Socio-Economic Decline and Death: The Life-Cycle Impacts of Recessions for Labor Market Entrants

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March 2023

Abstract

This paper uses several large cross-sectional data sources and a new approach to show that a large and recurring temporary economic shock affecting young adults– entering the labor market in a recession – has dynamic effects on mortality by cause, family outcomes, morbidity, and various measures of economic success throughout the life-cycle until middle age. We find that cohorts coming of age during the deep recession of the early 1980s suffer increases in mortality that appear in their late 30s and further strengthen through age 50, driven by behavior-related causes such as heart disease, lung cancer, and liver disease, as well as drug overdoses. At the same time, unlucky middle-aged labor market entrants earn less and work more while receiving less welfare support and experiencing higher rates of work-related disability. They are also less likely to be married, more likely to be divorced, experience higher rates of childlessness, and have lower income spouses. We show the entire trajectories of these outcomes are affected in a way predicted by economic life-cycle models. This implies long-lasting and costly effects for the large number of individuals graduating in recessions.

JEL-Codes: E32, I10, J10

[1]We are thankful to David Card, Janet Currie, Olivier Darmouni, Bill Evans, Jonathan Kowarski, Adriana Lleras-Muney, Steve Pischke, Julian Reif, Jonathan Skinner, Ann Stevens, seminar participants at UC Davis, Cemfi Madrid, Aarhus, Hohenheim, Ifo, University of Connecticut, University of Massachusetts Amherst, UC Riverside, UC Irvine and conference participants at NBER Summer Institute 2019, NBER Labor Studies meeting 2016, NBER Universities' Research Conference 2013, Federal Reserve Bank of Minneapolis, Barcelona GSE Summer Forum, Society of Labor Economics 2019, International Health Economics Association 2019, and the American Society of Health Economics 2019. Nicolas Oderbolz provided excellent research assistance.

1 Introduction

Recessions are large, recurring, aggregate shocks that are temporary in nature. But for cohorts that experience recessions in young adulthood during their transition into the labor market, these temporary shocks could have lifelong consequences.[2] In this paper, we show that entering the labor market in a downturn affects the entire life-cycle trajectories of economic, family, and health outcomes until age 50. Besides having lower long-term earnings, higher rates of disability, fewer children, fewer marriages, and lower-income spouses, in middle age unlucky entrants also have higher mortality due to lung, liver, and heart disease. Such broad and lasting impacts substantially affect our understanding of the cost of business cycles and of the populations that are most impacted. The population exposed to such long-term effects is large. Over 30% of prime-age workers in the U.S. labor force in 2019 entered the labor market for the first time during a year with a recession (45.9 million individuals aged 25 to 64, see Table A.1).

Young adulthood, when labor market entry occurs, is a formative and vulnerable transition period in which social and economic trajectories are set.[3] During this phase the vast majority of emerging adults transition from dependent adolescent roles to independent adult roles. They complete their training, find their first job, move to where that job is located, and might find a partner to start their family.[4] Recessions might be particularly consequential for young adults because they affect the parameters of this vulnerable transition period.

Business cycles are known to have particularly strong contemporaneous impacts on young adults and to affect a range of household decisions, including marriage, fertility, and homeownership.[5] Moreover, a growing body of research has documented that entering the labor market in a recession leads to large initial losses in earnings and employment that persist for about ten to fifteen years in the labor market.[6] As we will discuss, economic life-cycle models predict that these strong initial effects can affect the entire life-cycle trajectories of economic, social, and health outcomes initiated

[2]Policy makers and the public have long been concerned that entering the labor market in a recession could worsen lifetime outcomes of young workers (see, e.g., NJY (2006); WSJ (2009); SCOTUS (2022)).

[3]A large economic literature has identified the in-utero period, childhood, and adolescence as critical phases during which shocks can have lifelong impacts due to their effect on health and human capital development (e.g., Hoynes et al. (2016); Almond et al. (2018); Bailey et al. (2020)).

[4]An increasing number of studies in medicine and psychology, among other disciplines, show that early adulthood is also a critical phase for brain, social, and psychological development (Council et al., 2015; Wood et al., 2018). Brain systems supporting motivational and socio-emotional processing are still maturing in early adulthood, influencing a more developed prefrontal executive system. Among others, this can lead to more effective planning based on short-term rewards. (Council et al., 2015). At a psychological level, studies have shown that early adulthood is an important transition period between the adolescent phase marked by lack of self-regulation and high risk taking, among others, to more mature decision making of adulthood (e.g., Cauffman et al., 2010).

[5]E.g., Hoynes et al., 2012; Dehejia and Lleras-Muney, 2004; Kondo, 2011; Schaller, 2013.

[6]Oyer (2006); Kahn (2010); Wozniak (2010); Oreopoulos et al. (2012); Schwandt and von Wachter (2019); Rothstein (2019).

in young adulthood.[7] This further underscores the need to to establish whether recession shocks at the time of labor market entry persistently set young adults on different trajectories that imply profound social, economic, and health consequences throughout the life cycle.

In this paper, we show that an adverse shock during early adulthood can truly lead to pervasive and long-term effects. Following the literature, our approach focuses on fluctuations in state unemployment rates, which provides us with exogenous variation in local labor market conditions. To analyze effects in middle age, we focus on cohorts entering the labor market in different U.S. states before, during, and after the 1982 recession — the largest post-war recession before the Great Recession — that we can observe from labor market entry until age 50. We use Vital Statistics data from 1979 to 2016 and population estimates from the Census and the ACS to construct mortality rates, and the Decennial Census (Census), the American Community Survey (ACS), and the Current Population Survey (CPS) to obtain information on socioeconomic outcomes, including earnings, labor supply, marital status, divorce, and cohabitation. To harness the large sample sizes and wide coverage of these cross-sectional data that do not have information on state and year of labor market entry, we re-weight unemployment rates to reflect the economic conditions a cohort would have faced at graduation had it had migration and education rates similar to surrounding cohorts. A key advantage of this approach is that it only requires information at the birth-state and birth-year level and hence can be applied to Vital Statistics and Decennial Census data, which otherwise could not be used to study the long-term effects of state-level labor market entry shocks. This approach also controls for potentially selective migration or entry decisions that could otherwise bias our estimates. To further ensure we only measure the effect of temporary initial conditions and not of the ensuing evolution in regional economies, in an extensive robustness analysis we control for potentially confounding trends at the state, cohort, and national level.

Using this approach, we find that entering the labor market during a recession has effects on the entire life-cycle patterns of mortality, family formation, and economic outcomes from age 20 to age 50. Figure 1 shows estimated changes in the life-cycle profile of several of our core outcomes due to a one point higher unemployment rate at labor market entry.

Our first main finding is that a temporarily higher state unemployment rate at the age of labor market entry leads to precisely estimated increases in mortality in middle age (Figure 1A). The magnitude of these effects is meaningful: if sustained until the end of their life, a 3.9 percentage point higher unemployment rate (as experienced by the 1982 graduation cohort) would lead to a decrease in life expectancy by six to nine months. Consistent with our findings of increased mortality, we also see a rise in morbidity as measured by a rise in the incidence of self-reported disability and receipt of federal disability insurance in middle age.

Our second main finding (Figure 1B) is that these midlife mortality increases are driven to an

[7] See Gibbons and Waldman (2006); Oreopoulos et al. (2012); Moreau and Lleras-Muney (2019).

important extent by increases in mortality related to lifestyle and health behaviors, such as lung cancer, liver disease, and drug poisoning. In contrast, we find no long-term effects on other causes of death, such as accidents or cancers other than lung cancer.

Our third main finding is that entering the labor market during a recession has substantial dynamic effects on key economic outcomes over the life cycle, including annual earnings (Figure 1C), but also wages, employment, poverty, and program receipt. We find that despite initial earnings recovery in their mid-thirties, adversely affected entry cohorts suffer a reduction in annual earnings and hourly wages as they reach their mid-forties.

Our fourth main finding (Figure 1D) is that unlucky cohorts tend to marry and have children earlier, then experience a rise in divorce, and in the long run see lower marriage rates, higher divorce rates, and smaller family size.

Our fifth main finding is that unlucky labor market entrants tend to be married to spouses with slightly less education, who also have similar long-run income losses (Figure 1C) and increased disability risk from adverse labor market entry.

Our findings are in line with predictions from economic life-cycle models of earnings, family formation, and mortality. The mortality effects we find are well described by a benchmark mortality model (Moreau and Lleras-Muney, 2019) both in terms of magnitudes and dynamic effect patterns across age, with over a decade passing before increases in mortality levels are observed. Family formation, on the other hand, is affected more rapidly. In line with standard models of family formation (Becker, 1960), for the average recession entrant, lower opportunity costs of less steep career paths may dominate negative income effects and lead to earlier marriages and child bearing. Over time, worse matches from infra-marginal marriages and economic pressure leads to higher divorce rates. In the long run, lower permanent income, worse health, and increased family instability lowers marriage, fertility, and cohabitation with children.

While all demographic groups we study experience adverse long-term effects on mortality and socio-economic outcomes, some salient aspects of the life-cycle effects we find differ by race and gender. Compared to White recession graduates, non-White individuals experience larger initial economic losses, and mortality increases already appear during the first decade after joining the labor market. Non-White individuals further do not experience a short-term increase in family formation, suggesting that the stronger negative income effects may offset lowered opportunity costs. Across gender, on the other hand, effect patterns are similar in the short and medium run. But in the long-run, both female and non–White recession graduates increase their labor force participation while experiencing smaller income losses. At the same time, they suffer stronger mortality increases due to heart, liver, and lung disease in the long term, suggesting that buffering income losses through increased participation may come at the cost of additional health deterioration.

The paper makes several contributions to the literature. By establishing that temporary initial labor market conditions have persistent impacts throughout the life cycle until age 50, including on earnings, wages, family formation, disability, and mortality, these findings establish that the cost of business cycles are more pervasive and long-lasting than typically thought. Our findings underscore that the welfare consequences of recessions are particularly high for young workers (e.g., Storesletten et al., 2001; Hoynes et al., 2012), and that accounting for dynamic effects is crucial for assessing the costs of recessions (e.g., Davis and von Wachter, 2011). Our analysis of mortality and family outcomes also complements existing studies of the costs of business cycles and its heterogeneity focusing on income or consumption risk (e.g., Barlevy, 2005).

By showing broad dynamic life-cycle effects up to age 50, the paper further confirms that early adulthood is a critical age during which economic shocks can have consequences lasting a lifetime. The paper clarifies how such dynamic, longer-term effects on a larger set of outcomes are consistent with predictions from economic life-cycle models. This adds to a growing body of research documenting how various stages of development during pregnancy, childhood, and adolescence shape lifetime outcomes (e.g., Hoynes et al., 2016; Almond et al., 2018; Bailey et al., 2020) and complements research outside of economics indicating that early adulthood is a vulnerable transition period. This is consistent with recent work showing life-cycle effects of individual-level economic interventions in young adulthood on health, economic, and social outcomes (Aizer et al., 2020; Deshpande, 2016; Deshpande and Mueller-Smith, 2022).[8] Our findings are also consistent with Currie and Schwandt (2014) and Cutler et al. (2016), who show that economic conditions during young adulthood are associated with completed fertility and mortality in middle age, respectively, which suggests that labor market entry conditions might be a key driver underlying these relationships.[9]

The paper also extends a growing literature studying the short- to medium-term effects of entering the labor market in a recession on key labor market outcomes (Oyer, 2006, 2008; Kahn, 2010; Wozniak, 2010; Genda et al., 2010; Oreopoulos et al., 2012; Altonji et al., 2016; Schwandt and von Wachter, 2019; Rothstein, 2019)) in multiple ways: by doubling the length of follow up after the initial shock to 30 years, by studying mortality jointly with social and economic outcomes, by showing dynamic effects connecting short- and long-run responses, and by addressing the heterogeneity of these dynamic effects by race and gender. Our findings imply that initial conditions have long-lasting, pervasive, and heterogeneous effects on labor market entrants. Our analysis also adds to work by Maclean (2013) and Maclean and Hill (2015) who document in NLSY data mixed effects

[8]Aizer et al. (2020) show that job training interventions during early adulthood during the New Deal had lifetime consequences on income and mortality. Using country-level data. Deshpande (2016) finds that loss in Supplemental Security Income at age 18 leads to lasting losses in earnings while Deshpande and Mueller-Smith (2022) document positive effects on crime.

[9]Currie and Schwandt (2014) show that completed fertility at age 40 in the U.S. is negatively associated with state-level unemployment rates in women's early 20s but not at other ages. Cutler et al. (2016) find in cross-country data that periods of economic growth between birth and age 25 are associated with lower adult mortality, and effects tend to be stronger for the age range 16--25.

of graduating in a recession on health at age 40 and negative effects on sef-esteem, respectively.[10]

Our findings further complement an increasing literature showing that other labor market shocks, such as a job displacement, can have long-term effects on earnings (e.g., Davis and von Wachter (2011), Lachowska et al. (2020), Schmieder et al. 2023), mortality (e.g., Sullivan and von Wachter, 2009; Browning and Henesen, 2012; Eliason and Storrie, 2009), health (e.g., Schaller and Stevens 2015; Kuhn et al. 2009; Burgard et al. 2007; Browning et al. 2006), family outcomes (e.g., Charles and Stephens 2004b; Halla et al. 2020), and crime (e.g., Bennett and Ouazad 2019). By studying labor market entrants and an exogenous, market-level shock, the paper circumvents lingering concerns that individual job loss events for mature workers may occur selectively or endogenously.

By showing that the causal impact of initial conditions increases steadily with age, our results also contribute to a better understanding of potential causal factors that lead the gradient of mortality and socioeconomic status (SES) to rise with age (e.g., Case et al., 2002; Currie and Stabile, 2003). Increasing SES-health gradients with age have been well documented in the empirical literature and recently incorporated in a model of life-cycle mortality by Moreau and Lleras-Muney (2019). Yet, there have been doubts about how much of the gradient and its rise represent true causal effects of SES on health (e.g., Cutler et al., 2011). Our results are consistent with the notion that initial differences in SES tend to have an increasing impact on health and eventually on mortality as individuals age.

Our paper establishes a direct causal link between initial economic conditions, long-term socioeconomic decline, and mortality supporting the notion that persistent social and economic hardship may be a channel behind the recent midlife mortality crisis (Case and Deaton, 2015, 2017, 2018). However, by design, our paper is not meant to explain the midlife mortality crisis, because we look only at initial labor market conditions orthogonal to the national unemployment rate,; neither do we address the effects of recessions for older worker or the role of wider societal trends, for example, reductions in manufacturing jobs or the opioid epidemic (Autor et al., 2019; Venkataramani et al., 2020; Currie and Schwandt, 2021).

Finally, by showing how the concept of the "double-weighted" unemployment rate introduced by Schwandt and von Wachter (2019) can be used to study initial conditions in large cross-sectional mortality data sets, our paper makes a useful conceptual contribution that we expect will benefit a range of future studies based on similar administrative data. Taking this step is important because large administrative data spanning many cohorts and years are required to study the effect of long-term aggregate shocks on mortality – due to infrequently occurring shocks, moderate effects sizes, and substantially lagged effects as cohorts age – but typically vital statistics data lag key information

[10]Maclean (2013) finds negative effects on physical health at age 40 for men and positive effects on mental health at age 40 for women. A potentially limiting factor for the analysis is the NLSY's small sample size of fewer than 7,000 observations at age 40. In comparison, our mortality analysis is based on over 900 million person-year observations (8 entire U.S. birth cohorts observed over 38 years).

on labor market history typically used for this kind of analysis.

The remainder of the paper proceeds as follows. The next section provides a summary of theoretical predictions from economic models. The third section introduces the data, while the fourth section lays out our estimation approach. The fifth section provides benchmark effects of initial labor market conditions on earnings. The sixth section presents our main findings on the effects of entering the labor market in a recession on mortality in middle age, overall, and by cause of death. The seventh section summarizes our findings on long-term responses in measures of SES. Section 8 discusses the main results and differences in impacts by race and gender (and education for SES outcomes) in light of the theoretical predictions we laid out at the outset. The final section concludes.

