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Non-standard employment and underemployment at labor market entry and their impact on later wage trajectories

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Abstract

Using data from the Australian Household, Income, and Labour Dynamics in Australia (HILDA) Survey (2001–2020), we examine how combined patterns of non-standard employment and underemployment in the early career shape later wage trajectories, paying careful attention to gender differences on a representative sample of Australian young men ($N = 470$) and women ($N = 497$). By combining multichannel sequence analysis and random effects panel models, we make three central findings. First, we identify seven distinct early employment trajectories, with the "standard" career, characterized by stable, full-time permanent jobs in the first 5 years post-education, being the most prevalent. Second, we find that combined patterns of non-standard employment and underemployment during early careers are associated with significant wage penalties. However, these wage penalties diminish within 10 years. Third, enduring and widening wage disparities are found only among youth primarily unemployed or inactive early in their careers. These penalties are particularly pronounced among men, underscoring the influence of the "ideal" worker norm. Overall, integrating underemployed jobseekers into the workforce and addressing gender-based biases should be a priority for policymakers to ensure equal opportunities and fair treatment for all workers in the labor market.

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Keywords
Australia, casual employment, non-standard employment, labor market dynamics, underemployment, wages

Introduction

Across the globe, the rise of non-standard employment (NSE)[1]—such as casual, temporary, part-time or agency work—has marked one of the most profound transformations in the labor market over the past two decades (Heyes and Tomlinson, 2021). Parallel to this trend has been a rise in the proportion of underemployed individuals across Europe and the US since 2008 (Bell and Blanchflower, 2021; Blanchflower and Levin, 2015). Underemployed are usually defined as workers who wish to work more hours than their current job offers. In line with these global trends, Australia has also experienced a substantial shift towards NSE over the past two decades, with approximately 55% of all employment concentrated in some form of NSE (Laß and Wooden, 2019). Among the different forms of NSE, casual work, which is defined by the absence of guaranteed weekly work hours and termination entitlements, has become a prominent feature of the Australian labor market. Temporary jobs, which refer to contracts with a limited duration, are somewhat less prevalent in comparison. Alongside this trend, and despite a decline since 2021, underutilization rates have remained very high in Australia, at 10.2% in 2023 (Australian Bureau of Statistics, 2023b).

The substantial share of NSE and underemployment in recent decades has raised increased concerns in many countries about their consequences on a range of workers' outcomes (Kalleberg, 2012; Schmid and Wagner, 2017). This concern reflects growing evidence documenting that NSE workers on temporary or casual employment are more likely to build shorter tenure and to face unemployment than those in regular contracts (Gash and McGinnity, 2007; McGinnity et al., 2005), leading to slower career growth (Kopycka, 2023). Negative workforce outcomes have also been found among underemployed workers, with studies reporting that they are disproportionately female, young, less educated, and on temporary or casual contracts across the EU-28 (Hurley and Patrini, 2017; Valletta et al., 2020). Furthermore, underemployment has been linked to lower wages both in the US (Golden, 2016) and Europe (Bell and Blanchflower, 2018). Similarly, wage penalties among NSE workers have also been documented (Booth et al., 2002; Giesecke and Groß, 2004). In the context of casual employment, these wage penalties have been attributed to the irregularity of pay, unpredictable hours, and the absence of employment protections (Booth et al., 2002), whereas in the case of underemployment, lower wages have been linked to workers experiencing reduced bargaining power to negotiate higher pay (Bell and Blanchflower, 2021).

Despite the importance of these findings, at least two major limitations remain. First, the majority of empirical studies have primarily focused on the contemporaneous wage outcomes associated with NSE and underemployment (MacDonald, 2019; Watson, 2005; Wilkins, 2007), thereby overlooking individual-level wage dynamics. One could argue that if NSE and underemployment allow workers to accumulate work experience and serve as springboards to better-paying jobs, then they should be associated with higher earnings in the longer term. Yet, very few studies have investigated the long-term wage consequences

of NSE workers on temporary or casual employment (Mooi-Reci and Wooden, 2017), and none has examined the long-term relationship between underemployment and wages.

Second, there is a dearth of systematic empirical research that investigates how the joint prevalence of NSE and underemployment in early careers influences wage outcomes in the long term. This gap is surprising considering that NSE and underemployment are closely connected (Valletta et al., 2020). For instance, in Australia, recent studies have estimated that approximately 64% of NSE workers in casual jobs express a preference for working additional hours (Browne, 2019). Studies have also shown that early career patterns of underemployment (Fauser and Mooi-Reci, 2023) and casual employment (Mooi-Reci and Wooden, 2017) can vary significantly across gender. Yet, this complexity is often overlooked in previous research, with existing scholarship often concentrating on transitions either in or out of NSE types or in or out of underemployment rather than considering their combined prevalence. This has left us with a "black box" when it comes to understanding how NSE patterns of casual work and underemployment at the start of one's career combine and change over time, and how these combined employment trajectories differ among men and women, and ultimately influence wage inequalities in the future.

To address these gaps, we ask how combined patterns of NSE and underemployment in the early career shape later wage trajectories, and whether this relationship differs by gender. In our study, NSE refers to employment that is not permanent and ongoing, such as temporary and casual employment, whereas underemployment pertains to a situation where individuals express a desire to work more hours than their present labor force status permits, whether they are employed, unemployed, or inactive. We therefore use the term NSE to refer to temporary and casual employment throughout this article. To investigate our research question, we use two decades of annual panel data from the Australian Household, Income, and Labour Dynamics in Australia (HILDA) Survey, covering the period from 2001 to 2020, and employ a two-pronged empirical approach that makes several contributions to existing research. First, our study uses multichannel sequence models to study how NSE patterns and underemployment unfold in the 5 years after people finish their full-time education. This allows us to track the dynamic patterns of early NSE and underemployment and explore their unique variations. Second, having identified early career patterns, we then predict how these relate to later wage trajectories over a 10-year period. This longer-term focus helps uncover lasting patterns of wage inequalities linked to early job mobility and instability, thereby providing a more in-depth examination of NSE and underemployment on individuals' economic well-being. Finally, our analysis extends upon previous research by examining two distinct forms of NSE: temporary employment and casual work, thereby extending existing research that focuses on either one of the two forms.

Theoretical background and hypotheses

Non-standard employment, underemployment, and wage differentials

Two competing perspectives exist regarding the impact of early employment mobility on the wage growth of young workers. The optimistic view, shared by many economists and grounded in models of job search and job mobility (Burdett and Mortensen, 1998),

portrays the early labor market experiences of young individuals as a dynamic and active process. In this perspective, young people frequently transition between jobs (i.e., "job shop") or move in and out of the labor force (Neumark, 2002; Topel and Ward, 1992). According to these models, job mobility during the early stages of one's career is beneficial as it provides young individuals with the opportunity to develop skills, behaviors, or other characteristics that ultimately lead to a better person–job fit and higher wages in later life (Korpi and Levin, 2001; Wang and Weiss, 1998). Indeed, this perspective finds support in empirical studies conducted in the US, which have revealed that, on average, young people hold positions with multiple different employers during the first 10 years of their careers (Ozkan et al., 2023; Topel and Ward, 1992). Moreover, wages have been shown to increase with job mobility (Card, 1999).

Within this optimistic perspective, early experiences of underemployment and NSE can enhance job matching in the later career as young workers accumulate work experience across various jobs, explore their preferences and skills, and find employment pathways that promote upward mobility and higher earnings (Korpi and Levin, 2001; Wang and Weiss, 1998). In this context, both types of NSE and underemployment thus serve as steppingstones to securing permanent full-time employment by providing opportunities to accumulate experience.

An alternative more pessimistic perspective underscores the potential drawbacks of early job mobility on wage growth. Studies that link wage growth to human capital accumulation, either at the firm or industry level, argue that unstructured transitions from school to work can lead to slower accumulation of human capital (Doeringer and Piore, 1971; Neumark, 2002). This is because young people may fail to accumulate firm-specific skills and tenure by moving erratically between jobs, firms, or industries (Oreopoulos et al., 2012). Informed by human capital theory, which views wages as a function of both general knowledge acquired through education and specialized skills gained through tenure and work experience (Becker, 1964), studies advocating for stable early employment argue that these two components of human capital are typically acquired during one's tenure within a firm and through on-the-job training. This places workers with ongoing, permanent contracts in a more advantageous position because they will, on average, have spent more time accumulating specific skills relevant to their firm or industry. In contrast, casual, temporary, or underemployed workers, who may work fewer hours or have short-term positions within a firm, may have less opportunity to develop these specific skills. They will also be less likely to get on-the-job training as employers are often more inclined to invest in training for permanent employees to reduce the risk of valuable skills being lost when workers transfer to another company (Cutuli and Guetto, 2013).

