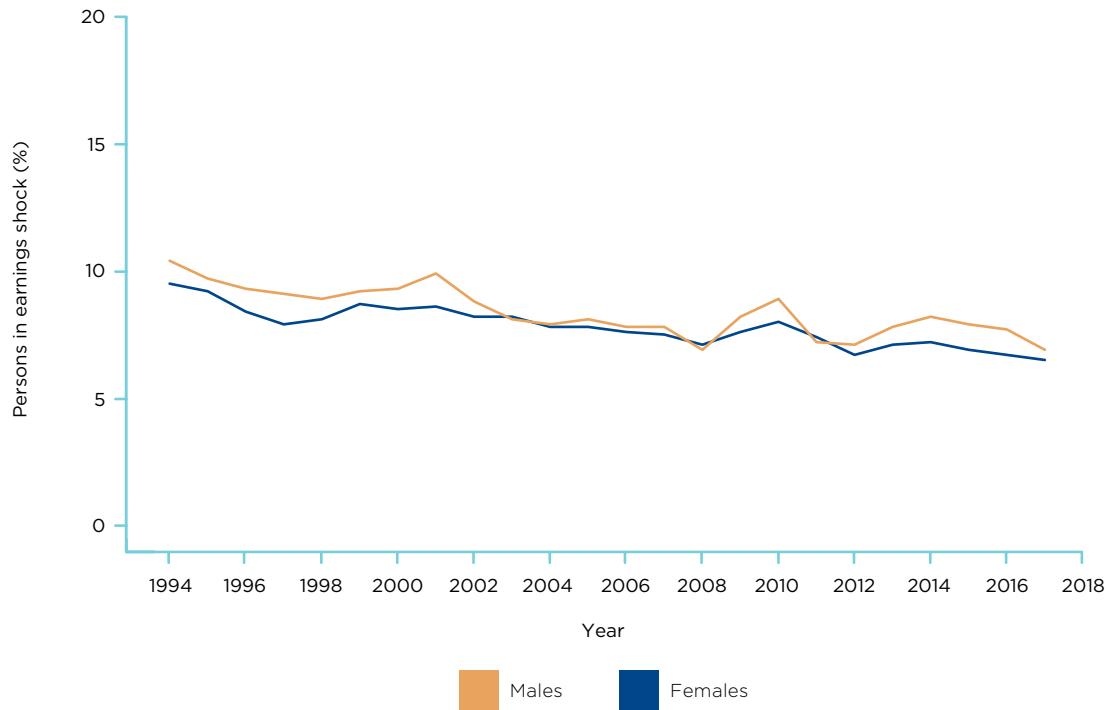


*Notes:* Numerator is the number of persons entering an earnings shock, denominator is number of persons who are at risk of experiencing shock.

For tax filers who fall into the third quartile of earnings, the rates also fall between the beginning and the end of the sample period by approximately two percentage points for females and one percentage point for males. Unlike the bottom two quartiles, however, females are observed experiencing higher shock rates than males. Unlike males, however, there are no discernible peaks around the period of the GFC for females.

**Figure 6.1C. Persons experiencing an earnings shock, by gender—Middle-High earners**



*Notes:* Numerator is the number of persons entering an earnings shock, denominator is number of persons who are at risk of experiencing shock.

Finally, for the fourth quartile of earnings, the female shock rate is higher than the male shock rate, but the overall shock rates are lower for both genders relative to the other three quartiles. For this quartile, both males and females have higher shock rates around the period of the GFC. Unlike the first two quartiles, however, the overall trend for the shock rates is relatively flat for females and the rates rise for males in the last part of the sample period.

**Figure 6.1D. Persons experiencing an earnings shock, by gender—Top earners**
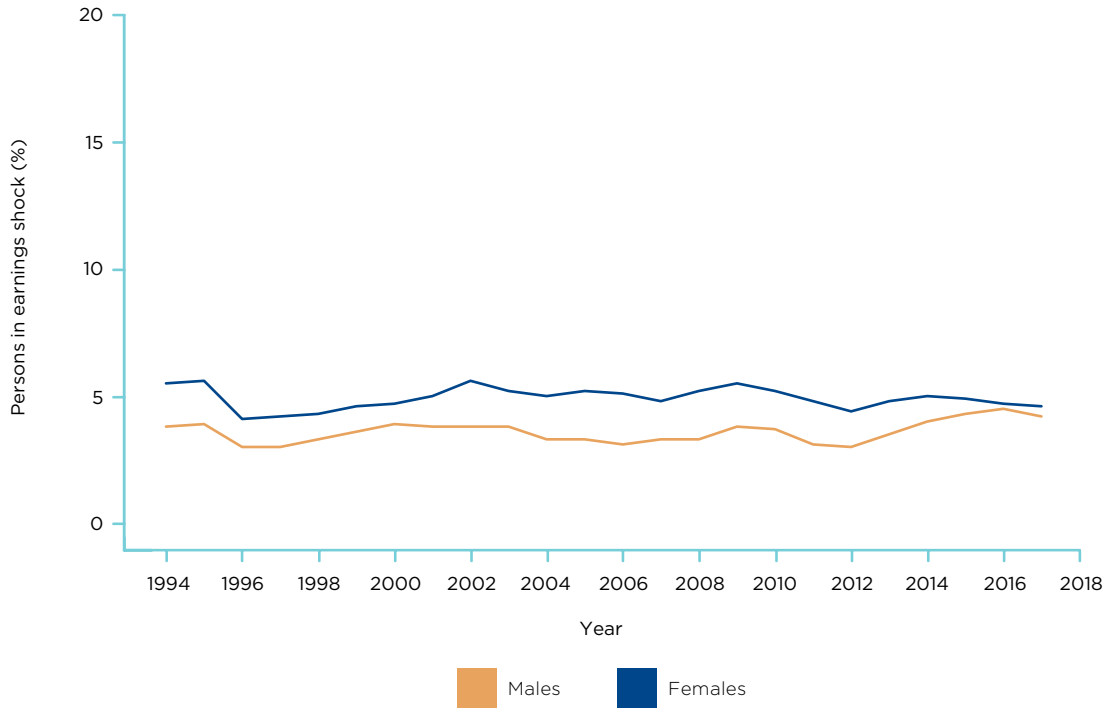


*Notes:* Numerator is the number of persons entering an earnings shock, denominator is number of persons who are at risk of experiencing shock.

While Figure 6.1 focuses on depicting raw statistics, in Figure 6.2 we show the predicted probability of experiencing an earnings shock. To create this prediction, we run a regression that controls for the following characteristics of the tax filer—pre-shock earnings, age, geographic location of residence, state level unemployment rates and indicator variables—to capture the four macroeconomics periods during the period under study.

From this analysis, we can then predict the likelihood of experiencing an earnings shock. Focusing on those who earn between $10,000 and $250,000, Figure 6.2 provides further evidence that there is a higher probability of experiencing an earnings shock if one's pre-shock earnings is at the bottom end of the earnings distribution. Moreover, males have a higher probability of experiencing an earnings shock for those with earnings less than $50,000. Females are more likely to experience an earnings shock for higher incomes.

**Figure 6.2. Predicted probability of experiencing an earnings shock, by gender**
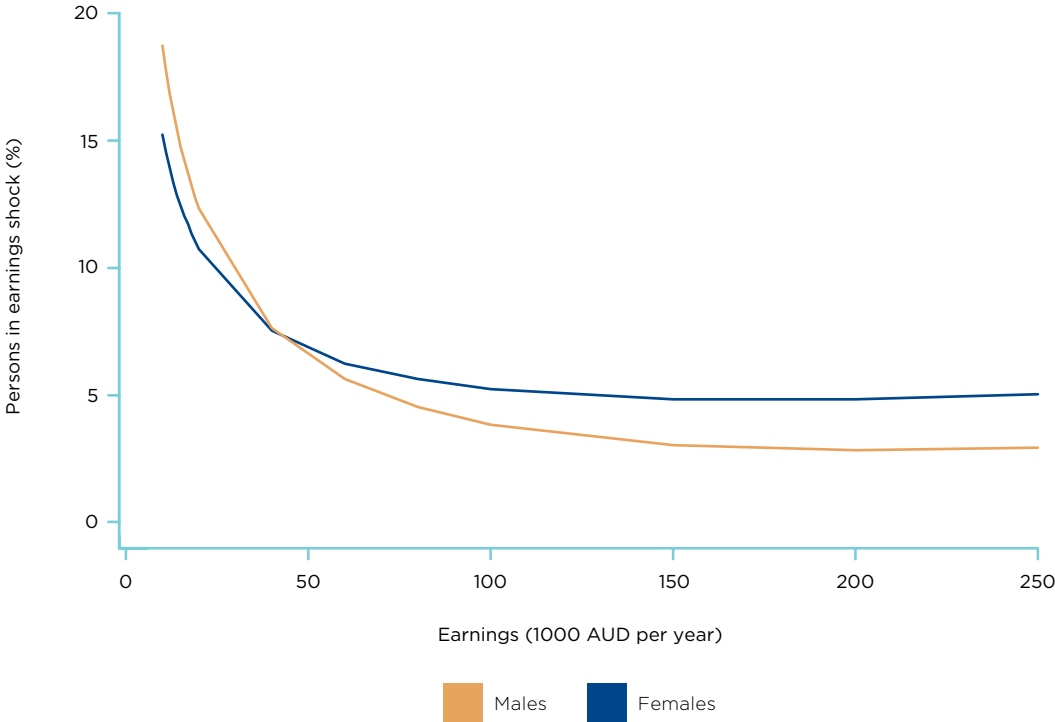


Notes: The predicted probabilities are calculated using a regression with earnings, earnings squared, age, age squared, sa4-level unemployment rate, positive and negative changes in unemployment rate and indicator variables for macroeconomic periods.

## 6.3

# Recovery from earnings shocks



In the last section, we demonstrated that rates of earnings shocks vary across the four income quartiles and that within each quartile the shock rates are the highest for those in the bottom two quartiles. These rates, for the most part, also vary by gender. Do we observe the same patterns of recovery? To explore this question, Figures 6.3A to Figures 6.3D depict the three-year recovery rates over time for each of the four quartiles. Focusing initially on the first two quartiles, Figures 6.3A and 6.3B, across all years, show that males recover at higher rates than females. Over time, the recovery rates are relatively flat for males, with approximately 50 percent recovering within three years for those with pre-shock earnings in the lowest quartile and approximately 40 percent recovering within three years for those with pre-shock earnings that fall into the second quartile. For females, there is a slight upward trend from 40 percent to 44 percent in the bottom quartile and a recovery rate of closer to 30 percent for those with earnings falling into the second quartile.

**Figure 6.3A. Recoveries from an earnings shock, by gender—Bottom earners**
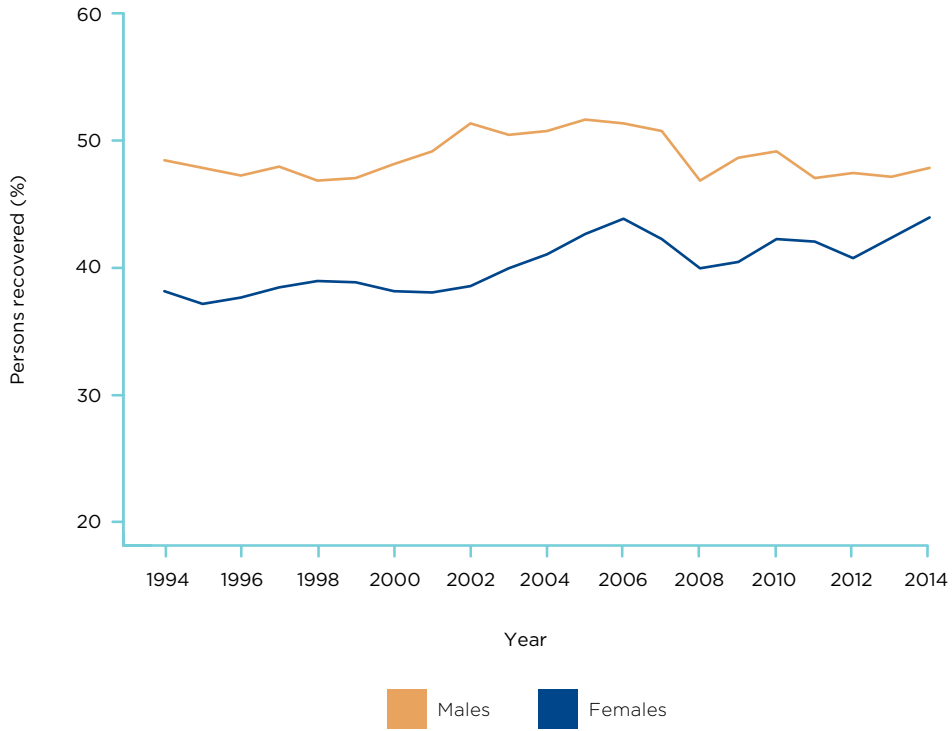


*Notes:* Numerator is number of recoveries within 3 years for persons who experienced an earnings shock in a given year. Denominator is number of persons experiencing shock.

**Figure 6.3B. Recoveries from an earnings shock, by gender—Low-Middle earners**
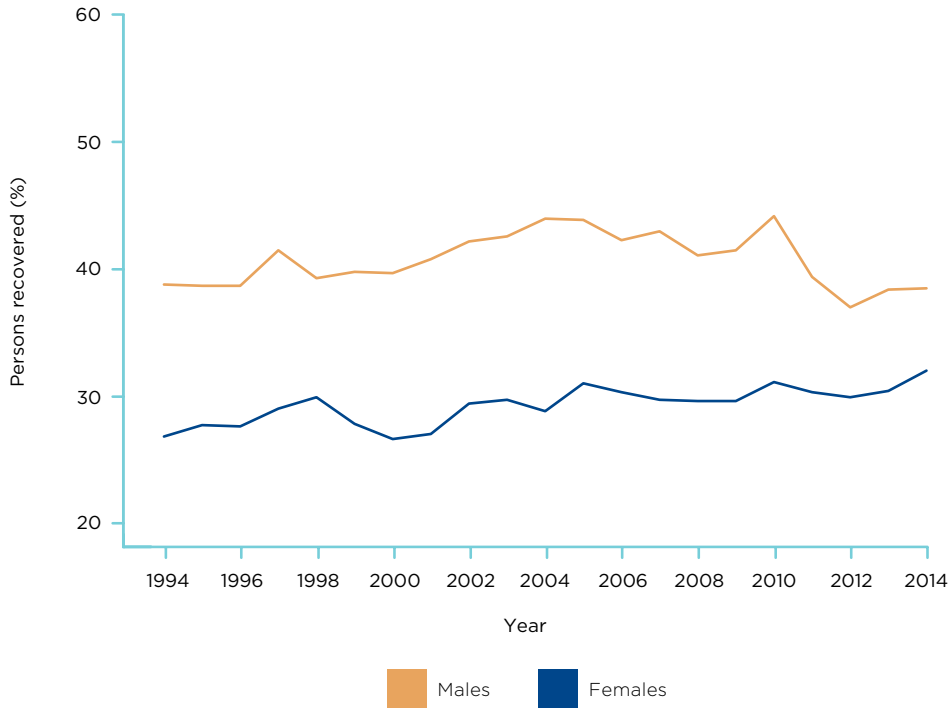


*Notes:* Numerator is number of recoveries within 3 years for persons who experienced an earnings shock in a given year. Denominator is number of persons experiencing shock.

**Figure 6.3C. Recoveries from an earnings shock, by gender—Middle-High earners**



*Notes:* Numerator is number of recoveries within 3 years for persons who experienced an earnings shock in a given year. Denominator is number of persons experiencing shock.

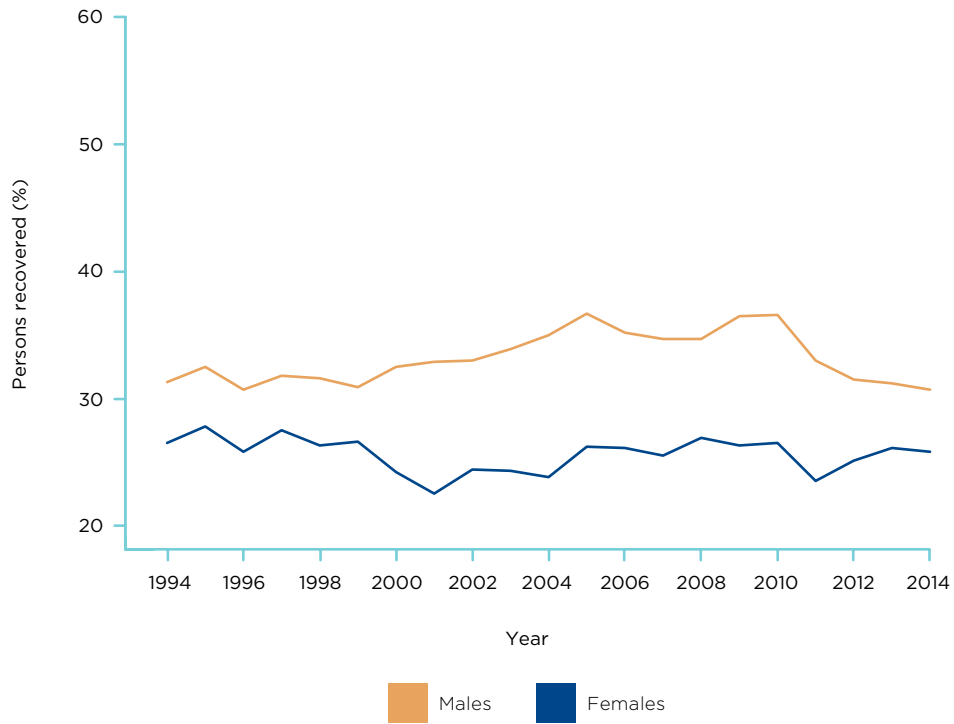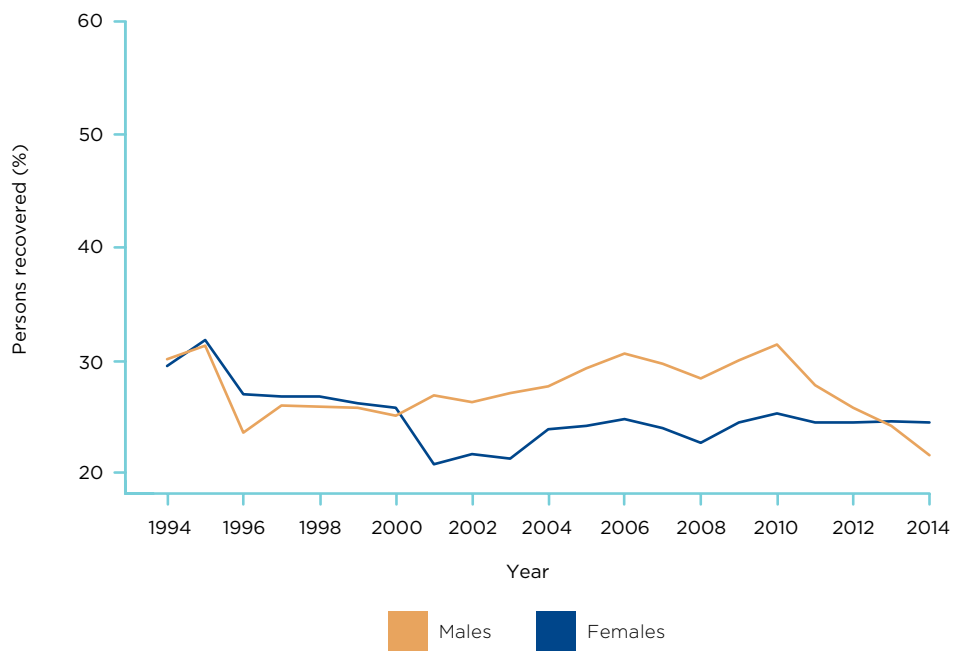**Figure 6.3D. Recoveries from an earnings shock, by gender—Top earners**



*Notes:* Numerator is number of recoveries within 3 years for persons who experienced an earnings shock in a given year. Denominator is number of persons experiencing shock.

For tax filers whose pre-shock earnings fall into the third and fourth quartiles, the three-year recovery rates are much lower with males having higher rates than females for most years. For males, however, the recovery rate in the years near the end of the sample period have been falling, not improving.

A challenge when studying recovery rates by income quartile is that at higher incomes it may be much more challenging to recover fully given the absolute drop in earnings is greater the higher the earnings. To investigate in more depth the proximity to recovery for those who experience an earnings shock, Figures 6.4A and 6.4B depict the flow from shock to recovery for 2003 and 2012, respectively, for males. For each figure there are three panels. The left panel captures the pre-shock earnings for those who experience a shock. We grouped the pre-shock earnings into four categories. The vertical distance for each category equates to the approximate distribution of the tax filers under study (those that are classified as experiencing an earnings shock).

The bottom two categories reflect those at the bottom part of the earnings distribution, those who likely fall near or below what might be considered living in poverty. These tax filers represent most tax filers who experience an earnings shock. In 2003, tax filers with pre-shock earnings above $75,000 represent the lowest part of the distribution of those with an earnings shock. In contrast, in 2012, those with pre-shock earnings greater than $50,000 represent a greater share of those observed with a shock. As we control for inflation, this change between 2003 and 2012 suggests that we should be considering the roles of such shocks across the earnings distribution.

The middle panel captures the extent of the earnings shock into three categories: a moderate shock (40 to 59.9 percent); a big shock (60 to 99.9 percent); and a complete or severe shock (100 percent). Across all income groups, tax filers are observed experiencing different levels of shocks. The patterns of the distribution of tax filers across the three shock categories is approximately the same for 2003 and 2012. Those with lower pre-shock earnings are observed with bigger shocks. Those with higher earnings are more likely to experience a moderate or big shock.

The right panel captures the earnings observed four years after the earnings shock. We grouped the earnings into five categories: those with no labour earnings; those with earnings that are up to 50 percent (less than half) of pre-shock earnings; those with earnings that range between 50 and 75 percent of pre-shock earnings; those with earnings that range between 75 and 99 percent of pre-shock earnings; and those who have returned or exceeded pre-shock earnings. No strong story emerges for each of the four groups of tax filers based on pre-shock earnings. Similarly, there is no strong story based on the depth of the shock (middle panel) in terms of level of recoveries. Across 2003 and 2012, however, it appears that a higher proportion of those who experience an earnings shock are observed with earnings greater than 75 percent of pre-shock earnings.

### Figure 6.4A. Experiencing an earnings shock, 2003–2005—Males
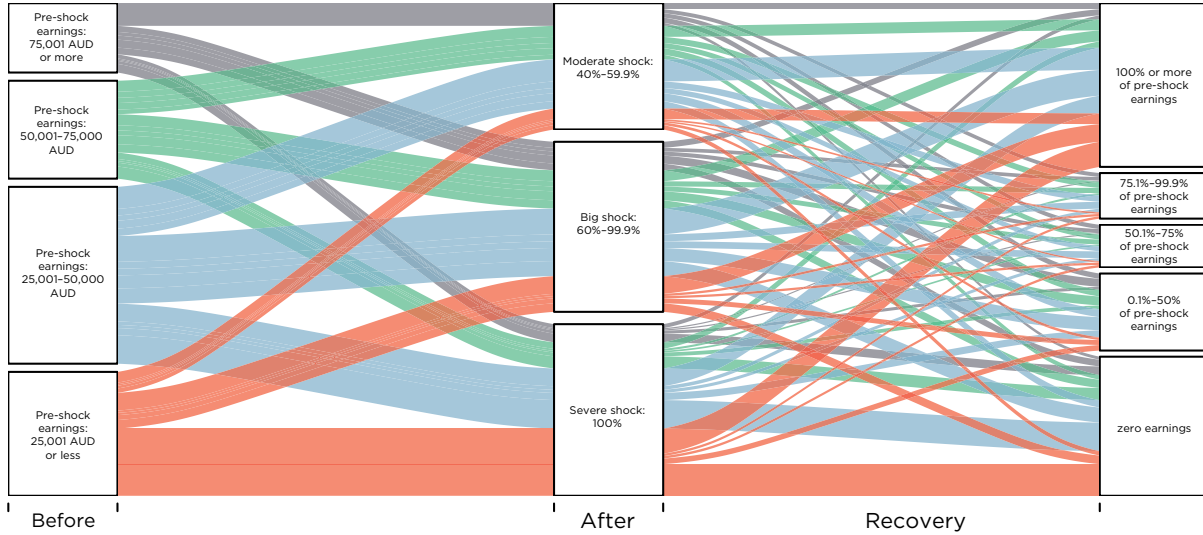


*Notes:* The flows represent persons who move between categories. Columns represent the following states: "Before" shows an earnings category before the income shock, "After" shows an earning category right after the shock based on the depth of the shock, "Recovery" shows the earning category three years after the shock based on the pre-shock earnings. Only individuals who experienced an income shock are depicted.