2 Predictions from life-cycle models

This section briefly reviews predictions from life-cycle models for the impact of a temporary initial labor market shock on career development, family formation, and health and mortality of unlucky cohorts such as those displayed in Figure 1. Because we are not aware of a comprehensive model integrating labor market shocks, career decisions, family formation, and health investments, we discuss predictions for each set of our main outcomes in turn. Although these models have a range of implications, here we focus on those most relevant for our empirical approach and data.

Career outcomes. Standard models of life-cycle earnings characterize the early career as a period when young workers invest in human capital — typically in terms of labor market experience — and look for better job opportunities (e.g., Ben-Porath, 1967; Burdett, 1978). Variations of this workhorse model can explain both persistent losses from a temporary labor market shock and reappearing wage and earnings losses in middle age.[11] For example, Gibbons and Waldman (2006) extend their workhorse model of career progression to allow for persistent effects of initial labor market conditions that could widen again in middle age. In their model, unlucky cohorts are more likely to enter and accumulate skills specific to lower-level jobs. While eventually they may get promoted to the higher-level job, by then luckier workers will have accumulated more skills on the higher level job, so that earnings gaps can persist for a long time. In Oreopoulos et al. (2012), workers in unlucky cohorts are more likely to start their jobs at lower paying employers than lucky cohorts. They then search for jobs at high-paying firms, and once there, they accumulate firm-specific skills. Because luckier workers had more time to accumulate specific skills at the high-wage firm, earnings gaps can be persistent.[12]

[11]The basic model would predict persistent wage and earnings losses only if entering the labor market in a recession led to persistent losses in employment and persistent reductions in the job offer distribution. Yet, the existing literature and our findings are based on the effects of a temporary reduction in the unemployment rate, holding evolving labor market conditions constant.

[12]Huckfeldt (2014) also develops a model in which fluctuation of job creation among low- and high-wage occupations over the business cycle can explain why job losers experience larger wage losses in recessions. Neal (1999) analyzes a

In both models, workers in unlucky cohorts, on average, have lower tenure and hence lower specific skills at the higher-level job or high-wage firm, respectively. Arellano-Bover (2021) provides empirical evidence of lower skill accumulation among unlucky labor market entrant cohorts. In middle age, this would lead them to be more vulnerable to job loss or less likely to be promoted further. In addition, worsening health and unstable family environments may depress earnings further in middle age.

Moving beyond earnings and wages, the effects on labor supply over the life cycle from an initial labor market shock are ambiguous. While lower wages while young and in middle age would lead to a negative substitution effect on labor supply, lower income and lower lifetime wealth would imply a positive effect. Further effects running through reduced health in middle age or incapacitation due to increased crime while younger would imply potential reductions in labor supply.

Family outcomes. Economic models predicting the effect of economic shocks on fertility choices over the life cycle rely on potentially counteracting substitution and income effects (Becker, 1960). An immediate reduction in economic opportunity during a recession is likely to trigger a reduction in fertility. While income and substitution effects are both present, the immediate urgency of a contracting economy might in fact increase opportunity costs in the short term, resulting in procyclical fertility (Dehejia and Lleras-Muney, 2004; Currie and Schwandt, 2014). For young adults, substantial fertility effects might only appear with some lag. Upon graduating, young individuals generally first find a job before they get married and have children. This process of family formation and childbearing is likely to take several years, and hence most of these young workers are unlikely to be on the margin of having children. As unlucky labor market entrants settle into employment at lower wages and less-promising careers, there are lower opportunity costs involved with earlier family formation and child bearing. Thus, a few years after entering the labor market, recession graduates would experience a temporary positive substitution effect on fertility. In contrast, in the long run, the reduction in lifetime earnings and lower marriage rates due to entering the labor market in a recession would predict a reduction in total lifetime fertility.[13]

Recent life-cycle models of marriage choices with limited commitment have incorporated random fertility shocks and therefore can make predictions on marital status and fertility jointly (e.g., Voena, 2015; Chiappori and Mazzocco, 2017). All else equal, as in traditional models of fertility, beyond the contemporaneous effect of a recession, a persistent decline in the labor market opportunities of women would predict a temporary rise in the rate of marriage and hence fertility. In the long run, again, lower lifetime earnings would predict a lower marriage rate, and insofar as marriages are conducive to child bearing, a lower lifetime fertility rate.

These basic predictions can be enriched by considering the dynamics of marriages and divorce

related model in which workers first search over occupations then look for an employer within that occupation.

[13]Following the discussion in Dehejia and Lleras-Muney (2003), if the lifetime earnings reduction is expected, a stronger negative income effect may counteract the positive substitution effect even in the short run.

in the presence of marital match quality. Because we observe data on both individuals and families, in our empirical analysis we will be able to test some implications of these predictions. Marginal marriages among young labor market entrants forged due to an initial recession would be predicted to be short-lived for several reasons. Such marriages induced by temporary economic conditions likely have lower match quality on average, putting them at higher risk of dissolution (Stevenson and Wolfers, 2007). Persistent reductions in earnings and short-run increases in poverty are likely to put these marriages under further stress.

In so far as individuals typically marry within cohorts, a further important implication of long-term adverse labor market outcomes from cohort-wide initial labor market shocks is that insurance against economic shocks within the family might be less effective. This reduction in insurance likely further limits the value of staying married. Finally, worsening health in middle age, discussed in the next section, is an additional factor raising the divorce rate and reducing the long-run rate of marriage (Charles and Stephens, 2004a).

Health and mortality. It has been difficult to conceptualize life-cycle decisions with respect to health and mortality jointly. Here, we follow Moreau and Lleras-Muney (2019) and consider the case in which mortality is a deterministic function of health. Health, in contrast, can be improved by monetary investments, is subject to increasing depreciation with age, and is subject to random shocks. If health investments are a normal good, they are predicted to permanently decline in response to persistent income reductions. One central result from this model is that both temporary and permanent reductions in health investments lead to persistent increases in mortality. Importantly, however, the age patterns strongly differ for log mortality (i.e., percentage changes in mortality relative to the baseline). Our analysis allows us to test this implication and use it to make inferences about the persistence of reductions in health investments.

The key mechanism driving the differential mortality responses in levels and logs in Moreau and Lleras-Muney (2019) is the interaction of age-dependent depreciation rates, cumulating health investments, and a fixed health threshold of mortality. When workers are young, the average stock of health is high, and depreciation and mortality rates are low. As a result, disparities in health investments between lucky and unlucky cohorts of labor market entrants push only few individuals over the death threshold. (And if there is a positive counteracting shock – e.g., due to a reduction in accidents because of lower economic activity – mortality might temporarily be lower for unlucky cohorts).

Over time, both transitory and permanent differences in health investments between lucky and unlucky cohorts imply a gap in mortality rates that rises with age. This is because over time, age depreciation increasingly pushes individuals' health toward the mortality threshold, and mortality begins increasing exponentially for both unlucky and lucky cohorts. The fact that unlucky cohorts have a lower health stock leads them, on average, to reach the health cutoff earlier and at an increasing rate, leading to a rising gap in mortality rates.

Transitory and permanent differences in health investments have contrasting implications for the gap in log mortality (i.e., proportional mortality differences) between lucky and unlucky cohorts. A transitory difference in health investments leads to a monotonously declining percent gap in mortality, as the linear effect of health investments is overtaken by the exponential effect of health depreciation, such that the health advantage of the luckier cohorts fades quickly with age. In contrast, a permanent difference in health investments leads to a hump-shaped percent gap in mortality between unlucky and lucky cohorts. This is because initially, when health depreciation is low, the cumulating difference in the health stock will raise the percent gap in mortality; yet, eventually, exponential depreciation again erodes the advantage of the lucky cohorts with age. We will return to these predictions when we discuss our empirical findings.

Of course, mortality and health are likely to also be affected by factors other than monetary investments into health. For example, increased labor supply and work in lower quality occupations in response to lower lifetime wealth may raise stress and lower time spent on health improvement (Fletcher et al., 2011). More generally, a life of economic, marital, and social stress could affect health directly (Shah et al., 2012). In addition, important health behaviors are formed in the transition from youth to adulthood that could act as an additional channel of long-term mortality effects. In our empirical analysis, we will analyze differences in cause-specific mortality that speak to some of these additional channels.

One important empirical finding that we replicate in our analysis is that mortality of young workers at the time of labor market entry tends to *decline* during recessions. A large literature established by Ruhm (2000) has found reductions in fatal accidents and an improvement in healthy life-styles during times of aggregate economic contractions (Ruhm, 2005; Miller et al., 2009; Ruhm, 2015; Stevens et al., 2015). Hence, in the very short run during the height of a recession, health investments and environmental health risks might actually improve temporarily (see also Evans and Moore (2011, 2012)), suggesting that the mortality impacts we measure in midlife are driven by changes in health investments occurring over a longer time period following the initial period.

Phases of predicted life-cycle impacts. The predictions discussed so far imply a particular timing of the effects on career, family, and health outcomes that plays out in four phases: from the contemporaneous effect through short-, mid- and long-term, midlife effects.

The contemporaneous prediction of entering the labor market in a recession is increased unemployment and reduced wages at lower quality employers. These young workers have low baseline risks of marriage, fertility, and death, but the rise in unemployment is likely to delay family formation and could lower mortality temporarily due to external causes (i.e., reductions in accidents).

Shortly after the end of the recession, when the economy and employment have returned to normal for most workers, career models predict persistent but declining earnings reductions. In this second phase, individuals have jobs with lower, but recovering, earnings. In this phase, increased family formation and fertility would occur if substitution effects dominate. Mortality is unlikely to be affected as average health is far from the death threshold.

In a third phase, careers have settled with almost a complete recovery, but a rise in divorces occur due to lower quality initial matches and possible chronic marital stress from lower wages, which can depress fertility. The latent health gap increases due to the effect of lower health investments and other stressors.

When individuals reach midlife, average health has declined enough that the health gap of unlucky graduates triggers increased mortality. At the same time, lower health tends to depress remarriage rates and earnings. Earnings may start declining for healthy individuals as well, possibly depressing marriage rates and affecting health.

The life-cycle models we have used to derive these predictions are very flexible, and one could alter some of the predictions. Yet, an important takeaway of our discussion is that economic models lead to specific plausible predictions for a range of potential short-, medium-, and long-term effects of initial labor market conditions. The appropriate signs of income and substitution effects and the sequence of impacts are thus an empirical question, and we will return to these predictions in the discussion of our findings.

3 Data

Our analysis is based on four data sets: the U.S. Vital Statistics (Vital Stats), which provides information on every death in the United States since 1968; the Decennial Census of Population (Census) in combination with the American Community Survey (ACS), which provide the population denominator for the construction of annual mortality rates as well as socioeconomic characteristics; the Annual Social and Economic Supplement of the March Current Population Survey (CPS), which provides socioeconomic characteristics for repeated cross-sections for large samples of individuals; and annual state-level unemployment rates from the Bureau of Labor Statistics.

To construct annual mortality rates, annual population estimates are required, which wee obtain by state of birth and year of birth from the Census years 1980, 1990, and 2000 and the ACS annual estimates for 2001–2016 (our results are robust to using the 2010 Census instead of the individual ACS years). We apply a linear interpolation for the pre-2000 inter-census years. The death files from the Vital Stats include the cause of death along with core demographic characteristics such as age, sex, race, and state of birth. The same characteristics are reported in the Census/ACS, which allows us to construct death rates for the subgroups defined by these demographics.[14]

[14]Education is not reported on death certificates before 1989 and missing information as well as coding mismatches between the Vital Stats and the Census in later years make it difficult to analyze mortality by education in our context (Currie and Schwandt, 2016).

We analyze labor market and family formation outcomes from pooled data from the CPS (waves 1979–2016), the Census (1980, 1990, 2000), and the ACS (2001–2016). Our baseline specification focuses on U.S.-born individuals and links the unemployment rate at labor market entry via individuals' state and year of birth. The CPS does not contain the state of birth so we use the state of current residence as a proxy (see Schwandt and von Wachter, 2019, and Section 5 for a discussion). We leave the CPS data unrestricted in terms of nativity in years prior to 1994, as the country of birth is only reported afterwards (results are robust to including foreign-born persons in all years). We analyze both mortality and socioeconomic outcomes separately for females and males and for non-Hispanic White individuals (referred to as White individuals) and individuals of all other races and ethnicities (referred to as non-White individuals).

Our main economic outcome is log earnings, which refers to an individual's total pre-tax wage and salary income in a given calendar year. We further calculate the earnings percentile by age and year, including zero earnings. Labor force participation is measured as reporting any positive earnings. The CPS further reports hourly wages, weekly hours worked, and part-time work status. In terms of household finances, we include household income and homeownership.

We observe several measures of welfare and disability transfers. First, we observe family welfare income which includes aid to families with dependent children (AFDC), old age assistance, and aid to the blind or totally disabled. Second, we analyze the receipt of foodstamps. Third, we include information on the receipt of any Social Security income. Fourth, starting in 1980 the CPS reports the receipt of Medicare. Before age 65, only Social Security Disability Insurance (SSDI) recipients have access to Medicare (after a two-year waiting period). We use this information to create an indicator that is one if a respondent reports either (or both) Social Security income or Medicare receipt. Fifth, we analyze self-reported disability ("disability that limits or prevents work") included in the CPS starting in 1988.

Family formation measures include current marital status and the number of own children currently living in the respondent's household (the number of own children ever born is not reported in the CPS or Census/ACS data after 2000). We can also match spouses and analyze the same set of outcomes for spouses as for the focal individual.

4 Empirical approach

To obtain the causal effect of economic conditions at job market entry on mortality and socioeconomic outcomes, we would ideally like to estimate the following regression model:

$$outcome_{i,t} = \alpha + \beta_a ec_{i0} + \gamma_a + \epsilon_{i,t} \quad (1)$$

where $outcome_{i,t}$ are different outcomes of an individual i at different ages a, ec_{i0} are local labor market conditions at labor market entry, and γ_a are age fixed effects. The coefficients β_a represent age-specific deviations from the typical age profile resulting from differences in initial local labor market conditions. To implement the equation, we have to choose a level of aggregation for the appropriate labor market. For our analysis, we follow the majority of the literature and use annual state-level unemployment rates as indicators for the state of the local labor market. For a causal interpretation of β_a we further require that economic conditions at labor market entry be orthogonal to other determinants of the respective outcome that are not captured by the model.

4.1 Identification strategy

There are two main challenges to estimating Eq. (1). The first challenge is a data limitation: the Vital Stats mortality data and other population-wide data sources do not contain the state and year of graduation. The second challenge is an endogeneity issue: people choose when to graduate or where to graduate depending on local labor market conditions, implying that economic conditions at labor market entry could be endogenous to other factors potentially impacting an individual's later outcomes.