Another potential cost of early job mobility is linked to information asymmetry. As described by the signaling theory (Spence, 1973), employers often assess the productivity of potential employees based on a set of observable features, including an individual's work history. It has been argued that a history of NSE jobs in temporary or casual contracts might signal that previous employers were hesitant to commit to long-term employment engagements (Boyce et al., 2007; Korpi and Levin, 2001). Employers may interpret these signals as indicators of reduced dedication or a lack of interest in pursuing permanent employment opportunities, which in turn could raise concerns about workers' productivity (Pedulla, 2016). This, in turn, could translate into lower wage offers. In a similar

vein, a history of underemployment, and particularly unemployment, may be seen as a sign of limited commitment or the inability to secure full-time work (Mooi-Reci and Ganzeboom, 2015; Pedulla, 2016). Employers may perceive underemployed individuals as not fully utilizing their skills or lacking competitiveness in the job market. These doubts regarding workers' competence and their ability to contribute effectively to the organization can manifest in lower wages being offered.

Theoretically, such negative signals should differ across different NSE forms and underemployment. However, empirical evidence on whether a history of temporary or casual employment and underemployment is more or less scarring for workers than a history of unemployment is mixed. Some studies suggest that temporary or casual forms of employment are less detrimental than unemployment (Addison and Surfield, 2009; Mooi-Reci and Dekker, 2015). However, there is also research in the US that demonstrates that a history of underemployment can be as harmful to workforce outcomes as a year of unemployment (Pedulla, 2016). Adding to these studies, we argue that it is not the individual impact of each NSE arrangement and underemployment that scars future wages, but rather their combined patterns during early careers. Moreover, in line with (Neumark, 2002), we argue that if young individuals change jobs without developing skills, behavior, or networks that facilitate better-fitting and higher-paying positions, they are more likely to end up in lower-quality job matches and, consequently, will earn lower wages in the future. We therefore expect that:

> *Hypothesis 1*: All else equal, early employment trajectories characterized by NSE and/or underemployment will be negatively associated with wage outcomes in the later career compared with early employment trajectories characterized by optimal permanent employment.

A priori, it is unclear whether the long-term wage disadvantages associated with a history of temporary or casual employment and underemployment will persist or will eventually start to decrease over the later career. The concept of cumulative disadvantage (DiPrete and Eirich, 2006; Merton, 1988) offers important insights into this process. This concept posits that initial disadvantage can accumulate and intensify over time, leading to further inequality and diminished opportunities for certain individuals or groups relative to others. Within this framework, the initial wage setbacks experienced by workers in temporary or casual jobs and underemployment, such as unstable employment, and limited access to training and skill development opportunities, can accumulate and amplify over time. For example, the disadvantage of insufficient training and skill acquisition owing to NSE and underemployment can restrict workers' ability to acquire new qualifications, adapt to changing job requirements, and pursue higher-paying roles (Green et al., 2010; Wilson et al., 2008). Such an initial disadvantage can perpetuate and exacerbate over the course of a career with prolonged or repeated spells of NSE, underemployment, and fragmented careers more generally (Gagliarducci, 2005; Mooi-Reci and Ganzeboom, 2015). Especially workers who have experienced both NSE and underemployment might face a double penalty for not fully using their skills. Based on these arguments, we expect that:

Hypothesis 2: All else equal, initial wage differentials between workers who are underemployed in NSE and those optimally employed in permanent jobs during their early careers will increase over the course of the later career.

Finally, decisions to engage in NSE jobs during early careers, or to accept jobs that do not fully meet the desired working hour standards, have gendered implications (Pedulla, 2016). This implies that the relationship with future wages may vary between men and women. Gendered wage penalties among workers in casual or temporary jobs are often attributed to the stigma attached to NSE, which some studies have found to be more pronounced among men than women (Ferber and Waldfogel, 1998; Mooi-Reci and Wooden, 2017). Stigmas refer to attributions that drive negative sanctions or penalties (Golden and Eddleston, 2020). In this context, they emerge when employees who engage in temporary or casual jobs are devalued because they are seen as deviating from the traditional "ideal worker" model, where full-time permanent work is considered the central focus of one's life (Blair-Loy, 2003; Williams, 2001). The concept of the "ideal worker" is rooted in cultural norms that assume women value and prioritize work–family balance more than men, and that men prioritize full-time work engagement throughout their careers (Bourdeau et al., 2019). In Australia, too, the prevalent "modified male breadwinner" norm suggests that women are often ascribed the role of secondary earners whereas men are expected to prioritize full-time work (Broomhill and Sharp, 2005).

These socially imposed gender expectations lead employers to rely on proxies when assessing their employees' commitment and productivity potential (Bourdeau et al., 2019). As a result, employers may assume that men engaged in full-time and permanent jobs will be more committed, and hence more productive, than women who are expected to prioritize their caregiving responsibilities. In this context, the perceived expectation that women are more likely to take on temporary and casual roles early in their careers in anticipation of their caring responsibilities may weaken the negative signals associated with underemployment or NSE arrangements. Consequently, this may mitigate the wage penalties women face. For men, however, underemployment and NSE are less prevalent (Fauser and Mooi-Reci, 2023), potentially conveying a more negative signal about their commitment and productivity. Employers might infer that men in such roles are unable to secure full-time permanent positions or are not fully dedicated to their work (Pedulla, 2016). Consequently, this may result in greater wage penalties for men compared with their female counterparts.

Ample evidence has demonstrated the presence of gender and parenthood wage penalties (for a review, see Blau and Kahn, 2017), and there is also supportive evidence demonstrating gendered wage disparities attached to NSE. In Australia, Mooi-Reci and Wooden (2017) find more severe wage penalties among prime-aged men with a history of casual employment compared with women. In the US, studies have shown that histories of part-time work impose greater wage penalties on men than on women (Ferber and Waldfogel, 1998). Similarly, in Canada, evidence suggests that temporary work is less penalizing for women than for men (Fuller, 2011). Overall, based on signaling and attributional models and in light of these findings, we expect that:

Hypothesis 3: All else equal, wage differentials between workers employed in NSE and/or underemployment and those optimally employed in permanent jobs during their early careers will be more pronounced for men than for women.

Previous literature

The literature has extensively documented the wage outcomes associated with the NSE (Eberlein et al., 2024; Gebel, 2009; Kiersztyn, 2016; McGinnity et al., 2005; Reichenberg and Berglund, 2019). Most earlier studies have focused on temporary employment and generally agree that temporary work pays less than permanent work, with some revealing heterogenous findings across gender (Gebel, 2009; Giesecke and Groß, 2004).

Though valuable, previous research has been partly limited in its methodological approach by focusing predominantly on cross-sectional samples over a short duration of time (Gash and McGinnity, 2007; Watson, 2005), which obscures whether wage disadvantages between temporary and permanent workers are long-lasting or diminish over time. The few panel studies that examine longer-term wage differentials between temporary and permanent workers show no clear consensus on the endurance of such differentials. In Canada, Fuller and Stecy-Hildebrandt (2014), using panel data for a representative sample of workers, show that temporary workers experience large initial wage penalties that decrease only slowly but remain significant over their five-year observation window, with differences being more pronounced for women. Conversely, Gebel (2010) finds that in the UK and Germany, initial wage gaps between temporary and permanent workers are weaker for women than for men and disappear for both genders about 4 years after entering the labor market. de Lange et al. (2014) reveal similar results for temporary workers in the Netherlands. One reason for these mixed findings could stem from differences in the studies' sample selection. Whereas Gebel (2010) and de Lange et al. (2014) focus on young labor market entrants for whom temporary jobs could be less stigmatizing, Fuller and Stecy-Hildebrandt (2014) examine individuals across various career stages.