### Figure 6.4B. Experiencing an earnings shock, 2012–2014—Males
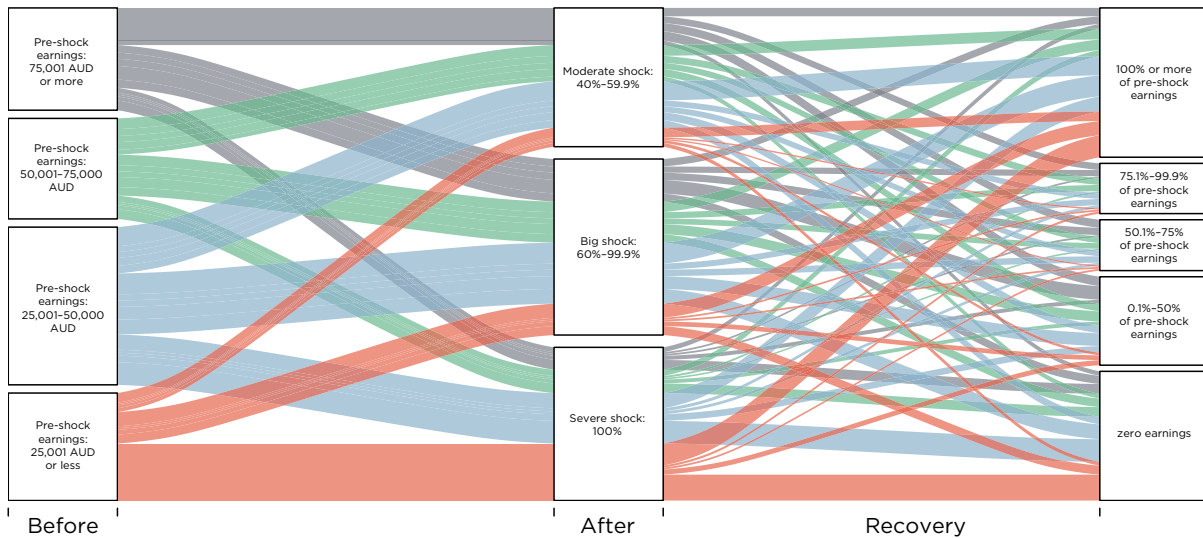


*Notes:* The flows represent persons who move between categories. Columns represent the following states: "Before" shows an earnings category before the income shock, "After" shows an earning category right after the shock based on the depth of the shock, "Recovery" shows the earning category three years after the shock based on the pre-shock earnings. Only individuals who experienced an income shock are depicted.

Do we observe the same patterns for females? In Figure 6.5 we depict the flow diagrams for females observed with an earnings shock in 2003 (6.5A) and 2012 (6.5B), respectively. Compared to males, the striking differences are the higher proportions of those who experience shock with lower pre-shock earnings and high proportions experiencing bigger shocks. In addition, there are fewer tax filers who have fully or even close to fully recovered within four years of our identifying an earnings shock.

### Figure 6.5A. Experiencing an earnings shock, 2003–2005—Females



*Notes:* The flows represent persons who move between categories. Columns represent the following states: "Before" shows an earnings category before the income shock, "After" shows an earning category right after the shock based on the depth of the shock, "Recovery" shows the earning category three years after the shock based on the pre-shock earnings. Only individuals who experienced an income shock are depicted.

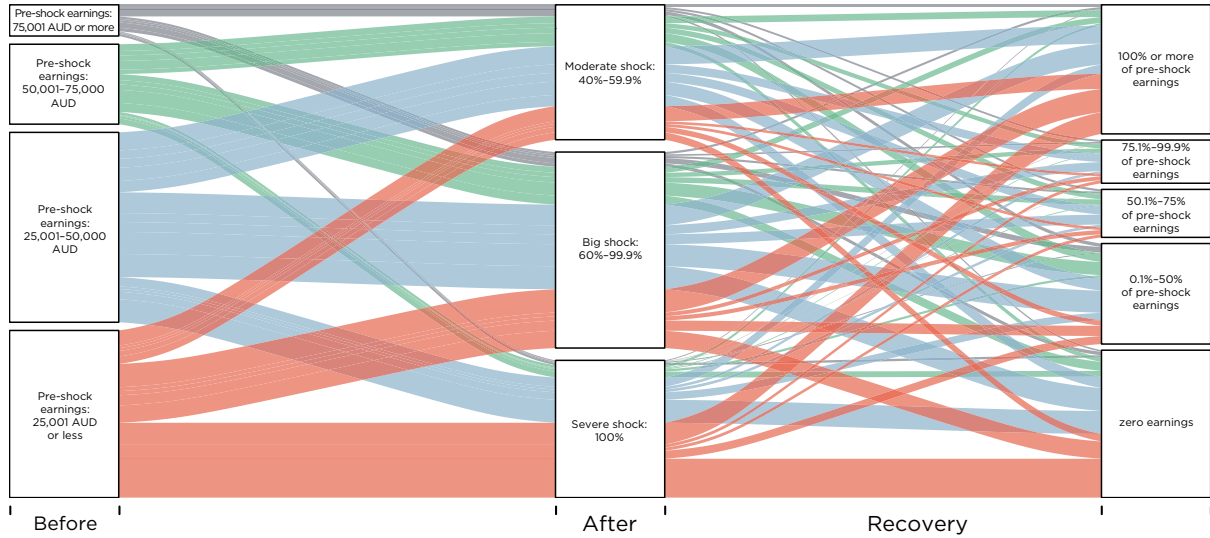### Figure 6.5B. Experiencing an earnings shock, 2012–2014—Females
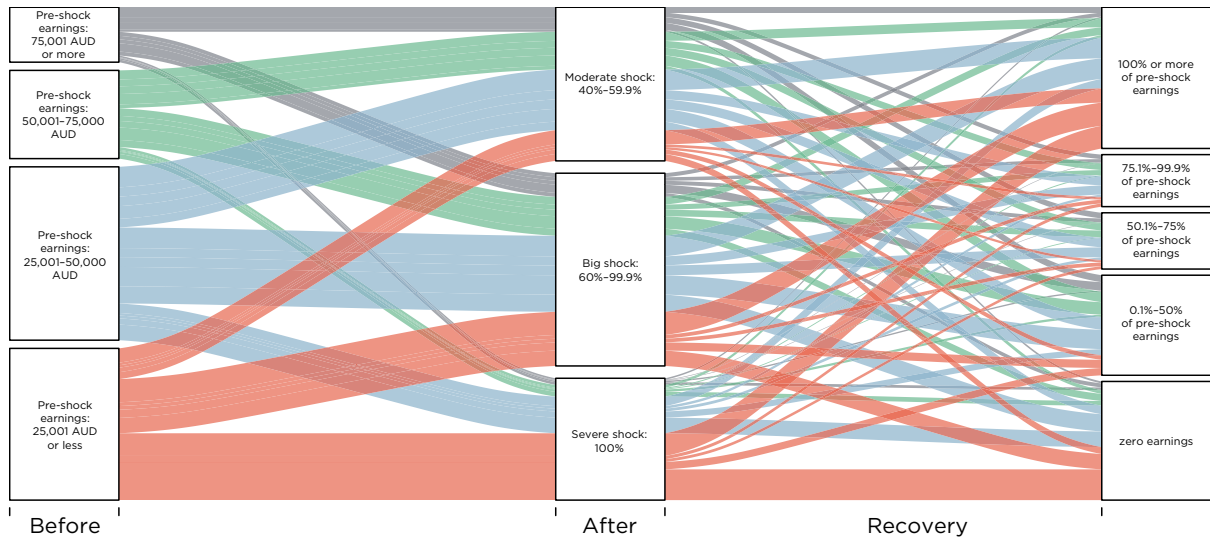


*Notes:* The flows represent persons who move between categories. Columns represent the following states: "Before" shows an earnings category before the income shock, "After" shows an earning category right after the shock based on the depth of the shock, "Recovery" shows the earning category three years after the shock based on the pre-shock earnings. Only individuals who experienced an income shock are depicted.

When we combine the depictions of Figures 6.3, 6.4 and 6.5, we continue to observe big differences in recoveries from earnings shocks between males and females. We also find that many do not recover within a few years and that many do not come close to recovering their pre-shock earnings.

How long does it take to recover? In Figures 6.6A and 6.6B, for several earnings thresholds we depict the probability of reporting earnings at least as much as the pre-shock earnings. The probabilities are based on regressions that control for year and geography of those who experience a shock.[20] In Figure 6.6A we depict the probabilities for those with pre-shock earnings between $15,000 and $35,000. In Figure 6.6B we depict the probabilities for those with pre-shock earnings between $60,000 and $160,000.

**Figure 6.6A. Predicted recoveries from an earnings shock, by pre–shock earnings level and gender**
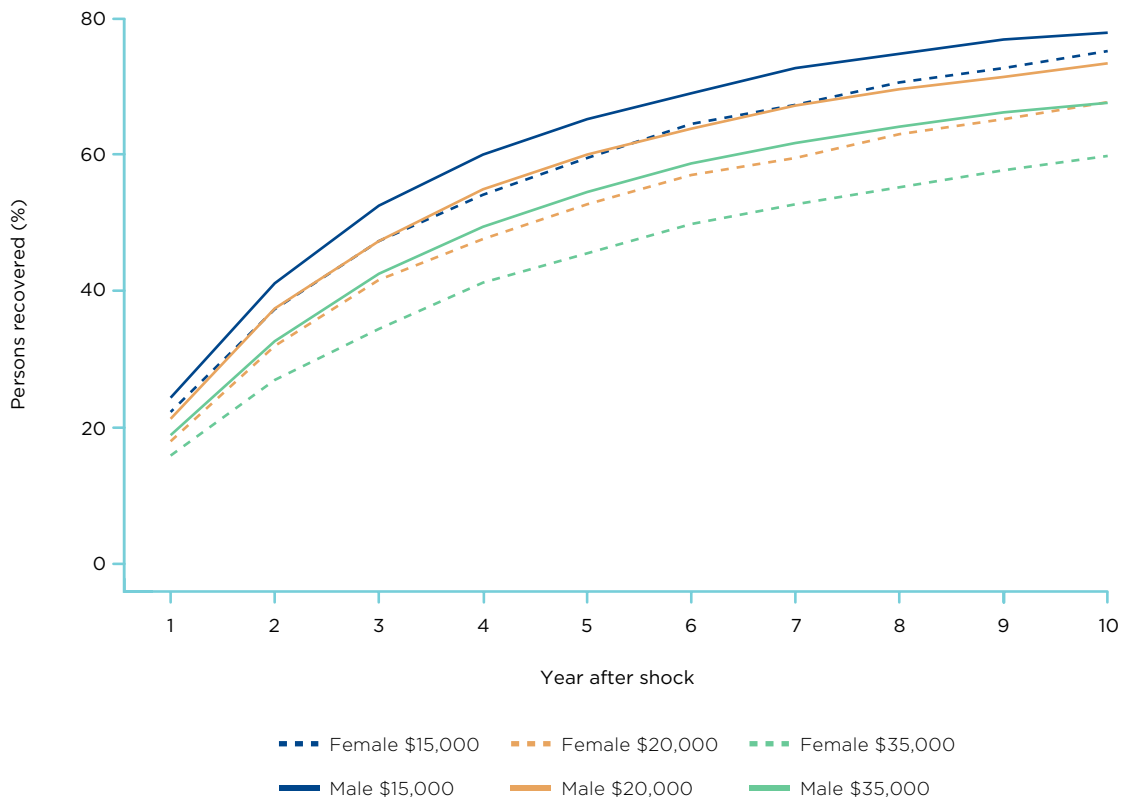


*Notes:* Horizontal axis shows after–shock years, vertical axis shows proportions of people projected to recover by a given year. Numbers are calculated using Cox proportional hazard model.

20   The probabilities were estimated using a Cox proportional hazard model. See Appendix F for more details.

**Figure 6.6B. Predicted recoveries from an earnings shock, by pre–shock earnings level and gender**
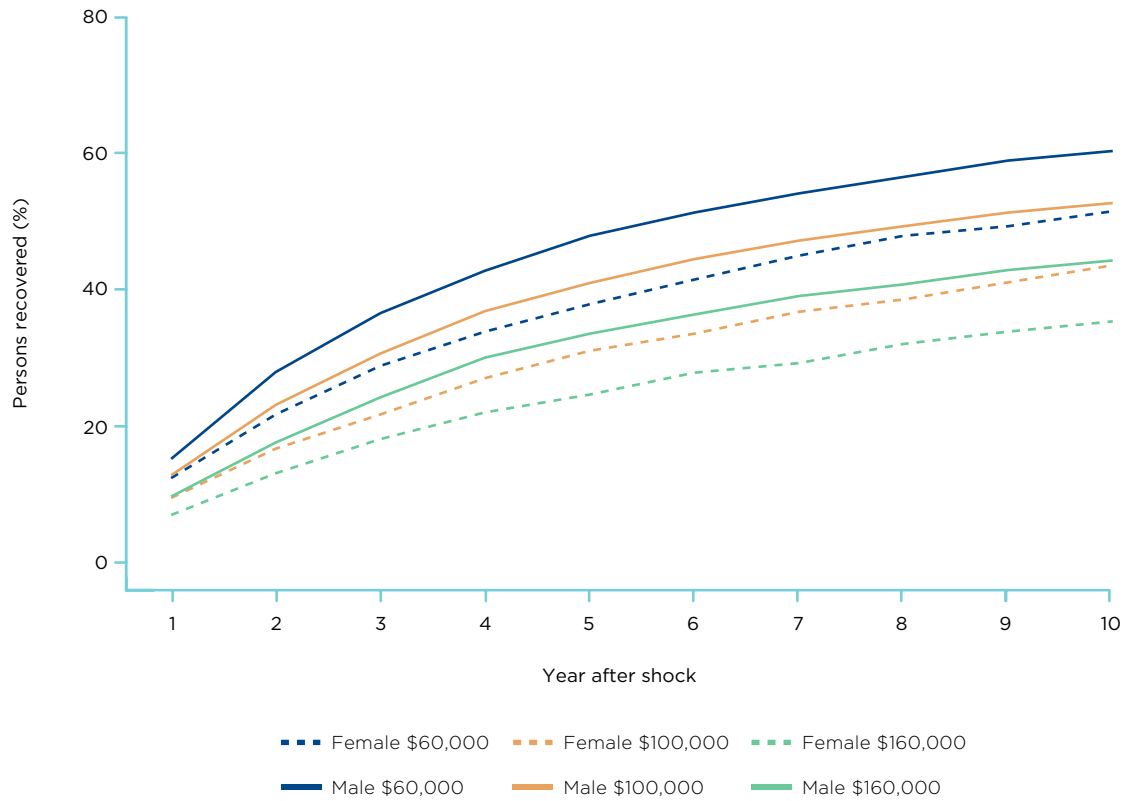


*Notes:* Horizontal axis shows after–shock years, vertical axis shows proportions of people projected to recover by a given year. Numbers are calculated using Cox proportional hazard model.

Figure 6.6 confirms that recovery from an earnings shock takes many years. Moreover, the recovery rates are fastest for those with lower pre-shock earnings. For example, 70 percent of males with pre-shock earnings of $15,000 are likely to be earning $15,000 or more within six to seven years. In contrast, for males with pre-shock earnings of $60,000, the probability of recovery within six years is closer to 50 percent. Across the board, recovery rates for a given pre-shock amount are lower for females than for males. For those with pre-shock earnings of $35,000, the probability of recovering within 10 years of the shock is 68 percent for males and 60 percent for females.

# 6.4

# Summary



We continue to observe sizable differences in shock and recovery rates across genders but also across different parts of the earnings distribution. A greater proportion of those at the bottom quartile of the earnings distribution are likely to experience an earnings shock. The share of those experiencing a shock, however, has fallen over time. Between 1994 and 2017, the rate of shock has fallen by approximately 40 percent, from 14 to 17 percent to 9 to 10 percent. Moreover, once we control for socio-demographic characteristics of the tax filer and the community in which the tax filer resides, for those tax filers earning less than $50,000, males are more likely to experience an earnings shock than females. Beyond $50,000, however, the likelihood of experiencing a shock becomes relatively flat and females are more likely than males to experience a shock.

In terms of recoveries, across most income profiles and most years, the recovery rate for females is lower and longer than for males. Recoveries for tax filers with low pre-shock earnings, however, are higher for both males and females.

From a policy perspective, this analysis illustrates the importance of understanding the reasons behind an earnings shock. This is particularly true for those whose pre-shock earnings fall below the median earnings observed, given we are observing relatively high rates of shocks for these tax filers. We have also observed, however, that those with earnings shocks at the higher end of the earnings distribution are likely to take longer to recover. Thus, it is equally important to better understand the factors that might influence a slow recovery from a shock.

# 7.
# Earnings shocks across age groups

*'Labour market experiences vary significantly over the life cycle: unemployment rates are higher for younger individuals while participation rates fall dramatically for workers after a certain age'.* Choi et al. (2015)

**Key Findings**

- For individuals under the age of 40, females are more likely to experience an earnings shock than males. After 40, the rates of males and females experiencing an earnings shock are very similar.

- The probability of earnings shocks for females aged 25 to 34 is higher than for males.

- The probability of falling into a shock is relatively similar at age 40-44. These differences are likely explained by females being more likely to leave the labour force, at least temporarily, after having children.

- Older individuals take longer to recover from an earnings shock than younger individuals.

# 7.1

# Introduction

In most countries, Australia included, younger adults (those aged 15 to 24) experience higher unemployment rates than older adults.[21] Cassidy et al. (2020) document that males experience longer periods of unemployment than females. They also document that older adults experience longer periods of unemployment relative to younger adults. More recently, Crossley et al. (2021) use data from the United Kingdom to explore the labour market shocks experienced during the pandemic. They were able to collect timely and important information from a representative sample of UK households through the *Understanding Society* survey. Their analysis demonstrates that individuals with precarious employment and younger workers experienced the biggest shocks, which included substantial declines in household earnings.

How do these observed employment trends relate to earnings shocks and recoveries? In this chapter, we focus the analysis of shocks and recoveries by grouping our tax filers based on the age in which we observe an earnings shock. We find striking differences in shocks and recoveries by age for each gender. The group with the highest shock rates is for females between the ages of 25 to 34, followed by males aged 25 to 29. Once we control for economic period, the earnings shock rates by age for males is relatively flat. For females, there is a sharp gradient by age, with a higher proportion of younger females experiencing an earnings shock relative to older females. Recovery from these shocks is faster for younger tax filers (versus older tax filers). Males, however, recover faster than females across all age groups.

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21   See, for example, https://www.aihw.gov.au/reports/australias-welfare/employment-trends

## 7.2

# Earnings shocks by age and gender



To study shocks by age and gender, we have grouped our tax filers into six age groups based on their age at the time of the earnings shock: 25 to 29; 30 to 34; 35 to 39; 40 to 44; 45 to 49; and 50 to 54. In Figures 7.1A to 7.1C we depict the earnings shock rates by age group and gender for each year for the period under study. In Figure 7.1A we focus on males and females aged 25 to 29 and 30 to 34. For both age groups, females are more likely to experience earnings shocks than males. During the mid-1990s the rates are at their highest level, ranging from 13 percent to 14 percent. Over the last two decades, however, their rates have fallen, ending at a shock rate of 9.6 percent for females aged 30 to 34 and 8.2 percent for females aged 25 to 29. For these two age groups, we should consider the extent to which observed shocks are correlated with personal decisions related to having and caring for children.

During the period under study, there would have been different rules in place regarding the availability of paid parental leave after the birth of a child. Based on a Productivity Commission Report (2009), 54 percent of female employees had some form of paid parental leave available to them. The leave was, however, variable and depended on salary level (higher wages more likely to have paid leave options), industry, and occupation. On average, unpaid maternity leave took up most of the leave taken by females. In 2011, Australia's first national paid parental leave schedule was introduced. The leave scheme provides eligible working parents (usually birth mothers) with up to 18 weeks of pay at the rate of the national minimum wage.

While the leave may be taken by females or males, we assume that most of the leave is taken by females. And given the ages between 25 and 34 are those in which females are likely to have children, it may be that the higher earnings shocks, relative to males, are partially attributable to decisions tied to having children. Moreover, given parental leave pay, in part, is received from one's employers, the steady decline in earnings shocks for females may only be partially tied to parental leave.

**Figure 7.1A. Persons experiencing an earnings shock, by gender—Age 25-34**
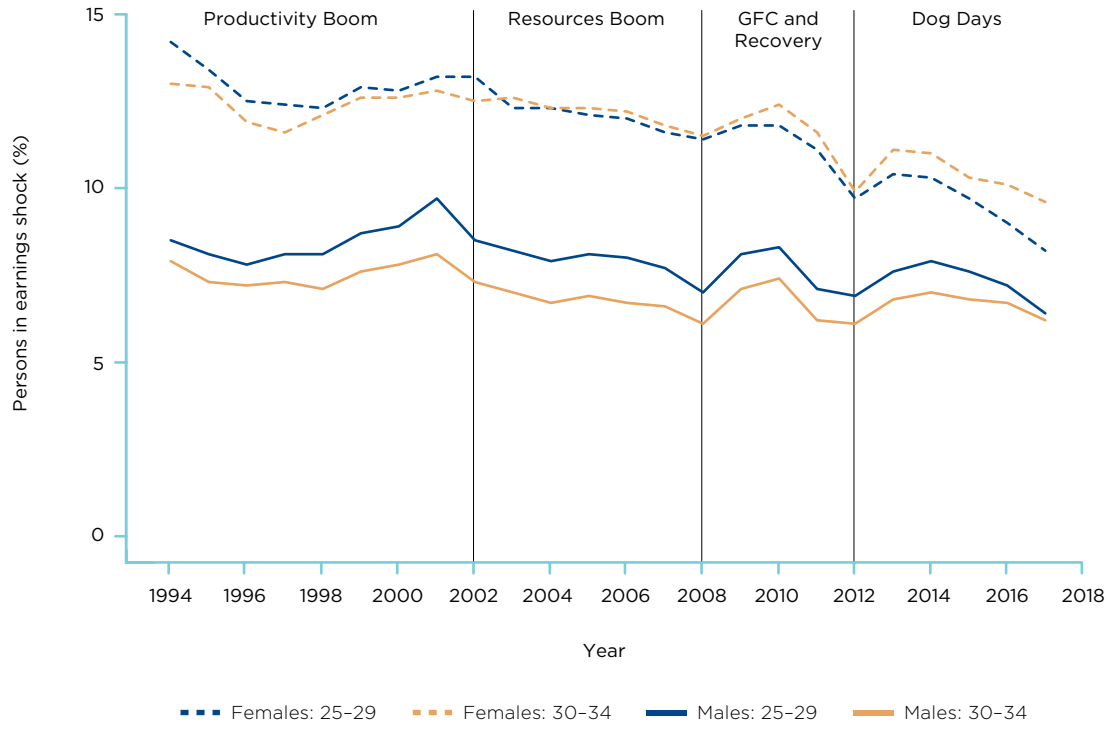


*Notes:* Numerators are number of people experiencing an earnings shock. Denominators are persons at risk of experiencing an earnings shock.