To address both challenges, we follow Schwandt and von Wachter (2019) and replace the annual state-level unemployment rate with a "double-weighted" unemployment rate that can be linked to characteristics in the Vital Stats and that is not affected by endogenous sorting. In particular, we use data from the Census and the ACS to construct a proxy for the graduation year unemployment rate that only relies on information on an individual's state of birth and year of birth. Because these characteristics are fixed within a cohort, they cannot be affected by labor market conditions around graduation. A key advantage of this approach is that these characteristics can be linked to the Vital Stats data, which also report the state and year of birth.[15]

To construct this proxy, we first estimate typical migration patterns observed among cohorts born in a given state. Using ACS and Census data, we calculate the migration share $\overline{mig}_{b,s}^{A}$ as the average share of cohorts in our sample born in state b that live in state s at ages $A = 16, 18, 20, 22$. Note that we only use state-specific *average* migration rates (i.e., state fixed-effects in the underlying regression model of individual level migration indicators) rather than migration rates of a specific birth cohort (state-cohort fixed effects), which could be driven by an endogenous response to contemporaneous labor market conditions. These average migration rates vary across states and across ages within a state but not for a given age and state. Next, we estimate the typical educational attainment distribution again using ACS and Census data. Graduation shares $\overline{edu}_{b,c}^{A}$, indicate the share of sample cohorts born in state b in year c who graduate at age $A = 16, 18, 20, 22+$. Note that we predict graduation shares using both state fixed effects and country-wide cohort fixed effects (but

[15] This approach is based on synthetic cohorts (Deaton, 1985) and is further developed in Currie and Schwandt (2014), which link maternal life cycles to unemployment rates using mothers' own state and year of birth.

not their interaction), hence these shares vary across cohorts both within and between states. The "double-weighted" (DW) average graduation year unemployment rate is then given by:

$$u_{b,c}^{DW} = \sum_{A} \overline{edu}_{b,c}^{A} \sum_{s=1}^{51} \overline{mig}_{b,s}^{A} u_{s,c+A} \tag{2}$$

Where $u_{s,c+A}$ is the unemployment rate in state s, A years after the birth of cohort c (hence in year c+A). The two sums then integrate the unemployment rates over all states and different graduation ages, with each cohort's tendency to graduate in a given state at a given age as weights. The resulting double-weighted unemployment rate does not rely on endogenous migration at labor market entry or timing of labor market entry in response to local labor market conditions, as it is constructed using only state averages over time and national averages across periods, but not state-period variation. Moreover, because the cohorts are assigned their graduation state based on their state of birth, which is a fixed characteristic, the double-weighted unemployment rate is also not affected by state-cohort-specific migration after graduation.

4.2 Double-weighted specification (baseline)

We regress mortality and other outcomes on the double-weighted average unemployment rate, using the following specification:

$$outcome_{b,c,a} = \alpha + \beta_a u_{b,c}^{DW} + \gamma_a + \lambda_b + \delta_c + \theta_t + \epsilon_{b,c,a} \tag{3}$$

The indices b, c, a, and t refer to the birth state, birth year (cohort), age, and calendar year; hence γ, λ, δ, and θ are the coefficients on unrestricted age, birth state, birth cohort, and calendar year fixed effects, respectively.[16] The data are collapsed at the state-of-birth by year-of-birth by age level. Observations are weighted by the relevant population in a given cell and standard errors are clustered at the level of treatment (state-of-birth by year-of-birth) to account for serial correlation at the level of treatment.[17]

Given the included fixed effects, the coefficient vector β_a captures deviations from the typical mortality age profiles related to cohort-state-specific variation in the unemployment rate at labor market entry that are uncorrelated with contemporaneous nationwide shocks and independent of responses in graduation timing and migration to state-cohort-specific shocks. Notice that we do not include the current state unemployment rate in our main results; therefore β_a captures the effect of graduating in a recession, given the regular subsequent evolution of local labor market condi-

[16]We drop one dummy for each age, birth state, birth cohort, and calendar year effects. It is well known that cohort, year, and age effects are not separately identified,. Therefore, we drop a second dummy from the birth cohort effects. Choosing alternative restrictions has no bearing on our main results.

[17]Our main results are robust to clustering at the state-of-birth level only.

tions. As such, the potentially effect of ongoing conditions correlated with the initial shock is not a confounding factor but a channel through which initial labor market affects long-term outcomes. However, controlling for the current state unemployment rate does not affect results substantially. In our robustness analysis, we also include proxies for potentially confounding trends in local economic conditions, such as division-cohort-specific trends and controls for local manufacturing declines. We also show that potential endogenous migration or timing choices surrounding the labor market entry do not play a large empirical role. The effect patterns that we estimate remain largely unchanged when we use the simple average unemployment rate between age 18 and 22 instead of the double-weighted unemployment rate.

4.3 Mincerian specification

We compare our baseline estimates to a specification that links individuals to the economic conditions in the state and the year in which they graduated. Such a specification has been used in previous studies that focused on college graduates and typically use longitudinal data containing direct information on the state and the year of labor market entry. In the CPS, we can proxy for this information using individuals' current state of residence and their reported educational attainment. We construct the "Mincerian" year of labor market entry as year of birth, plus six, plus years of education, and use it as the main explanatory variable in the following regression:

$$outcome_{s,g,t} = \alpha + \beta_e u_{s,g} + \gamma_e + \lambda_s + \delta_g + \theta_t + \pi_d + \epsilon_{s,g,t} \tag{4}$$

where $u_{s,g}$ is the unemployment rate in the state of current residence s at the "Mincerian" year of graduation g, e refers to years of potential experience (years since graduation) and t refers to the calendar year. We additionally include education-group fixed effects π_d. The data are collapsed by the state of residence, graduation year, calendar year, and four education groups, and observations are weighted by the population-weighted cell size. Standard errors are clustered at the level of graduation year by state.

Compared to the double-weighted average unemployment rate, the unemployment rate used in the Mincerian specification contains more identifying variation as it is not averaged across multiple years and all states. Moreover, the sample of the Mincerian specification is larger, as the double-weighted specification links each cohort to unemployment rates between ages 16 and 22. Although the contrast with the Mincerian model is useful when we analyze economic outcomes, as discussed above the double-weighted specification is our preferred model for two key reason. It is not prone to bias stemming from endogenous timing or migration before graduation or to migration after graduation. Most importantly, the double-weighted specification can be used in the Vital Statistics mortality data.

Figure A.1 compares residual variation in state-level unemployment rates (Panel A) and the double-weighted unemployment rate (Panel B) with state and year fixed effects partialled out. The residual variation of the double-weighted unemployment rate is smaller in magnitude as it contains averaged unemployment rates, but a lot of variation remains to be exploited across states and cohorts.

4.4 Sample restrictions

State-level unemployment rates are available from the Bureau of Labor Statistics only since 1976. Therefore, we exclude individuals who were born before 1960, that is, who were 16-year-olds before 1976, in the double-weighted specification and individuals who graduated before 1976 when using the Mincerian specification. Our sample period starts in 1979, which is the year in which Vital Statistics death certificates started to report the state of birth. All data sets are further restricted to individuals born in the United States, with the exception of CPS data prior to 1994. Finally, we include only cohorts that are observed across all ages, resulting in different cohort ranges when analyzing wider or narrower age ranges. Our baseline cohorts were born between 1960 and 1967, and are observed from age 19 to 49 in the Vital Statistics data and from age 19 to 52 in the CPS/ACS.

4.5 Summary statistics

Table 1 shows mortality rates across three age groups and mortality causes for the 1960–1967 birth cohorts. As these cohorts age from 19 to 49, their mortality increases about threefold (deaths per 10,000 for ages 19–25 to 31.1 deaths per 10,000 for ages 46–49). Disease-related mortality, which increases from 3.7 deaths to 23.2 deaths per 10,000, drives this increase. Deaths due to external causes fluctuate between 8 and 6.3 per 10,000 over these age ranges (see Appendix Figure A.2 for the typical age profiles of mortality due to diseases and external causes). Table 2 reports summary statistics for socioeconomic outcomes and displays familiar life-cycle gradients.

5 Short- and long-run earnings impacts using the Mincerian and the double-weighted specifications

To benchmark our approach to the prior literature, we start by comparing the short- and medium-run effects for log earnings for individuals entering the labor market in 1976–1987 (the equivalent to our 1960–1967 baseline birth cohorts in the double-weighted specification) with results for individuals entering the labor market 1976–2015 that are studied in Schwandt and von Wachter (2019), using the Mincerian and the double-weighted specifications.

The top panel in Figure 2 shows the impact of the graduation year unemployment rate on log earnings by years of potential labor market experience based on the Mincerian specification in three different samples. The blue line and the green line with dotted markers show effects in CPS and Census/ACS data, respectively, for individuals graduating in 1976–1987 who can be followed up to 30 years past graduation. The dashed lines show 95 % confidence intervals. The red line with hollow squares (labeled SvW) replicates the baseline estimates from Schwandt and von Wachter (2019) using CPS data and including observations from all individuals graduating between 1976 and 2015.[18]

All three sample specifications show a similar short- and medium-term effect. Initially, earnings are decreased by -2.5 to -4 percent for every percentage point increase in the graduation year unemployment rate, and this effect fades out within ten years. But negative effects reappear 15 to 20 years after graduation and they remain at around -1% until the end of our observation period.

We replicate these findings using our double-weighted unemployment rate in the bottom panel of Figure 2, which shows earnings effects by age using the double-weighted specification and the baseline cohorts used in the mortality analysis. Compared to the Mincerian specification, estimates are less precise, both due to the smaller number of included cohorts and the reduction in identifying variation caused by the two-way averaging inherent in the double-weighted average graduation year unemployment rate (as shown in Figure A.1). But the overall pattern is very similar to the Mincerian specification shown in the top panel. The strong initial negative effects of the unemployment rate at labor market entry largely fade out in the late 20s and early 30s but a smaller permanent long-term effect of around 1 % remains through the end of the observed experience and age range. The point estimates, shown by decade of age in Table 8, column (1), imply about a 1.3 % loss in middle-age income for every percentage point increase in the double-weighted graduation year unemployment rate.

In sum, this comparison shows that the double-weighted approach successfully replicates the short- and medium-term effects described by the prior literature suggesting that this approach works and that it can be used to measure long-term effects in the mortality data.

6 Impacts on mortality

As a backdrop to our mortality analysis, we assessed nationwide cohort-level trends of overall mortality and mortality due to deaths of despair. Figure 3 shows age profiles for different cohorts that are divided into boom, bust, and regular cohorts depending on the unemployment rate around their graduation age (proxied by age 18 in this figure). As a benchmark, we include the mortality trend at age 40 across cohorts as black straight lines. For overall mortality, this line has a negative slope, indicating that all-cause mortality at age 40 fell over time. For drug overdose deaths, however, the trend line has a positive slope, indicating that mortality for this cause increased across cohorts. Notably, the mortality rate at age 40 for bust cohorts lies above the dashed line in both figures, suggesting that cohorts facing higher unemployment rates at age 18 experienced higher mortality rates

[18] As described in the data section, we use state of current residence in the CPS data as a proxy for state of birth. The similarity between the CPS and the Census results suggests that this proxy is reasonable.

at age 40 than those with more favorable economic conditions. At the same time, these figures also show the presence of cohort and time effects unrelated to labor market entry conditions, such as the HIV/AIDS epidemic in the mid-1990s. This highlights the need to control for time and cohort effects in a regression framework if one seeks to estimate the causal effect of economic conditions at labor market entry on subsequent mortality.

6.1 Overall mortality

Figure 4(A) plots the coefficients (with 95 % confidence intervals) from regressions of overall deaths per 10,000 on the double-weighted average graduation year unemployment rate, interacted with two-year age groups (β_a in Eq. (3)). The effects at age 19 and 20, i.e. the contemporaneous effects of higher unemployment on mortality, are negative. For every additional percentage point in unemployment at graduation, mortality at age 19 and 20 is reduced by about 0.2 deaths per 10,000. This finding is in line with Ruhm (2000) and related studies, who have shown that mortality tends to decrease during times of high unemployment. The figure shows that this negative effect vanishes at subsequent ages, and fluctuates around zero between the mid-20s and the mid-30s. In the late 30s, however, a positive effect on mortality appears that further increases up to the late 40s. Mortality at age 49 increases by about 1 death per 10,000 for every percentage point increase in the graduation year unemployment rate. Overall, these results suggest that entering the labor market during bad economic times has a positive long-term effect on mortality. Furthermore, this effect is not visible or even reversed in the short run. Figure 4(B) shows that the age profile is also increasing for log-mortality with a flattening out of the effect profile at around 2 % after age 45.

Table 4, column (5), shows the point estimates corresponding to Figure 4. To obtain a balanced sample across all ages, our main results focus on individuals born between 1960 and 1967 that entered the labor market approximately between 1978 and 1989. However, this cohort restriction does not drive our main finding. The first four columns of Table 4 show estimates are similar when expanding the sample to an increasingly larger number of cohorts (including only the age interaction effects that can be identified with all cohorts present).

6.2 Effects on cause-specific mortality

Figure 5 shows separate regression results for deaths due to diseases and external causes. It is apparent that the negative effect on mortality at young ages is driven by external causes, while the positive and increasing effects at middle ages are driven by disease-related deaths.

To further explore the drivers of the positive long-term effects at middle ages, Table 5 shows regression results for individual mortality causes. These regressions use mortality in logs (as rates differ up to a factor 100 across age groups). For deaths due to liver disease, heart disease, and lung cancer, we find an effect pattern that resembles the positive effects for overall disease-related mortality in Figure 5. We do not find effects of early labor market conditions on deaths due to other cancers, even though cancers other than lung cancer are jointly a leading cause of death in the late 40s. For external causes, we do not find long-term impacts on suicides or accidents, however, relatively large impacts on drug overdose deaths appear in mid-life.

Figure 6 shows detailed age patterns for individual causes. For comparability with Figure 5, effects are shown for mortality rates in levels, but the age patterns are qualitatively similar to the regression results using log rates in Table 5. The figures for heart disease, liver disease, lung cancer, and drug overdose show a similar pattern as the overall disease-related graph in Figure 5. The pattern for suicide is remarkably flat. However, deaths of despair, which include drug overdose, liver disease, and suicide, are positively impacted after age 40. Finally, we see a pronounced negative impact on fatal accidents at age 19 and 20.

Overall, we find that the positive effects on mortality in middle age from adverse initial labor market conditions are to a large extent driven by disease-related causes that can be linked to detrimental health behaviors, such as smoking, drinking, poor diet, and lack of exercise.

Mortality effects by gender and race are shown in Table 6 and discussed in Section 8.

6.3 Magnitude of mortality effects

How large are the estimated mortality effects? The answer to this question crucially depends on whether and how we assume the mortality impact sustains after age 49, which is the end of our age window. If mortality impacts only occurred between ages 19 and 49, the impact on life expectancy would be moderate: entering the labor market during the 1982 recession (i.e., facing a 3.9 percentage point increase in the entry unemployment rate) would reduce life expectancy by 0.6 months. However, given our estimates of increasing mortality impacts over age, it seems more likely that effects sustain past age 49. We calculate life expectancy losses based on a linear and a percent extrapolation, in line with a permanent 1% reduction in health investments (see Figure 7 and Section 8.2 for more details). The linear extrapolation assumes that impacts increase linearly with age, following the trend estimated for age 40 to 49. For the percent extrapolation, we use a constant 2 % effect for the rest of life.

Adding the impact of a 3.9 percentage point increase in the entry unemployment rate to the mortality age profile (using the percent extrapolation) makes only a minor difference at any given age (see Figure A.3). But these impacts accumulate over the life cycle. As reported in Table 7, the linear and percent extrapolations imply a loss in life expectancy of 5.9 and 8.9 months, respectively. For a hypothetical cohort of 4 million (approximately the size of the 1964 birth cohort), this is equivalent to a total of 2 million and 3 million life years lost, respectively.