Another strand of literature, which is more relevant to our study, leverages panel data to examine within-worker wage trajectories. For example, Booth et al. (2002) investigate the wage dynamics among workers in temporary and casual jobs in the UK. They show that women—but not men—in temporary jobs who subsequently transition to permanent positions can catch up in terms of their hourly wages with women who have always held permanent jobs. However, for women and men in casual jobs, even after securing a permanent position, their wage growth is not steep enough to close the wage gap. In line with these findings, Laß and Wooden (2020) demonstrate that in Australia, workers in casual jobs experience relatively lower rates of growth in hourly wages when compared with permanent workers.

Leveraging the strength of sequence analysis, a growing number of studies have investigated how employment trajectories (instead of single transitions) are associated with wage outcomes. Fuller and Stecy-Hildebrandt (2015) provide evidence of high wage growth for workers in Canada who are able to utilize temporary jobs as a pathway to permanent positions, and Reichenberg and Berglund (2019) demonstrate a similar trend in Sweden. However, Fauser (2020) highlights that in Germany, despite the

utilization of temporary jobs as a means of obtaining permanent positions, discrepancies in cumulative wages persist for both genders when compared with individuals who initially secure continuous full-time permanent employment. The disadvantages are especially pronounced for workers who get "stuck" in temporary jobs. Also focusing on the composition of early employment trajectories, Mooi-Reci and Wooden (2017) investigate the longer-term wage effects of earlier casual employment sequences in Australia. They find that continuous casual job trajectories result in longer-term wage penalties, particularly for men. They also show that the wage gap between casual and permanent workers narrows over time, except for prime-aged men, for whom the wage gap widens over time.

Surprisingly, there are almost no studies on the cross-sectional or longer-term wage outcomes associated with underemployment. One exception is Wilkins (2007), who finds no significant effects of underemployment on hourly wages for men or women in Australia. In contrast, a more recent report by the OECD finds underemployment to be associated with disadvantages in hourly pay in Australia and Germany, especially for those at the bottom of the income distribution (MacDonald, 2019).

Taken together, though there is extensive research on the wage consequences of either temporary contracts or casual jobs, little is known about the link between underemployment and (longer-term) wage outcomes. Nor has any study to date investigated the combined effects of NSE and underemployment on later wage trajectories. Furthermore, previous studies have mostly looked at single spells or transitions during a worker's career and very few studies have been able to address initial conditions bias, where observed wage differentials may be owing to pre-existing unobserved differences in previous employment experiences. We address these issues by focusing on career entrants, allowing us to avoid biases stemming from unobserved past work experiences (Eberlein et al., 2024; Gebel, 2010).

The Australian labor market context

The Australian labor market is defined by a highly skilled workforce (Australian Bureau of Statistics, 2023a), a reasonably high participation rate (Australian Bureau of Statistics, 2023b), low to moderate income inequality, and a hybrid wage-bargaining system (Coelli et al., 1994). As demonstrated by Coelli and Borland (2023), the highly skilled workforce is underscored by the relatively large proportion of the population holding a bachelor's degree (over 30% as of early 2020). In Australia, as in other OECD countries, it is common to distinguish between workers employed in permanent and NSE contracts. Permanent employees benefit from a range of rights and protections that promote job security (Productivity Commission, 2015). They have the right to resign or be dismissed with a notice period of four weeks, and there are strict regulations in place that govern the termination process, limiting acceptable reasons for dismissal, such as poor work performance (Productivity Commission, 2015). In the event of redundancy, permanent employees may be eligible for redundancy pay based on their length of service.

On the other hand, NSE includes workers employed in two primary categories: temporary employees, who have contracts that conclude on a specified date or upon completing a specific task (Campbell et al., 2009), and casual workers, who are paid by the

hour along with a 25% casual loading (Fair Work Commission, 2017). Among the two categories, those engaged in temporary contracts typically enjoy the highest level of employment security, as they are entitled to similar benefits as permanent employees for the duration of their contract (Productivity Commission, 2015). Meanwhile, casual workers have access to a more limited range of entitlements compared with their temporary and permanent counterparts. For example, they do not receive benefits such as paid annual leave, sick leave, or redundancy pay, although they may have access to unpaid carers and family and domestic violence leave. However, as mentioned above, casual workers receive a 25% casual loading. The presence of a casual loading sets casual work in Australia apart from casual work in countries where it is less regulated and primarily found in low-wage, low-productivity sectors. This casual loading may also in part explain why Australia experiences a relatively high level of casualization compared with other OECD countries, with approximately 25% of workers engaged in casual employment (Laß and Wooden, 2019).

Another notable trend in the Australian labor market over the recent decades has been the considerable share of underemployment (Australian Bureau of Statistics, 2023c). The longstanding definition of underemployment according to the Australian Bureau of Statistics (and internationally consistent) refers to part-time and full-time workers who desire and are available for more hours than they typically work. In more recent studies, including this study, there has been a shift towards broadening the definition of underemployment to encompass individuals outside the labor force who would prefer and are available for work in order to provide a more complete view of the available labor capacity within the economy (Fauser and Mooi-Reci, 2023; Treasury of the Australian Government, 2023). With this broader definition, it is estimated that today, 2.8 million people in Australia either want to work or wish to work more hours than they currently do (Treasury of the Australian Government, 2023). The problem of underemployment has been attributed to the lack of full-time employment opportunities rather than to workers' preferences for part-time schedules (Carney and Stanford, 2018). Recent research in Australia has revealed that approximately two-thirds of casual workers express a desire for more working hours (Browne, 2019).

Overall, considering the unique labor market context in Australia, where NSE and underemployment are widespread, we can reasonably assume that the stigma associated with such a combination is likely to be less pronounced than in other regions. This could result in wage consequences that are both less significant and less enduring.

Data, variables, and methods

Data

We use nationally representative panel data from the HILDA Survey that includes individuals aged 15 and older living in Australian households (Watson and Wooden, 2012). Since 2001, the survey has conducted annual interviews with all household members aged 15 and older covering topics such as labor market participation, job history, and job characteristics. With 20 survey years (2001–2020) included in the dataset, we can track and study workers' employment and wage trajectories over longer periods.

Our sample of analysis is restricted to respondents between the ages 18 to 55, who (i) were observed during the first 5 years after completing full-time education (part-time students are thus included), (ii) were employed by an employer for wages or salary (i.e., employees) at the time of the interview, and (iii) reported wages at least once 6 years or more after completing full-time education. These restrictions leave us with an analytical sample of 4596 person-year observations stemming from 967 individual workers.

Dependent variable: Log of hourly wages

The outcome variable is the *log of hourly wages*, in the main job, which are adjusted to 2020 Australian Dollars using the Consumer Price Index. We construct hourly wages by dividing the estimated usual gross weekly wages and salaries from the main job by the usual weekly working hours in the main job (with usual working hours including both paid and unpaid overtime). To account for non-random item non-response, we use the imputed version of the weekly wage variable that is provided by the HILDA team. Wages are observed in the later career, meaning 6 years and later after respondents have left education.

Key independent variables: Early employment trajectories

Our key explanatory variable focuses on the types of *early employment trajectories* that unfold during the initial 5 years after respondents have completed full-time education. We group the most common employment pathways into categories using multichannel sequence and cluster analysis (Gauthier et al., 2010; Ritschard et al., 2023). In this analysis, early employment trajectories are structured along two main pathways or "sequences" that unfold simultaneously. The first sequence traces how respondents move between different labor force statuses, distinguishing between transitions in and out of (i) permanent, (ii) temporary, or (iii) casual employment, as well as (iv) unemployment and (v) inactivity statuses during the first 5 years after completing full-time education. The second sequence tracks the level of underemployment during the same timeframe. This sequence distinguishes between three underemployment states: (i) being underemployed, (ii) not being underemployed, and (iii) not applicable.

Underemployment is defined as a situation in which respondents would prefer to work at least four more hours than they currently do.[2] We derive this information by subtracting the preferred weekly working hours from the usual weekly working hours in the respondent's main job (with usual working hours including both paid and unpaid overtime). In contrast, respondents are categorized as fully employed (not underemployed) if the difference between their preferred and actual working hours is less than 4 hours. Furthermore, all respondents who are unemployed in the first sequence are considered as underemployed in the second sequence, as they are actively seeking employment but currently have zero actual working hours. Furthermore, we categorize respondents who are inactive as underemployed in the second sequence channel if they meet these conditions: (i) they want to work, (ii) they are ready to start working, and (iii) they prefer to work at least 10 hours per week. For all other inactive respondents, the underemployment measure is denoted as "not applicable."