**Figure 7.1B. Persons experiencing an earnings shock, by gender—Age 35–44**



*Notes:* Numerators are number of people experiencing an earnings shock. Denominators are persons at risk of experiencing an earnings shock.
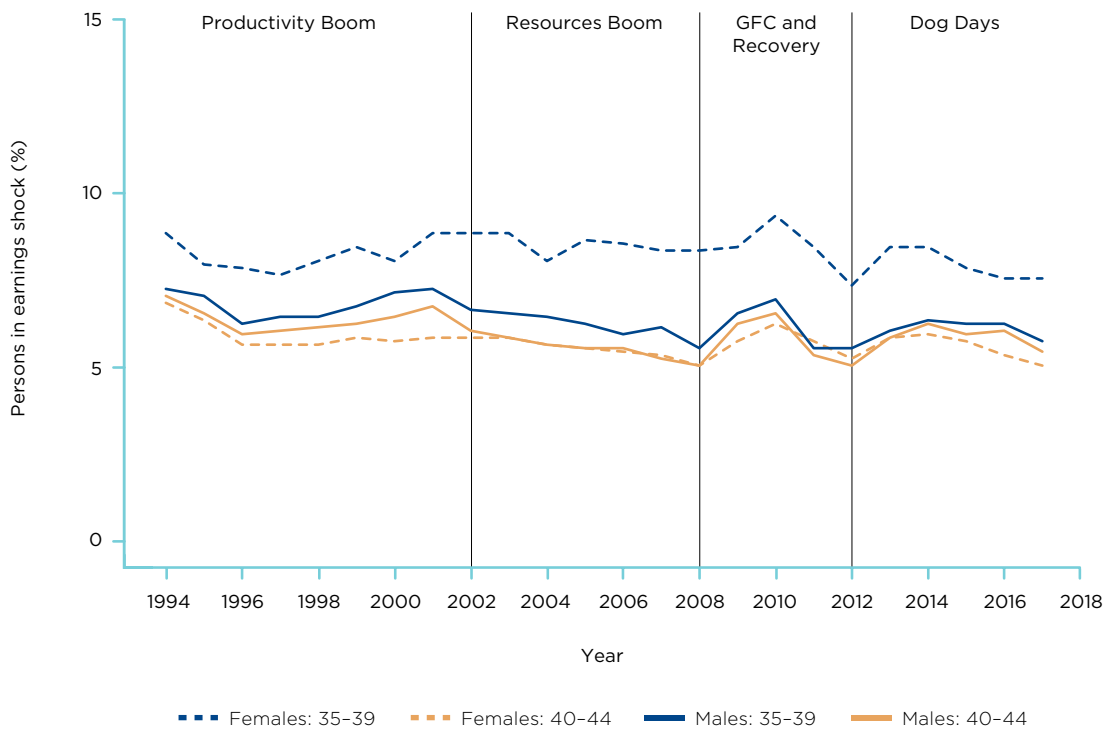
**Figure 7.1C. Persons experiencing an earnings shock, by gender—Age 45–54**



*Notes:* Numerators are number of people experiencing an earnings shock. Denominators are persons at risk of experiencing an earnings shock.
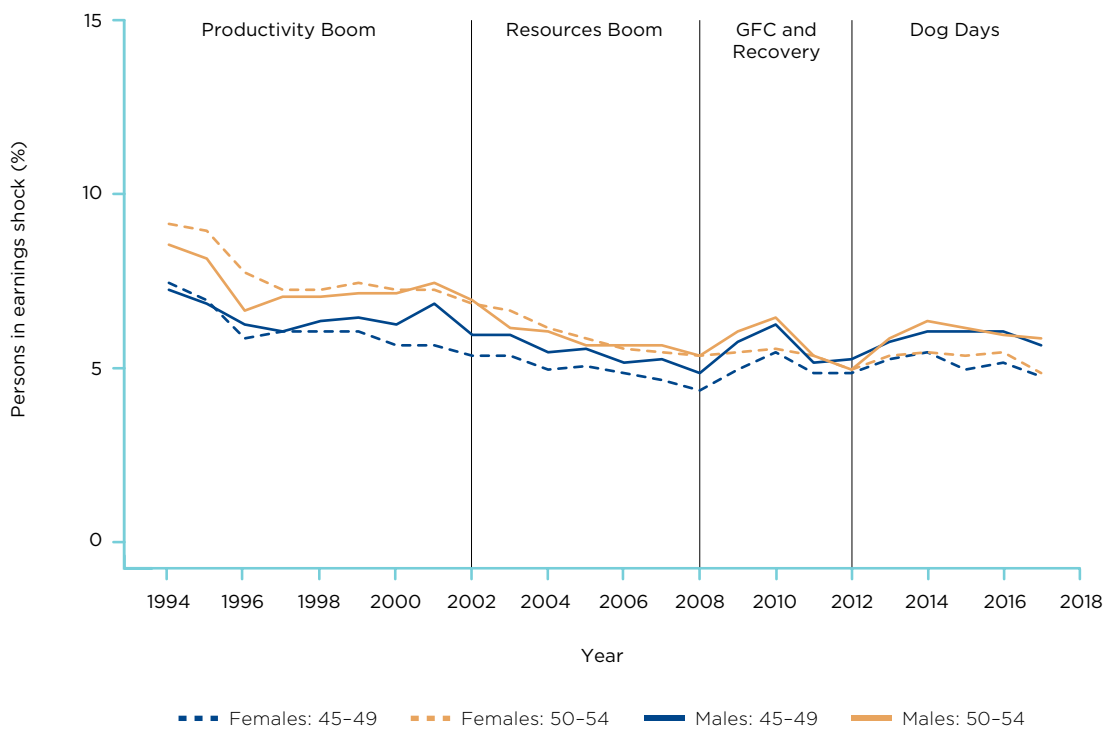
The earnings shocks for males, aged 25 to 29 and 30 to 34, respectively also declined for most of the sample period. The decline between 1994 and 2017 was about two percentage points, from approximately 8 percent to 6 percent. Around the 2001 recession and again around the GFC the earnings shock rates, however, increased. Rates are mostly higher for males aged 25 to 29 than for males aged 30 to 34.

In Figure 7.1 B, we depict the earnings shock rates for those aged 35 to 39 and 40 to 44. Focusing first on those aged 35 to 39, the rates are lower than for younger ages, reaching a maximum of 9 percent for females and 7 percent for males. Between 1994 and 2017, the rates have fallen for both genders by approximately 1.5 percentage points. Both genders exhibit higher shock rates during economic downturns. Consistently across the period, the rates for females are higher than the rates for males. For those aged 40 to 44, across the period, the earnings shock rates are very similar for females and males. Males, however, exhibit higher shock rates during the late 1990s and early 2000s.

The earnings shock rate for older individuals are depicted in Figure 7.1C. For those aged 45 to 49, the rates are very similar for males and females with the female rate being slightly lower and less sensitive to periods of economic downturns (2001 and 2009–2011). The rates are also the lowest for all ages, across most years. The shock rate starts around 7 percent in 1994 but then falls during the 1990s and hovers around 5 percent for most of the period from 2011 to 2017. In contrast, the rates are higher for those aged 50 to 54, starting around nine percentage points in 1994 and falling to less than six percent in 2017. The rates for males and females in this age group are nearly identical.

**Figure 7.2A. Predicted probability of experiencing an earnings shock, by age and period—Males**
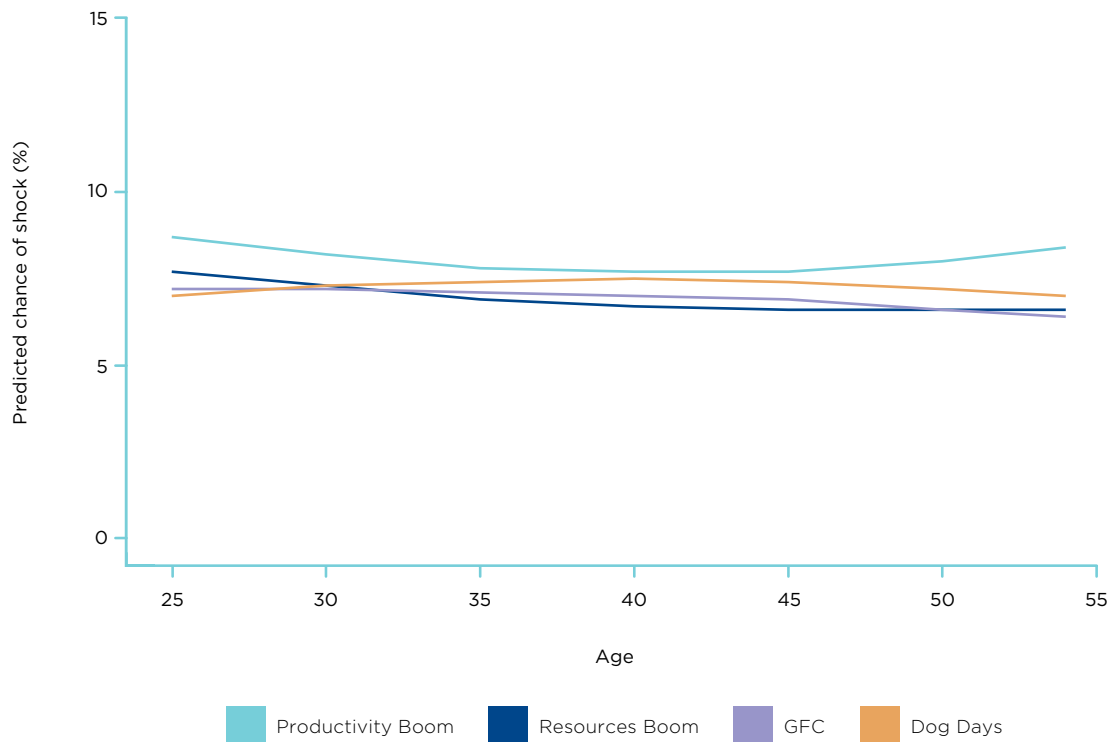


*Notes:* The predicted probabilities are calculated using a regression with earnings, earnings squared, age, age squared, sa4-level unemployment rate, positive and negative changes in unemployment rate and indicator variables for macroeconomic periods.

**Figure 7.2B. Predicted probability of earnings shock, by age and period—Females**
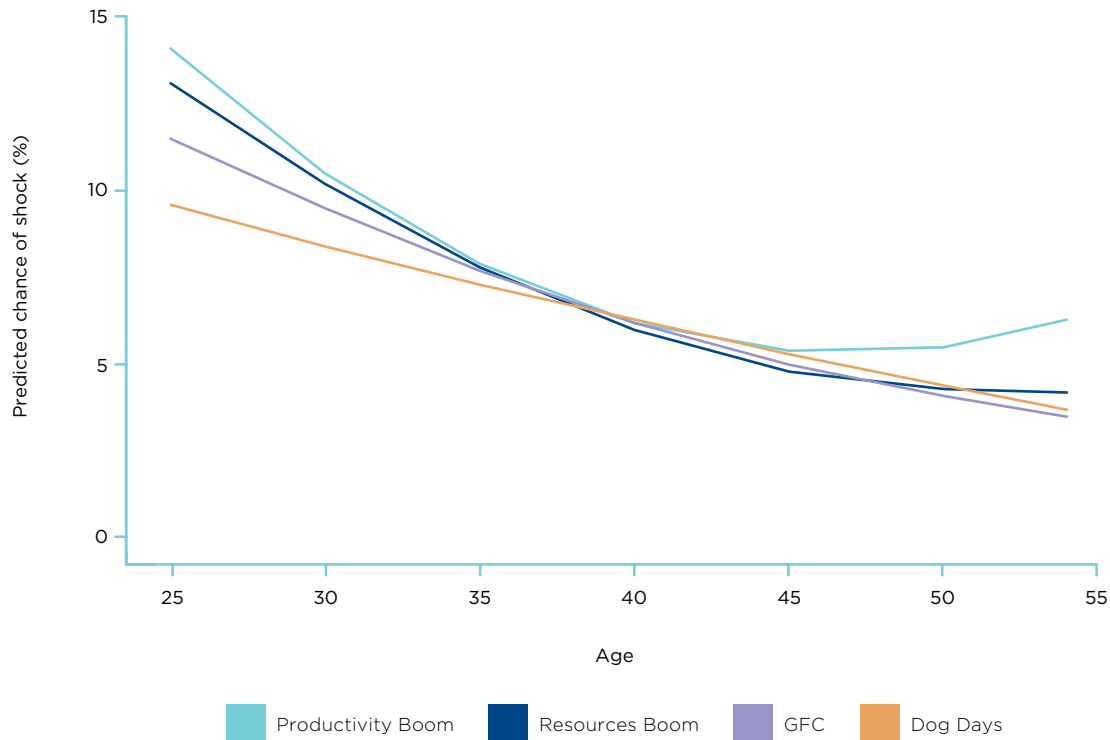


*Notes:* The predicted probabilities are calculated using a regression with earnings, earnings squared, age, age squared, sa4-level unemployment rate, positive and negative changes in unemployment rate and indicator variables for macroeconomic periods.

In Figures 7.2A and 7.2B we explore the predicted probability of a shock after controlling for pre-shock earnings, regional unemployment rates, age and macroeconomic period. The figures depict the predicted probability of an earnings shock by age and macroeconomic period. In Figure 7.2A we depict the probabilities for males. For the period of the productivity boom (pre-2000), the predicted probability of an earnings shock resembles a u-shape curve. Males near 25 and 55 are more likely to experience an earnings shock, close to 9 percent, than males in their 40s (close to 8 percent). As we observed in Figure 7.1, the rates are highest for all ages for this period. In contrast, for the more recent period, the 'dog days' period, males aged in their 40s are more likely to experience an earnings shock than younger or older males. During this period, younger and older males have a 7 percent probability of experiencing a shock versus a closer to 7.5 percent for those aged in their 40s. Across all periods, once we control for earnings and other factors, the probability of a shock for males ranges from 6.4 to 8.7 percent.

The range of shock rates for females after controlling for income and other factors, is 14.1 to 3.7 percent. The patterns of the shocks, moreover, are mostly symmetric across the four economic periods. Young females, those aged around 25, have much higher rates than older females. During the productivity boom (pre-2000), females near the age of 55 have earnings shock rates that mirror the rates for those around 40. As raised above, for younger females, the earnings shock rates are highest for the period before 2000 and lowest for the most recent period.

When we compare the predicted probabilities for males and females, there are big differences by gender and age. From 25 to 35, females are observed with higher shock rates than males. From 40 to 55, however, males are observed with higher shock rates than females. There are striking differences between Figures 7.2A and 7.2B. This highlights the importance of considering the importance of controlling for confounding factors when assessing the likelihood of experiencing an earnings shock.

## 7.3

# Recovery from earnings shocks by age and gender

In the previous section we observed striking differences in earnings shocks by age and gender. In this section we explore recovery rates by age and gender. Our analysis focuses on the predicted probability of recovery up to ten years after the shock, after controlling for pre-shock earnings, macroeconomic period and other factors. We define recovery as earning at least as much as one did in the two years prior to the observed earnings shock.

In Figure 7.3A we depict the probability of recovering from a shock over a 10-year period for those aged 25, 30 or 35 at the time of the earnings shock. Males are depicted using a solid line; females are depicted using a dashed line. For these ages and for both genders, the probability of recovering from a shock within one year is less than 30 percent. More than 50 percent of males aged 25 or 30 have recovered within three years, however. For males aged 35, it takes four years for at least 50 percent to have recovered. Within 10 years, close to 80 percent of males who were 25 at the time of the shock have recovered from the earnings shock but for males who were 35 at the time of the shock, the 10-year recovery rate is closer to 70 percent.

Across the three ages for females, recovery takes longer. It takes an average of six years to reach the point where 50 percent of those with a shock are observed with pre-shock earnings. The 10-year recovery rates are approximately 65 percent for these ages. The question of what is driving these slower recovery rates for females is likely to require a quite complex answer. One of the potential explanations is fertility decisions by females. It is also worth pointing out that the rates of recovery between males and females are slowly converging over time. This might reflect a change in attitudes—it becomes more socially acceptable for males to take parental leave— as well as workplace changes, such as more organisations offering parental leave.

**Figure 7.3A. Predicted recoveries from an earnings shock, by age and gender— Age 25–35**
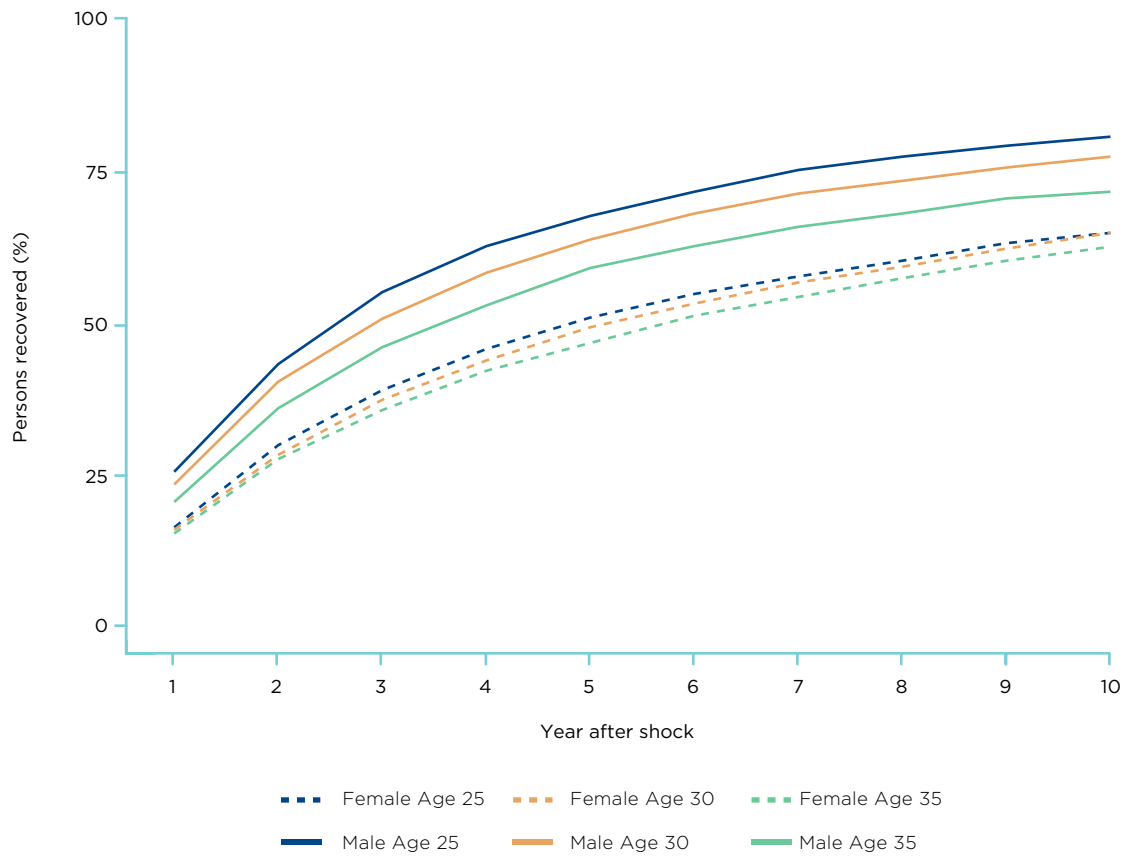


*Notes:* Horizontal axis shows after–shock years, vertical axis shows proportions of people projected to recover by a given year. Numbers are calculated using Cox proportional hazard model.

**Figure 7.3B. Predicted recoveries from an earnings shock, by age and gender— Age 40–54**
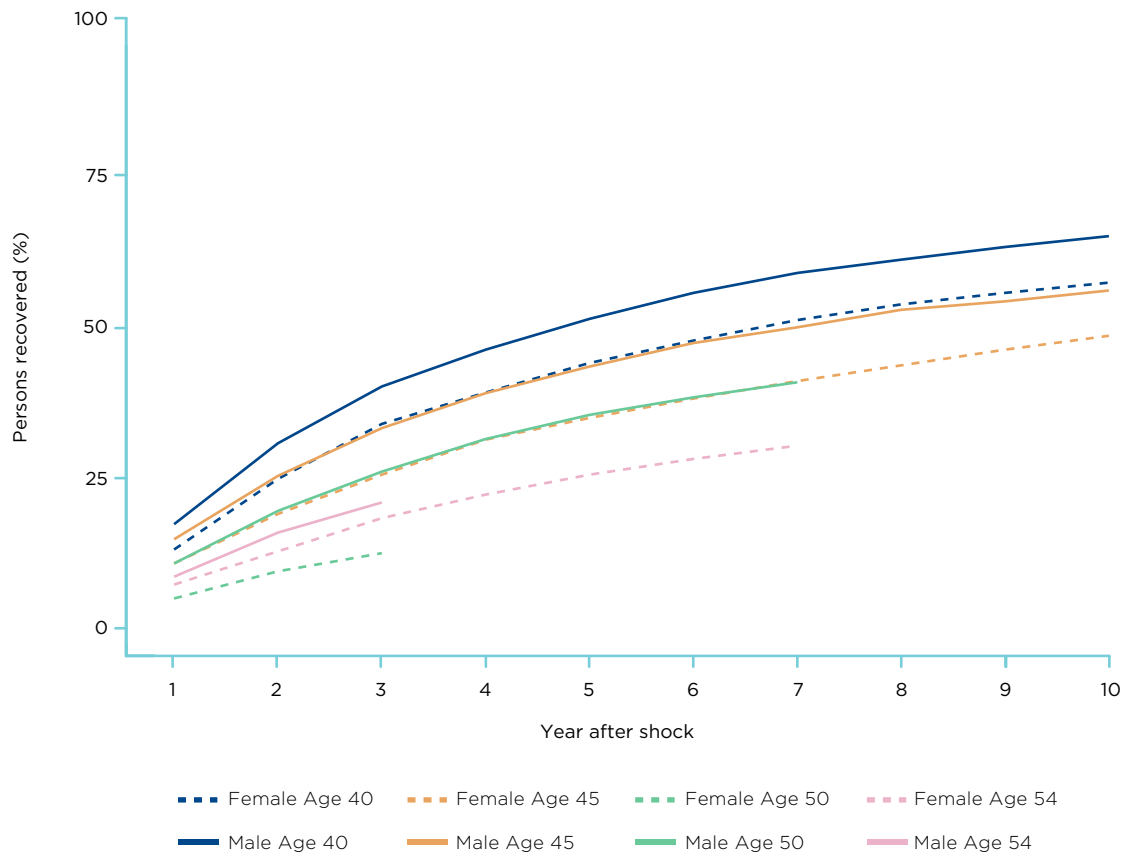


*Notes:* Horizontal axis shows after–shock years, vertical axis shows proportions of people projected to recover by a given year. Numbers are calculated using Cox proportional hazard model.