A life expectancy loss of six to nine months is reasonable compared to mortality impacts of labor market and business cycle shocks estimated in previous literature. Sullivan and von Wachter (2009) find that job loss as part of a mass layoff reduces life expectancy by 1 to 1.5 years. Our mortality effect is about half the size, but our estimated impacts on income are smaller, too. Sullivan and von Wachter (2009) estimate a 10–20 % reduction in lifetime earnings, whereas our findings discussed in Section 5 imply a loss of about 5% of the present discounted value of earnings by age 50 from entering the labor market in a recession.[19]

6.4 Robustness analysis

To ascertain that our results are driven chiefly by initial labor market conditions and not by the ongoing evolution of economic conditions influencing cohorts over their life cycle we have engaged in an extensive robustness analysis. Among others, we have explored the robustness of our findings to including regional trends in cohort-specific age gradients, controls for the contemporaneous unemployment rate, and controls for cohort-specific shocks. Table 12 shows that neither the inclusion of age-specific linear cohort trends interacted with dummies for 15 U.S. divisions nor the inclusion of age-specific cohort fixed effects interacted with division dummies substantively alters our main results.[20] This result emphasizes that our estimates are not driven by any regional trends, e.g., regional convergence, that could be correlated with local economic conditions. To assess whether the effect of the initial unemployment rate is partly driven by its correlation with adverse contemporaneous economic conditions, columns (4) and (5) of Table 12 control for the current state unemployment and the current within-state share in manufacturing employment, interacted with age fixed effects. Although point estimates vary somewhat, neither specification alters our main conclusions. This confirms that it is chiefly the initial exposure to adverse labor market conditions that matters, not exposure to persistently depressed labor markets that unlucky workers may face after entry. Column (6) shows results when clustering at the state-level instead of the level of treatment (state x cohort). Standard errors increase somewhat but all of the relevant effects remain significant. The final column of the table shows that using the average unemployment rate our cohorts faced when young (rather than the double-weighted unemployment rate) yields similar results, albeit measurement error leads to somewhat smaller estimates. Finally, we show the same robustness analyses focusing on a subset of mortality causes (heart, liver disease, and lung cancer mortality). In sum, Table 12 shows that our results are not impacted by regional trends or by major social and economic shocks that profoundly impacted the health and economic wellbeing of the U.S. society over the past decades, such as manufacturing decline (Pierce and Schott, 2020), the HIV/AIDS epidemic, and the opioids epidemic (Currie and Schwandt, 2021).

[19]This is based on an increase in the unemployment rate of 3.9 percentage points and a 5% discount rate. For the average worker, the loss corresponds to about 75-80% of mean annual earnings, or about $35,000-$40,000 in 2019 prices.

[20]We also re-estimated these models using five-year age groups, and our results are robust to this higher-level specification as well.

In the Appendix, we further explore the impact of dropping annual ACS population estimates (Figure A.4) and of alternatives choices of cohort, age, and year fixed effects. Appendix Figure A.6 shows that specifications with alternative cohort effects result in virtually the same effect pattern. In the Appendix, we further explore the impact of dropping annual ACS population estimates (Figure A.4) and using alternative choices of cohort, age, and year fixed effects. Our results are robust in both cases.

7 Impacts on labor market and family formation outcomes

In this section, we expand our analysis and estimate the longer-term effects in middle age of entering the labor market in a recession on a broad set of labor market and family formation outcomes. This is of interest in its own right since most prior studies have focused on effects in the first ten to fifteen years, partly motivated by the desire to combine a larger number of entry cohorts in their estimates. Here we focus on cohorts coming of age before, during, and after the early 1980s recession, and consequently, we can follow these cohorts into middle age. In addition, these findings are relevant since they give further context for the increases in mortality in middle age we find. In interpreting these findings, it is important to bear in mind that our research design allows us to estimate the causal effect of adverse initial entry on a range of outcomes, but does not allow us to disentangle likely complex interdependencies.

7.1 Effects on economic outcomes

Table 8 shows the impact on log earnings in the pooled sample along with further labor market outcomes. Figure 8 plots the detailed age patterns for the key outcomes. The decreases in log earnings observed in midlife are driven both by lower hourly wages and fewer usual hours worked per week. Earnings percentile rankings which include zero earnings show a very similar effect profile as log earnings. And despite having lower annual earnings, recession graduates have higher rates of labor force participation. Column (5) of Table 8 further shows positive effects on the share of unlucky cohorts working in part-time jobs across all age groups.

Columns (6) and (7) of Table 8 show that unlucky cohorts report higher rates of Social Security income, Medicare receipt, and work disability in midlife. These are strong indicators of worsening morbidity in midlife, in accordance with the increasing mortality impacts that we find in that age range.

As shown in column (8), the earnings losses in midlife are accompanied by losses in household income of a similar magnitude. For each percentage point increase in the unemployment rate at labor market entry, household income decreases by almost 2 % in midlife. The effect on poverty (column 9) follows the opposite pattern, with large increases at entry, and more moderate effects afterwards that increase gradually as workers age. Home ownership (column 10), an indicator of wealth accumulation reported in all three included data sets, is positive initially among unlucky recession cohorts – consistent with increased family formation – but has an increasingly negative, albeit small, effect past their mid-30s.

7.2 Effects on family outcomes

Table 9 and Figure 9 expand the analysis to family formation, household transfers, and spousal outcomes.

Marriage and divorce. In the short-term, recession graduates experience slightly elevated marriage rates. However, with increasing age this marriage bonus decreases and turns negative in the late 30s when recession graduates are less likely to be married than their more lucky counterparts. This effect on marriage rates is partially driven by divorces, which spike in the late 20s and follow the peak of the marriage rate effect by about five years (Table 9). For unlucky labor market entrants, divorce rates remain elevated until age 50. Compared to their sample means, the magnitude of these effects is small to moderate. A three-point rise in the unemployment rate — roughly the typical increase in a recession — would imply a reduction of somewhat more than 2.3 % in middle age marriage rates relative to the mean, and a rise of about 5 % in middle-age divorce rates relative to the mean.

Children. Columns (3) and (4) of Table 9 and the second row of Figure 9 show corresponding effects of entering the labor market in a recession on cohabitation with own children. Recession graduates are more likely to have own children living in their household in their mid-20s, in line with higher marriage rates at that age.[21] However, in midlife they are less likely to have any own children in their household. The effects are again of moderate size, with a three-point rise in unemployment rates implying effects of 3-4 % relative to the mean. We cannot distinguish whether this effect is driven by adolescent children moving out, younger children living with a divorced parent, or lower overall fertility rates. Given that Currie and Schwandt (2014) show that increased unemployment rates during women's early 20s lower their completed fertility, it is likely that at least part of our findings are due to reduced overall fertility rather than being only a reflection of differences in birth spacing or cohabitation patterns. Our effects sizes are similar to those of Currie and Schwandt (2014) who find that each percentage points increase in the initial unemployment rate is associated with a reduction in marriage rates at age 40 by 0.65 (our estimate is 0.44 at age 41-52) and a reduction in the number of children by 0.014 (compared to our estimate of 0.011). In a recent paper, Anstreicher et al. (2020) finds similar long-term impacts on marriage and fertility rates for cohorts exposed to

[21] Note that the zero effect at age 19, one year after the modal labor market entry, is not in line with procyclical fertility (Currie and Schwandt, 2014). One potential explanation is that fertility tends to lead rather than lag fluctuations in the unemployment rate (Buckles et al., 2018). Moreover, the sample also includes college graduates who will not yet have entered the labor market at age 19, driving the contemporaneous effect towards zero.

the Great Recession.

Transfers. Turning to household transfers in columns (5) and (6) of Table 9 and the third row of Figure 9, we find that unlucky cohorts report substantially higher rates of welfare income receipt in the first decade after labor market entry. However, in their mid-30s the positive impact turns negative and remains at around -0.13 % through age 50. We see a similar pattern for the receipt of foodstamps, with a strongly positive effect initially, which fades after about a decade (though a smaller positive impact re-emerges in the late 40s). In other words, while welfare income and foodstamps are buffering some the negative impacts among unlucky cohorts in their 20s and early 30s, they fall through the cracks of the social safety net in midlife.

Spousal outcomes. The last three columns of Table 9 and the fourth row of Figure 9 show strong evidence of assortative mating: unlucky recession graduates marry partners with slightly less education who graduates from more lucky cohorts. These partners experience very similar adverse impacts on log earnings and the likelihood of Social Security/Medicare receipt as the focal spouse him or herself.

7.3 Robustness analysis

In Table 13 we provide the same set of extensive robustness analyses as shown for mortality in Table 12 and discussed in Section 6.4. Overall, our main findings are confirmed, consistent with the view that our approach isolated temporary economic conditions that are not correlated with either pre-existing economic trends or contemporary economic conditions.

8 Discussion: Phases of estimated life-cycle impacts and heterogeneity

We find broad long-term effects of entering the labor market in a recession on a range of measures of socioeconomic status and specific causes of death. In this section we discuss how our results are consistent with key predictions from economic life-cycle models summarized in the conceptual Section 2. The predictions discussed in Section 2 imply a particular timing of the effects in four phases: from the contemporaneous effect through short-, mid- and long-term, midlife effects. Our findings reflect this sequential life-cycle pattern in the main outcomes we study. We also review findings from an extensive analysis of heterogeneity in the impacts of adverse initial labor market conditions. While the main findings of long-term adverse consequences hold broadly across demographic groups, we find some salient differences by race and gender that provide further insights into underlying economic mechanisms.

8.1 Contemporaneous to medium-term effects

Contemporaneous effects. While our main estimates group estimates into age decades, the graphical analysis by single age reveals patterns consistent with the models' predictions on immediate impacts in Figures 4, 6, 8, and 9. In line with previous research (e.g., Kahn, 2010; Oreopoulos et al., 2012), entering the labor market in a recession leads to sharp reduction in intensive and extensive labor supply and earnings and a sharp increase in the receipt of foodstamps and poverty (Schwandt and von Wachter, 2019). However, as expected given the time it takes recent graduates to start a family there are no immediate effects on our measures of family outcomes.[22] Consistent with sharp temporary reductions in economic activity and following related results in the literature, we find a contemporaneous reduction in mortality due to external causes (i.e., reductions in accidents).

Short-term effects (age 19-29). After the recession ends, we find that employment losses disappear and earnings partially recover (Table 8 and Figure 8) which is in line with the existing literature. Poverty rates recede but remain significantly elevated. At the same time, we document a temporary rise in family formation (Kondo, 2011) and fertility, as well as homeownership, indicating that substitution effects dominate income effects in the short run (Table 9).[23] Consistent with a sustained elevation in poverty, we see increasing receipt in family welfare income. As expected, we do not find an effect on mortality in this age range when baseline mortality is very low (Table 6).

Medium-term effects (age 30-39). In their thirties, we find that unlucky workers' earnings and wage losses recede further without fully fading, and labor supply now exhibits a positive effect. We return to this interesting result in the discussion of heterogeneity below. At the same time, we see a decline in marriages, a rise in divorce rates, and a small reduction in the rate of home ownership, consistent with lower quality matches and chronic economic stress dissolving some of the families formed in the aftermath of unlucky entry. We do not yet see reductions in fertility (Table 9). As unlucky workers have spent 10 to 20 years with lower earnings and increasingly complex family lives, their mortality begins to rise in their 30s, consistent with a steadily widening gap in underlying health compared to more lucky individuals.

8.2 Long-term effects

Career outcomes. Consistent with predictions of career models that situate unlucky entrants at lower paying firms, occupations, or jobs, the adverse impacts of initial conditions on all economic indicators strengthen again during middle age (age 40-50), including the effects on household in-

[22] In our sample, 96.8% of people aged 18-22 who are currently in school are singles, which implies there are few marginal births among that group. Among those who are no longer in school at that age, 71.3% remain single. Hence, the vast majority of graduates are not married at labor market entry, which suggests few of them might be at the margin of having a child.

[23] Kondo (2011) finds short-run increases in marriage rates if female labor market conditions are worse than for men, but no effect by age 30.

come, earnings, intensive labor supply, poverty, and house ownership. While our data do not allow us to distinguish between different models, our findings point to at least three additional channels depressing economic outcomes in middle age.[24] Reductions in health associated with the mortality increases we document are likely to reduce earnings capacity as workers age. This is underscored by the rise in work-related disability and receipt of SSDI benefits we find. The persistent rise in family instability we document may further lower productivity and workers' ability to pursue a steady career. It may not be a coincidence that the timing of a renewed widening of wage and earnings losses around age 40 coincides with the timing of the onset of our mortality effects and the timing of the persistent negative effects on marriage and family size. Finally, the fact that spouses of unlucky entrants have lower long-term earnings and a higher incidence of work-relate disability further lowers household income, drains economic resources and raises the need for caregiving, and reduces the scope of insurance against economic and health shocks within the family.

Family outcomes. The reduction in lifetime resources we find likely reduces remarriage rates and induces some women to have fewer children. Given that age limits women's fertility, the rise in divorces we document and the ensuing search for a partner likely further reduce childbearing and life-time fertility. Our findings on long-term mortality and disability and their likely associated health behaviors and outcomes point to additional channels of marital instability and reductions in family size. Worse health and economic outcomes may further destabilize marriages, lower success in the marriage market, and reduce fertility (e.g., Charles and Stephens, 2004a).

Health outcomes. As individuals age, the impact on mortality rates increase steadily, consistent with a persistent decline in health investments (i.e., costly actions targeted at improving health) induced by lower life-time earnings.[25] The magnitude and dynamic patterns of the mortality effects we find are closely aligned with the predictions of the Moreau and Lleras-Muney (2019) model. Figure 7 shows simulations of both temporary and permanent shocks to health investments of 1% and 10% magnitude. The comparison to the estimated mortality effects (in response to a 1 percentage point increase in the graduation unemployment rate), both in levels and logs, indicates that our results are most closely aligned with a permanent 1% reduction in health investments. The lasting increase in log mortality would be difficult to explain with a temporary reduction in health investments, because rapidly rising mortality with age would likely erase the impact of transitory differences in invest-

[24] We did not find a systematic effect on the number of employers last year available in the ASEC Supplement of the Current Population Survey. However, given the large volume of beneficial job changes in the U.S. economy, it is not clear whether one should expect a lower number, or a higher number due to repeated job loss. Similarly, we did not find an effect on obtaining a higher paying occupation, were we ranked occupations by their mean wage holding age and education constant. Given these proxies for skills are typically found to explain a low fraction of wages, our rankings likely reflect worker sorting based on skill as much as they reflect average job quality.

[25] The central mechanism derived from the Moreau and Lleras-Muney (2019) mortality model in Section 2 is a reduction in health investments in response to income reductions. In particular, if health is a normal good, a permanent reduction in income should lead to a permanent reduction in health investments.

ments between lucky and unlucky cohorts.[26] Given the 1.3% long-term earnings losses that we find for each percentage point increase in the graduation unemployment rate, a permanent 1% reduction in health investments seems reasonable.

Although health investments are a plausible first-order mechanism based on economic theory, the health of recession graduates may also deteriorate due to other economic, social, or psychological factors. Lower permanent income and socioeconomic status can result in a worse social environment and living conditions, which may directly affect health, e.g., via stressful exposure to violence or increased pollution (e.g., Maestas et al. 2017). Maclean (2013) shows that unlucky male labor market entrants during the early 1980s recession experience worse health by age 40, suggesting that these workers enter middle age already vulnerable to further adverse health outcomes.

Health may further decline due to employment in lower-ranked occupations and lower-quality jobs (e.g., Altonji et al., 2016). Such employment effects would help explain the rise in the incidence of self-reported work-related disability and in the receipt of SSDI that we find. Work-related stressors may play a particular role for those recession graduates who increase their labor supply to buffer income reductions (Fletcher et al., 2011; Ravesteijn et al., 2018).

The worse family outcomes we document in midlife may further contribute to poor health behaviors and unhealthy living circumstances, e.g., via social isolation (Cornwell and Waite, 2009) and might deteriorate health sufficiently to raise mortality in midlife (Steptoe et al., 2013). Finally, the labor market entry shocks occurring during a vulnerable transition period and at an impressionable age could also persistently alter behavioral and psychological traits. Adverse initial conditions may lead young workers to adopt unhealthy behaviors or fail to eliminate those acquired in high school or college (Kessler et al., 2005) and they may trigger persistent behavioral or psychological responses, such as lower self-esteem (Maclean and Hill, 2015) or depression. Such conditions could worsen health and health behaviors, consistent with the rise in drug deaths we find.

8.3 Heterogeneity of estimated life-cycle impacts

Our conceptual framework is also useful for understanding heterogeneity in the life-cycle impacts of initial labor market conditions by gender, race, and education shown in Table 10 and Appendix Table A.2.