Control variables

To establish the time order of early employment trajectories and later wages and to avoid overcontrol bias we only control for confounding variables in our models (Elwert and Winship, 2014). These are measured when individuals complete their full-time education and thereby affect both early employment dynamics (the treatment) and later wage trajectories (the outcome). We include sex (0 = female, 1 = male), ethnic background (0 = non-Indigenous Australian, 1 = Indigenous Australian, 2 = non-Australian English-speaking, 3 = non-Australian non-English),[3] birth year, and the year of sequence start (i.e., the year respondents completed full-time education). Moreover, we include the highest educational attainment (0 = postgraduate, 1 = graduate diploma/certificate, 2 = bachelor, 3 = advanced diploma/diploma, 4 = certificate III/IV, 5 = year 12, 6 = year 11), marital status (0 = not married, 1 = married), number of children (0–4 years of age), remoteness of the respondents' residence (0 = major city, 1 = inner regional, 2 = outer regional and remote areas), and the presence of a long-term health condition (0 = no, 1 = yes), all measured when respondents left full-time education. Table A1 in the Appendix summarizes the mean descriptive statistics by early employment trajectories. As expected, men are overrepresented in all groups of permanent work (both optimally employed and underemployed), whereas women are more often in consistently underemployed and inactive underemployed groups. Indigenous Australians and Non-Australian non-English speakers are also more likely to be in the underemployed jobseekers category. Further, there is a clear negative association between having tertiary education and experiencing underemployment or joblessness.

Methods

Our study uses multichannel sequence analysis and cluster analysis to uncover the most common employment trajectories that respondents followed in the first 5 years following graduation. As mentioned earlier, we structure early employment trajectories along two channels: a labor force status sequence and an underemployment sequence. These two sequence channels are combined into one multichannel sequence and then clustered based on their dissimilarity using the Optimal Matching (OM) approach. The OM algorithm considers two multichannel sequences to be more different from one another if it takes more changes to turn one multichannel sequence into the other (Studer and Ritschard, 2016). Each alteration applied to the sequences comes with a specific cost, determined by the researcher. In this study, we use constant substitution costs of two, and insertion or deletion costs of one. The alignment of sequences results in a distance matrix, summarizing how similar or different each pair of multichannel sequences is in the sample. Using this distance matrix, we conduct a cluster analysis to uncover common patterns of early employment and underemployment dynamics, using Ward's algorithm (Ward, 1963). Ward's algorithm aims to form groups that are similar by minimizing the differences within each group and maximizing differences between them.

Determining the right cluster solution is not straightforward. We look at both objective measures (Average Silhouette Width, Hubert's Gamma, Point Biserial Correlation, and Hubert's C) and the theoretical meaningfulness of various cluster solutions,

following the approach of previous studies (Studer, 2013). Figure A1 in the Appendix displays the quality of different cluster solutions based on objective measures. In the end, we decided on a seven-cluster solution that fits our theoretical expectations best and performs well on objective measures. We get similar cluster solutions when we use alternative algorithms, like the Hamming Distance or the Dynamic Hamming Distance.

We conduct the multichannel sequence analysis in R using the TraMineR and TraMineRextras packages (Gabadinho et al., 2011) and the WeightedCluster package (Studer, 2013). We use the seqHMM package to illustrate the clusters of sequences (Helske and Helske, 2019). The created clusters will always have some variation, and the sequences within each cluster will not be identical. However, each cluster represents a different and distinct pattern of employment trajectories. Next, we use random effects panel models to predict how early employment trajectories influence later wage trajectories. Our model takes the following form:

$$y_{it} = \beta_0 + \beta_1 ET_i + \beta_2 \boldsymbol{X}_i + \alpha_i + \varepsilon_{it}$$

where y_{it} represents the logarithm of the hourly wage for worker i at time t, covering the period from 6 to 10 years after completing full-time education. ET_i denotes early employment trajectories measured during the first 5 years after completing full-time education; $\boldsymbol{X}_i$ represents a vector of control variables, all measured when respondents left full-time education, with β_1 and β_2 representing their respective effects. The term α_i represents a random individual-specific effect and ε_{it} represents the model's random disturbance error. To test our expectations on gender differences, we estimate separate models for men and women.

Results

Early employment trajectories

Figure 1 illustrates seven distinct employment and underemployment patterns during the first 5 years after the completion of full-time education. The largest cluster (44%) represents early careers characterized by permanent jobs without underemployment, which we call "optimally employed permanent workers." These individuals spend around 4.0 years in permanent jobs and approximately 4.3 years without underemployment within the first 5 years after education. The second cluster (5%) consists of workers primarily engaged in temporary jobs without underemployment, spending around 3.1 years in such employment and approximately 4.3 years without underemployment. We call this group "optimally employed temporary workers." The third cluster (12%) includes individuals mainly working in permanent jobs but experiencing periods of casual employment and underemployment. On average, they spend about 3.4 years in permanent jobs, 0.8 years in casual jobs, and 3.2 years as underemployed. We call this group "underemployed permanent workers." The fourth cluster (21%) represents early careers starting in underemployed casual jobs, with trajectories becoming more diverse over time, involving permanent employment, inactivity, and temporary jobs. Workers in this cluster spend around 2.2 years in casual jobs, 1.5 years in permanent jobs, 0.5 years in inactivity, and approximately 2.7 years as underemployed. We call this cluster "precarious workers" owing to the volatility of the career trajectories in this group.

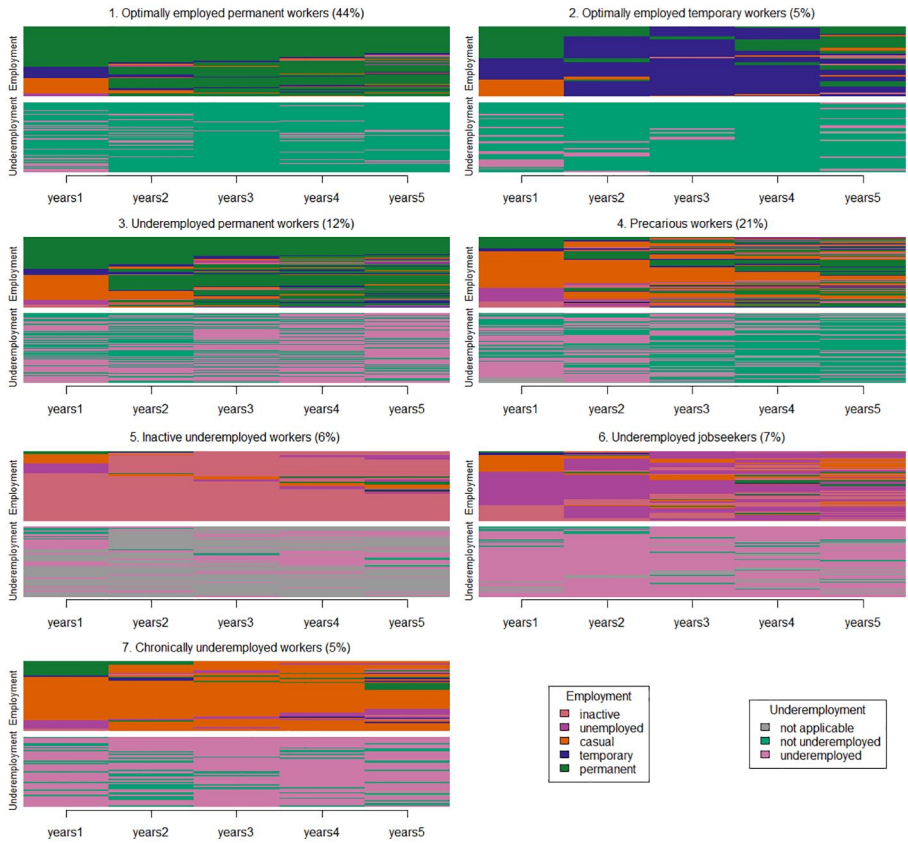


Figure 1. Sequence index plots identifying the seven most common early employment and underemployment dynamics.
Source: HILDA survey (2001–2020), own calculations.