## 7.4

## Summary

This section explored earnings shocks and recoveries by age and gender. We observe striking differences. We find that females are more likely to experience earnings shocks and take longer to recover. The shares of males experiencing shocks at age 24–35 declined throughout the period, but the decline is of smaller magnitude than among females. The probability of earnings shocks for females aged 40–44 is the same as for males. These facts hint at the potential explanation of such differences: female fertility decisions. When it was customary for females to leave the workforce or reduce hours to care for a newborn child, the gap in the shares of males and females experiencing earnings shock was the largest. The gap gradually declined throughout the period, hinting at the role of changing attitudes and workplace policies.

The age distribution of shocks and recoveries is also different among males and females. For females, the highest rate of shock is observed for younger individuals (consistent with the mechanism discussed above), but for males the probability of a shock (conditional on other factors) is relatively flat. We also observe that the speed of recovery declines with age. This fact calls for thinking about potential policy interventions to help older individuals.

# 8.
# The role of place

**Key Findings**

- Females in rural areas experience shocks more often than those who reside in urban areas. The differences for males are less discernible.

- People who live in the areas with the lowest poverty rate experience slightly fewer shocks.

- For males (but not for females) urban living and low poverty rate is associated with faster recoveries.

## 8.1

# Introduction

In this chapter, we investigate the role geography might play in the probability that a person experiences earnings shocks. In the previous *Breaking Down Barriers* reports, we have explored the role of community in poverty entrenchment. While our previous analysis in this area relied only on three observations per person separated by five years, the tax data allows us to observe the same person for many years in a row.

In this section, to investigate the role of location, we demonstrate the potential difference in the shares of people experiencing earnings shocks in association with the poverty rate of the place where they live. We also demonstrate the association between the place where a person lives and their propensity to exit the shock within three years. This allows us to draw conclusions about the community-level determinants of earnings shocks and recoveries.

We define poverty level according to the definition employed in Payne and Samarage (2020): a share of families whose total income is lower than 60 percent of median income adjusted for family composition. Here, we use data on poverty rate in 2011. Because in the tax data we only observe SA4 level where an individual resides (and not SA2 level), we use the previously calculated poverty rates for SA2 areas to roll them up, adjusting for the population, to the SA4 level. Next, we separate SA4 areas into quartiles based on their poverty rates. We also record an urban status of every individual: whether a person is residing in an area denoted by the ABS to be 'a significant urban area' (a locality or a cluster of localities with the population higher than 10,000 people). The construction of the urban status variable is described in Appendix E.

As in our previous chapters, we separate the analysis by gender. We find that the highest incidence of shocks is for males residing in high-poverty urban areas, while the slowest recovery is observed among those who live in high-poverty rural areas. Our results in this section reinforce the importance of place in analysing and addressing earnings shocks and their long-term consequences.

## 8.2

## Shock distribution by urban/rural residence, poverty rate, and gender

We begin by comparing vulnerability to shocks of people who reside in urban and rural areas. Urban status can be important for shocks in several ways. First, cities are usually places with diverse economies and many employers are located in one area, so that even if a person loses work, they may quickly find employment in another organisation. The concentration of economic activity may shield people from economic shocks. If, however, all the different types of organisation concentrated in cities are vulnerable to the same type of downturn, then it may exacerbate the shocks. For example, if a significant proportion of businesses in a particular area depend on tourism, then the decline in the flow of tourists may spread to all other businesses. Which of the effects prevails is an empirical question that can be answered with our data.

Figure 8.1 compares the percentages of males who experience earnings shocks in urban and rural areas. We find that, on average, males living in rural areas are more likely to experience shocks. The trends and the differences between the periods are broadly similar. Males living in rural areas, however, experienced larger increases in the incidence of shocks during the 'dog days'. It is possible that rural mining areas were more affected by the end of the mining boom than other areas.

Figure 8.2 compares the percentages of females who experience earnings shocks. We find that females have a higher incidence of shocks than males, despite the incidence of shocks gradually declining. The incidence of shocks and the decline in the 1990s and early 2000s is especially pronounced for females living in rural areas. These trends might be explained by the changing norms around fertility decisions and caring for newborn children. As with the males residing in rural areas, we find an increase in the incidence of shocks during the Dog Days.

**Figure 8.1. Persons experiencing an earnings shock, by urban/rural status—Males**
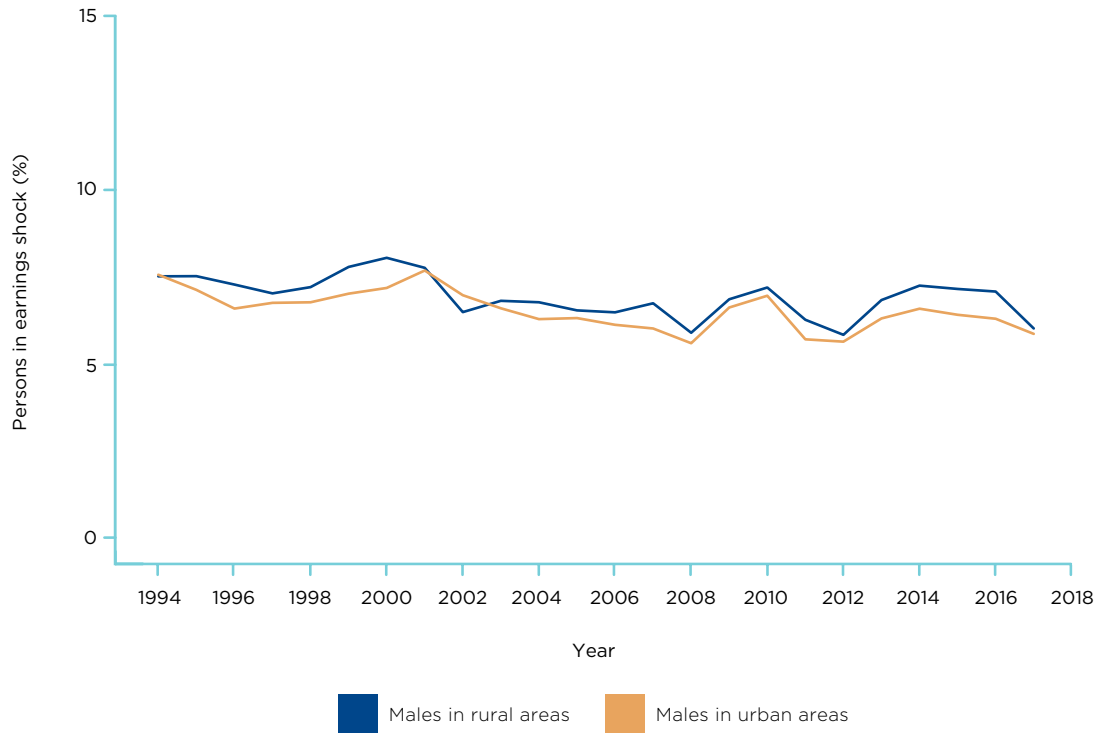


*Notes:* See Appendix D for definition of urban/rural areas.

**Figure 8.2. Persons experiencing an earnings shock, by urban/rural status—Females**
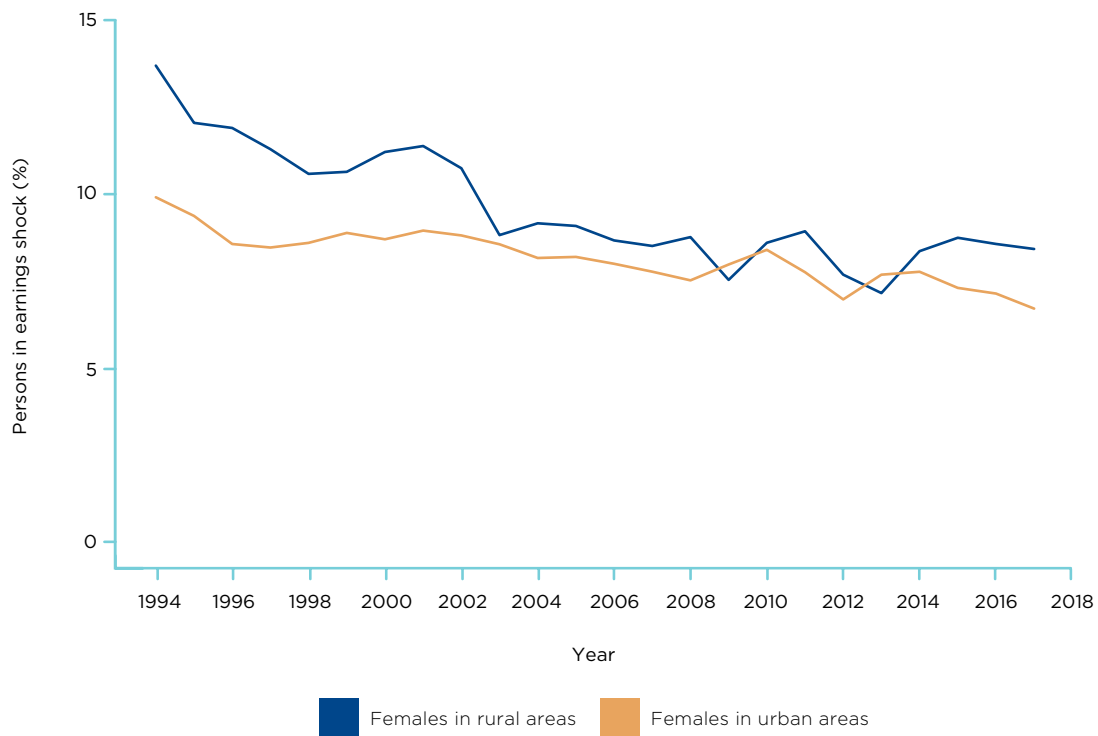


*Notes:* See Appendix D for definition of urban/rural areas.

It is also worth pointing out that urban and rural areas differ in terms of their poverty rate. For example, in 2017, only 9.8 percent of males and 9.7 percent of females lived in rural areas. But if we only look at those who lived in areas with the highest poverty rate (top quartile), then 26.4 percent and 27.6 percent of females lived in rural areas. Thus, another factor contributing to the higher incidence of shocks for males and for females must be overall higher poverty rates in those areas.

To study the association between the poverty rate and the incidence of shocks even further, we show the plots of shocks, separating individuals by the poverty rate of the SA4 where they live into the four categories based on the quartile of the poverty rate. The 'poorest' areas are in the top quartile—those areas have the highest poverty rate.

Figure 8.3 shows the plot of earnings shock for males throughout the period, by the area's poverty rate. We find that, consistently in every period, the lowest incidence of shocks was observed in the areas with the lowest poverty rate. We do not observe many differences among the other three quartiles. This observation supports the hypothesis that the areas with the lowest poverty rates are more likely to have vibrant economies that somewhat shield their residents from the shocks.

**Figure 8.3. Persons experiencing an earnings shock, by SA4 poverty rate—Males**
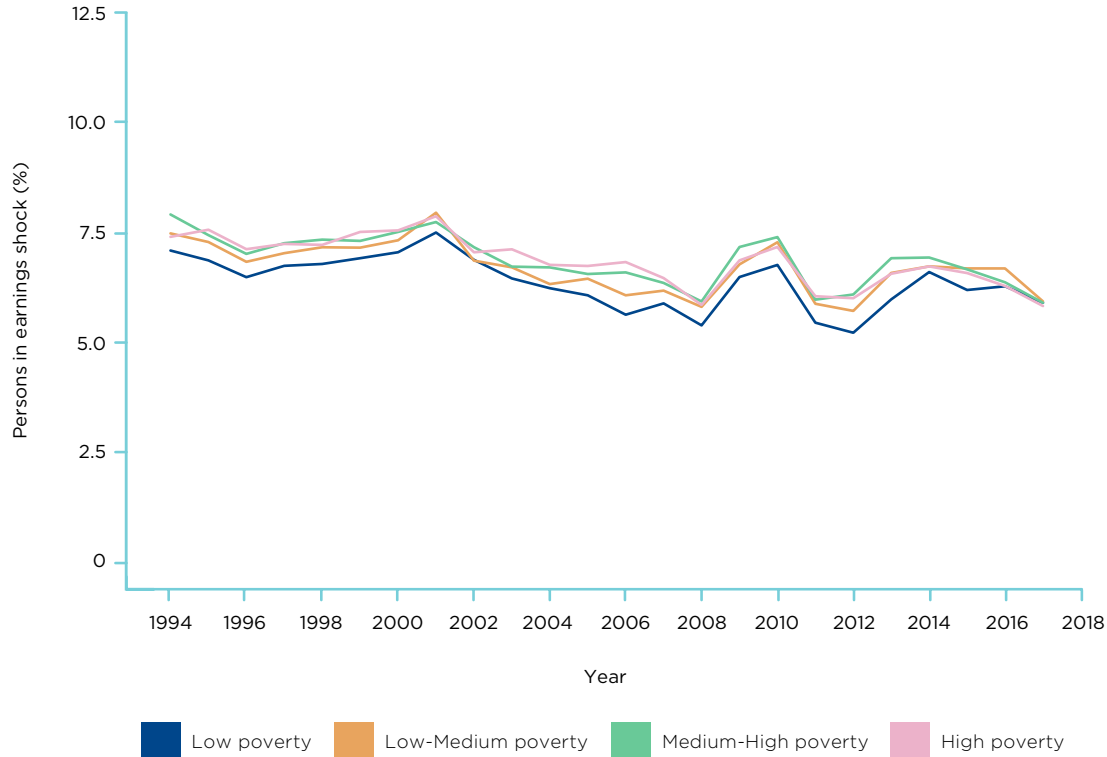


*Notes:* Poverty rate is defined as share of households below 60 percent of median adjusted family income in 2011.

**Figure 8.4. Persons experiencing an earnings shock, by SA4 poverty rate—Females**
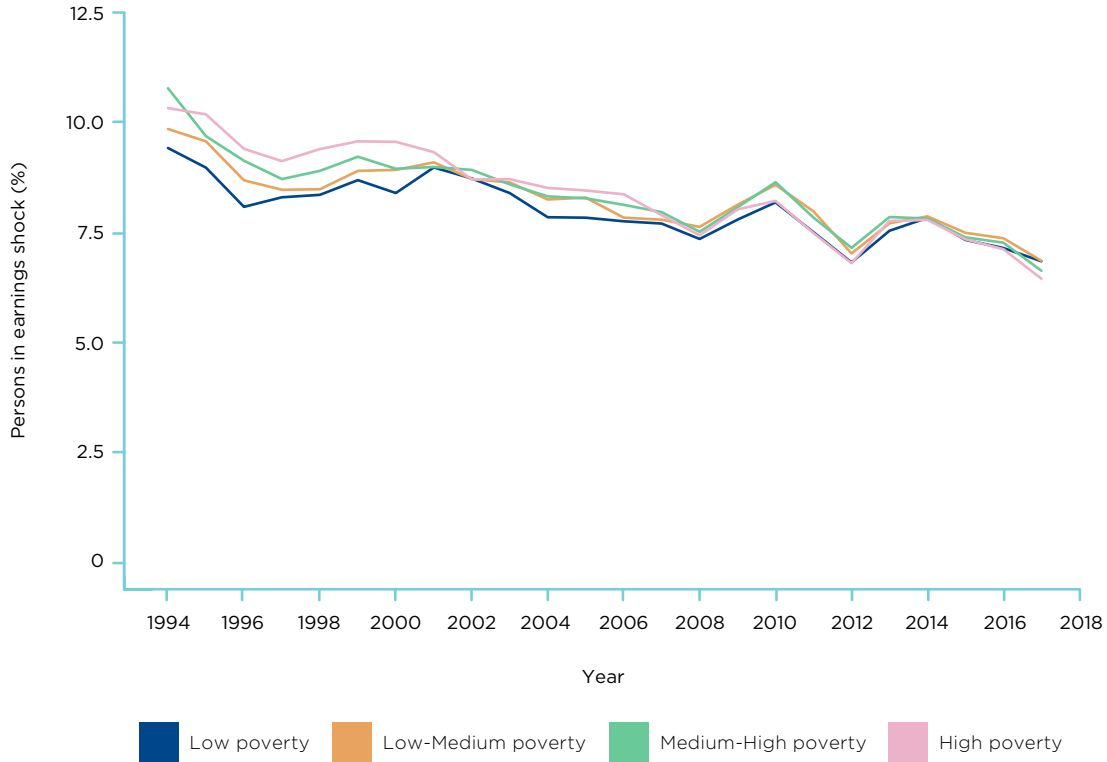


*Notes:* Poverty rate is defined as share of households below 60 percent of median adjusted family income in 2011.

Figure 8.4 shows the changes in the incidence of earnings shock over time for females by the area's poverty rate. We find that in the initial years of our data, the difference is significant, with the areas of highest poverty rate experiencing the highest rates of income shocks. For later years, we do not observe many differences. This trend could be explained by improving work opportunities for females who may come from differentially affected high-poverty areas.

## 8.3

## Recovery by residential location and community poverty



Now we turn to the analysis of recoveries. To adjust for the fact that we may not observe all the recoveries due to people dropping out of the sample, we calculate estimated chances for experiencing recoveries using the Cox duration model (see Appendix F for details). Our expectations are the same as in the analysis of the incidences of shocks: we expect people living in low poverty/urban areas to have faster recoveries due to higher density of economic activity and diversity in their industrial composition.

Figure 8.5 shows the results for males, confirming the intuitions based on our previous analysis. The highest probability of recovery is observed in urban areas with the lowest poverty rate, while the lowest probability of recovery is observed in rural areas with the highest poverty rate. These results suggest that both factors discussed above are important for the experiences of shocks: urban status, since urban areas usually have more types of economic activity, and poverty rate, since areas with low poverty rates, whether they are urban or rural, provide more economic opportunities.

Figure 8.6 shows the results for females. We find that the differences in recovery rate by urban/ rural status and poverty rates are much more muted than in the case of males. This is consistent with changing norms around fertility decisions and caring for the newborn children being a major factor in females experience of earnings shocks, since those factors represent a secular trend and may not differ by areas.

**Figure 8.5. Predicted recoveries from an earnings shock, by urban/rural status and SA4 poverty rate—Males**
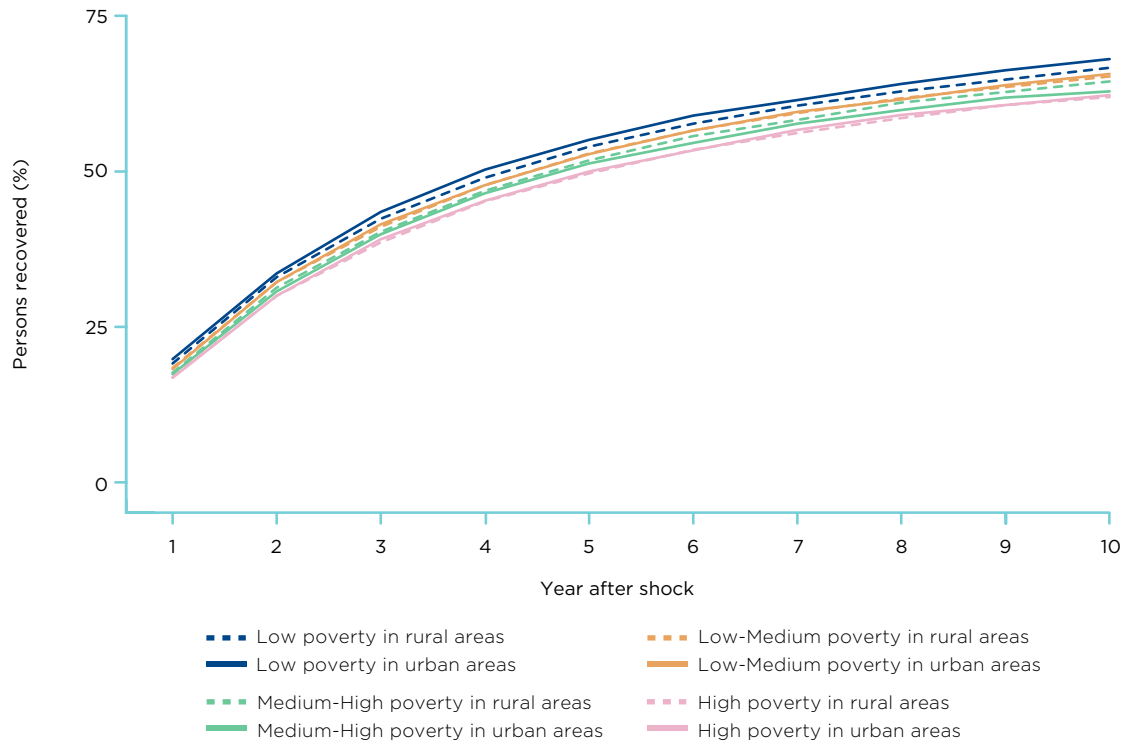


Low poverty in rural areas
Low poverty in urban areas
Medium-High poverty in rural areas
Medium-High poverty in urban areas
Low-Medium poverty in rural areas
Low-Medium poverty in urban areas
High poverty in rural areas
High poverty in urban areas

*Notes:* Poverty rate is defined as share of households below 60 percent of median adjusted family income in 2011.

**Figure 8.6. Predicted recoveries from an earnings shock, by urban/rural status and SA4 poverty rate—Females**
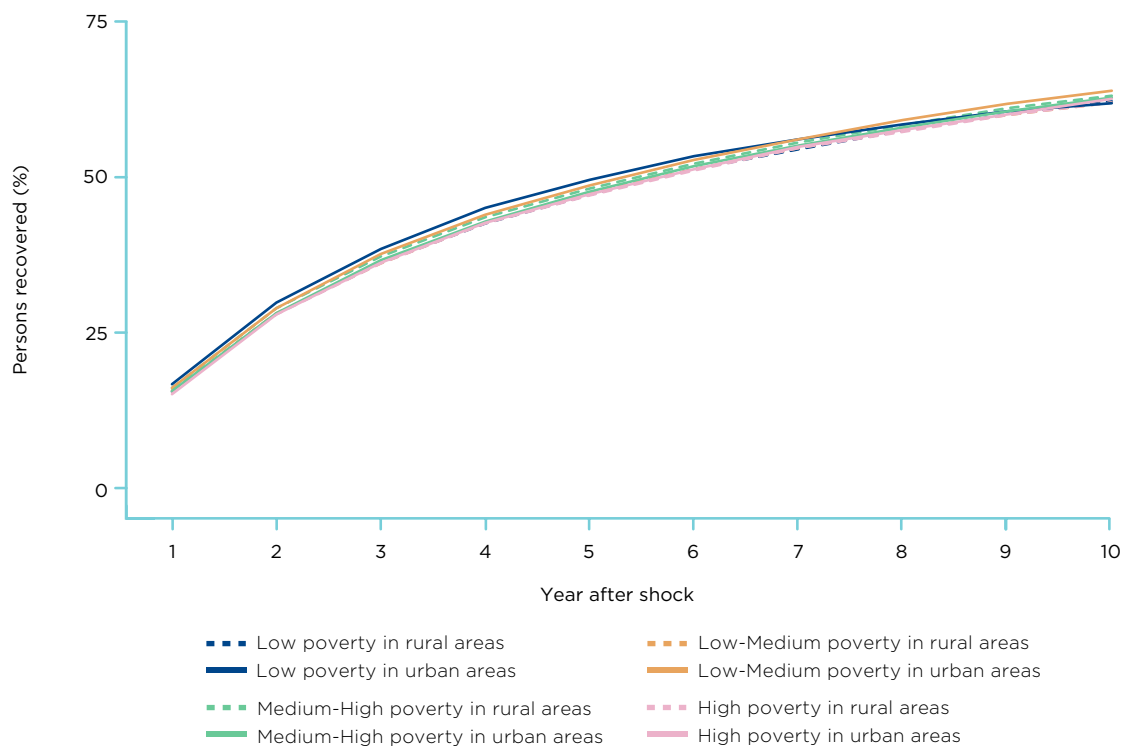


Low poverty in rural areas
Low poverty in urban areas
Medium-High poverty in rural areas
Medium-High poverty in urban areas
Low-Medium poverty in rural areas
Low-Medium poverty in urban areas
High poverty in rural areas
High poverty in urban areas

*Notes:* Poverty rate is defined as share of households below 60 percent of median adjusted family income in 2011.