Gender. The effects of adverse labor market entry for unlucky women differ in two important respects from those of unlucky men. First, the long-run increase in extensive labor supply we find is concentrated among women, whereas no such effects in middle age are present for men. As a result, women experience smaller earnings and wage losses than men in middle age but have similar reductions in household income.[27] The stronger labor supply response may arise partly because in

[26] We are thankful to Adriana Lleras-Muney for providing us with these simulation results.

[27] We also find increases in the incidence of poverty and the receipt of SNAP benefits in middle age that are pronounced

the cohorts we study, women had lower average employment rates and hence more room to adjust by working more. Labor supply among unlucky women may respond both due to lower family incomes (if married) or rising divorce rates. The fact that unlucky individuals are more likely to be married to other unlucky, lower-earning workers at higher risk of disability raises the negative impact on household income and strengthens the income effect on labor supply. Furthermore, it implies that there is less scope for economic insurance within the family, such that labor supply may rise for a precautionary motive as well.

Second, we find that women experience larger long-term increases in mortality from adverse initial conditions than men, driven largely by causes of death relating to liver, lung, and heart disease. This could partly arise because men have larger baseline mortality rates for these causes of death than women, but possibly also due to stress related to higher lifetime labor supply.

Race. Consistent with findings in Schwandt and von Wachter (2019), non-White workers experience the largest short-term effects on economic outcomes, with large losses in employment, earnings and wages and increases in poverty, despite a rise in receipt of SNAP and family welfare income (see column 1 of Table A.2). In the medium and long run, non-White workers experience a larger increase in labor supply than White workers. With lower average employment rates, non-White people may be more able to increase employment to offset strong initial earnings losses and lower insurance within the family. As a result, non-White workers experience smaller long-term earnings losses than White individuals, despite similar sized long-term losses and household income.

Non-White individuals also experience different short-term family responses to adverse labor market entry. The short-term rise in marriage rates and fertility is clearly apparent for White individuals, but not for non-White individuals who experience stronger earnings losses. Here, the positive substitution effects appear to balance out with negative income effects, likely because of larger earnings losses and lower baseline earnings. In the long run, our findings show that both non-White and White labor market entrants have fewer children in the household and experience a rise in divorce and reduction in marriage rates in middle age.

We also find different short- and long-term effects of initial labor market conditions on mortality by broad race categories, shown in Table 6. Non-White individuals already experience a rise in disease-related and overall mortality during the first 10 years after labor market entry, perhaps related to the larger economic shock that an initial recession entails, while there are no such short-term increases for White individuals. In the long term, both race groups experience increases in

among Men and White individuals. This may partly reflect differences in labor supply, and partly reflect already higher baseline rates among women and non-White individuals. Note that we find in Table A.2 that unlucky individuals experience an increase in the receipt of income from family welfare in their 20s. This occurs among all groups, but is particularly large among women, Non-White individuals, and less educated individuals. In middle age, these patterns are reversed, with all groups of unlucky individuals experiencing a reduction in the receipt of family welfare that is stronger among women and non-White individuals. This may partly reflect the increasing prevalence of family welfare programs' term limits during this period.

disease-related mortality, especially due to heart, liver, and lung disease. However, the long-term rise in disease-related mortality is stronger for the non-White population, which also has higher labor force participation in the long run. At the same time, drug overdose mortality is more strongly affected among White individuals (with a p-value for the difference across racial groups of 0.11), not surprisingly given that the opioid epidemic hit the White population particularly strongly (Case and Deaton, 2015). These differential cause-specific effects balance out with a similar impact on overall mortality across race groups.

Education. We can also analyze differences in impacts by education. Although we do not have sufficient coverage of education in the data to extend this analysis to mortality, we briefly discuss the results for economic and family outcomes by broad education group since they extend the prior literature on initial conditions into middle age. Given the importance of education in policies that aim to improve economic mobility, the results are also interesting in their own right and require additional steps in the empirical analysis.[28] The findings are shown in columns (6) and (7) in Tables 10and 11.

Lower-educated workers have larger short-, medium-, and long-term effects in economic outcomes than higher-educated workers. Yet, we show that the medium-term reductions in wages and earnings found for higher-educated entrants in the prior literature (Kahn, 2010; Oyer, 2006, 2008; Oreopoulos et al., 2012; Altonji et al., 2016) extend until age 50 as well. Turning to family outcomes, the short-term rise in marriage rates and fertility is only present for higher-educated individuals, consistent with findings in Dehejia and Lleras-Muney (2004). This suggest that for higher educated workers substitution effects prevail, whereas for less educated workers these substitution effects are offset by negative income effects. In the long-run, higher-educated labor market entrants have fewer children, consistent with a reduction in life-time earnings, but do not experience a long-term rise in divorces and reduction in marriage rates.[29] Education is protective against some, but not all, life-cycle consequences of adverse initial economic conditions.

[28]Because the double-weighted unemployment rate is averaged across both migration destinations and the education distribution, we regenerated a single-weighted unemployment rate separately for two broad education groups which only averages across migration destinations. We use this single-weighted unemployment rate to compare the effects by age versus potential labor market experience (to assess whether it is the end of schooling rather than age that matters for the onset of the adverse effect of initial conditions). While career effects appear to be more closely linked to potential experience, we find the effect on family outcomes are more closely related to biological age than time in the labor market. The results in Tables 10 and 11 by education groups are based on the education-group specific single-weighted unemployment rate. The literature has addressed the common concern that education may be affected by initial labor market conditions and hence may be endogenous, and has found no evidence this introduces a bias (e.g., Kahn 2010; Oreopoulos et al. 2012). The similarity of the Mincerian specification and the double-weighted specification results shown in Figure 2 further suggests that endogenous education choices do not play a large role.

[29]Perhaps surprisingly less-educated workers do not experience a long-run effect on the number of children in the household. This may be because they have a lower mean number of children or it may be a statistical artifact due to underlying sampling error.

9 Conclusion

In this paper we have used several large cross-sectional data sources and a new approach to estimate life-cycle effects of entering the labor market in a recession on mortality by cause and various measures of socioeconomic status. We find that cohorts coming of age during the deep recession of the early 1980s experience dynamic effects on mortality by cause, family outcomes, morbidity, and various measures of economic success throughout the lifecycle until middle age consistent with the predictions of economic life-cycle models. Unlucky cohorts suffer increases in mortality that appear in their late 30s and further strengthen through age 50, driven by behavior-related causes such as heart disease, lung cancer, and liver disease, as well as drug overdoses. At the same time, unlucky middle-aged labor market entrants earn less and work more while receiving less welfare support and experiencing higher rates of work-related disability. They are also less likely to be married, more likely to be divorced, experience higher rates of childlessness, and have lower-income spouses.

These findings imply that economic shocks during young adulthood can have broad and dynamic adverse effects with long-term repercussions, with important implications for the costs of recessions. As recessions are a recurring phenomenon, we show the stock of individuals potentially affected by the broad and long-lasting repercussions we find is substantially higher than previously assumed. The results also reaffirm that young adulthood is a critical period during which individuals are particularly vulnerable to economic shocks. Entering the labor market during a recession is a particularly salient shock, because it is large, recurring, and affects a substantial number of individuals.

Our findings also cast a new light on the ability of unlucky individuals to self-insure against a temporary initial shock. While those not already working full time can partly self-insure through increased earnings, we find that gaps in lifetime earnings remain, and that this increased labor supply may come at a cost in terms of health. Moreover, the comprehensive effect on economic, family, and health outcomes we document may make it hard to successfully avoid the impacts of the shock. Given unlucky individuals marry unlucky spouses within their cohort, further implies that insurance within the family is not as effective.

These findings spotlight public social insurance mechanisms and the role of government interventions during recessions. We find government programs targeted at the poor play some role to buffer these losses, mostly initially, but appear to be unable to prevent long-lasting losses. Currently only the progressive nature of income taxation and Social Security benefits are likely to help buffer some of the cross-cohort earnings variation due to recessions. Similarly, workers are only indirectly and imperfectly insured against adverse life-cycle effects on health by general health and disability insurance such as Medicaid, disability insurance, or public funding of unpaid emergency room care.

Employment or education programs assisting unlucky graduates to avoid entering the labor market in a recession may be the most promising for avoiding the destabilizing effects of unlucky early labor market entry. Absent such new interventions, our findings imply that monetary and fiscal policies aimed at avoiding or dampening downturns play an important role in avoiding the long-term effects of adverse labor market entry.

Additional research is needed to fully quantify the costs and to understand the mechanisms behind the dynamic, long-lasting effects we find, and how this differs across workers. Since mortality is an extreme health outcome, our estimates may provide a lower bound for the full long-term health effects of initial conditions in the cohorts we study, and an analysis of other health outcomes would be valuable. Future research could also study the intergenerational effects of adverse labor market entry. A deeper understanding of how careers are affected, ideally using information on employers such as Oreopoulos et al. (2012), may point to potential policy interventions. Studying further health and career outcomes would also contribute to a better understanding of differences in the life-cycle impacts among demographic groups we have documented, including for example, the potential impact of increased labor supply among women and Non-White individuals on mortality. Finally, analyses of the life-cycle effects of other economic shocks and interventions during young adulthood would complement our work based on recession entrants and deepen our understanding of this critical period.

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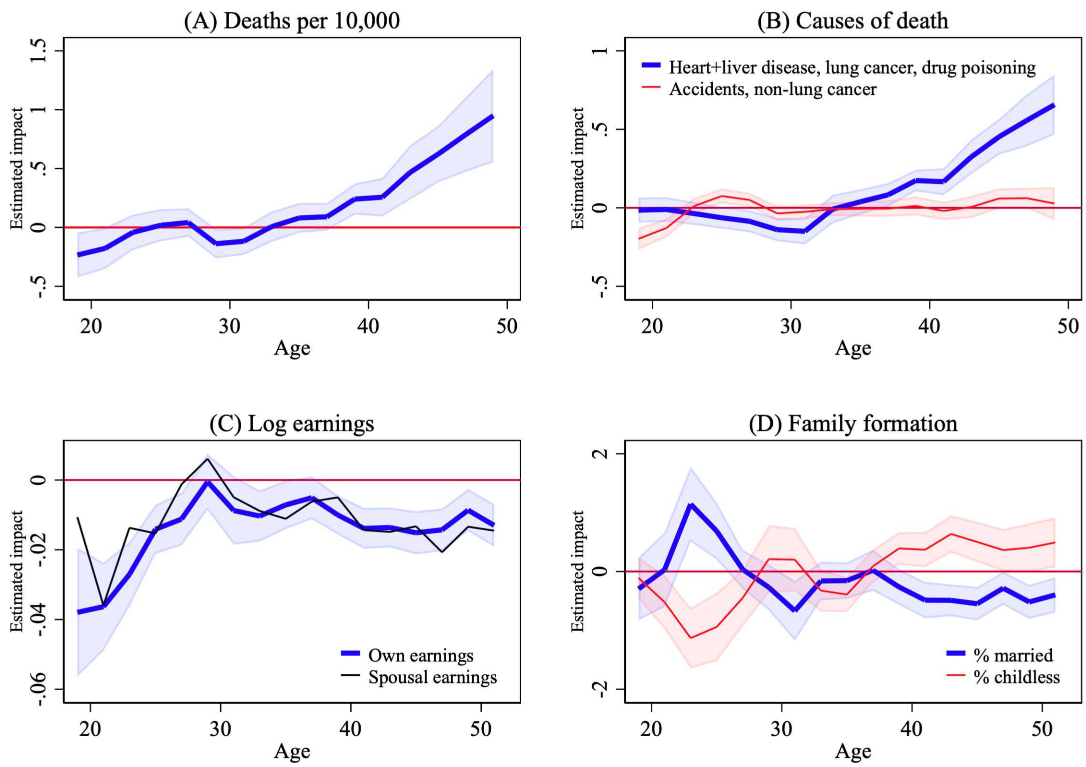
10 Figures and Tables

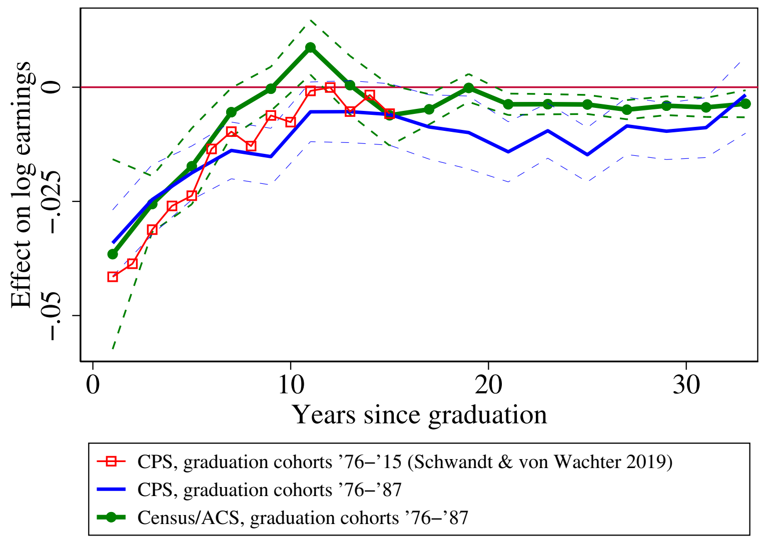
Figure 1: Effect of State Unemployment Rate at Labor Market Entry on Mortality and SES Outcomes by Age



Note: This figure shows coefficients and 95 % confidence intervals from regressions of death rates in levels (left) and in logs (right) on the double-weighted labor market entry unemployment rate interacted with 2-year age group dummies (Eq. 3), including fixed effects for age groups, cohort, year, and state of birth. Data from Vital Stats, Census, and ACS, years 1979–2016. Further regression and sample details as in Table 4. Coefficients for 5-year age groups are reported in Table 4, column (5). Log deaths refer to the logarithm of deaths per 10,000.

Figure 2: Impact of Labor Market Entry Conditions on Log Earnings, Across Specifications and Data Sets

(A) Mincerian specification — effects by potential labor market experience

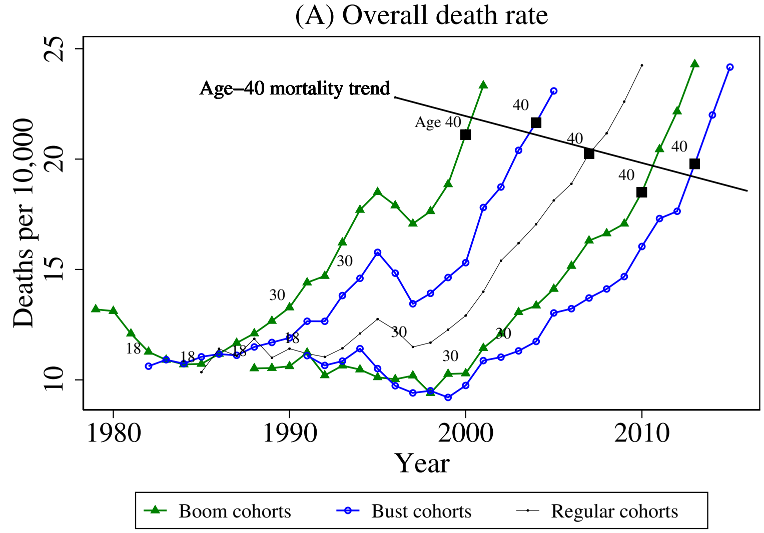


(B) Double-weighted specification — effects by age

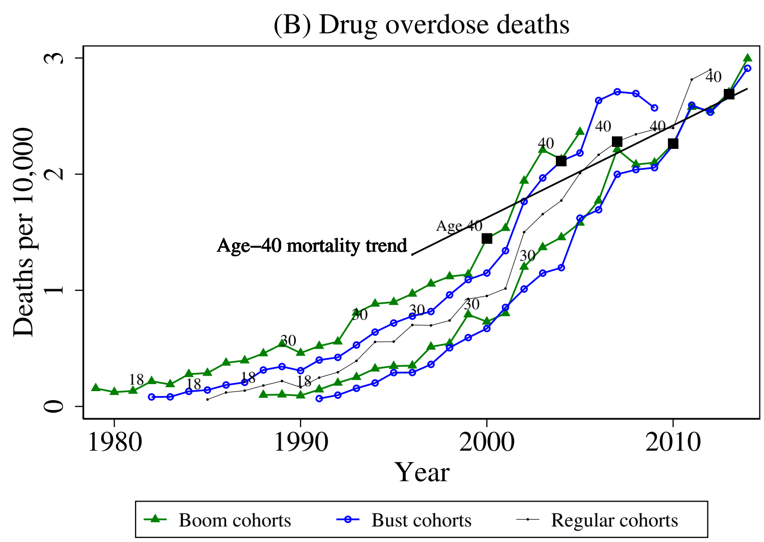
Notes: Coefficients and 95% confidence intervals are plotted from regressions of log earnings on labor market entry unemployment rates interacted with 2-year experience / age group dummies. Results in Panel (A) and Panel (B) are based on the Mincerian specification (Eq. 2) and double-weighted specification (Eq. 3), using data from the ASEC Supplement to CPS from 1976 to 2018, the Censuses from 1980, 1990, 2000, and the ACS from 2001–2018, respectively.