The fifth cluster (6%) consists mainly of inactive individuals who express a desire to work. They experience an average of 4.1 years of inactivity and 1.5 years of underemployment. We call this group "inactive underemployed workers." The sixth cluster, representing 7% of cases, consists of respondents who are primarily jobless after leaving education, with some experiencing short periods of casual employment. These workers predominantly face joblessness, spending approximately 2.6 years in unemployment, 1.2 years in inactivity, and 0.9 years as casual workers. On average, they experience around 3.9 years of underemployment. We call this group "underemployed jobseekers." The seventh cluster, accounting for 5% of respondents, consists of workers primarily engaged in casual jobs upon entering the labor market. However, they desire more hours of work, leading to underemployment during the early stages of their careers. These workers spend approximately 3.7 years in casual employment and experience an average of about 3.9 years of underemployment. We call this group "chronically underemployed workers."

Table 1. Results of the random effects models predicting the relationship between early career patterns and later wage outcomes.

	All	Men	Women
	b/se	b/se	b/se
Ref: Optimally employed permanent workers			
Optimally employed temporary workers	0.046	0.117	−0.150
	(0.064)	(0.065)	(0.128)
Underemployed permanent workers	−0.166***	−0.210***	−0.090
	(0.039)	(0.055)	(0.057)
Precarious workers	−0.178***	−0.197***	−0.166***
	(0.033)	(0.049)	(0.047)
Chronically underemployed workers	−0.113**	−0.111	−0.103*
	(0.041)	(0.075)	(0.046)
Underemployed jobseekers	−0.257***	−0.245**	−0.273**
	(0.062)	(0.089)	(0.096)
Inactive underemployed workers	−0.206*	−0.069	−0.278*
	(0.088)	(0.101)	(0.112)
Person-year observations	4596	2509	2087
Wald chi-squared	352.7	204.3	207.6
Sigma μ	0.325	0.360	0.274
Sigma ϵ	0.427	0.385	0.473
Rho	0.367	0.466	0.251

Source: HILDA survey (2001–2020), own calculations.
Controls for gender (full model), ethnic background, remoteness, educational attainment, long-term health condition, marital status, number of children (all measured at sequence start), year of sequence start, and birth year.
*$p < 0.05$. **$p < 0.01$. ***$p < 0.001$.

Wage differentials

Table 1 presents coefficient estimates obtained from our random effects models to test whether early careers characterized by NSE and underemployment result in wage penalties compared with optimal employment on permanent jobs during the early career (Hypothesis 1). Model 1 presents the estimates from the pooled model, and separate models were also estimated for men (Model 2) and women (Model 3). The variable of primary interest is the categorical variable "early employment trajectories," with *optimally employed permanent workers* serving as the reference category because of the close resemblance of their early career paths to "standard careers."

Consistent with Hypothesis 1, results from the pooled Model 1 reveal that, except for those optimally employed on temporary contracts, all other forms of NSE and underemployment pathways during the early career are associated with wage penalties in the later career when compared with workers who are optimally employed in permanent jobs. As expected, highest wage penalties of around 16.3%[4] ($b = -0.178$;

$p < 0.001$) are found for *precariously employed* compared with *optimally employed permanent workers*, over the course of their later careers. Though slightly lower in magnitude, there are still considerable hourly wage disadvantages of 15.29% ($b = -0.166$; $p < 0.001$) for individuals who are permanently employed but underemployed compared with their peers in the reference category, suggesting that having a permanent job does not automatically translate to higher wages. Further, coefficient estimates from Model 1 show that, all else being equal, *chronically underemployed workers* earn on average 10.68% lower hourly wages ($b = -0.113$; $p < 0.01$) compared with our reference group.

The wage gaps are even more substantial when comparing optimally employed individuals with those individuals who have limited or no active participation in the labor market during the first 5 years after completing full-time education. According to Model 1, compared with *optimally employed permanent workers*, *underemployed jobseekers* experience wage penalties of an average of 22.67% ($b = -0.257$; $p < 0.001$) per hour later in their career, whereas *inactive underemployed workers* face hourly wage penalties of an average of 18.7% per hour ($b = -0.206$; $p < 0.05$). The group least penalized are those mostly on temporary contracts indicated as *optimally employed temporary workers*, who earn about the same as the reference group, and thus experience no wage penalties compared with the reference group. Overall, these findings lend support to Hypothesis 1, indicating that early careers characterized by frequent career fragmentations and transitions in and out of the labor force are associated with lower wages in later careers compared with careers where workers are optimally employed in permanent jobs.

The possibility that these wage gaps are distributed unequally across gender (Hypothesis 3) is tested in Models 2 and 3 in Table 1. The results indicate that wage gaps across the different groups are larger for men who undergo NSE and underemployment in the early stages of their careers as opposed to women. Specifically, men who are *underemployed permanent workers* face substantial hourly wage disadvantages of 18.94% ($b = -0.210$; $p < 0.001$), whereas this relationship for women is much smaller and not statistically significant ($b = -0.90$; ns). Regarding *precarious workers*, once again, men ($b = -0.197$; $p < 0.001$) tend to face larger hourly wage penalties than women ($b = -0.166$; $p < 0.001$). So far, these findings align with the expectations from Hypothesis 3.

Turning to *chronically underemployed workers*, the initially small wage penalty of 10.68% revealed in Model 1 is no longer statistically significant for men ($b = -0.111$; ns), but it remains significant for women ($b = -0.103$; $p < 0.05$). Considering the magnitude of the coefficient but the relatively large standard errors (and hence the imprecise estimator) among men, one could argue that these differences may be attributed to the limited number of men in this specific cluster ($N = 25$). Similarly, in the case of *inactive underemployed workers*, women in this cluster experience significant wage disadvantages averaging at 24.27% per hour ($b = -0.277$; $p < 0.05$) in their later careers. However, for men, the effect is small and not statistically significant ($b = -0.069$; ns). Finally, we find no evidence of gendered wage

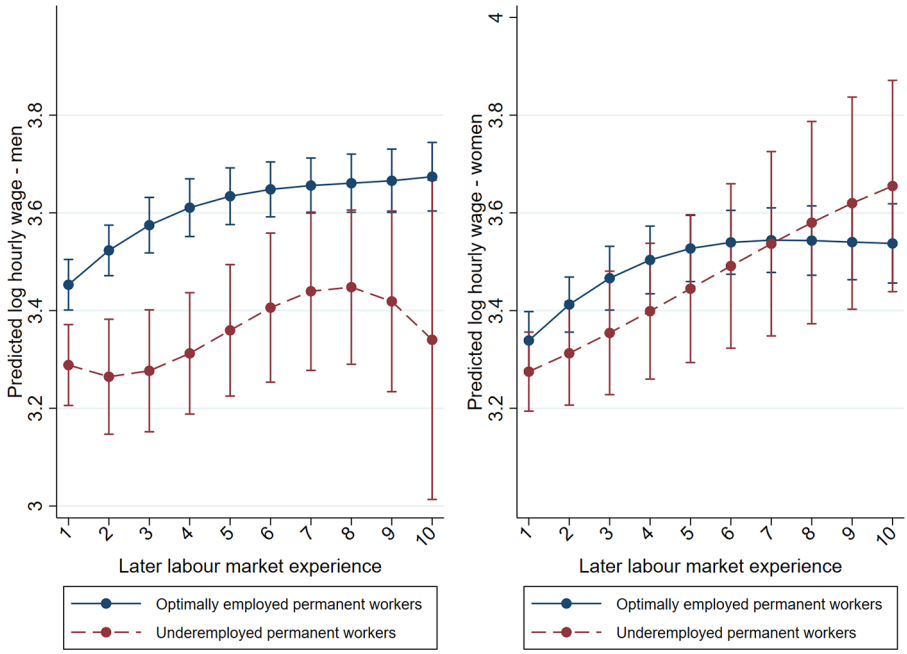


Figure 2. Predicted wage trajectories of optimally employed permanent workers (solid line) vs underemployed permanent workers (dotted line)—male vs female respondents.
Source: HILDA survey (2001–2020), own calculations.
Controls for ethnic background, remoteness, educational attainment, long-term health condition, marital status, number of children (all measured at sequence start), year of sequence start, and birth year are included. 95% confidence intervals displayed.

penalties among *underemployed jobseekers*. Our results indicate that women following this path experience significant wage disadvantages of 23.89% ($b = -0.273$; $p < 0.01$) in their later careers. The wage disadvantage for men in this cluster is somewhat smaller at 21.73% ($b = -0.245$; $p < 0.01$). Overall, these results provide partial support for Hypothesis 3, which expected that the wage differentials between groups would be larger for men who experience NSE and underemployment early in their careers compared with women.