# 8.4

# Summary

In this chapter, we looked at the experience of earnings shocks of males and females who reside in different areas: urban or rural, and areas of different poverty rates. The results here confirm the importance of place of residence. Both males and females in rural areas experience shocks more often on average throughout the studied period than those who reside in urban areas. We explore the same pattern when we are separating persons by the poverty rate of areas in which they live. While we do not observe differences among females, when we look at the rates of earnings shocks experienced by males, we find that people who live in the areas with the lowest poverty rate experience fewer shocks. When we look at recoveries, we, again, find no difference among females, but important differences among males: both urban status and low poverty rate in the community are associated with faster recoveries. Thus, the characteristics of places where a person lives are important determinants of their frequency and experience of earnings shock. Further research is needed that dives more deeply into the specific geographical factors that facilitate shocks and recoveries and the gender differences in such experiences.

# 9.
# The role of family composition, education, and disability

**Key Findings**

- When we augment the tax data with the analysis of Household, Income and Labour Dynamics in Australia (HILDA) data, we find that earnings shocks and recovery rates differ by family composition, educational attainment and participation, and by disability status.

- Males who have a partner are less likely to experience an earnings shock. Females, however, have a greater likelihood of experiencing an earnings shock if they have young children.

- Those with university education are less likely to fall into earnings shock and recover more rapidly. Persons with a disability have higher earnings shocks rates and recover more slowly.

# 9.1

# Introduction



In Chapters 4 to 8 we documented the importance of gender, pre-shock earnings, age and geography in explaining differences in earnings shock and recovery rates. Yet there is more to an earnings shock and recovery than a change in employment and/or hours. A range of factors contributes to and exacerbates periods of earning shocks and/or recoveries, as well as speeding up recovery. Although the primary focus of this report has been to document and to explore shocks and recoveries, this chapter explores a few of the factors that are correlated with shocks and recoveries. We focus on family composition, education, and disability.

Family composition is a critical component for both experiencing and recovering from a shock. If one is single, one might be less inclined to take on risk in terms of a willingness to change jobs, to pursue a different career and/or a changing effort that will affect employment performance. Similarly, if one has young children, one may face different constraints from those experienced by an individual without children. We also might expect family composition to have differential effects on males and females.

Many studies have found that highly educated people have higher earnings, higher chances of falling into unemployment and more 'prestigious'

careers (see, for example, Psacharopoulos and Patrinos, 2018, for a recent review). The reason for this is that schooling enhances productivity, imparting knowledge, improving skills and increasing general ability. In a study on earnings shocks, Blundell et al. (2016) use Norwegian administrative data and find that less-educated people experience greater permanent shocks, and those shocks are more severe at older ages. Earnings shocks of highly educated people are, on average, less severe and mostly occur at younger ages.

Finally, we explore the role of having a temporary or permanent disability on earnings shocks. Disability may reduce productivity and, in some cases, increase absenteeism. There is an extensive literature that explores the relationship between disability and earnings. Studies for Australia have found that poor health decreases labour force participation for males and females (Cai and Kalb, 2006) and disability reduces employment and hours worked while increasing welfare reliance (Wilkins, 2003). Polidano and Vu (2013) show that disability has a stronger impact on earnings for less-educated people. They find that, compared to people with higher educational attainment, the less educated are more likely to be unemployed and on income support several years after the onset of a disability.

ALife contains limited information on the presence of a partner and the presence of dependent children. In more recent years, this information has become better in terms of the consistency in information across time for a tax filer. ALife, however, on its own, has limited to no information on information tied to educational attainment and disability. Therefore, we will use data taken from the Household, Income and Labour Dynamics in Australia (HILDA) Survey, a longitudinal survey representative of the Australian population that collects data on earnings, income and a variety of socio-demographic characteristics, including educational attainment and disability status.

## 9.2

# Earnings shocks and recoveries: The role of family composition



The role of partners in earnings shocks and recoveries is ambiguous. In couples with a primary 'breadwinner', the breadwinner may be particularly incentivised to avoid earnings shocks and, in the event they experience a shock, recovers from the shock quickly. On the other hand, individuals in dual-earner couples may find it easier to quit a job or to delay the search for a new job if they can rely on their partner's earnings.

The role of children in earnings shocks and recoveries is likely to differ by gender. Motherhood tends to reduce female labour supply, increases the probability of females experiencing a voluntary earnings shock, and slows down recoveries if the family decides it is better for the mother to take on the lion's share of childminding. Moreover, females may spend more time in looking after children even after returning to work, which will result in working fewer hours, and, thus, an observed longer period for recovery from an earnings shock associated with having children. On the other hand, if a man is considered the family's primary breadwinner, he may search for stable jobs to avoid fluctuations in earnings.

In 2001, modifications to the Australian tax form were made that makes it easier to identify if an individual is living with a spouse (married or de facto) and their number of children. Initially, however, information on a spouse was not required unless the individual was claiming a tax offset related to having a spouse. From 2012 onwards, all tax filers are expected to complete questions relating to their marital status.

Information on children is limited to the number of children and students claimed for the purposes of reporting information used to calculate the individual's Medicare levy. We do not observe the ages of children in ALife. As we observe each year of the tax filer's return, however, we can approximate whether the individual has recently had a child by comparing the information provided in the previous year with the information provided in the year under study.

Our analysis will focus on the period from 2012 to 2017 and will only capture information for those individuals who lodge a tax return because we do not observe family characteristics for tax years in which an individual has not lodged a tax return.

Further, as the impact on labour supply and earnings may vary with children's ages, we study separately parents aged 25 to 40 and those aged 41 to 54 (which imperfectly captures parents with younger versus older children).

To study the role of family composition on earnings shocks, we group tax filers based on the following classification:

• partner and newborn child;

• partner and dependent children (no newborn child);

• partner and no dependent children;

• single parent (includes dependent children of any age);[22]

• single.

We classify the tax filer's family status for each year. Thus, an individual can change family status over time. For the purposes of this report, we focus on differences relating to the current status of the individual for the year under study.[23]

In Table 9.1 we report the share of tax filers observed between 2012 and 2017, by family type. Given one's family status can change over time, the shares represent ever having been observed as a given family type. Thus, a given tax filer may be represented in more than one grouping.

### Table 9.1. Persons, by family type. Years 2012—2017

|  | Males (1) | Females (2) |
| --- | --- | --- |
| **ALife sample under study** | 498,730 | 441,131 |
| % Partner, newborn | 4.7 | 3.9 |
| % Partner, no children | 20.9 | 24.1 |
| % Partner with dependent chilldren (no newborn) | 40.0 | 35.9 |
| % Single parent | 6.5 | 10.4 |
| % Single | 27.9 | 25.7 |

*Notes:* This table shows the proportion of adults who have ever been classified in a family type from 2012 to 2017. As family types can change over time, percentages do not add up to 100.

22   Due to sample sizes, we could not create a subgroup of single parents with or without a newborn child.
23   In future report and with more data, we can study the effects of changes to one's family composition on shocks and recoveries.

**Figure 9.1. Persons experiencing an earnings shock, by family type—Males aged 25 to 40**
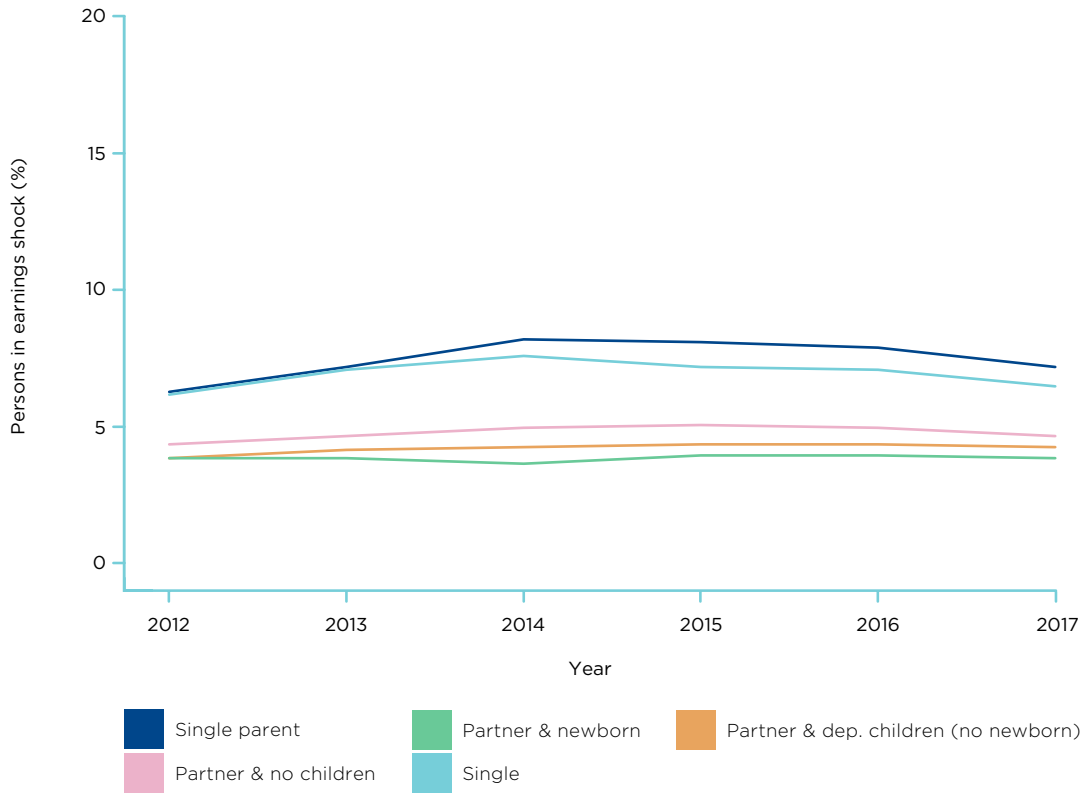


*Notes:* Shares represent persons entering an earnings shock in a particular year as defined in chapter 9, section 2.

In Figure 9.1 we depict the earnings shock rates for males by family type for the year under study. For all family types, the trends in shocks rates are similar. Males without a partner have a higher probability of experiencing an earnings shock. Singles and single-parent males have an earnings shock rate around three percentage points higher than males living with a partner. In 2014, 7.6 percent of single males and 8.2 percent of single parents experienced an earnings shock. Males with a newborn child have the lowest earnings shock rate at 3.7 percent. Partnered males have similar earnings shock rates, ranging between 4 and 5 percent, irrespective of the presence of children.

The fact that not having a partner is associated with a higher probability of experiencing earnings shocks may reflect a different dynamic for males with children than for those without children. Single-parent males who experience a shock and need to provide for their children may face financial hardship, whereas single males without dependent children may be more likely to reduce earnings as a voluntary decision.

The trends and shock rates for females aged 25 to 40, depicted in Figure 9.2, look very different. Females with a newborn child have the highest earnings shock rate. In 2014, 16.6 percent of females with a newborn child experienced an earnings shock. The share decreased slightly, to approximately 14 percent, in 2016 and 2017. Compared to males, females with dependent children are more likely to experience an earnings shock. This finding likely is attributed to the observation that females are more likely to bear child-care responsibilities and may prefer to reduce earnings by moving to part-time employment or not working for some time. In 2014, 9.5 percent of single-parent females and 10.4 percent of females who have a partner and children experienced an earnings shock. Females with no dependent children have the lowest probability of experiencing an earnings shock. In 2014, the earnings shock rate was 5.9 percent for both single and partnered females without children.

**Figure 9.2. Persons experiencing an earnings shock, by family type—Females aged 25 to 40**
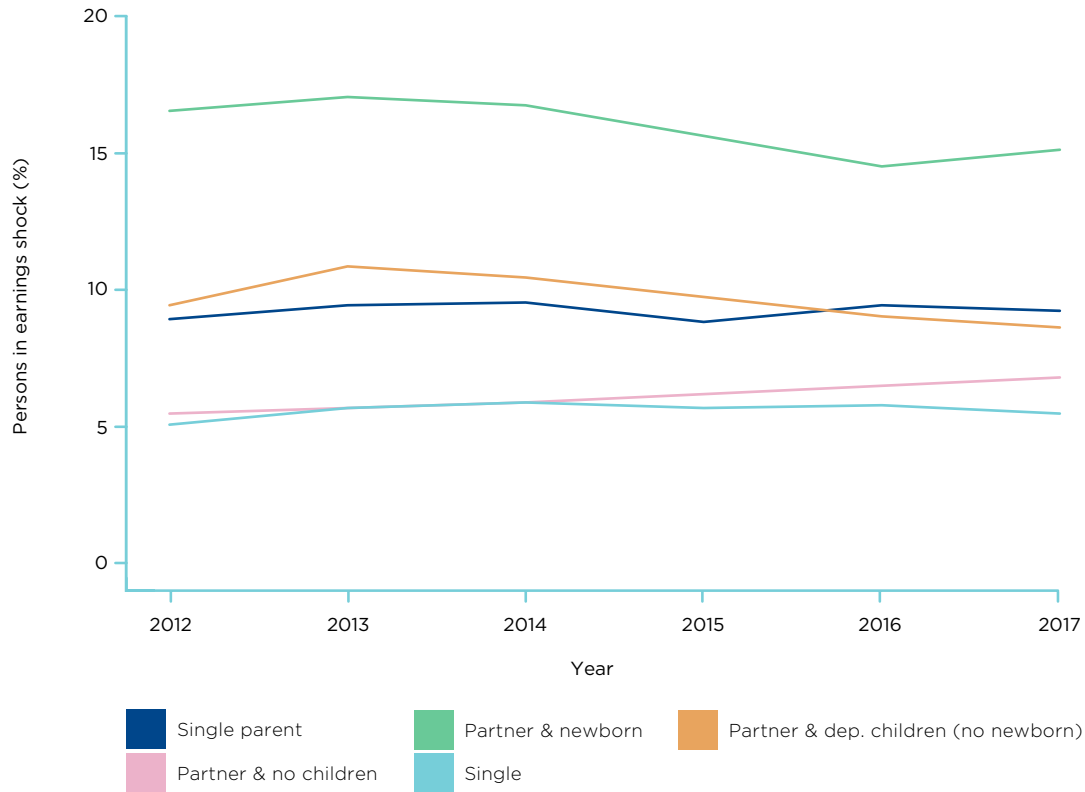


*Notes:* Shares represent persons entering an earnings shock in a particular year as defined in chapter 9, section 2.

In Figures 9.3 and 9.4 we depict the probability of experiencing an earnings shock by family type for males and females aged 41 to 54. The earnings shock rates for males aged 41 to 54 are similar to those for males aged 25 to 40, with the exception of single-parent males. Older single-parent males exhibit a lower probability of experiencing an earnings shock than younger single-parent males.

Comparing Figures 9.2 and 9.4, the earnings shock rates of females aged 41 to 54 are lower than those aged 25 to 40 for all family types. The shock rates of females with children are considerably lower, confirming that the labour supply of females at older ages is likely more stable as children grow up and become more independent. In 2014, 4.2 percent of partnered females aged 41 to 54 with dependent children experienced an earnings shock, compared to 10.4 percent of those aged 25 to 40. In the same year, the share of single-parent females aged 41 to 54 experiencing an earnings shock was 5 percent, compared with 9.5 percent for single-parent females aged 25 to 40. Finally, it is interesting to note that the probability of experiencing an earnings shock is higher for single males and single-parent males aged 41 to 54 than females in those family types.

Does the time it takes to recover from a shock vary by family type? Figures 9.5 and 9.6 depict recovery rates by gender for those aged 25 to 40, respectively. As we can only examine earnings shocks by family type from 2012, the longest period over which we can examine recoveries is five years.

Males recover faster than females in all family types except for singles. Single females recover faster (by an order of magnitude of more than 10 percent within five years) than males, even though single females are less likely to experience an earnings shock relative to single males. Figure 9.5 illustrates that the probability of recovering from a shock for males is similar in all family types. Only males with a partner and no dependent children have a slightly higher recovery rate than the other groups: 39.2 percent of partnered males with no dependent children have recovered within three years and 50.6 percent have recovered within five years, compared with respective recovery rates of 36 percent and 47 percent for the other family types.

**Figure 9.3. Persons experiencing an earnings shock, by family type—Males aged 41 to 54**
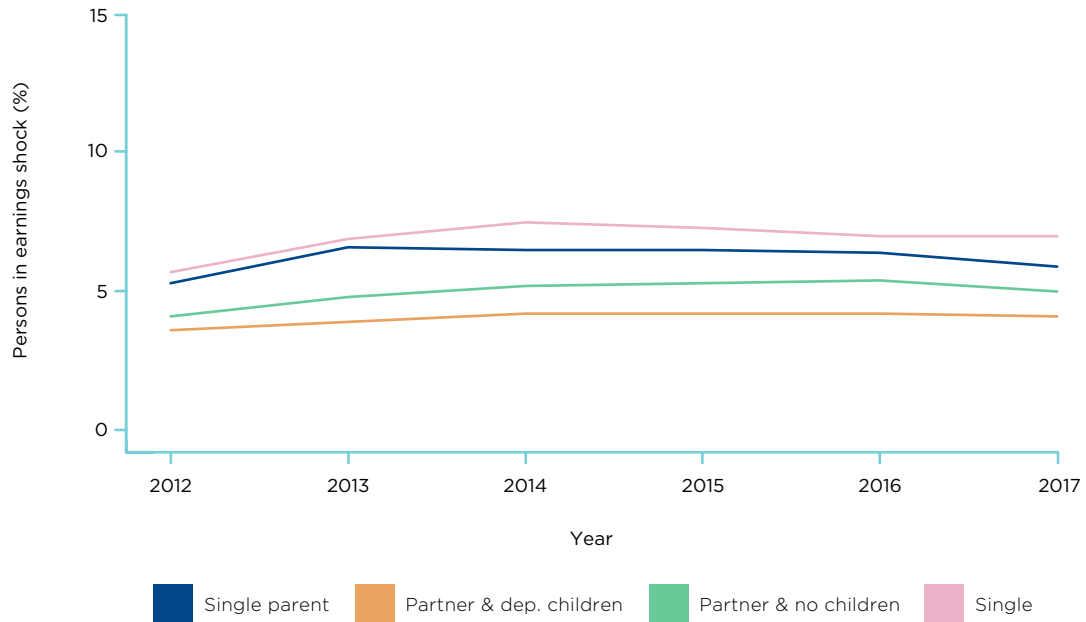


*Notes:* Shares represent persons entering an earnings shock in a particular year as defined in chapter 9, section 2.

**Figure 9.4. Persons experiencing an earnings shock, by family type—Females aged 41 to 54**
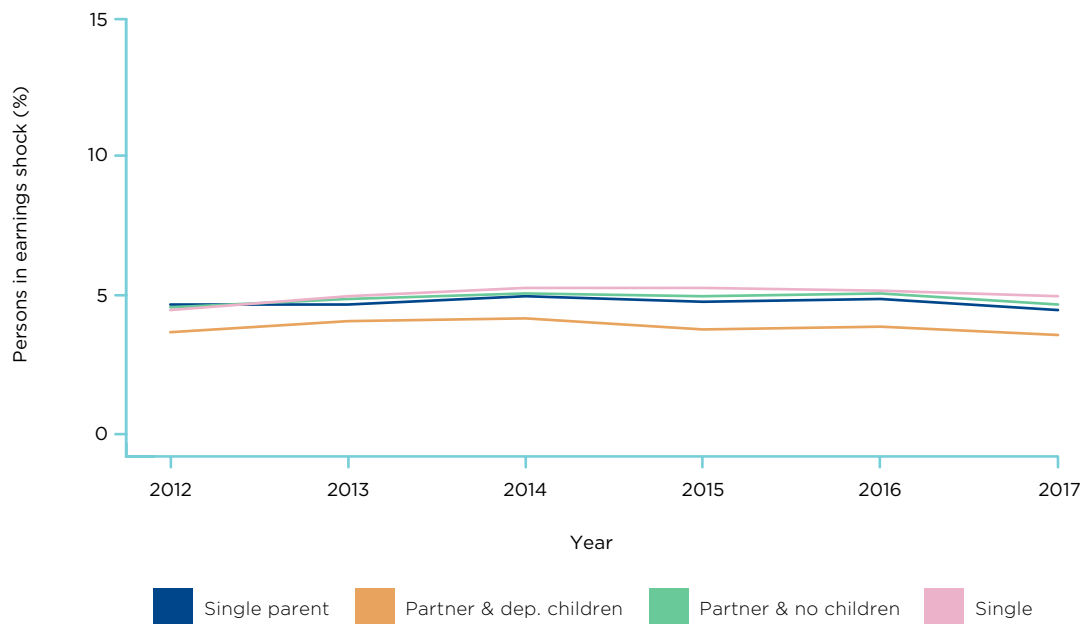


*Notes:* Shares represent persons entering an earnings shock in a particular year as defined in chapter 9, section 2.

**Figure 9.5. Predicted recoveries from an earnings shock, by family type—Males aged 25 to 40**
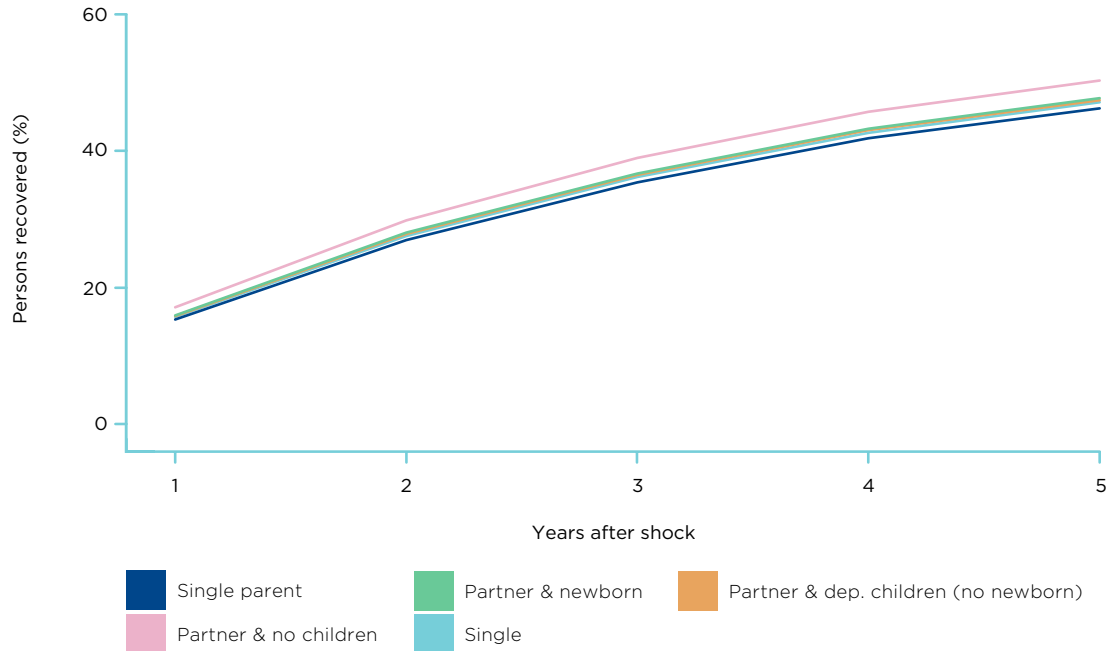


*Notes:* Predicted recovery rates are estimated from a Cox regression model. The model estimates the probability of recovering from the shock after t years given that the person has not recovered after t-1 years. Covariates are family type, macroeconomics period, earnings squared, age, age squared, depth of the shock, an indicator for a losing 100% of earnings.