Figure 3: Mortality Profiles Across Cohorts Experiencing Booms and Busts at Age 18

(A) Overall death rate

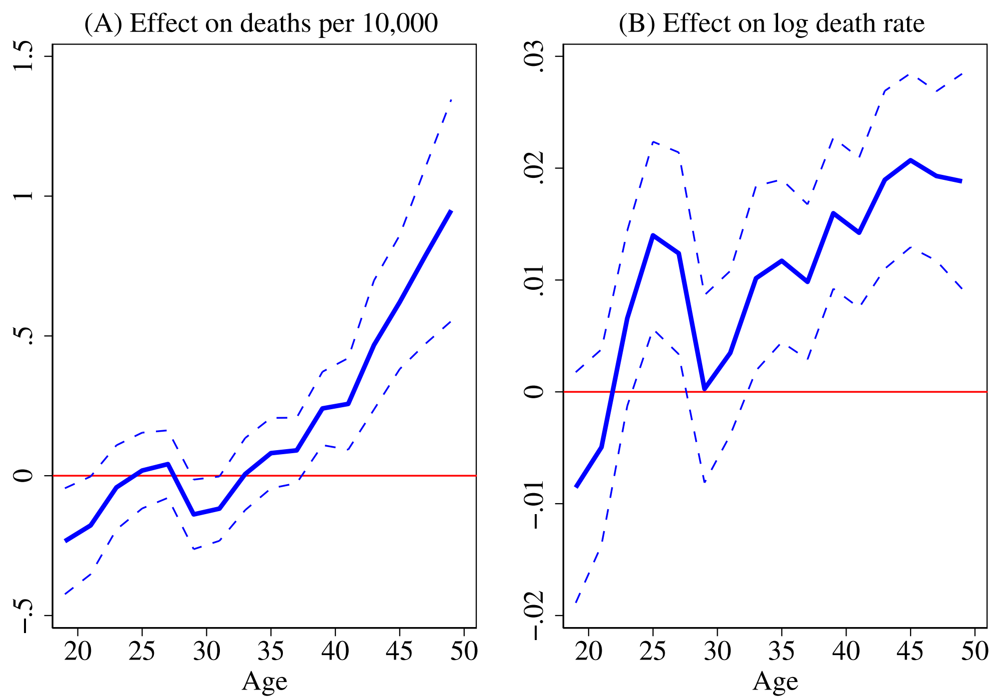


(B) Drug overdose deaths



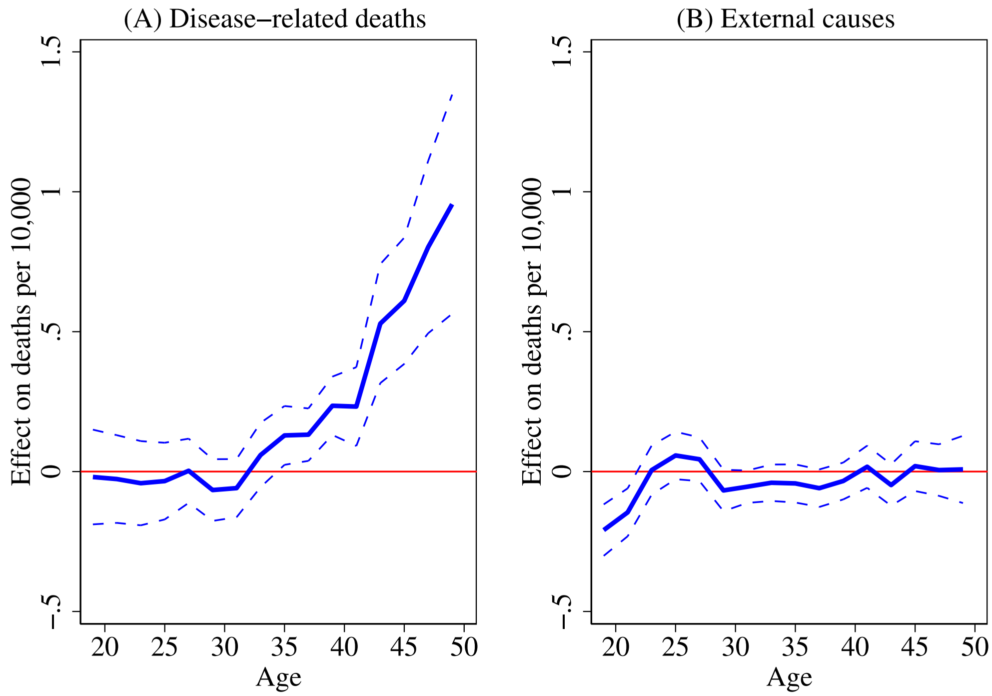
Notes: Mortality profiles from age 18 up to age 43 are shown for selected cohorts. Boom/bust/regular cohorts refer to cohorts experiencing low/high/medium national unemployment rates at age 18. Dashed red lines fitted through the mortality rates of boom cohorts at age 40. Deaths of despair include deaths due to drug overdose, liver disease, and suicide.

Figure 4: Effect of State Unemployment Rate at Labor Market Entry on Mortality Rate by Age



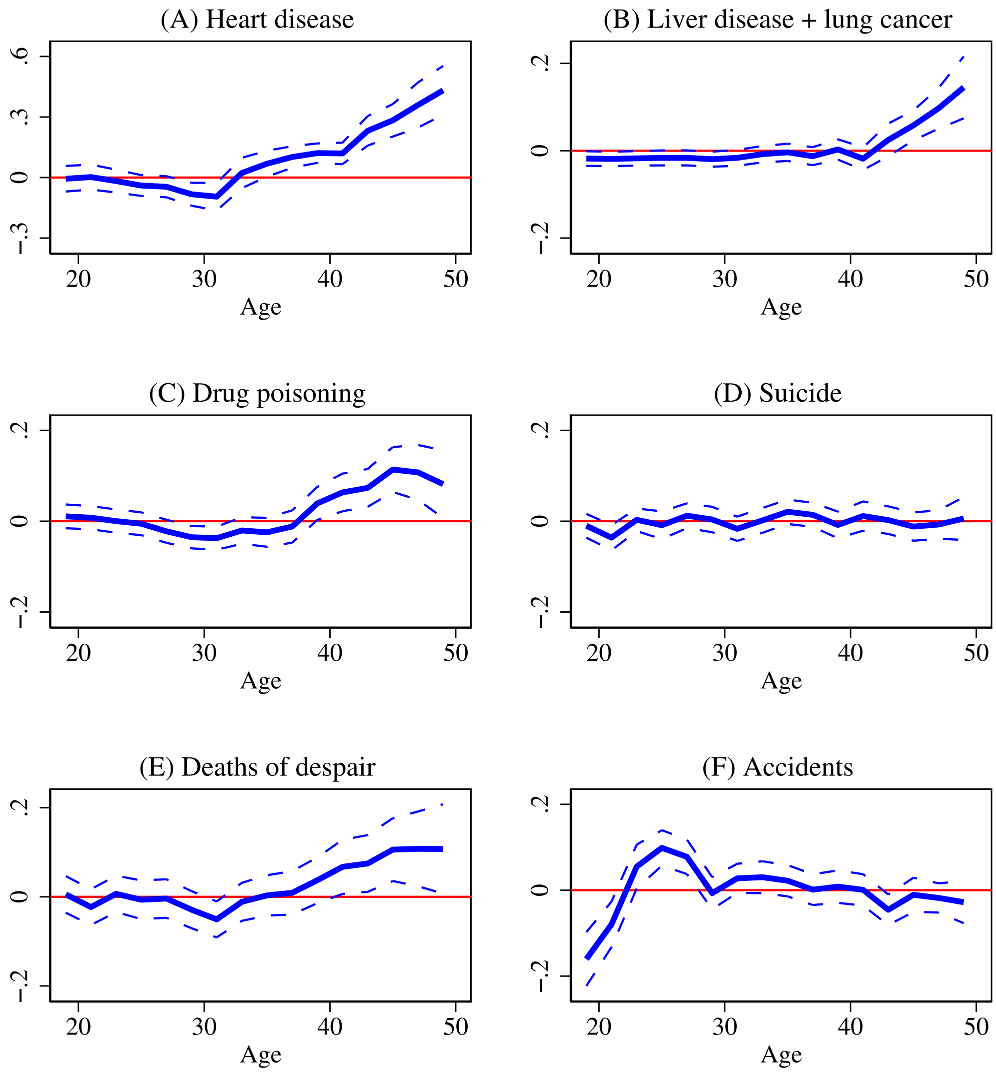
Note: This figure shows coefficients and 95% confidence intervals from regressions of death rates in levels (left) and in logs (right) on the double-weighted labor market entry unemployment rate interacted with 2-year age group dummies (Eq. 3), including fixed effects for age groups, cohort, year, and state of birth. Data from Vital Stats, Census, and ACS, years 1979–2016. Further regression and sample details as in Table 4. Coefficients for 5-year age groups are reported in Table 4, column (5). Log deaths refer to the logarithm of deaths per 10,000.

Figure 5: Effect of State Unemployment Rate at Labor Market Entry on Cause-Specific Mortality



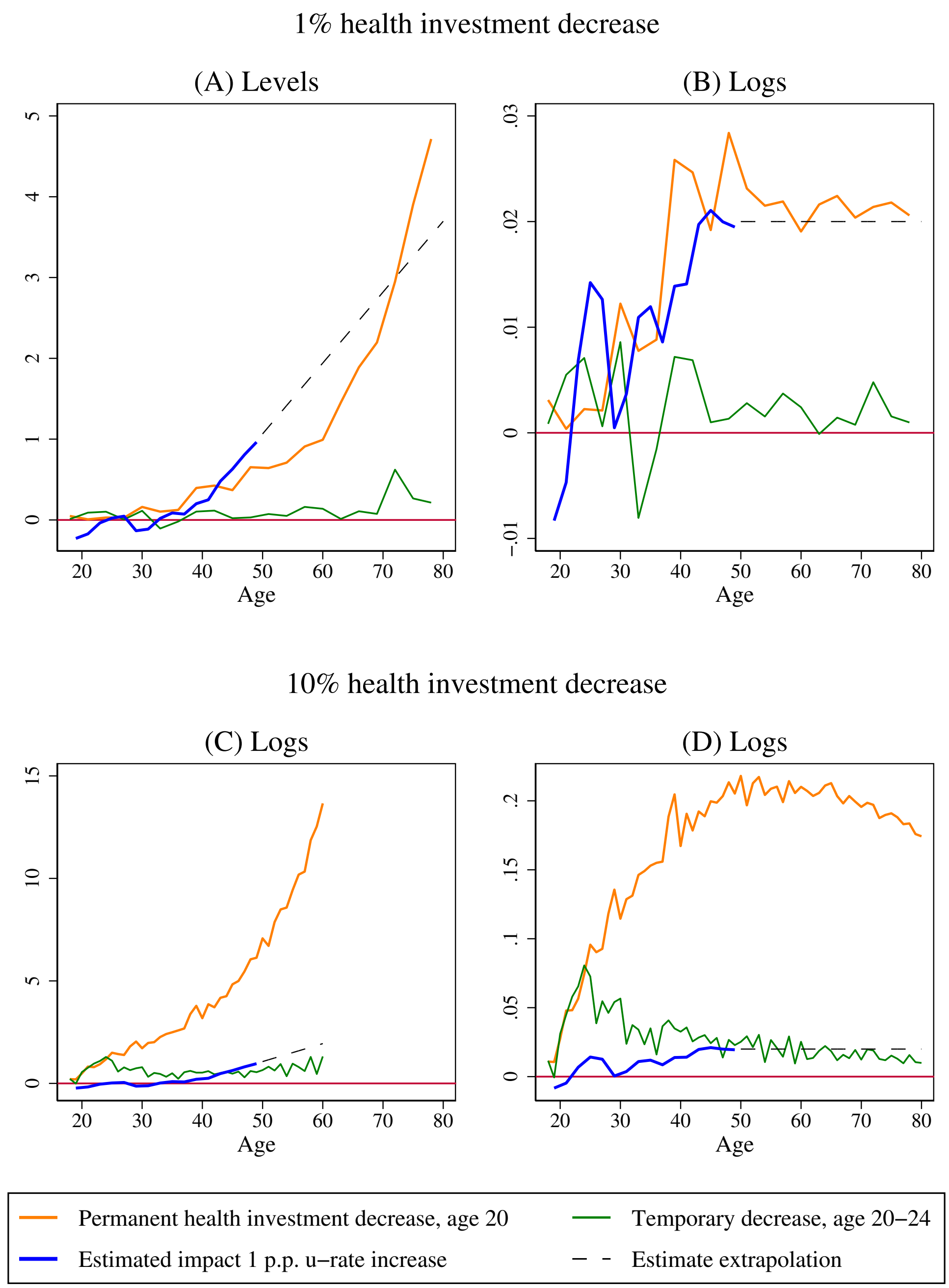
Notes: Coefficients and 95% confidence intervals are plotted from regressions of cause-specific death rates on the double-weighted labor market entry unemployment rate interacted with 2-year age group dummies (Eq. 3), including fixed effects for age groups, cohort, year, and state of birth. Data from Vital Stats, Census, and ACS, years 1979–2016. External causes refer to all causes not included in disease-related deaths. Further regression and sample details as in Table 4.