Wage trajectories

Will initial wage differentials eventually diminish or accumulate over the course of the later career (Hypothesis 2)? To test this hypothesis, we estimated the predicted wage trajectories based on a series of random effects panel models presented in Figures 2 through 5. The figures illustrate the predicted wage trajectories of men (left panel) and women (right panel) during a 10-year period for workers belonging to different clusters of labor market entry patterns.

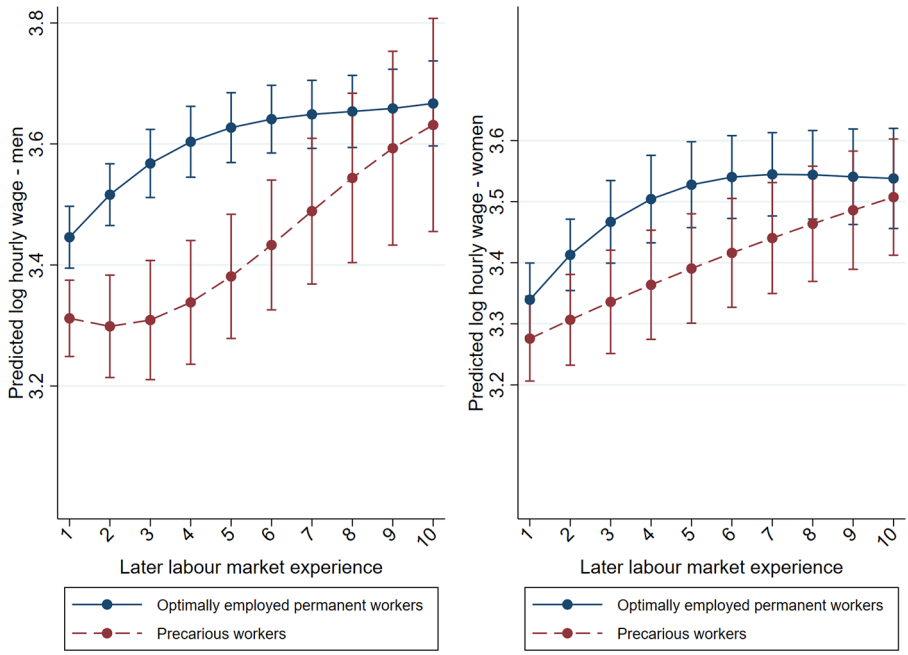


Figure 3. Predicted wage trajectories of optimally employed permanent workers (solid line) vs precarious workers (dotted line)—male vs female respondents.
Source: HILDA survey (2001–2020), own calculations.
Controls for ethnic background, remoteness, educational attainment, long-term health condition, marital status, number of children (all measured at sequence start), year of sequence start, and birth year are included. 95% confidence intervals displayed.

As shown in Figure 2, men in the reference category who are *optimally employed permanent workers* experience steep yearly wage trajectories from year one up until year six of their later career, after which their hourly wages stabilize. In contrast, *underemployed permanent workers* start with significantly lower wages in the first 2 years of their later careers, but see their wages accelerate significantly thereafter. By year seven of the later career, the hourly wage gap between male workers belonging to the two different clusters is no longer statistically significant. This finding provides no support for Hypothesis 2. When examining these trajectories for women (right panel), we find no significant wage differences. That is, women who are *underemployed permanent workers* experience no slower wage growth over the course of their careers compared with equivalent women who are optimally permanently employed, again lending no support for Hypothesis 2.

Next, Figure 3 compares the predicted wage trajectories of *optimally employed permanent workers* with *precarious workers*. As expected, male *precarious workers* (left panel of Figure 3) who experience casual and underemployment very early in their career and whose employment pathways become more volatile towards the end of the labor

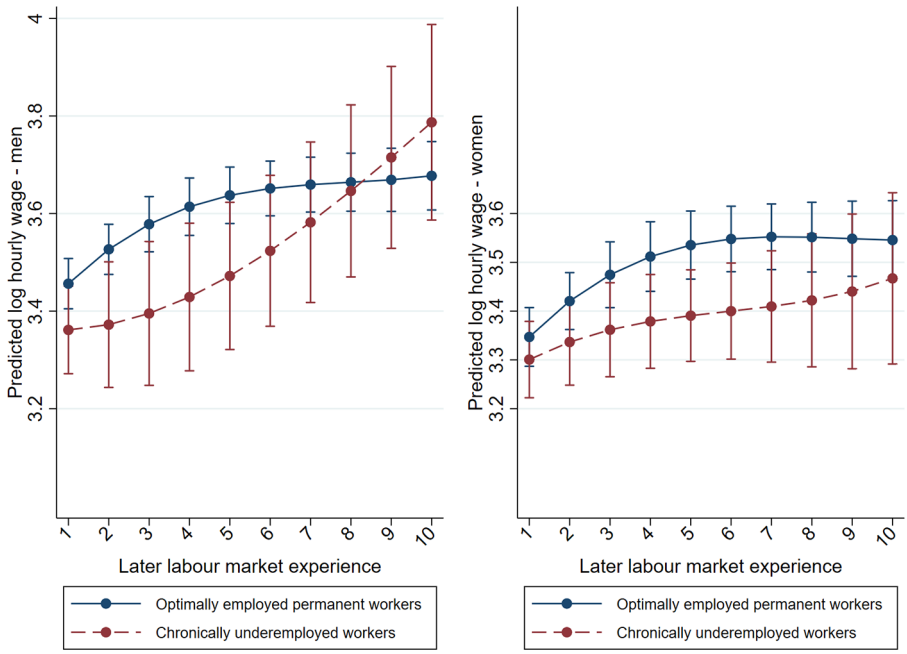


Figure 4. Predicted wage trajectories of optimally employed permanent workers (solid line) vs chronically underemployed workers (dotted line)—male vs female respondents.
Source: HILDA survey (2001–2020), own calculations.
Controls for ethnic background, remoteness, educational attainment, long-term health condition, marital status, number of children (all measured at sequence start), year of sequence start, and birth year are included. 95% confidence intervals displayed.

market entry phase experience large wage penalties during the first few years of their later career. Specifically, wage differentials increase up to year 4 before they decrease and become non-significant in year 7 of the later career. For women (right panel of Figure 3), having a career entry phase that is characterized by casual jobs and underemployment, especially right after leaving education, does not result in longer-term wage disadvantages, providing no support for accumulating wage penalties over time and thus no support for Hypothesis 2.

What about workers who are "stuck" in casual jobs and underemployment during the first 5 years of their careers? For men and women alike, the wage trajectories show no significant long-term wage gaps between *chronically underemployed workers* and *optimally employed permanent workers* (Figure 4). Overall, these findings indicate that, contrary to Hypothesis 2, initial wage gaps between different labor market entry patterns do not accumulate over the later career. Instead, the observed wage gaps diminish and become statistically insignificant over time.