**Figure 9.6. Predicted recoveries from an earnings shock, by family type—Females aged 25 to 40**
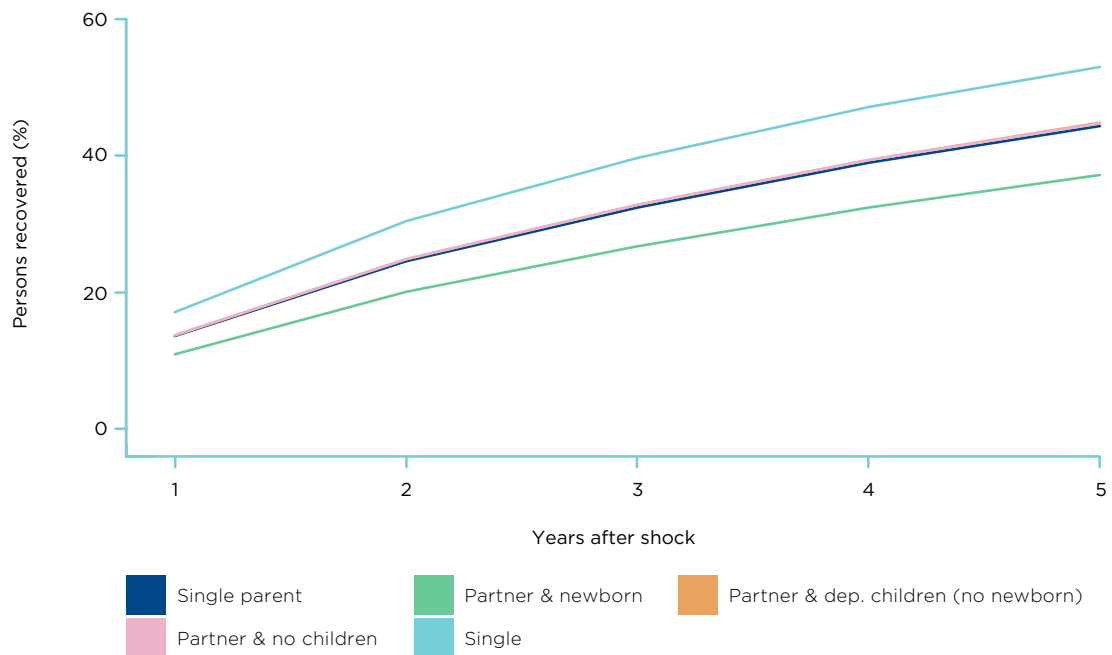


*Notes:* Predicted recovery rates are estimated from a Cox regression model. The model estimates the probability of recovering from the shock after t years given that the person has not recovered after t-1 years. Covariates are family type, macroeconomics period, earnings squared, age, age squared, depth of the shock, an indicator for a losing 100 percent of earnings.

Females aged 25 to 40, however, have more variable recovery rates by family type. Maternity slows down recoveries suggesting that females may take some time before returning to work or move to part-time employment after giving birth. The recovery rates of females with newborn children are 26.8 percent after three years and 37.3 percent after five years. On the other hand, single females are the fastest group to recover. Their probability of recovery is 39.8 percent after three years and 53.2 percent after five years. Recovery rates of the three other family types are similar. The recovery rates of females who live with a partner (with children or without) and single parents are 36 percent after three years and 47 percent after five years.

In Figures 9.7 and 9.8 we depict the recovery rates for males and females aged 41 to 54. As shown in Chapter 7, recovery rates decrease with age. Across family type, recovery rates for males are similar, regardless of family type. These rates are uniformly lower for older than for younger males, to the order of 10 percentage points. Females aged 41 to 54 recover more rapidly than males in the same age range across all family types.

Overall, however, there is little difference in recovery rates by family type, with single-parent females exhibiting a slightly faster recovery rate. Moreover, the recovery rates for older females are slightly lower than for younger females.

Overall, the highest association between family type and shocks is observed for younger adults, those closer to childbearing ages, aged 25 to 40. This is most evident for females. Thus, our findings in Chapter 7, which illustrated significant differences in shocks and recoveries by gender, is likely explained by differences that may be attributed to family composition.

**Figure 9.7. Predicted recoveries from an earnings shock, by family type—Males aged 41 to 54**
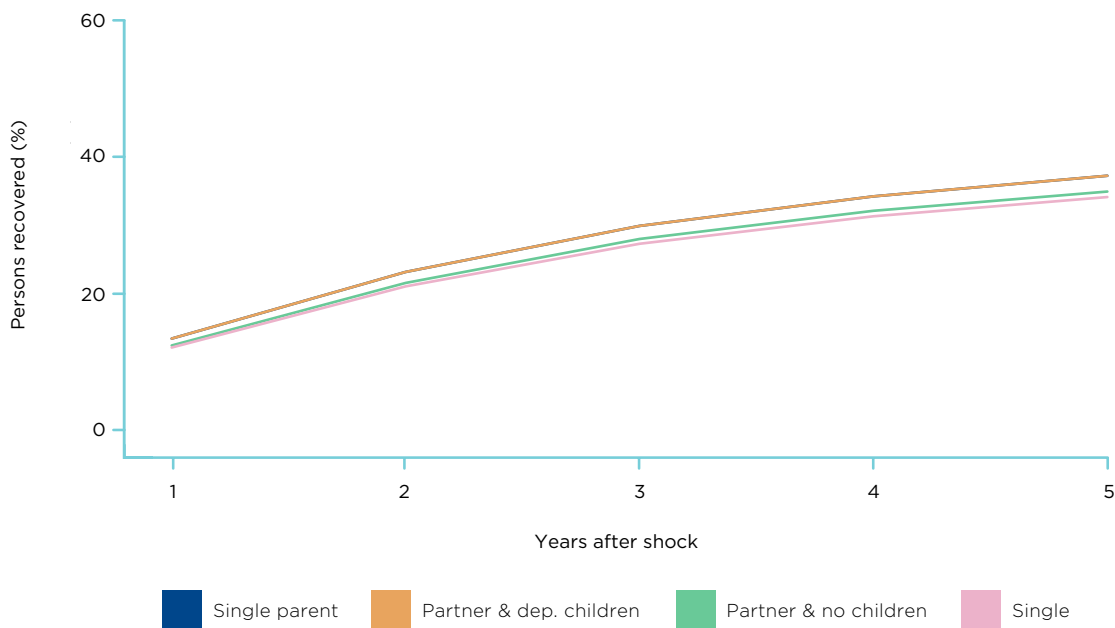


*Notes:* Predicted recovery rates are estimated from a Cox regression model. The model estimates the probability of recovering from the shock after t years given that the person has not recovered after t-1 years. Covariates are family type, macroeconomics period, earnings squared, age, age squared, depth of the shock, an indicator for a losing 100 percent of earnings.

**Figure 9.8. Predicted recoveries from an earnings shock,, by family type—Females aged 41 to 54**
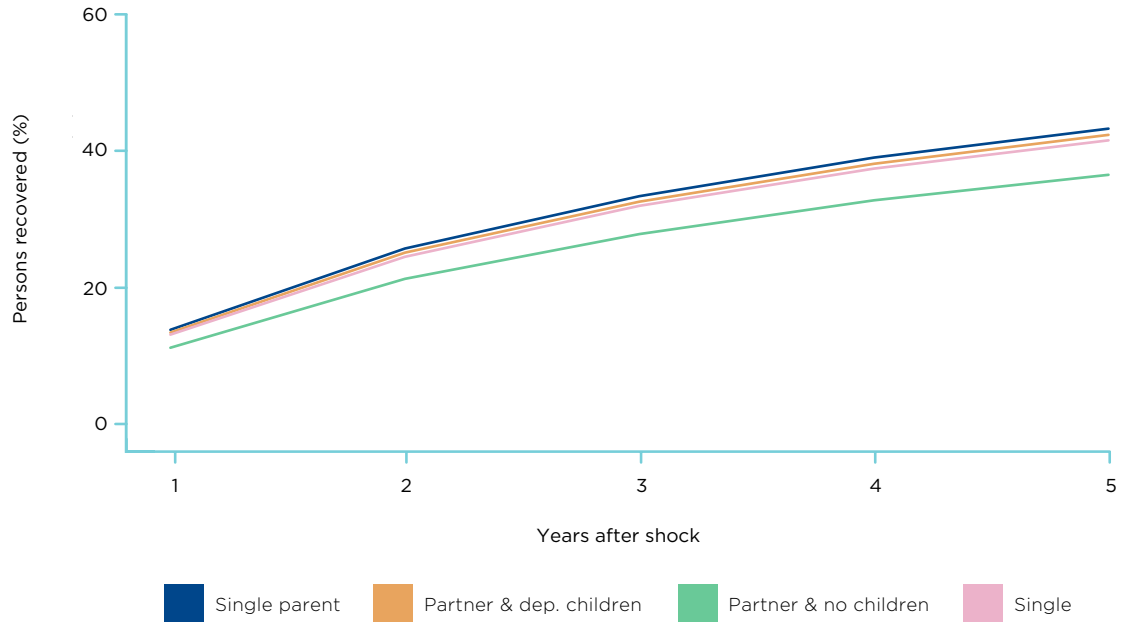


*Notes:* Predicted recovery rates are estimated from a Cox regression model. The model estimates the probability of recovering from the shock after t years given that the person has not recovered after t-1 years. Covariates are family type, macroeconomics period, earnings squared, age, age squared, depth of the shock, an indicator for a losing 100 percent of earnings.

## 9.3

# Earnings shocks and recoveries: The role of education and disability status

In this section, we examine the role of educational attainment and disability status in the year of a shock to explore the potential correlation between these two characteristics and earnings shocks or recoveries. This analysis uses data from the HILDA Survey.

For this analysis we rely on data for those respondents aged 25 to 54 between 2001 and 2017. In Table 9.2, we report the statistics on the number of individuals available for study using the HILDA data. The initial sample captures information on 21,476 individuals. After excluding those for whom we never observe annual earnings above what is needed to qualify for an earnings shock, those we do not observe for at least three consecutive years, and those for whom we do not observe earnings that are above the threshold for the two years used to measure an earnings shock, we are left with a sample of 12,978 individuals that can be used to explore earning shocks.

Our starting point is to explore potential differences in the samples constructed using HILDA and the ALife datasets.[24] There are two key reasons for the HILDA and ALife samples to differ. The first is with respect to the population from which the HILDA sample is drawn. Although

the sample is periodically refreshed to capture recent immigrants to Australia, ALife draws from a population that captures all tax filers, which would include immigrants. Second, earnings and other sources of income are captured in HILDA based on a self-report by the respondent. While earnings are also self-reported by the tax filer, there are differences in the potential repercussions for misreporting earnings and other sources of income between ALife and HILDA. There are no repercussions for misreporting earnings in HILDA, whereas there could be serious repercussions for misreporting income on one's tax return.

Figure 9.9 depicts the earnings shock rates for HILDA and ALife, by gender. The shock rates using HILDA data are depicted in orange and those using ALife data are depicted in blue. For both genders, the shock rates are higher in ALife than for HILDA. For the earlier years, the gap for females is in the order of two percentage points. This gap is reduced to closer to one percentage point by the end of the sample period. For females, the trends in shock rates for the two datasets are similar.

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24   The analysis using the HILDA Survey data spans 2001–2017. We use earnings data for the two preceding years to measure pre-shock earnings, which means we can measure shocks for the period 2003 to 2017.

**Table 9.2. Development of the working data set. HILDA data, 2001—2017**

| | Total persons | | |
| --- | --- | --- | --- |
| | Males (1) | Females (2) | Total (3) |
| **Persons ever aged 25 to 54** | 10,704 | 10,771 | 21,476 |
| Persons whose earnings never exceed the minimum threshold for measuring an earnings shock (-$8,900 in 2017) | 907 | 1,857 | 2,764 |
| Persons who are never observed for at least three consecutive years | 1,930 | 1,522 | 3,452 |
| Persons whose earnings for the two consecutive years used to identify an earnings shock are always less than the minimum threshold (-$8,900 in 2017) | 1,089 | 1,192 | 2,282 |
| Number of persons studied | 6,778 | 6,200 | 12,978 |

*Notes:* For the definition of earnings shock, see chapter 2, section 2.

**Figure 9.9. Persons experiencing an earnings shocks, by gender and data source**
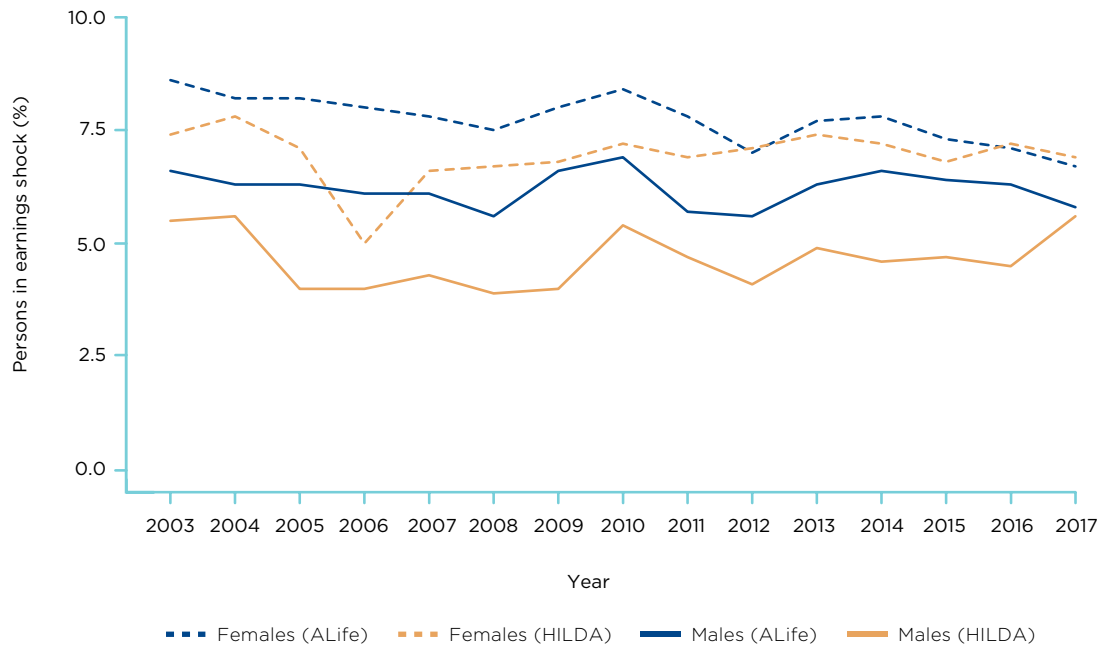


*Notes:* Shares are persons entering an earnings shock in a specific year as defined in chapter 2, section 2.

For males, there is a bigger gap in the earnings shocks calculated using ALife and HILDA data. For most years, the shock rates are higher using the ALife data by approximately 2.5 percentage points. Except for the period around 2006, however, the trends in the shock rates are similar.

HILDA has the advantage of collecting information on socio-economic characteristics but, compared to ALife, is a much smaller sample. For example, between 2003 and 2017, we observe a total of 1,924 earnings shock events for males and a total of 2,387 shock events for

females using HILDA. Unfortunately, this limits our ability to analyse shocks and recoveries on a yearly basis. Thus, to explore the association between educational attainment or disability on shocks and recoveries, we will explore the data for the entire sample period.

We focus on educational attainment by identifying whether the person under study has received a university degree and/or a post-high school trade certificate, diploma or degree. Education is potentially an important factor to prevent earnings shocks and/or to assist in a more rapid recovery from a shock. Individuals who are highly educated are likely to have more valuable skills in the labour market and therefore be more sought after by employers. In Table 9.3, we report the share of the HILDA sample under study by highest level of educational attainment. Females are more likely to report having some training beyond high school (58 versus 47 percent) as well as having a university degree (40 versus 29 percent).

The last dimension we analyse is disability, which in this analysis we define as a long-term health condition that restricts daily activities. These disabilities may or may not affect the working conditions of the individual depending on the nature of the condition and the individual's occupation. Disability may lower people's productivity by deteriorating skills, worsening mental health, limiting the ability to do tasks or increasing absenteeism.

The measure of disability used in this analysis is a proxy for a potential health condition that could affect the ability to undertake certain tasks, restrictions to the number of hours one might be able to work and/or increased absences from work. Table 9.3 shows the share of the HILDA sample under study by ever having reported a disability. Given we include temporary spells of disability, the share of respondents observed with at least one year of a disability is close to 50 percent for both males and females.

To explore the correlation of education and/or disability in respect of experiencing an earnings shock, we run a regression that uses as a dependent variable a value of 1 indicating the respondent experienced an earnings shock in that year, and 0 otherwise. The regression includes, as controls, measures to reflect the level of educational of the respondent in that year, whether the respondent reports a disability in that year, and a set of controls to capture age, year, family composition and previous earnings.

## Table 9.3. Persons by educational attainment, attendance in education and disability status

|  | Males (1) | Females (2) |
|---|---|---|
| **HILDA sample under study** | 6,778 | 6,200 |
| With university degree | 28.8% | 40.4% |
| Ever attended post high school certificate, diploma or degree in the period under study | 46.6% | 57.6% |
| Ever reported a temporary or permanent disability in the period under study | 45.2% | 45.9% |

*Notes:* The sample consists of HILDA respondents aged 25—54 who fit the criteria defined in Table 9.2. Disability is defined as a health condition affecting daily activities.

**Figure 9.10. Persons experiencing an earnings shock, by educational attainment and disability status**
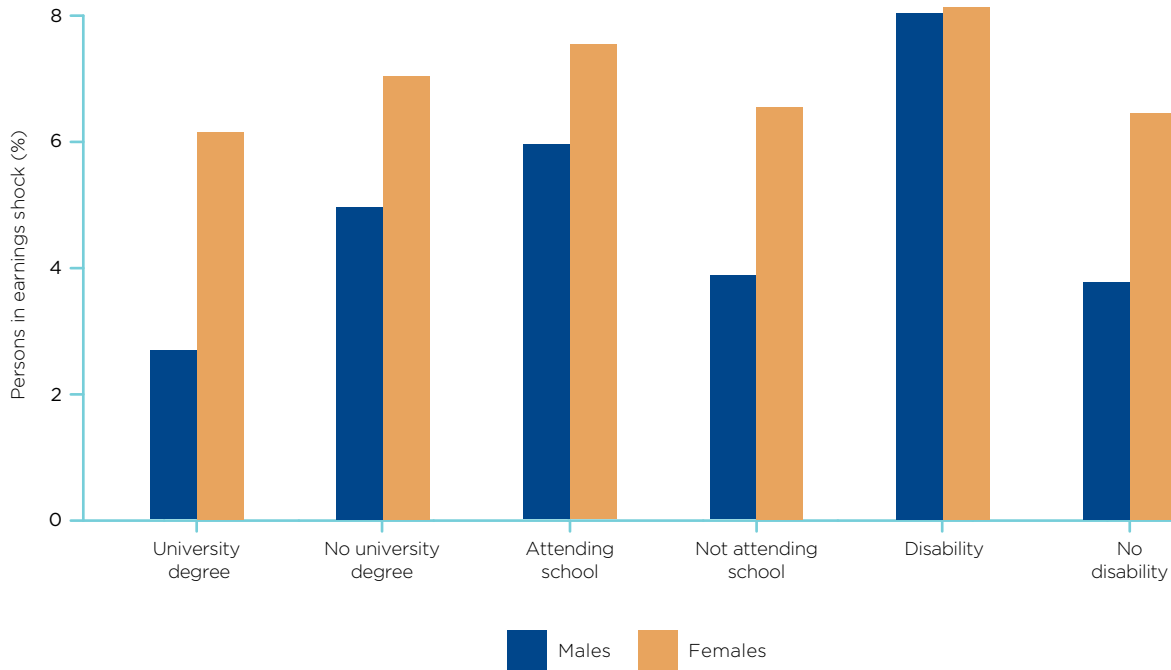


*Notes:* Shares are predicted probabilities recovered from a linear probability model. The dependent variable is a dummy indicator of experiencing an earnings shock. Covariates are age, age squared, survey–wave, having partner, having newborn child, dependent children, previous earnings. Data source: HILDA.

Figure 9.10 reports the share of respondents with an earnings shock conditioned on the characteristics of the respondent (e.g., age, family composition). The first four characteristics capture different levels of educational attainment. Both males and females are less likely to experience an earnings shock if they have a university degree than if they have not. The difference in shock rates is higher for males (~2 percentage points) than for females (~1 percentage points). If, in the year of the shock, the respondent is attending a program beyond high school, the respondent is more likely to experience a shock than if the respondent is not attending high school.
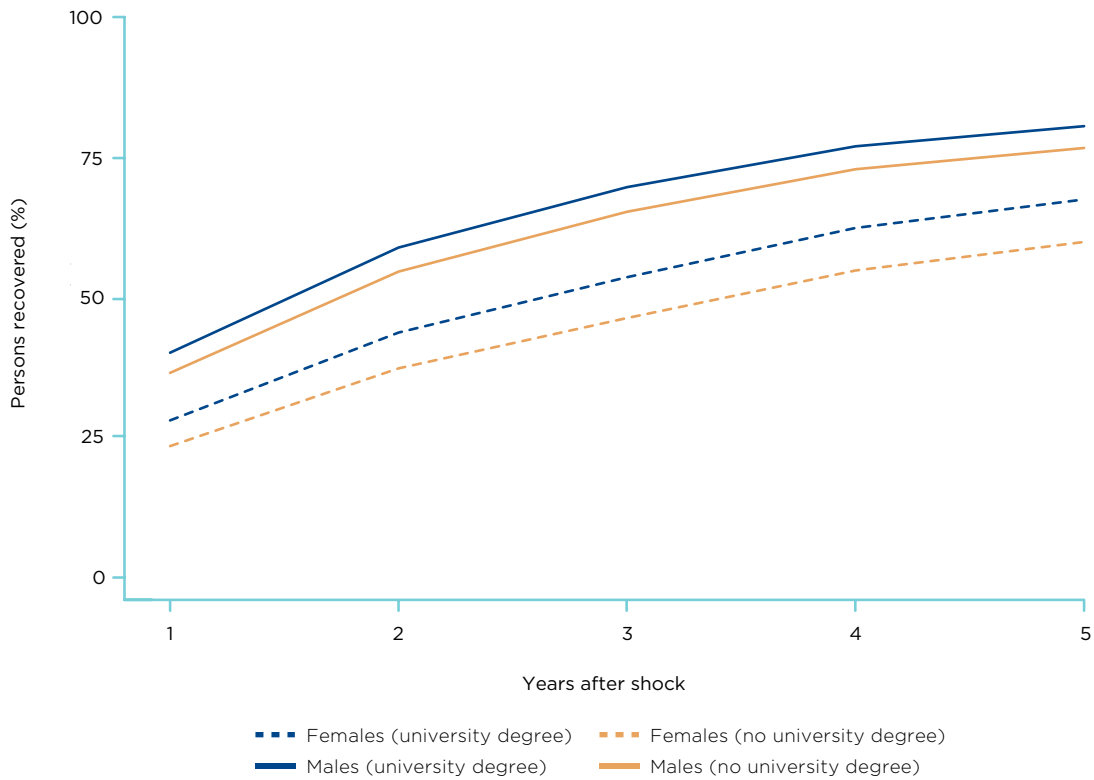
In Figure 9.11, we report the recovery rates from shocks based on whether the respondent in shock has a university degree or not.[25] The recovery rates shown in Figure 9.11 support the belief that education is an important asset in the labour market. Recovery rates of males and females with a university qualification are considerably higher. The probabilities of recovering for university-education males are 40

percent within a year and 70 percent within three years compared to 37 percent and 65 percent for males with no university qualification. The recovery rates are 28 percent within a year and 54 percent within three years for females with university qualifications and 24 percent within a year and 47 percent within three years for females with no university qualifications.