Figure 6: Effect of State Unemployment Rate at Labor Market Entry on Causes-Specific Mortality Rates (per 10,000)



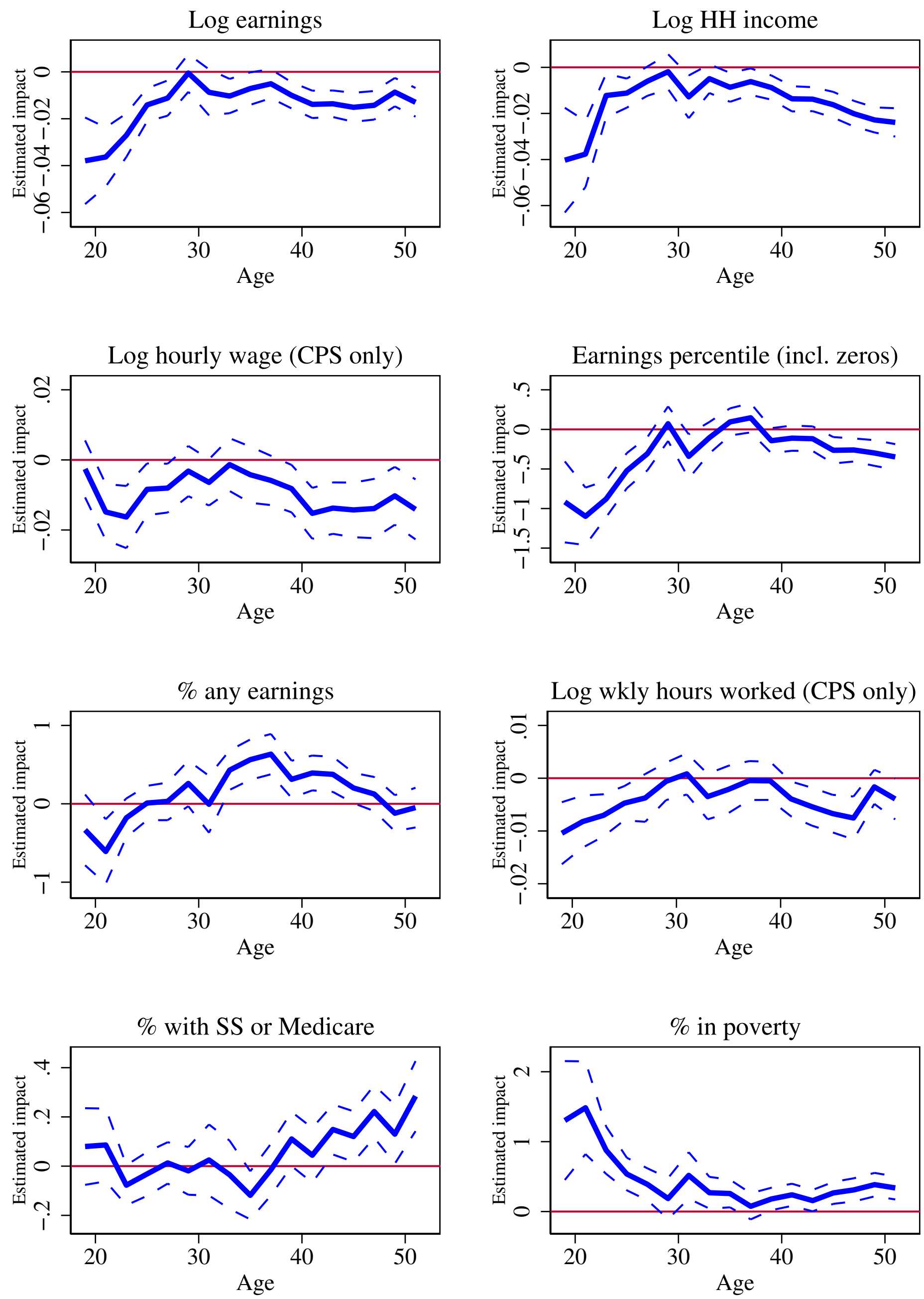
Notes: Coefficients and 95% confidence intervals are plotted from regressions of cause-specific death rates on the double-weighted labor market entry unemployment rate interacted with 2-year age group dummies (Eq. 3), including fixed effects for age groups, cohort, year, and state of birth. Data from Vital Stats, Census, and ACS, years 1979–2016. Accidental drug poisoning counted as "drug poisoning" but not as "accidents." Deaths of despair include deaths due to drug overdose, liver disease, and suicide. Further regression and sample details as in Table 4.

Figure 7: Regression Estimates in Comparison to Permanent and Temporary Health Investment Shocks in Simulated Mortality Model (Moreau and Lleras-Muney, 2019)



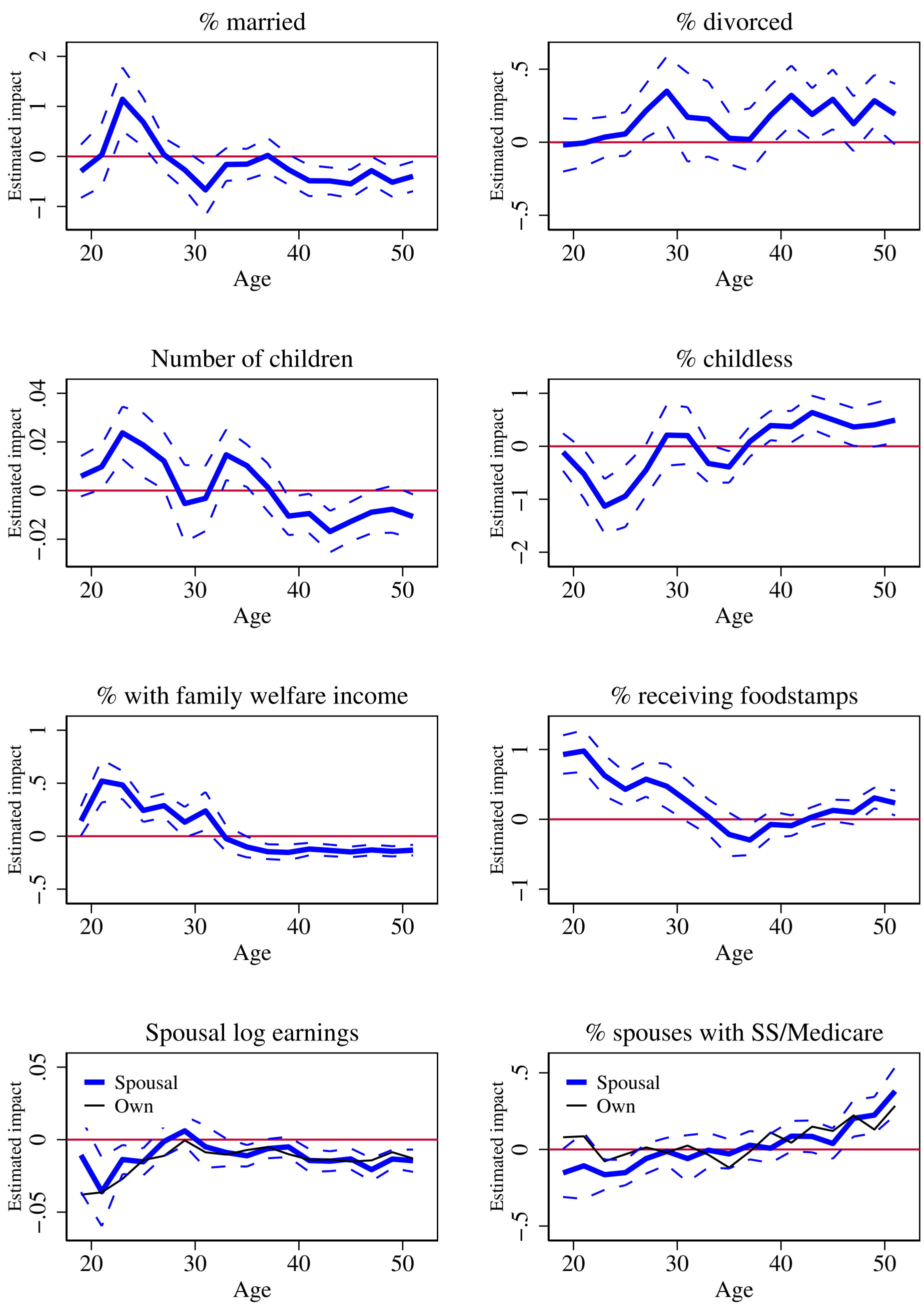
Notes: This figure compares the estimated impact of a 1 percentage point increase in the graduation year unemployment rate on mortality in levels and logs with the simulated impact of a 1% and 10% reduction in health investments at age 20, based on the mortality model in Moreau and Lleras-Muney (2019). The orange line shows a simulation with a permanent reduction starting at age 20 and lasting for the rest of life. The green line shows a temporary reduction, lasting from age 20–24. The dashed line shows estimate extrapolations that are used in Table 7.

Figure 8: Effect of State Unemployment Rate at Labor Market Entry on Labor Market Outcomes



Coefficients and 95% confidence intervals are plotted from regressions of economic outcomes on the double-weighted labor market entry unemployment rate interacted with 2-year age group dummies (Eq. 3), including fixed effects for age groups, cohort, year, and state of birth. Data from Census, ACS, and CPS, years 1979–2016. Further regression and sample details as in Table 4.

Figure 9: Effect of State Unemployment Rate at Labor Market Entry on Family Formation Outcomes



Notes: Coefficients and 95% confidence intervals are plotted from regressions of family formation outcomes on the double-weighted labor market entry unemployment rate interacted with 2-year age group dummies (Eq. 3), including fixed effects for age groups, cohort, year, and state of birth. Data from Census, ACS, and CPS, years 1979–2019. Further regression and sample details as in Table 4.

Table 1: Summary Statistics - Mortality (deaths per 10,000)

	Age 19-29 (1)	Age 30-40 (2)	Age 41-49 (3)
A. Any cause	11.73	16.37	31.11
B. Disease-related causes			
Any disease-related cause	3.71	10.03	23.25
Heart disease	1.10	3.08	5.70
Liver disease	0.05	0.38	1.38
Lung cancer	0.02	0.23	1.36
Any other cancer	0.74	1.92	5.19
Heart disease + liver disease + lung cancer	1.18	3.70	8.45
C. External causes			
Any external cause	8.03	6.34	7.85
Drug overdose	0.29	1.14	2.66
Accidents	4.48	2.54	2.52
Suicide	1.55	1.56	1.98

Notes: Death rates per 10,000 based on Vital Statistics, Census, and ACS data. Sample includes cohorts born in the United States from 1960 through 1967 who are observed from age 19 to age 49. “Deaths of despair” are the sum of “Liver,” “Suicide,” and “Drug poisoning.” “Heart” and “Liver” refer to deaths due to heart and liver disease, respectively. Accidental drug poisoning counted as “drug poisoning” but not as “accidents.”

Table 2: Summary Statistics - Socioeconomic Outcomes

	Age 19-29 (1)	Age 30-40 (2)	Age 41-52 (3)
A. Labor market outcomes			
Log earnings	9.36	10.07	10.23
Log hourly wage	2.15	2.56	2.71
Log weekly usual hours worked	3.56	3.66	3.67
Any earnings (%)	83.02	81.86	77.42
Working part-time (%)	23.86	21.32	21.34
B. Household finances, transfers, disability			
Log household income	10.22	10.76	10.86
Owning house (%)	33.71	70.36	78.44
With family welfare income (%)	4.36	2.35	1.22
Receiving foodstamps (%)	9.30	6.78	8.77
With Soc. Sec, income or Medicare (%)	2.01	2.60	4.75
With work disability (%)	3.75	5.94	9.77
C. Family formation			
Married (%)	38.17	63.95	63.10
Divorced (%)	6.41	15.41	19.96
Number of children	0.52	1.38	1.08
Childless (%)	69.36	34.52	42.81
Spousal education minus own education	0.10	0.02	0.03
Log spousal earnings	9.72	10.17	10.30
With spousal Soc. Sec. income or Medicare (%)	0.95	1.52	3.67

Notes: Socioeconomic outcomes from the Census, ACS, and CPS, aggregated using population weights. Sample includes cohorts born in the United States from 1960 through 1967 who are observed from age 19 to age 52. “Number children” refers to the number of own children living in the household. “No children” refers to respondents without any own children living in the household.

Table 4: Effect of State Unemployment Rate at Labor Market Entry on Mortality for Different Birth Cohorts

	Dep. var.: Deaths per 10,000				
	(1)	(2)	(3)	(4)	(5)
	Cohort ’60-’91	Cohort ’60-’86	Cohort ’60-’76	Cohort ’60-’71	Cohort ’60-’67
Age 19	-0.100**	-0.101**	-0.097	-0.201**	-0.242**
	(0.049)	(0.050)	(0.068)	(0.079)	(0.104)
Age 20-25	-0.016	-0.083**	-0.028	-0.040	-0.095
	(0.043)	(0.038)	(0.047)	(0.058)	(0.080)
Age 26-30		0.002	-0.037	-0.107**	-0.038
		(0.042)	(0.041)	(0.046)	(0.057)
Age 31-35			0.070	0.022	-0.004
			(0.053)	(0.051)	(0.057)
Age 36-40			0.195***	0.149***	0.111**
			(0.059)	(0.057)	(0.053)
Age 41-45				0.485***	0.415***
				(0.091)	(0.091)
Age 46-49					0.805***
					(0.146)
Total deaths	811,140	1,208,897	1,703,722	1,839,011	1,730,886
Mean d. v.	10.41	11.00	13.35	15.89	18.96
R^2	0.66	0.67	0.81	0.89	0.92

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Regressions of death rates on the double-weighted labor market entry unemployment rate interacted with age group dummies (Eq. 3) are shown. Data from Vital Stats, Census, and ACS, years 1979–2016. Each column shows one regression, varying age ranges and restricting cohorts to those observed across the entire analyzed age range. Total deaths vary accordingly. Regressions include fixed effects for age groups, cohort, year, and state of birth. Standard errors (in parentheses) clustered at the state-of-birth by year-of-birth level. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Observations are population-weighted.

Table 5: Effect of State Unemployment Rate at Labor Market Entry on Cause-Specific Mortality (Log Death Rate)

		Disease-related mortality (logs)					External causes (logs)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Overall	Disease-related	Liver disease	Heart disease	Lung cancer	Other cancer	Drug overdose	Accidents	Suicide
Age 19-29	0.003	0.009**	0.004	-0.022***	-0.071**	-0.014**	-0.059***	0.003	-0.006
	(0.003)	(0.004)	(0.026)	(0.007)	(0.030)	(0.007)	(0.013)	(0.004)	(0.006)
Age 30-40	0.010***	0.019***	0.030**	0.029***	-0.012	-0.006	0.000	0.015***	0.002
	(0.003)	(0.004)	(0.013)	(0.006)	(0.014)	(0.005)	(0.010)	(0.004)	(0.006)
Age 41-49	0.018***	0.029***	0.045***	0.046***	0.060***	0.006	0.070***	0.004	-0.000
	(0.003)	(0.005)	(0.011)	(0.006)	(0.013)	(0.005)	(0.011)	(0.004)	(0.007)
Total deaths	1,730,886	1,055,846	50,354	285,436	43,891	222,228	116,058	295,378	153,482
R^2	0.92	0.95	0.83	0.89	0.87	0.87	0.84	0.73	0.29

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Regressions of cause-specific death rates on the double-weighted labor market entry unemployment rate interacted with age group dummies (Eq. 3) are shown. Death rates in logs (i.e. the logarithm of cause-specific death rates per 10,000) as disease-related deaths increase sharply with age. Data from Vital Stats, Census, and ACS, years 1979–2016. Regressions include fixed effects for age groups, cohort, year, and state of birth. Accidental drug poisoning counted as "drug poisoning" but not as "accidents." Standard errors (in parentheses) clustered at the state-of-birth by year-of-birth level. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Observations population-weighted.

Table 6: Effect on Mortality by Demographic Group

		Gender		Race	
	Baseline (1)	Male (2)	Female (3)	Non-White (4)	White (5)
Dep. var.: Log death rate					
Age 19-29	0.003	*0.0012*	*0.009***	**0.022*****	**0.003**
	(0.003)	(0.0032)	(0.003)	(0.007)	(0.003)
Age 30-40	0.010***	0.009***	0.011***	0.017***	0.011***
	(0.003)	(0.003)	(0.004)	(0.006)	(0.003)
Age 41-49	0.018***	**0.015*****	**0.024*****	0.021***	0.020***
	(0.003)	(0.003)	(0.004)	(0.006)	(0.003)
Mean dep. var.	2.83	3.13	2.36	3.15	2.71
Dep. var.: Log disease-related mortality					
Age 19-29	0.009**	0.010*	0.007	0.019*	0.008*
	(0.004)	(0.005)	(0.005)	(0.010)	(0.005)
Age 30-40	0.019***	**0.027*****	**0.015*****	*0.033****	*0.019****
	(0.004)	(0.004)	(0.005)	(0.008)	(0.004)
Age 41-49	0.029***	0.032***	0.029***	*0.044****	*0.028****
	(0.005)	(0.005)	(0.006)	(0.009)	(0.005)
Mean dep. var.	2.11	2.30	1.99	2.56	1.94
Dep. var.: Log drug overdose mortality					
Age 19-29	-0.059***	-0.055***	-0.055***	**0.025**	**-0.053*****
	(0.013)	(0.015)	(0.016)	(0.024)	(0.013)
Age 30-40	0.0004	*-0.013*	*-0.031****	-0.004	0.011
	(0.0101)	(0.011)	(0.011)	(0.014)	(0.011)
Age 41-49	0.070***	0.064***	0.061***	0.048***	0.075***
	(0.011)	(0.012)	(0.012)	(0.014)	(0.011)
Mean dep. var.	-0.14	0.24	-0.13	0.20	-0.14
Dep. var.: Log (heart + liver disease + lung cancer mortality)					
Age 19-29	-0.015**	-0.017**	-0.027**	0.005	-0.020***
	(0.007)	(0.008)	(0.011)	(0.014)	(0.007)
Age 30-40	0.031***	0.038***	0.037***	0.048***	0.032***
	(0.006)	(0.006)	(0.009)	(0.010)	(0.006)
Age 41-49	0.043***	**0.043*****	**0.064*****	**0.076*****	**0.038*****
	(0.006)	(0.006)	(0.009)	(0.012)	(0.005)
Mean dep. var.	0.96	1.32	0.83	1.51	0.79

Notes: Data and specification as in Table 5. White refers to non-Hispanic White. Non-White refers to all other race groups. Coefficients that differ across subgroups at the 5% and the 10% level are printed in bold and italics, respectively.