Finally, Figure 5 compares the predicted wage trajectories of *underemployed jobseekers* with *optimally employed permanent workers*. The wage trajectories for male

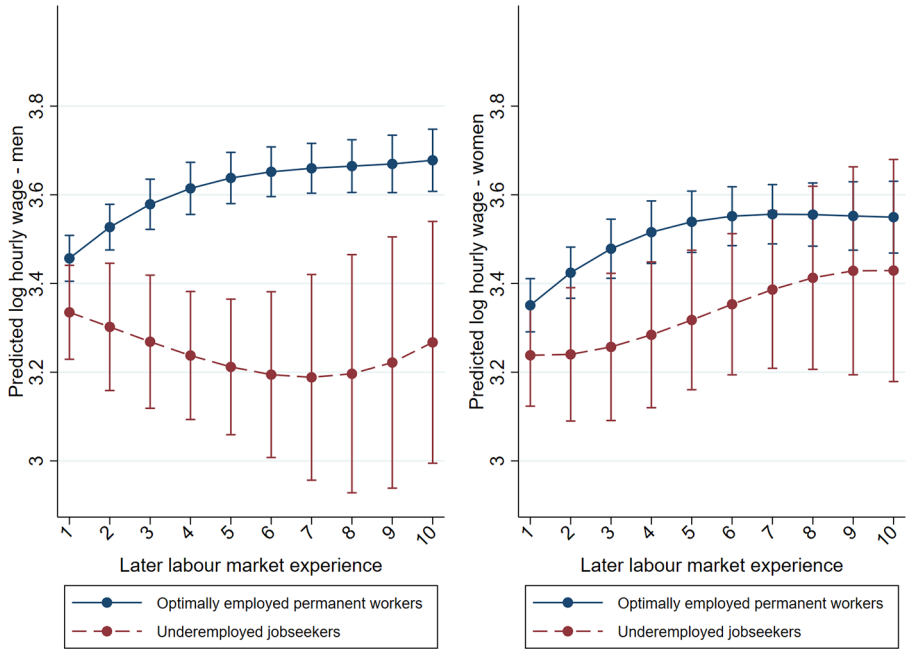


Figure 5. Predicted wage trajectories of optimally employed permanent workers vs underemployed jobseekers—male vs female respondents.
Source: HILDA survey (2001–2020), own calculations.
Controls for ethnic background, remoteness, educational attainment, long-term health condition, marital status, number of children (all measured at sequence start), year of sequence start, and birth year are included. 95% confidence intervals displayed.

workers who struggle with joblessness and underemployment in the early stages of their careers align closely with the concept of accumulating disadvantages and the notion of being trapped in low-quality jobs (left panel of Figure 5). The hourly wage trajectories of men in this cluster initially decrease, only showing an increase after year 7. As a result, compared with *optimally employed permanent workers*, the wage gaps widen up until year 8 of the later career and remain statistically significant even at year 10. This is the only finding providing support for Hypothesis 2, which expected wage penalties to widen over time. When predicting the same wage trajectories for women, we find that the longer-term wage penalties associated with early career joblessness are not statistically significant (right panel of Figure 5). This finding again provides no support for Hypothesis 2.

Robustness checks

We also conducted three major tests to check the robustness of our findings. First, it could be argued that our findings may be biased because we only include

respondents who have at least one wage observation in their later careers in our regression models. This selection criterion introduces the possibility of non-random selection bias. To account for this potential bias, we perform a two-step Heckman (1978) correction procedure and re-estimate all models displayed in Table 1. In the first step, we estimate the predicted probability of having a valid wage observation at least once 6 years after completing full-time education, controlling for a range of individual characteristics. In the second step, the predicted probability of being selected into the sample is used to calculate the selection correction term (i.e., the Inverse Mills Ratio). This is identified through the instrumental variable *other income*. This variable is constructed by first taking the total personal income of the respondent adjusted to 2020 Australian dollars and subtracting all wages and salaries from this amount. We assume that the remaining income represents non-labor market or other income, which, though it may influence respondents' probability of employment, should have no direct effect on their individual wages. The results of the Heckman correction procedure regression are presented in Table A2 (Column 1) in the Appendix. Results in Column 1 go in the same direction as the main results presented in Table 1 but are less pronounced. This suggests that selection bias may have had a slight inflationary effect on our results.

As a second robustness check, we re-estimated models in Table 1 after including additional control variables, which should affect workers' later wage outcomes but may potentially be a result of the early labor market entry pathways and are thus not included in our main specification to avoid overcontrol bias (Elwert and Winship, 2014). These additional time-varying variables include current job type, industry, and occupation during the later career. Results in column 2 of Table A2 of the Appendix show that the reported wage penalties in Table 1 remain robust even after controlling for these additional variables.

As a final robustness check, we include the presence of a long-term health condition and the number of children below 10 as time-varying control variables instead of time-constant variables measured at the sequence start. This leads to overall similar estimates of wage disadvantages associated with early career dynamics (results not presented but available upon request).

Discussion and conclusion

NSE and underemployment are common experiences among young workers in Australia, but their combined impact on long-term wage trajectories is often overlooked. In this study, we used 20 years of Australian panel data to examine how early career dynamics shape later wage trajectories, paying careful attention to gender differences. Our central argument based on human capital (Becker, 1964), signaling (Spence, 1973), and cumulative disadvantages theories (DiPrete and Eirich, 2006) expected that disadvantaged wage trajectories may not simply arise from a few isolated NSE or underemployment experiences, but rather arise from enduring combinations of casual or temporary employment and underemployment experiences that interact and compound over time. Gender differences were also expected based on the "ideal" worker norm and women's anticipation of career interruptions (Williams, 2001). To identify common career patterns within the first 5 years after completing

full-time education, we employed multichannel sequence analysis. Subsequently, we utilized random-effects panel models to predict how early career patterns are associated with later wage trajectories over the following decade.

Multichannel sequence analysis identified seven common career entry patterns with varying degrees of NSE and underemployment. Our results revealed that the "standard career" characterized by continuous, optimally employed permanent positions was the most prevalent career start, encompassing 44% of our sample. At the same time, this finding also indicates that the remaining 56% of workers in our sample experienced periods of precarious types of employment and underemployment to some extent. This implies less than ideal career starts for a majority of young workers.

Further, in line with our expectations, we found that early careers defined by underemployment and NSE are associated with significant wage penalties compared with those in permanent contracts, which are particularly significant for men. These wage setbacks, however, tend to fade away within a decade in the labor market. This pattern of results is consistent with job mobility models and the notion that young people in NSE and underemployment are able to catch up as they learn how their qualifications are valued and rewarded across various jobs and employers and as they eventually find the right match, improve their negotiation skills and secure higher wages as their careers progress. They also align with recent findings from Europe (le Grand and Tåhlin, 2002) and the US (Ozkan et al., 2023; von Wachter, 2020).

In addition, we found that the ability to close the wage gaps over the course of later careers is contingent upon employment. Specifically, our findings indicate that initial careers primarily marked by unemployment are linked to substantial wage penalties in later life. These penalties not only endure but also intensify over time, implying that unemployment leaves a lasting and deepening impact on wage growth, akin to a chronic scar. These findings are consistent with previous findings (Mooi-Reci and Wooden, 2017; Neumark, 2002) and also lend support to the concept of cumulative disadvantages as they demonstrate that initial career disadvantages in the form of joblessness tend to amplify and intensify over time. Furthermore, they contribute to the existing body of research (Addison and Surfield, 2009; Pedulla, 2016) by revealing that episodes of early unemployment have more profound negative effects on wages than initial underemployment or casual or temporary employment.

Finally, upon examining the data separately by gender, we found that wage penalties tended to be more negative and persistent among men than among women. This finding aligns with existing research in Australia (Mooi-Reci and Wooden, 2017), further substantiating expectations regarding implicit biases against men experiencing underemployment or engaging in temporary and casual jobs.

Despite these contributions, our study is not without limitations. First, our analysis included a comprehensive examination of both casual employment (relevant in the UK and Australia) and temporary contracts (more common in Germany, the Netherlands, or Italy), making our study directly relevant and insightful in a broader international context. Nevertheless, a direct replication of our analysis with longitudinal data from other countries is necessary to test the generalizability of our findings to other regions. Second, despite employing random effects models to predict the relationship between early career patterns and later wage trajectories, our analysis may not fully capture unobserved

heterogeneity among workers. We conducted sensitivity checks to assess the impact of endogeneity, demonstrating that our findings are generally robust. However, future research should explore alternative methodological approaches, that can more effectively address concerns related to omitted variable bias and endogeneity.

Overall, our study underscores the significance of considering labor market entry as a continuous process rather than a singular transition. It reveals that this process may involve simultaneous periods of NSE and underemployment, emphasizing the dynamic nature of early career trajectories. Although our study shows that individuals who experience early NSE and underemployment can ultimately overcome the initial wage disadvantages associated with such employment, they still endure wage penalties for a substantial portion of their careers. Thus, in terms of lifetime earnings and cumulative wages they might still endure penalties (Fauser, 2020). Moreover, this prolonged period of wage disadvantage negatively impacts their ability to accumulate financial savings or engage in significant financial investments (Fauser and Scheuring, 2022).