Figure 9.10 shows that a disability increases the probability of experiencing an earnings shock. More than 8 percent of males and females with a disability experience an earnings shock, compared to 3.8 percent of males and 6.5 percent of females who have not reported a disability. Disability may have a long-lasting effect on a worker's productivity. Figure 9.12 illustrates that having a disability reduces recovery rates for males and females. The 1-year rate for males with a disability is 33 percent and the three-year rate is 60 percent. The corresponding rates for males not reporting a disability are 39 percent and 68 percent. The three-year recovery rate is 44 percent for females with a disability and 51 percent for females not reporting a disability.

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25   Note that the recovery rates observed using the respondents in the HILDA Survey are, on average, higher than those observed using the sample in the ALife data.

**Figure 9.11. Predicted recoveries from an earnings shock, by education and gender**



Legend:
- Females (university degree)
- Females (no university degree)
- Males (university degree)
- Males (no university degree)

*Notes:* Predicted recovery rates are estimated from a Cox regression model. The model estimates the probability of recovering from the shock after t years given that the person has not recovered after t-1 years. Covariates are family type, macroeconomics period, earnings squared, age, age squared, depth of the shock, an indicator for a losing 100 percent of earnings.

**Figure 9.12. Predicted recoveries from an earnings shock, by disability status and gender**
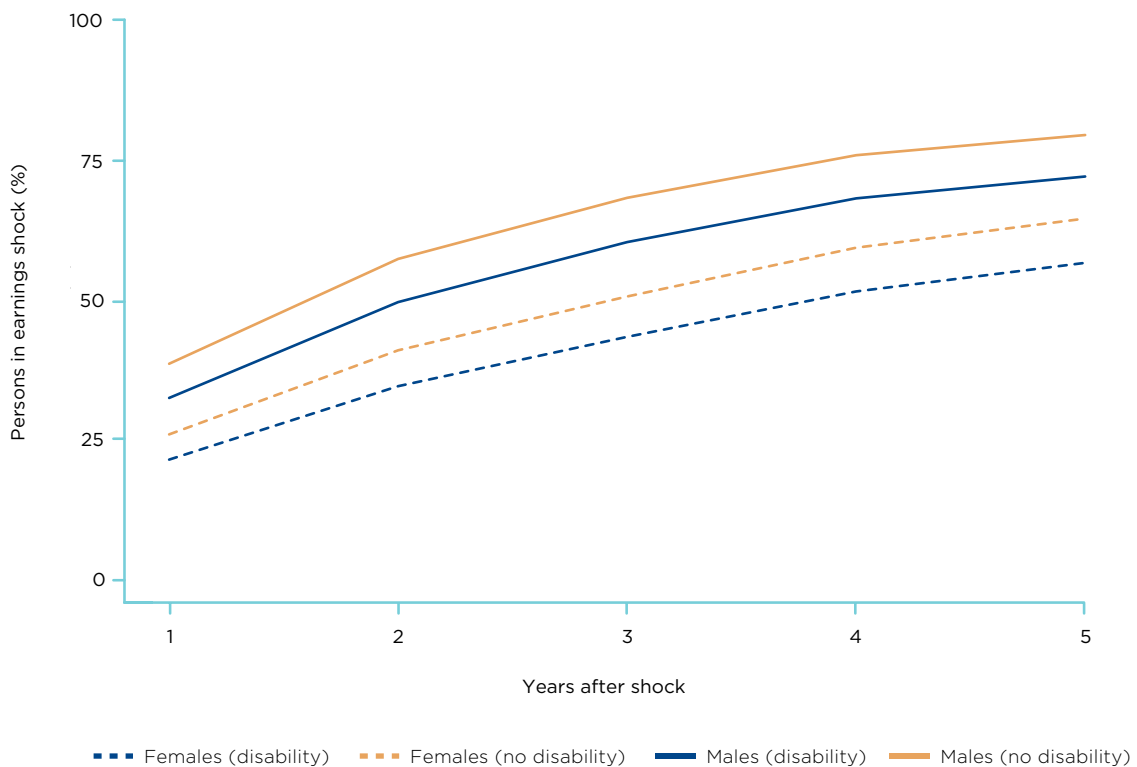


Legend:
- Females (disability)
- Females (no disability)
- Males (disability)
- Males (no disability)

*Notes:* Predicted recovery rates are estimated from a Cox regression model. The model estimates the probability of recovering from the shock after t years given that the person has not recovered after t-1 years. Covariates are family type, macroeconomics period, earnings squared, age, age squared, depth of the shock, an indicator for a losing 100 percent of earnings.

# 9.4
# Summary

Earnings shocks and recovery rates differ substantially by family composition, educational attainment and participation, and disability status. Males who have a partner are less likely to experience an earnings shock, suggesting that they may aim at earnings stability as a response to the responsibilities of providing for a family. Childbirth, and having dependent children more generally, increases the probability of earnings shocks and slows recoveries of young females. University education improves skills and provides qualifications that people can use in the labour market. The increase in productivity due to education reduces the probabilities of falling into shock and increases the pace of recoveries. Disability may deteriorate skills and capacity to work, reducing productivity. Females and males with a disability have higher earnings shock rates and lower recovery rates.

Our findings suggest that policies that help females with children balance work and family duties, increase educational attainment and reduce employment barriers faced by people with disability will reduce the prevalence of earnings shocks and increase the rate of recovery from these shocks. The analysis presented here does not, however, provide guidance on the specific form these policies should take.

# 10.
# Conclusion

For most Australians, earnings play a critical role in being able to make ends meet and to live a healthy lifestyle. When one experiences an earnings shock, be it voluntary (e.g., changing careers) or involuntary (e.g., a plant closure), the risk of becoming vulnerable to entering a state of economic disadvantage increases. This report illustrates that while the depth of earnings shocks has fallen over the past 30 years, during periods of booms, busts and 'dog days', males and females alike suffer from earnings shocks. In more recent years (e.g., 2017, pre-pandemic) the rate of shocks saw 10 percent of wage-earning tax filers experience shocks in any given year; rates were higher during periods of economic turmoil such as during the GFC in 2010.

Admittedly a significant earnings shock (a drop in earnings that exceeds 40 percent) can be voluntary; these rates exceed reported unemployment rates in most years. We document that earnings shocks will vary based on pre-shock earnings, with those at the bottom distribution much more (e.g., three times) likely to experience an earnings shock than those at the top end of the distribution. We also document higher rates of earnings shocks for individuals under 35. Across most metrics, moreover, females experience higher rates of earnings shocks, although a portion of these shocks may be attributable to a reduction in hours and/or exiting from the work force after having children.

The analysis in this report also documents that the likelihood of a rapid recovery from an earnings shock is very low. In many cases, of those who experience an earnings shock, far fewer than half have returned to their pre-shock earnings within three years. Recovery rates, however, are better for younger Australians and those with low incomes. Uniformly, however, recovery rates are stronger for males than for females.

This report also touches on a few characteristics that are correlated with earnings shocks and recoveries. Those with higher educational attainment are observed with lower rates of earnings shocks and faster recoveries. Those with a temporary or permanent disability are observed with higher rates of earnings shocks and slower recoveries.

This report illustrates that understanding the dynamics of earnings apart from income poverty rates and unemployment rates will help us to better understand how best to insure against the risk of moving into a state of economic disadvantage and to address the potential vulnerabilities that are associated with states of increased risk of poverty or disadvantage.

This report also illustrates the value of using large longitudinal datasets such as the tax-filer dataset known as ALife to explore issues that relate to the economic wellbeing of individuals and households.

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## Professor A. Abigail Payne

Professor A. Abigail Payne has been the Director and Ronald Henderson Professor at the Melbourne Institute: Applied Economic & Social Research since 2016. A driving force behind Professor Payne's work is the use of data and statistics to inform economic policy, especially in the area of public economics. Her research covers (a) the effects of policy on educational outcomes, transitions in schooling, gender differences in educational attainment, and student performance, (b) understanding donor and charity behaviour, and (c) exploring the determinants of poverty and disadvantage in Australia and identifying mechanisms and effective policies for reducing poverty. Her research has been published in top economic and public policy journals. In 2022, she was a Visiting Fellow at Hoover Institution (Standford University, USA).

Prior to moving to Melbourne, Professor Payne was a professor of economics at McMaster University (Canada) where she was the inaugural director of MacDATA, McMaster's Big Data Institute, and the creator and director of the Public Economics Data Analysis Laboratory ("PEDAL") a secure data facility to address key public sector issues. She also has held positions at the University of Illinois and the University of Toronto, and she practised law for five years at a private law firm in Washington, DC. Previously Professor Payne was a Tier II Canada Research Chair in Public Economics, and she received a National Academy of Education/Spencer Foundation Post-Doctoral Fellowship for her research on higher education issues. Professor Payne received her PhD from Princeton University. She holds a JD from Cornell University and a B.A. with honours from Denison University

Professor Payne has been a driver behind the building of the Melbourne Institute Data Lab and the creation of shared data environments. She serves on many committees in Australia and internationally. This includes serving as a member of the Australian Statistics Advisory Council, chair of the ifo Institute's Scientific Advisory Council, co-editor of Economic Inquiry, member of the Asian and Australasian Society of Labour Economics Board, panel member of the Department of Treasury's Macroeconomic Group Economic Advisory Panel, member of the Go8

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Roger Wilkins is Deputy Director of the Melbourne Institute as well as being Deputy Director (Research) of the HILDA Survey program area.

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As part of his work in the HILDA Survey program, Roger produces the annual HILDA Survey Statistical Report, which each year analyses the latest release of the HILDA data.

He has also produced the Australian income component of the World Wealth and Income Database (WID) since 2014.

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Dr Zilio has contributed to a report for the Fair Work Commission on low-paid workers in Australia and a report for the Australian Defence Force on the socio-economics characteristics of the female population. He has also produced reports on the impact of COVID-19 and inflation on Australians' consumption behaviour.

He currently works on an ARC research grant that investigates non-standard forms of employment and fertility. He also works on a project funded by the Faculty of Business and Economics, University of Melbourne that studies the economic consequences of climate disasters.

# Appendices

# Appendix A: Further information about the sample construction

In this appendix we provide additional detail about the individuals we study and the extent to which we can observe all relevant tax filings for these individuals. Part of this exploration is tied to the sample exclusions we employ, which relates to dropping tax filers with limited information. For any given birth year, our comparisons are based on having at least one observation during the sample period.

To illustrate the effect of our sample exclusions on each birth cohort, Figures A.1 and A.2 depict the share of tax filers in the sample that are included in our analysis. In Figure A.1 we depict the males in the sample. At the tail ends, we can study between 59 and 75 percent of the sample of individuals in the ALife dataset. For most years, however, we can study close to 90 percent of the individuals in the sample. The figure also
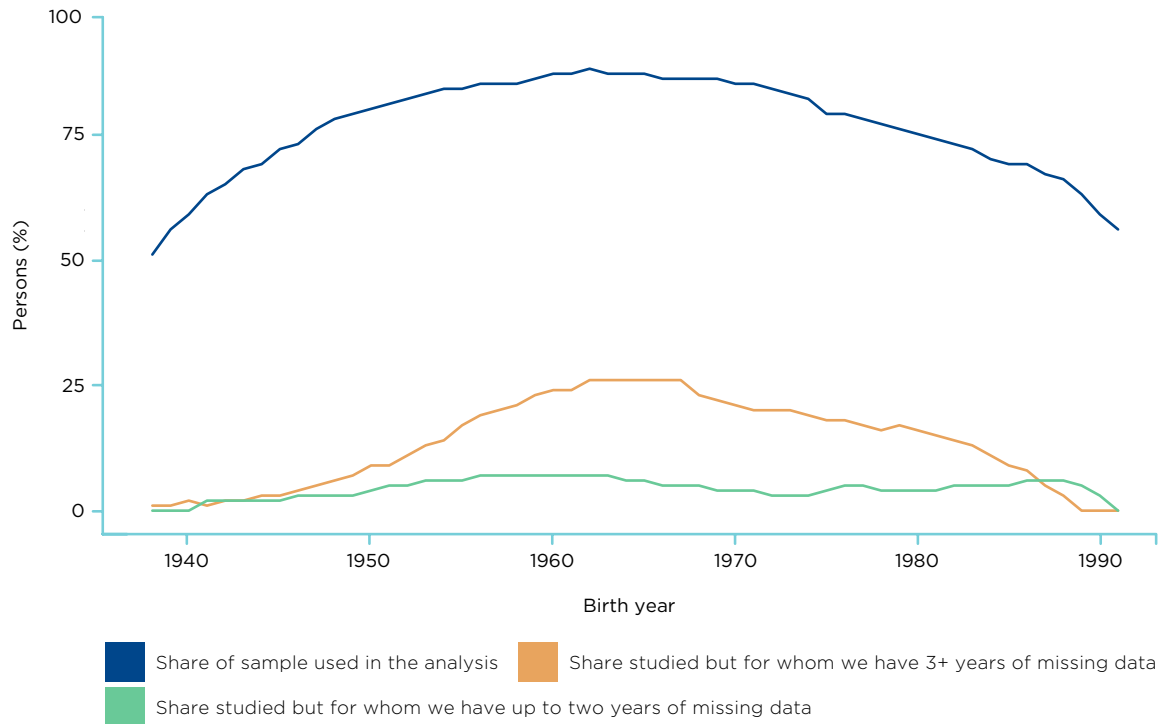
depicts the share of individuals who have one or two years of missing data as well as the share of individuals who have three or more years of missing data. For most individuals, we observe earnings and income in all years. For those born between the mid-1960s to the mid-1970s (those who would have information from their mid-20s to mid-50s), close to 20 percent of the individuals have three or more missing years of earnings.

Figure A.2 depicts the female tax filers. The shapes of the lines in the figure mirror male tax filers. The share studied, however, is lower for the birth years at the tails of the years we can study. In addition, there is a higher proportion of females with three or more years of missing information. We suspect that this higher rate of having missing information reflects females who exit the workforce for a period due to childbirth.

**Figure A.1. Persons under study, by birth year—Males**
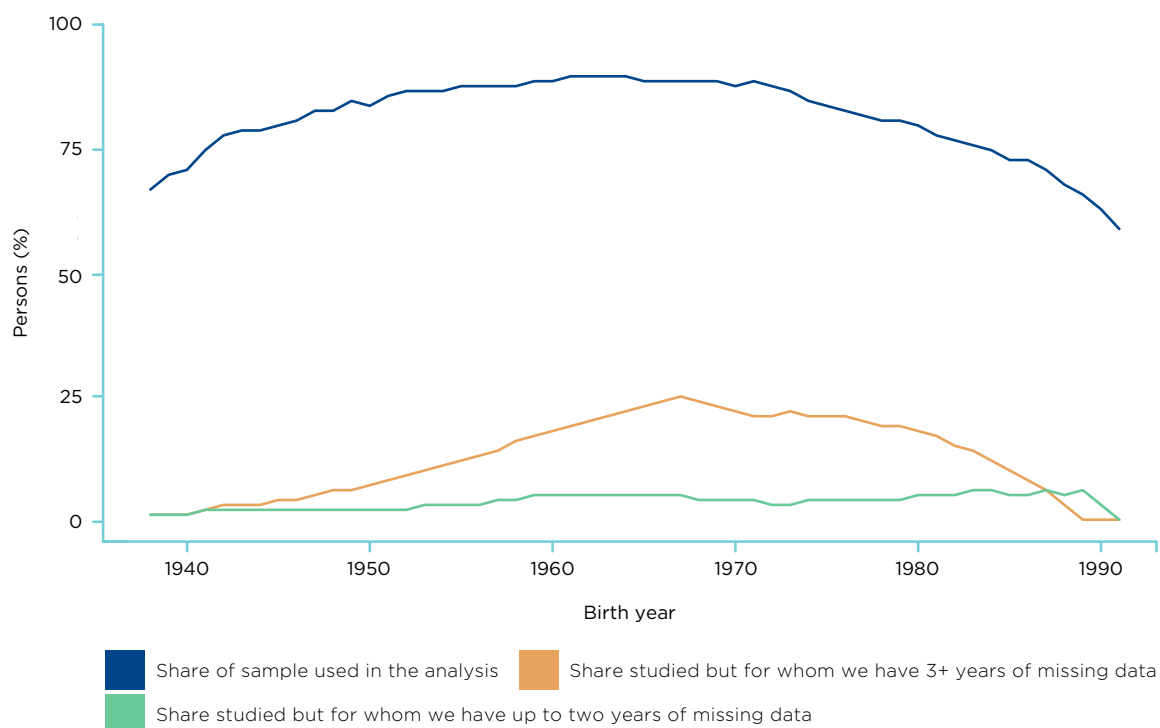


*Notes:* See Table 2.1 for exclusion restrictions.

**Figure A.2. Persons under study, by birth year—Females**



Legend:
- Share of sample used in the analysis
- Share studied but for whom we have 3+ years of missing data
- Share studied but for whom we have up to two years of missing data

*Notes:* See Table 2.1 for exclusion restrictions.

In Figures A.3 and A.4, we depict the tax filers used in our analysis by age. Figure A.3 captures male tax filers and Figure A.4 captures female tax filers. For each age, we report the share of those used in our sample based on having reported earnings that fall above or below the earnings threshold of one quarter of the annual full-time minimum wage. The share not depicted is the share of individuals who should be observed in ALife but for whom there is no information. This 'missing' share would include those who are living outside of the country in the given tax year—immigrants who arrived in Australia aged older than 25 and emigrants leaving when aged younger than 54—and, for the period prior to 2002, those who have not filed a return.[25] Across all ages, approximately 70 percent of male tax filers report earnings above the threshold (Figure A.3). The share of the sample that reports earnings less than the threshold ranges between 11 percent (younger males) and 21 percent (older males).

For females (Figure A.4), there is a slightly different story. For those aged in their mid-20s, close to 70 percent report earnings above the threshold. This share drops between ages 29 and 39. Around age 40, the share increases to closer to 70 percent or higher, with the share dropping again at around age 53.

Figures A.1 to A.4 demonstrate that the ALife dataset captures the relevant information we need to measure earnings shocks and that most of the tax filers in the dataset have been filing regularly and reporting earnings that are sufficiently above the income threshold.

25   Non-lodgers' data are available from the financial year 2000–01.

## Figure A.3. Persons under study with reported earnings, by age—Males
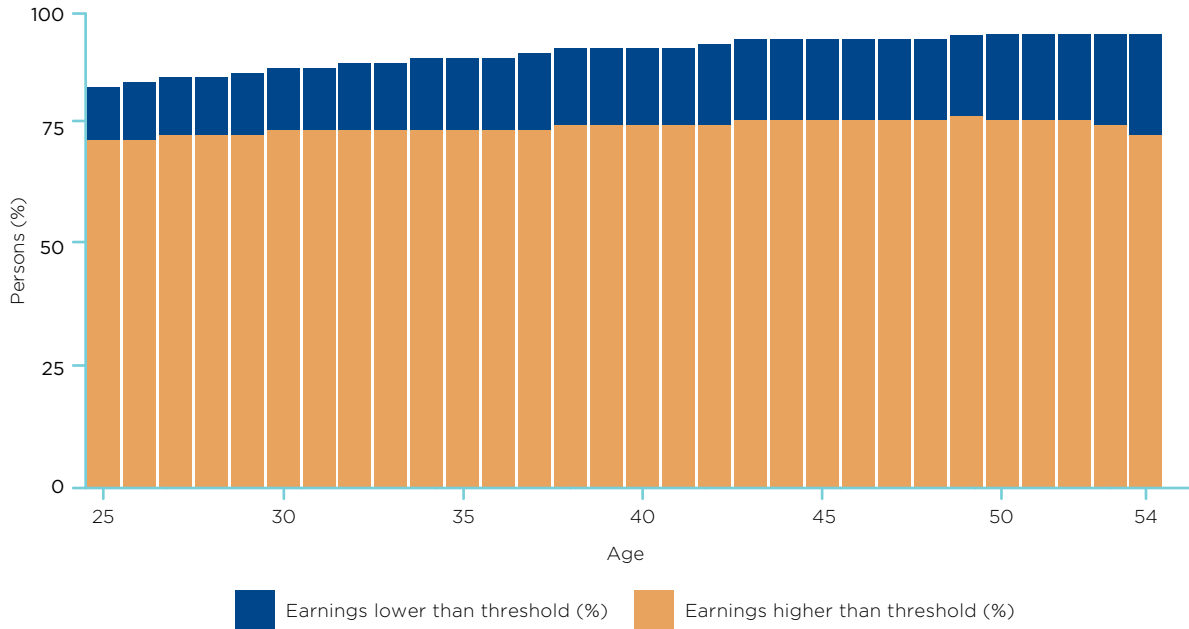


Legend: Earnings lower than threshold (%) ; Earnings higher than threshold (%)

*Notes:* Persons with non-reported earnings are those who do not have taxable income and do not receive any payment from government or work, those who arrive in Australia older than 25 or leave Australia younger than 54. The threshold is defined as the 25 percent of the annual minimum wage for the year under study.

## Figure A.4. Persons under study with reported earnings, by age—Females
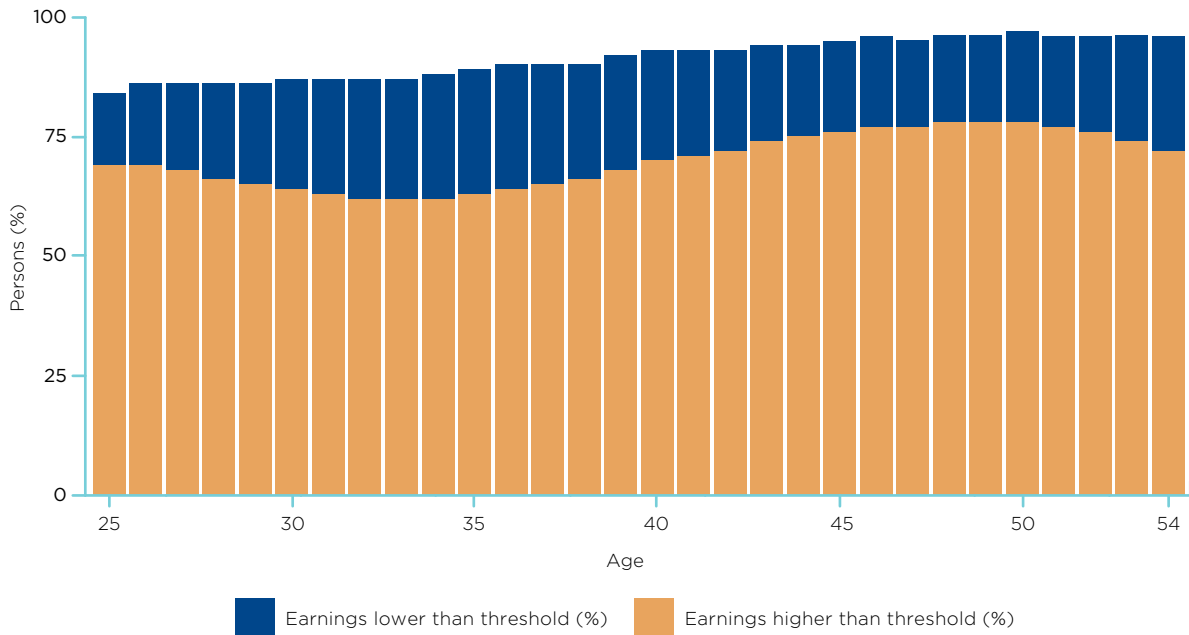


Legend: Earnings lower than threshold (%) ; Earnings higher than threshold (%)

*Notes:* Persons with non-reported earnings are those who do not have taxable income and do not receive any payment from government or work, those who arrive in Australia older than 25 or leave Australia younger than 54. The threshold is defined as the 25 percent of the annual minimum wage for the year under study.

# Appendix B: Robustness to alternative definition of total income

**Table B.1. Earnings change vs total income change matrix**

| | Change in total income (excluding government benefits) | | | |
|---|---|---|---|---|
| | Number of observations (1) | Decrease 40—100 percent (2) | Decrease <40 percent (3) | Increase or no change (4) |
| **Panel A: Males** | | | | |
| A. Decrease in earnings of 40-100% | 677,529 | 82.40% | 10.11% | 7.49% |
| B. Decrease in earnings of <40% | 1,824,798 | 1.80% | 84.04% | 14.15% |
| C. Increase or no decrease in earnings | 5,419,810 | 0.27% | 4.41% | 95.32% |
| **Panel B: Females** | | | | |
| A. Decrease in earnings of 40-100% | 662,382 | 85.20% | 8.34% | 6.46% |
| B. Decrease in earnings of <40% | 1,416,869 | 2.28% | 82.70% | 15.03% |
| C. Increase or no decrease in earnings | 4,304,177 | 0.36% | 4.69% | 94.95% |

*Notes:* Rows represent the size of earnings changes and columns represent size of total income change (excluding government benefits, additional payments from one's employers such as employer's allowances, lump sum payments and termination payments, attributable personal services). Earnings (total income) change is calculated as percentage change between earnings (total income) in the current year and the minimum value of earnings (total income) in the two previous years.

In this section we test how the distribution of the observations would change if we vary the definition of total income. In Table B.1 we replicate Table 2.2, which shows the distribution of the observations by earnings and total income changes. Compared to Table 2.2, in Table B.1 we remove all additional payments made by employers from total income. The rationale for this check is that some individuals who experience a large drop in earnings may not fall into the definition of shock because additional payments buffer losses in total income. For example, we may not identify as experiencing shock some dismissed workers whose annual earnings fall by more than 40 percent because they receive a termination payment that prevents their total income dropping by more than 40 percent.

When comparing Table 2.2 and Table B.1 we see that excluding additional payments makes little difference. The proportion of workers experiencing a 40 percent or larger decline in earnings is 8.6 percent for males and 10.4 percent for females. Of those workers 82 percent males and 85 percent females have total income falling by more than 40 percent and fulfil the definition of shock if we exclude additional payments compared to 78 percent of males and 82 percent of females if we include them.

# Appendix C: Robustness to inclusion/ exclusion of non-lodger data

ALife contains data on earnings and income of tax filers who lodge a tax return from 1990–91 to 2016–17. Data for non-lodgers are available from 2001–02 to 2016–17, so earnings and income of non-lodgers prior to 2001–02 are not observed. Earnings and income of individuals who leave the country temporarily or permanently are missing in all years if they do not lodge a tax return. In the main analysis we assume zero earnings and income in cases of missing data.

This approach likely overstates earnings shocks as some individuals with imputed zero earnings do not actually experience an earnings shock. In the analysis below, we show that this assumption does not bias our conclusions.

Figures C.1 and C.2 show the sensitivity of the prevalence of earnings shocks to the use of non-lodger data and the assumption of zero earnings and income. Figure C.1 depicts the sensitivity checks for males and Figure C.2 for females.

**Figure C.1. Persons experiencing an earnings shock. Robustness checks—Males**
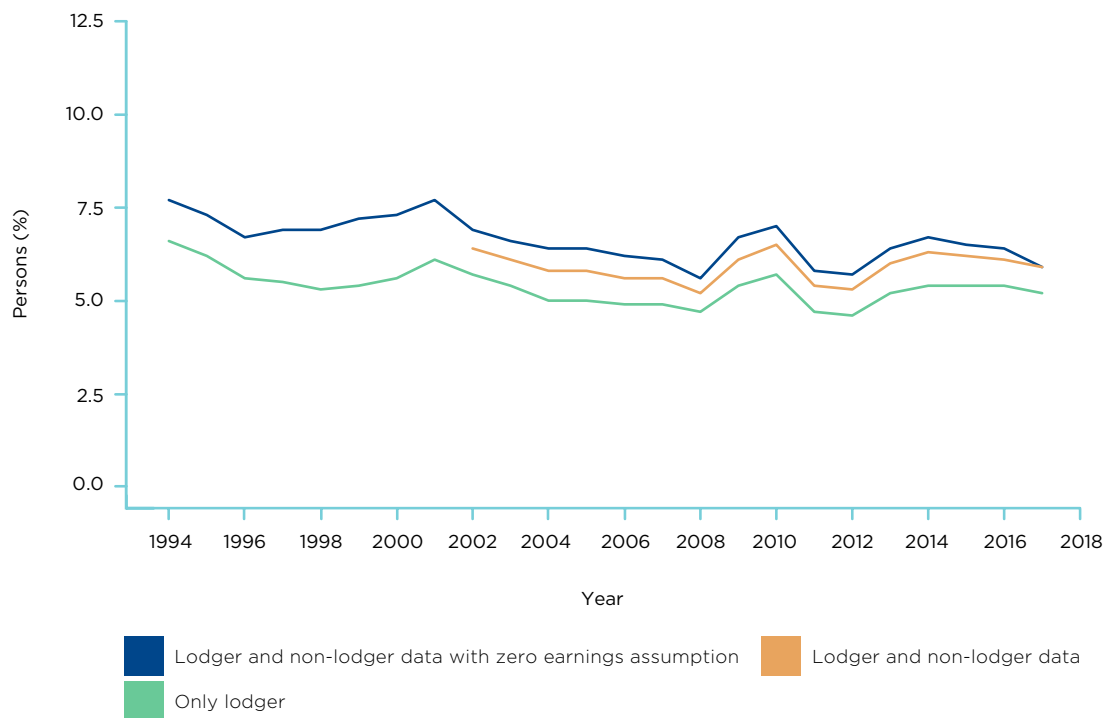


*Notes:* The blue line calculates the share of persons experiencing an earnings shock using lodger and non-lodger data. In the calculation of the blue line non-reported earnings are set to zero. The orange line and the green line exclude the years when persons do not report earnings. The orange line depicts the share of persons experiencing an earnings shock using lodger and non-lodger data. The green line uses lodger data only. The orange line starts from 2001–02 as non-lodger data are unavailable in earlier years. For the definition of earnings shock, lodger and non-lodger see chapter 2, section 2.

**Figure C.2. Persons experiencing an earnings shock. Robustness checks—Females**



Legend:
- ■ (dark blue) Lodger and non-lodger data with zero earnings assumption
- ■ (orange) Lodger and non-lodger data
- ■ (green) Only lodger

*Notes:* The dark blue line calculates the share of persons experiencing an earnings shock using lodger and non-lodger data. In the calculation of the blue line non-reported earnings are set to zero. The orange line and the green line exclude the years when persons do not report earnings. The orange line depicts the share of persons experiencing an earnings shock using lodger and non-lodger data. The green line uses lodger data only. The orange line starts from 2001–02 as non-lodger data are unavailable in earlier years. For the definition of earnings shock, lodger and non-lodger see chapter 2, section 2.

The blue line replicates the prevalence of earnings shocks presented in the main analysis, which is calculated using both lodger and non-lodger data and imputing zero earnings and income for missing data. The orange line draws the prevalence of shocks calculated by using lodger and non-lodger data but excludes the individuals when their earnings and income are missing. It starts from 2001–02 as non-lodger data are unavailable prior to that year. The green line uses lodger data only and, as the orange line, reproduces the prevalence of shocks without imputing missing earnings. The real value of the prevalence of shocks lies between the orange and blue line. The dark blue line overstates the prevalence of shocks because we are assuming that *all* those individuals with missing information are experiencing an earnings shock.

The orange line understates the prevalence of shocks because some individuals with missing earnings are *actually* experiencing an earnings shock. The green line further understates the prevalence of earnings shocks because it ignores that a large share of non-lodgers receives zero or low earnings and would fall into the definition of earnings shock. In Figures C.1 and C.2 we note that the differences between the orange and blue are minimal from 2001–02 onwards and conclude that the imputation does not significantly bias our calculations. The gap between the orange and green lines shows the importance of including non-lodger data in the analysis. Given the small bias produced by the imputation, we conclude that, for the period prior to 2001–02, assuming zero earnings is preferable than excluding all the individuals with missing information and using lodger data only.

# Appendix D: Robustness to alternative thresholds of total income

Our main definition of earnings shock implies 40 percent or more drop in earnings and 40 percent drop in total income. This is not the only possible definition. One may also consider alternative definitions. First, total income can be defined net of termination payments from the employer because these could be a confounding factor. Also, one might consider milder thresholds, such as 20 percent drop in total income, not 40 percent. This section explores potential differences in the estimations of shock episodes given different potential definitions of shocks.

We compare shocks according to four definitions.

1. Main definition: total income is defined as a sum of all taxable income categories, an earnings shock requires 40 percent drop in total income.

2. Total income is defined as a sum of all taxable income categories, an earnings shock requires 20 percent drop in total income.

3. Total income is defined as a sum of all taxable income categories except for termination/lump sum payments from employer, an earnings shock requires 20 percent drop in total income.

4. Total income is defined as a sum of all taxable income categories except for termination/lump sum payments from employer, an earnings shock requires 40 percent drop in total income.

For reference, it is important to keep in mind that our main definition of earnings shock implies 525,015 shock episodes for males, and 519,415 for females. We find that the biggest difference with the main definition is achieved, unsurprisingly, with definition 3. This definition produces 33,350 more shock episodes for males and 25,664 more episodes for females.

Figures D.1 and D.2 depict rates of shocks for males and females by year. In none of the years the difference exceeds 0.6 percentage points. The trends and the differences between macroeconomic periods are the same across all definitions.

**Figure D.1. Persons experiencing an earnings shock, by definition of total income—Males**
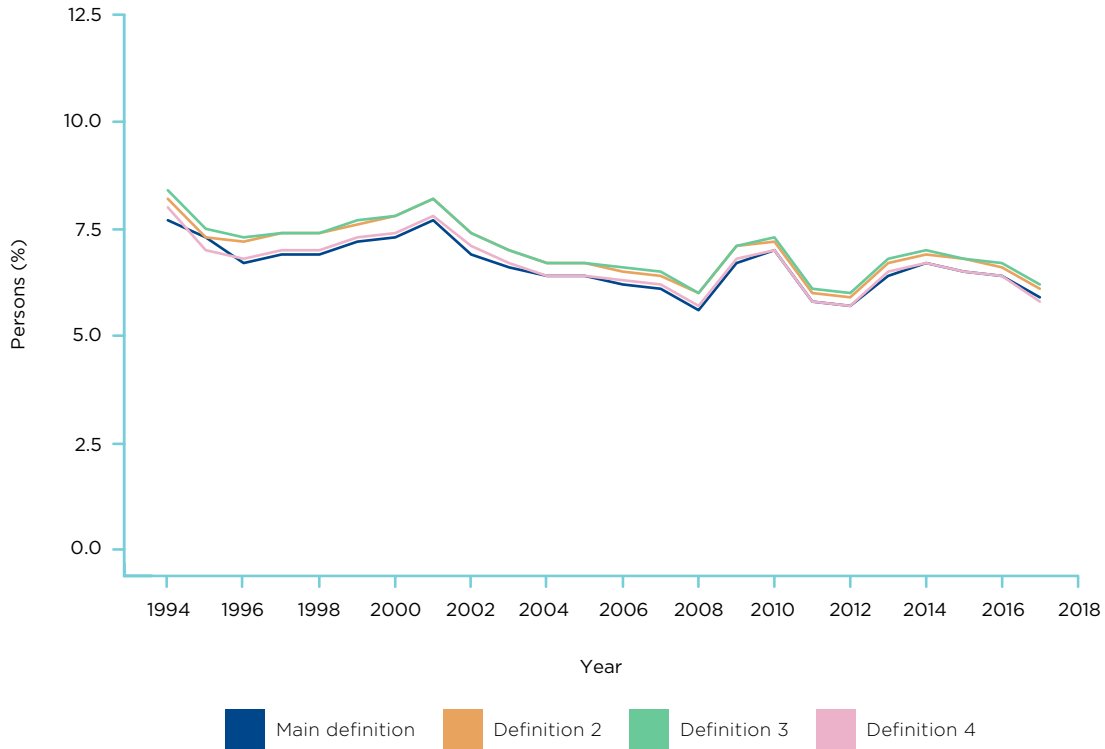


■ Main definition   ■ Definition 2   ■ Definition 3   ■ Definition 4

*Notes:* See text in Appendix D for differences between main definition and definition 2, 3 and 4.

**Figure D.2. Persons experiencing an earnings shock, by definition of total income—Females**
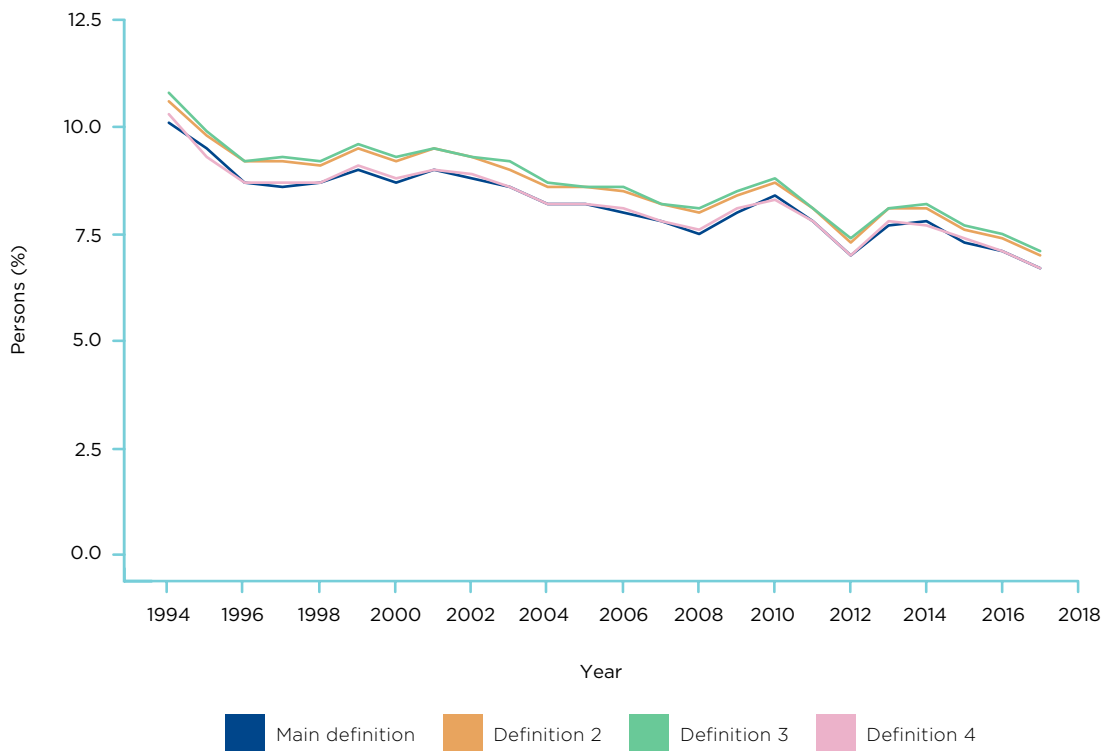


■ Main definition   ■ Definition 2   ■ Definition 3   ■ Definition 4

*Notes:* See text in Appendix D for differences between main definition and definition 2, 3 and 4.

# Appendix E:
# Construction of urban status
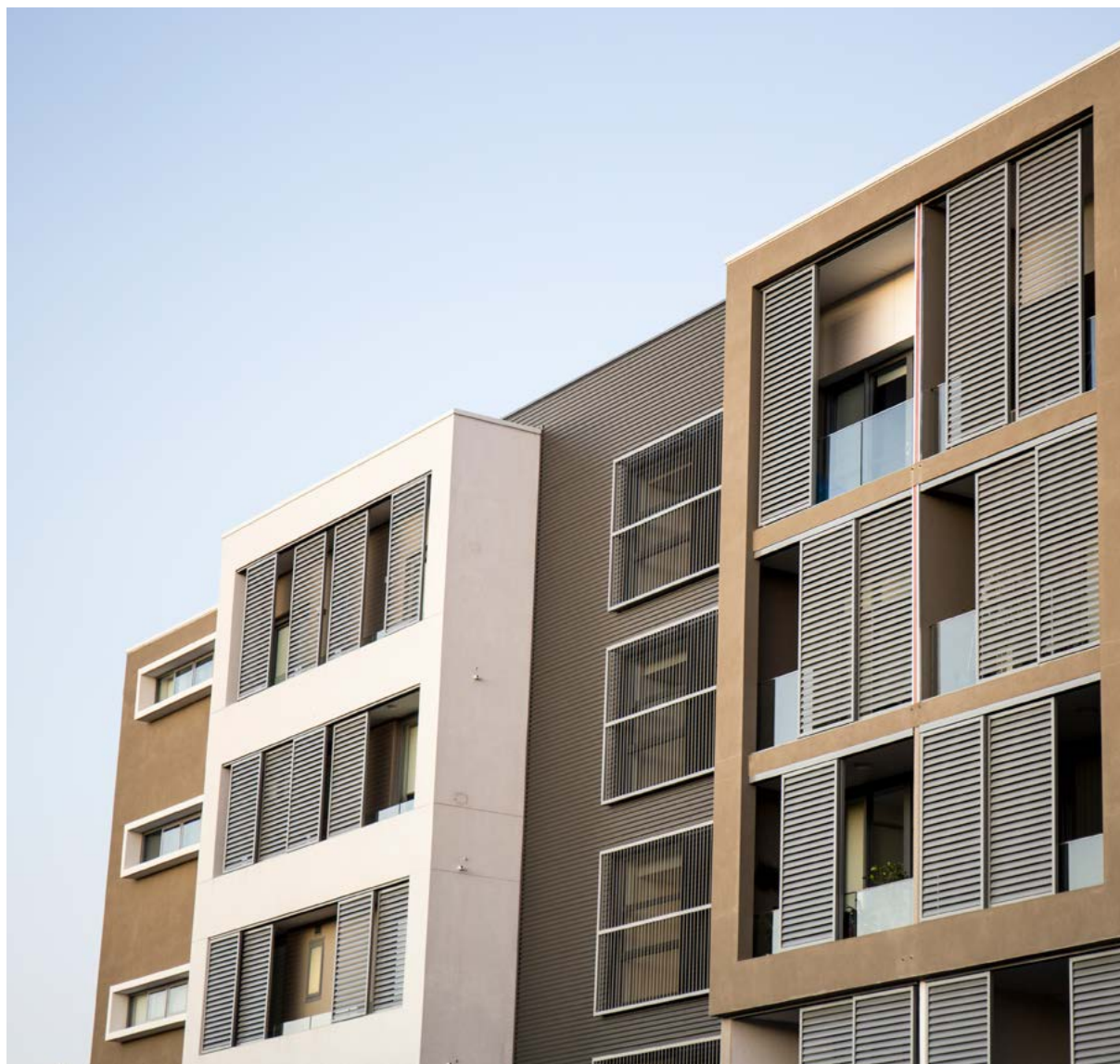


In Chapter 8, we separate individuals based on their urban status: that is, whether they reside in a 'significant urban area' or not. The definition of 'significant urban area' is taken from the ABS, which represent localities (or clusters of localities) with population over 10,000 individuals.

Unfortunately, for many observations (10,295,129 out of 29,409,908), the variable indicating urban status was missing from the ALife data. To alleviate this issue, we have adopted the following imputation algorithm.

1. For individuals for whom this variable exists in one of the years, fill in the current year with the closest available date. This step leaves 2,081,529 observations missing.

2. For individuals who reside in SA4 that are more than 90 percent urban/rural, assign them to urban/rural status. After this step, we observe 758,789 observations missing.

3. Repeat step 1. After this procedure, only 660,503 observations remain missing.

As a result of this process, the missingness rate of 35 percent is reduced to just 2 percent.

# Appendix F: Cox proportional hazard model

We use a Cox proportional hazard model, which is a statistical model that estimates a relationship between a set of factors and the durations of an earnings shock spell. The model estimates the probability of recovery in year t, conditionally on a person not having recovered in year $t-1$. Formally, we estimate the following equation:

$$h(t)=h_0(t) \times exp(b_1 x_1 + b_2 x_2 + ... + b_p x_p)$$

Here, h(t) is a 'survival' function that shows a 'risk' of recovery in year t, $h_0(t)$ is a baseline probability of recovery, $x_1$, $x_2$, ...$x_p$ are the factors that might influence the probability of recovery, such as: macroeconomic period, earnings, earnings squared, age, age squared, depth of the shock, an indicator for losing 100 percent of earnings. The model is estimated separately for males and females. See Cox (1972) for more details on the Cox proportional hazard model.

**Breaking Down Barriers**

The **Breaking Down Barriers** report series provides in-depth analyses of questions that will help us to better understand the challenges faced by individuals, families, communities and governments that affect the existence and persistence of deep and entrenched poverty and disadvantage in Australia. The analyses have been undertaken by Melbourne Institute researchers and utilise economic and statistical techniques which involves developing shared data environments to study disadvantage and developing data visualisations.

This report has been produced as part of an ongoing partnership between the Paul Ramsay Foundation and the Melbourne Institute with the goal of informing and shaping policy and practice to break cycles of disadvantage. This includes improving our understanding of the extent, nature and causes of socio-economic disadvantage in Australia and encouraging solutions that enable program development and policy innovation that foster opportunity and reduce poverty and disadvantage.

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**Melbourne Institute: Applied Economic & Social Research**

The Melbourne Institute is a research-only, academic department in the Faculty of Business and Economics at the University of Melbourne with over 60 years of experience informing and shaping economic and social policy. The Melbourne Institute's list of longstanding accomplishments includes playing an active role in the establishment of the Henderson Poverty Line (by inaugural director Ronald Henderson), the development of the blueprint for Medibank/Medicare (John Deeble and Dick Scotton), the execution of the HILDA Survey and resulting analyses (Mark Wooden), the creation and running of the **Australian Economic Review**, the establishment of the consumer sentiment index (our longest-running survey having been established in 1973 and now conducted in partnership with Westpac), and a host of many other achievements that have resulted from the engagement of researchers as part of the bedrock that informs macroeconomic, microeconomic and social policy in Australia.

The Melbourne Institute is home to more than 50 economic researchers that are supported by survey methodologists and data scientists. Their work is recognised internationally by both academic and policy communities. All work undertaken by the Melbourne Institute is independent and impartial.

From the Institute's inception, researchers have been engaged in understanding poverty and disadvantage from a range of perspectives. This work has been in partnership with other organisations such as the Brotherhood of St. Laurence, as a node of the ARC-funded Centre of Excellence for Children and Families over the Life Course, and a range of commonwealth and state government departments. Current projects that affect our understanding of poverty or disadvantage include studies to understand employment, family dynamics, social housing, tax and transfer policies, consumer expectations, the delivery of health care, intergenerational disadvantage and studies of particular populations in Australia.

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**Paul Ramsay Foundation**

The Paul Ramsay Foundation seeks to identify and partner with individuals, communities and organisations working to create an Australia where people can overcome disadvantage and realise their potential.

The late Paul Ramsay AO established the Foundation in 2006 and, after his death in 2014, left the majority of his estate to continue his philanthropy for generations to come.

His commitment to good works has allowed the Paul Ramsay Foundation to support the for-purpose sector with grants of more than $350 million made since 2016 to more than 90 different partners, committed as the Paul Ramsay Foundation is to achieving lasting change.