Further, our study also underscores that the most disadvantaged group of workers, those who experience mainly joblessness after leaving education, face significant challenges in catching up to their peers who have more favorable early labor market experiences. Against this background, policymakers should develop strategies that facilitate the labor market integration of this group, as they are at risk of not only labor market exclusion but also social exclusion. In this regard, our findings highlight that NSE during the early career yields more favorable longer-term outcomes than joblessness. However, for this to hold, policymakers must prioritize measures that facilitate the continuous attachment of workers in NSE to the labor market, including training and skill development programs or networking and mentorship programs (for a review, see Kluve et al., 2016). This sustained connection enables the accumulation of skills that subsequently contribute to securing more stable positions over time. Conversely, regulatory frameworks should be implemented to prevent fragmented careers, particularly spells of involuntary joblessness. This may include early warning systems to identify companies at risk of closure, enabling timely interventions such as reskilling programs or support for affected workers (OECD, 2018). Other measures may include stricter regulations against arbitrary dismissals and provisions for fair severance packages (Giannoni, 2021). Furthermore, developing programs that support workers in transitioning between jobs or industries can help prevent workers from falling into joblessness.

Finally, the gender differences we have uncovered indicate potential stigmatization of male workers with histories of NSE or underemployment. Addressing these gender-based biases and challenging stereotypes is essential to ensure equal opportunities and fair treatment for all workers in the labor market.

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Notes

1 The term non-standard employment usually refers to all jobs that are not full-time permanent jobs. There is no clear consensus in previous literature concerning the terms used to describe different job types. In particular, the terms standard and non-standard employment, regular and non-regular employment, as well as precarious jobs and insecure jobs, have all been used in previous literature to describe the same phenomena (Kalleberg, 2012; Valenzuela et al., 2023). Moreover, the terms fixed-term jobs and temporary jobs are used interchangeably by previous studies to refer to jobs with a predefined fixed duration. We decided to use the term temporary job throughout this study.

2 We arbitrarily chose the cut-off point of 4 hours to ensure that respondents are non-negligibly underemployed. Robustness checks in which also respondents who would like to work between 0.5 and 3.5 hours more are considered as underemployed result in largely similar findings.

3 This variable is created from two variables, namely a variable on Indigenous origin and a variable distinguishing the country of birth into Australia, English-speaking, and other countries. It thus accounts for Indigenous origin, migration background, and language skills.

4 To turn log points into %: $(e^{\beta} - 1)$ multiplied by 100.

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Appendix

Table A1. Descriptive statistics by early employment trajectories.

	Optimally employed permanent workers	Optimally employed temporary workers	Under-employed permanent workers	Precarious workers	Chronically under-employed workers	Under-employed jobseekers	Inactive under-employed workers
Gender							
Male	52.4	60.5	55.8	49.3	33.2	51.4	22.4
Female	47.6	39.5	44.2	50.7	66.8	48.6	77.6
Ethnic background							
Non-indigenous Australian	90.5	90.6	89.0	91.2	89.2	74.8	80.7
Indigenous Australian	1.6	–	1.2	3.3	3.1	12.7	9.8
Non-Australian English-speaking	2.7	2.3	2.5	1.7	3.4	2.1	2.6
Non-Australian non-English	5.2	7.0	7.4	3.9	4.4	10.4	6.9
Remoteness							
Major city	67.1	57.5	59.3	65.7	59.7	52.7	58.8
Inner regional	22.7	30.8	22.8	23.9	36.3	20.8	19.5
Outer regional and remote areas	10.2	11.7	18.0	10.4	4.1	26.5	21.6
Education							
Postgraduate	1.9	7.7	0.3	1.1	–	–	3.2
Grad diploma/ certificate	2.6	6.0	0.4	–	–	–	–
Bachelor	19.4	38.5	9.9	7.2	9.2	1.0	9.8
Advanced diploma/ diploma	4.1	–	2.9	4.9	2.0	4.2	0.3
Certificate III/IV	11.7	2.3	16.7	4.6	12.9	4.7	6.9
Year 12	50.5	33.4	55.5	65.4	59.0	60.5	50.4
Year 11	9.9	12.0	14.4	16.9	17.0	29.6	29.6
Has work-limiting long-term health condition or disability	7.6	11.0	15.2	11.1	22.0	24.2	36.7
Married	25.8	26.8	23.2	14.6	23.1	22.1	44.3
Birth year (SD)	1985.1 (4.1)	1985.2 (4.3)	1987.0 (3.8)	1987.1 (3.9)	1987.4 (4.2)	1988.3 (3.9)	1987.8 (4.2)
No. of children 0–4 (SD)	0.03 (0.23)	0.0 (0.0)	0.03 (0.22)	0.05 (0.25)	0.0 (0.0)	0.11 (0.31)	0.22 (0.46)
Year of sequence start (SD)	2005.1 (3.5)	2006.4 (3.1)	2006.2 (3.5)	2005.9 (3.7)	2006.0 (3.8)	2006.9 (3.7)	2007.3 (3.4)
Total person-year observations = 5865* (%)	2608 (44.5)	299 (5.1)	690 (11.8)	1209 (20.6)	295 (5.0)	385 (6.6)	379 (6.5)

Source: HILDA survey (2001–2020), own calculations.
* Also includes those respondents without a wage observation in the later career.

Table A2. Robustness checks: Heckman correction and additional control variables.

	Heckman model	Including additional controls
	b/se	b/se
Ref: Optimally employed permanent workers		
Optimally employed temporary workers	0.052	0.038
	(0.064)	(0.060)
Underemployed permanent workers	−0.160***	−0.126***
	(0.039)	(0.038)
Precarious workers	−0.157***	−0.139***
	(0.033)	(0.033)
Chronically underemployed workers	−0.100*	−0.062
	(0.040)	(0.041)
Underemployed jobseekers	−0.139*	−0.196***
	(0.071)	(0.062)
Inactive underemployed workers	−0.048	−0.155
	(0.108)	(0.085)
Inverse mills ratio	−0.846**	
	(0.279)	
Additional controls: current job type, occupation, and industry		✓
Person-year observations	4596	4555
Wald chi-squared	369.5	596.5
Sigma μ	0.319	0.303
Sigma ϵ	0.426	0.426
Roh	0.360	0.336

Source: HILDA survey (2001–2020), own calculations.
Controls for gender, ethnic background, remoteness, educational attainment, long-term health condition, marital status, number of children (all measured at sequence start), year of sequence start, and birth year.
*$p < 0.05$. **$p < 0.01$. ***$p < 0.001$.

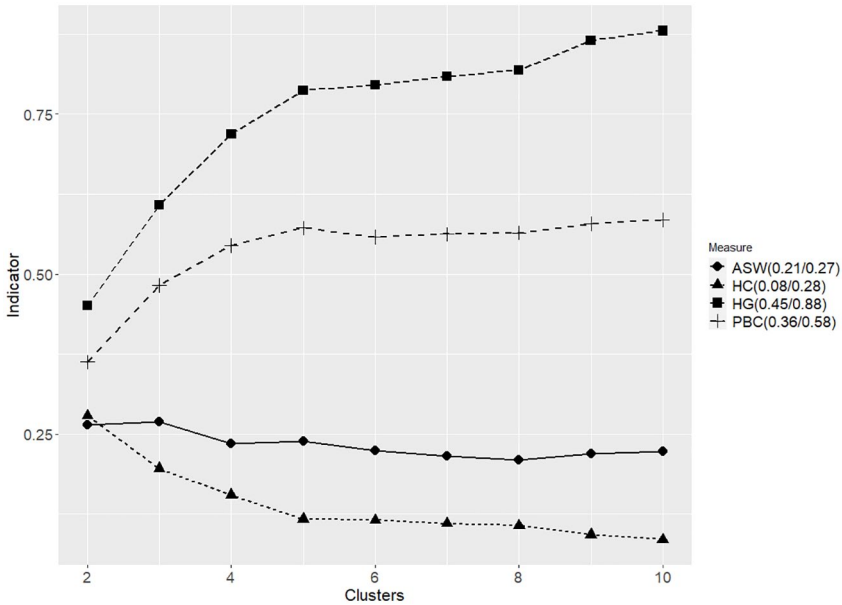


Figure A1. Quality of different cluster solutions obtained with OM.
Source: HILDA survey (2001–2020), own calculations.