Table 7: Predicted Impacts of Effect of Unemployment Rate at Labor Market Entry On Overall Cohort Mortality

	1982 recession graduation cohort (+3.9 p.p. unemployment rate)	
	linear extrapolation (1)	percent extrapolation (2)
Excess deaths (in cohort of 4 million)		
At age 0	0	0
At age 20	-374	-374
At age 50	7,089	7,089
At age 65	41,741	39,183
At age 80	90,624	121,327
Cohort share deceased prematurely		
At age 65	1.04	0.98
At age 80	2.27	3.03
Loss in life expectancy at birth		
Months per capita	-5.90	-8.91
Sum of life years (in cohort of 4m)	-1,973,297	-2,978,912

Notes: Linear extrapolation assumes that after age 50 the mortality rate increases annually by an additional 0.09 per 10,000 and percent extrapolation assumes that after age 50 the mortality rate is increased by a constant 2% , respectively, for each percentage point increase in the graduation year unemployment rate. Excess deaths and life years lost are based on initial birth cohort sizes of 4 million (the 1964 birth cohort is 4,027,490). Mortality effects prior to age 50 are taken from the baseline results shown in Figure 4. Appendix Figure A.3 plots the extrapolated effect patterns.

Table 8: Effect of State Unemployment Rate at Labor Market Entry on Economic Outcomes

	Log earnings (1)	% any earnings (2)	Log hourly wage (3)	Log weekly hours worked (4)	% working part-time (5)	% with SS or Medicare (6)	% with work disability (7)	Log household income (8)	% in poverty (9)	% owning house (10)
Age 19-29	-0.022***	-0.131	-0.009***	-0.006***	0.692***	-0.003	-0.276***	-0.018***	0.798***	0.302*
	(0.003)	(0.096)	(0.003)	(0.001)	(0.147)	(0.038)	(0.086)	(0.003)	(0.118)	(0.159)
Age 30-40	-0.008***	0.426***	-0.006**	-0.0011	0.264**	-0.007	-0.262***	-0.007***	0.214***	-0.326***
	(0.002)	(0.092)	(0.002)	(0.0012)	(0.130)	(0.035)	(0.088)	(0.002)	(0.067)	(0.100)
Age 41-52	-0.013***	0.156**	-0.014***	-0.005***	0.322**	0.155***	0.197**	-0.018***	0.286***	-0.618***
	(0.002)	(0.078)	(0.003)	(0.001)	(0.130)	(0.037)	(0.089)	(0.002)	(0.064)	(0.096)
Observations	21,063	21,063	13,872	13,872	13,872	21,012	11,628	21,055	21,055	21,055
Mean dep. var.	9.93	80.36	2.48	3.63	22.19	3.32	7.22	10.65	10.57	63.30
R^2	0.913	0.411	0.847	0.603	0.453	0.380	0.355	0.844	0.533	0.898

Notes: Regressions of socioeconomic outcomes on the double-weighted labor market entry unemployment rate interacted with age group dummies (Eq. 3) are shown. Data from Census, ACS, and CPS, years 1979–2019. Columns (3) - (5) only CPS. Regressions include fixed effects for age groups, cohort, year, and state of birth. Standard errors (in parentheses) clustered at the state-of-birth by year-of-birth level. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 9: Effect of State Unemployment Rate at Labor Market Entry on Family Outcomes

	% married	% divorced	Number of children	% childless	% with family welfare income	% receiving foodstamps	Spousal minus own education	Spousal log earnings	% with spousal SS/ Medicare
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Age 19-29	0.343*	0.096*	0.014***	-0.632***	0.314***	0.696***	-0.014**	-0.012***	-0.120***
	(0.199)	(0.054)	(0.004)	(0.188)	(0.035)	(0.076)	(0.006)	(0.004)	(0.039)
Age 30-40	-0.173*	0.108*	0.002	0.004	-0.070**	-0.090	-0.011**	-0.007**	-0.005
	(0.097)	(0.065)	(0.003)	(0.093)	(0.028)	(0.075)	(0.004)	(0.003)	(0.032)
Age 41-52	-0.437***	0.232***	-0.011***	0.443***	-0.132***	0.120**	-0.012***	-0.015***	0.165***
	(0.106)	(0.056)	(0.004)	(0.141)	(0.021)	(0.054)	(0.004)	(0.003)	(0.036)
Observations	21,063	21,063	21,063	21,063	21,063	20,502	21,028	21,023	20,978
Mean dep. var.	56.29	14.73	1.01	47.79	2.46	8.21	0.05	10.10	2.24
R^2	0.841	0.707	0.864	0.866	0.443	0.423	0.044	0.691	0.311

Notes: Regressions of socioeconomic outcomes on the double-weighted labor market entry unemployment rate interacted with age group dummies (Eq. (3)) are shown. Data from Census, ACS, and CPS, years 1979–2019. Regressions include fixed effects for age groups, cohort, year, and state of birth. Standard errors (in parentheses) clustered at the state-of-birth by year-of-birth level. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 10: Effects of State Unemployment Rate at Labor Market Entry on Economic Outcomes by Gender, Race, and Education

		Gender		Race		Education	
	Baseline	Male	Female	Non-White	White	<= 12 yrs	>12 yrs
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dep. var.: log earnings							
Age 19-29	-0.022***	-0.024***	-0.017***	**-0.037*** **	**-0.019*** **	**-0.025*** **	**-0.009*** **
	(0.003)	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)
Age 30-40	-0.008***	*-0.009****	*-0.003*	-0.0009	-0.008***	**-0.009*** **	**0.0012**
	(0.002)	(0.002)	(0.003)	(0.0042)	(0.002)	(0.003)	(0.0022)
Age 41-52	-0.013***	*-0.016****	*-0.009****	**0.0006**	**-0.016*** **	**-0.014*** **	**-0.004** **
	(0.002)	(0.003)	(0.003)	(0.0038)	(0.003)	(0.002)	(0.002)
Mean dep. var.	9.93	10.17	9.68	9.69	9.98	9.61	10.24
Dep. var.: % any earnings							
Age 19-29	-0.131	0.002	-0.224*	**-0.518** **	**-0.079**	-0.203**	-0.030
	(0.096)	(0.115)	(0.131)	(0.225)	(0.091)	(0.084)	(0.079)
Age 30-40	0.426***	0.365***	0.466***	0.502***	0.352***	0.166*	0.085
	(0.092)	(0.089)	(0.133)	(0.189)	(0.088)	(0.089)	(0.079)
Age 41-52	0.156**	**-0.025**	**0.302*** **	**0.455** **	**0.042**	0.020	0.042
	(0.078)	(0.085)	(0.107)	(0.181)	(0.080)	(0.080)	(0.064)
Mean dep. var.	80.36	84.71	76.14	75.01	81.73	75.34	84.34
Dep. var.: log hourly wage (CPS only)							
Age 19-29	-0.009***	-0.011***	-0.006*	**-0.018*** **	**-0.006** **	**-0.011*** **	**-0.005** **
	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)	(0.002)	(0.002)
Age 30-40	-0.006**	-0.006**	-0.002	-0.004	-0.003	-0.003	-0.003
	(0.002)	(0.003)	(0.003)	(0.004)	(0.002)	(0.002)	(0.002)
Age 41-52	-0.014***	**-0.018*** **	**-0.008** **	-0.008*	-0.013***	-0.011***	-0.007***
	(0.003)	(0.003)	(0.003)	(0.005)	(0.003)	(0.003)	(0.002)
Mean dep. var.	2.48	2.59	2.35	2.31	2.51	2.25	2.71
Dep. var.: log HH income							
Age 19-29	-0.018***	-0.018***	-0.016***	**-0.031*** **	**-0.016*** **	**-0.018*** **	**-0.002**
	(0.003)	(0.004)	(0.004)	(0.005)	(0.004)	(0.003)	(0.002)
Age 30-40	-0.007***	-0.009***	-0.004	-0.002	-0.008***	**-0.008*** **	**0.005*** **
	(0.002)	(0.002)	(0.003)	(0.004)	(0.002)	(0.002)	(0.002)
Age 41-52	-0.018***	-0.020***	-0.016***	**-0.009** **	**-0.021*** **	**-0.016*** **	**-0.003**
	(0.002)	(0.003)	(0.003)	(0.004)	(0.002)	(0.002)	(0.002)
Mean dep. var.	10.65	10.68	10.61	10.32	10.73	10.38	10.93

Notes: Data and specification as in Table 8. White refers to non-Hispanic White. Non-White refers to all other race groups. Coefficients that differ across subgroups at the 5% and the 10% level are printed in bold and italics, respectively.

Table 11: Effects of State Unemployment Rate at Labor Market Entry on Family Outcomes by Gender, Race, and Education

		Gender		Race		Education	
	Baseline (1)	Male (2)	Female (3)	Non-White (4)	White (5)	<= 12 yrs (6)	>12 yrs (7)
Dep. var.: % married							
Age 19-29	0.343*	0.435**	0.282	**-0.280**	**0.426****	**-0.157**	**0.627*****
	(0.199)	(0.196)	(0.232)	(0.248)	(0.195)	(0.128)	(0.162)
Age 30-40	-0.173*	-0.164	-0.148	0.036	-0.244**	*-0.165**	*0.089*
	(0.097)	(0.116)	(0.135)	(0.200)	(0.099)	(0.093)	(0.112)
Age 41-52	-0.437***	-0.517***	-0.354***	**-0.099**	**-0.573*****	-0.247***	-0.111
	(0.106)	(0.124)	(0.126)	(0.197)	(0.108)	(0.096)	(0.094)
Mean dep. var.	56.29	54.54	58.52	42.75	60.37	50.78	62.77
Dep. var.: % divorced							
Age 19-29	0.096*	0.164**	0.004	**-0.225***	**0.199*****	**0.126****	**-0.100***
	(0.054)	(0.071)	(0.080)	(0.128)	(0.059)	(0.058)	(0.060)
Age 30-40	0.108*	**0.301*****	**-0.109**	-0.069	0.166**	**0.125***	**-0.107**
	(0.065)	(0.081)	(0.091)	(0.146)	(0.070)	(0.075)	(0.077)
Age 41-52	0.232***	**0.410*****	**0.031**	0.116	0.281***	**0.241*****	**-0.054**
	(0.056)	(0.078)	(0.079)	(0.123)	(0.064)	(0.072)	(0.060)
Mean dep. var.	14.73	12.86	16.43	16.69	14.16	16.46	13.74
Dep. var.: number of children							
Age 19-29	0.014***	**0.008****	**0.018*****	**0.003**	**0.016*****	-0.0002	0.006*
	(0.004)	(0.004)	(0.005)	(0.005)	(0.004)	(0.0025)	(0.004)
Age 30-40	0.002	0.0014	0.0008	-0.002	0.0014	-0.003	0.0006
	(0.003)	(0.0032)	(0.0038)	(0.005)	(0.0032)	(0.003)	(0.0028)
Age 41-52	-0.011***	-0.010***	-0.011**	-0.017***	-0.010***	**0.0001**	**-0.011*****
	(0.004)	(0.004)	(0.004)	(0.005)	(0.004)	(0.0025)	(0.003)
Mean dep. var.	1.01	0.90	1.13	1.00	1.03	0.89	1.04
Dep. var.: % with SS or Medicare							
Age 19-29	-0.003	-0.008	-0.007	0.040	-0.011	0.054*	-0.007
	(0.038)	(0.045)	(0.048)	(0.066)	(0.039)	(0.031)	(0.036)
Age 30-40	-0.007	-0.014	-0.014	-0.010	-0.010	0.005	-0.045
	(0.035)	(0.043)	(0.050)	(0.080)	(0.036)	(0.037)	(0.035)
Age 41-52	0.155***	0.185***	0.112**	0.120	0.160***	**0.158*****	**-0.004**
	(0.037)	(0.046)	(0.047)	(0.079)	(0.037)	(0.038)	(0.035)
Mean dep. var.	3.32	3.14	3.48	4.36	3.03	4.70	2.47

Notes: Data and specification as in Table 8. White refers to non-Hispanic White. Non-White refers to all other race groups. Coefficients that differ across subgroups at the 5 percent and the 10 percent level are printed in bold and italics, respectively.

Table 12: Robustness, Mortality Outcomes

	Baseline	Control for 15 division FEs # cohort trends	cohort FEs	Control for current conditions: Unempl. rate	Manufact. share	State-level cluster	Use average unempl. rate age 18-22
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dep. var.: Log death rate							
Age 19-29	0.003	-0.002	0.005	0.005*	0.007***	0.003	-0.0013
	(0.002)	(0.004)	(0.005)	(0.003)	(0.003)	(0.005)	(0.0024)
Age 30-40	0.010***	0.010**	0.011**	0.008***	0.015***	0.010*	0.0005
	(0.002)	(0.004)	(0.005)	(0.003)	(0.003)	(0.005)	(0.0023)
Age 41-52	0.018***	0.009*	0.020***	0.024***	0.012***	0.018***	0.010***
	(0.002)	(0.005)	(0.005)	(0.004)	(0.003)	(0.005)	(0.002)
Dep. var.: Log disease-related mortality							
Age 19-29	0.009***	-0.014**	-0.011	0.003	0.014***	0.009*	0.002
	(0.003)	(0.005)	(0.007)	(0.004)	(0.004)	(0.005)	(0.003)
Age 30-40	0.019***	0.012**	0.013*	0.015***	0.022***	0.019***	0.008***
	(0.003)	(0.005)	(0.007)	(0.004)	(0.003)	(0.006)	(0.003)
Age 41-52	0.029***	0.016**	0.033***	0.037***	0.017***	0.029***	0.021***
	(0.004)	(0.006)	(0.008)	(0.005)	(0.005)	(0.007)	(0.004)
Dep. var.: Log (heart + liver disease + lung cancer mortality)							
Age 19-29	-0.015**	-0.032***	-0.030**	-0.031***	0.005	-0.015	-0.005
	(0.006)	(0.010)	(0.013)	(0.009)	(0.007)	(0.011)	(0.006)
Age 30-40	0.031***	0.022**	0.006	0.036***	0.034***	0.031***	0.018***
	(0.006)	(0.009)	(0.009)	(0.006)	(0.006)	(0.009)	(0.004)
Age 41-52	0.043***	0.016*	0.031***	0.058***	0.020***	0.043***	0.037***
	(0.006)	(0.009)	(0.011)	(0.007)	(0.006)	(0.010)	(0.005)

Notes: Column (1) shows the baseline estimates as reported in column (1) of Table 6. Column (2) adds 16 division FEs interacted with linear cohort trends, while column (3) interacts the division FEs with cohort FEs. In columns (4) and (5) regressions include the current unemployment rate and current manufacturing share, respectively, interacted with age FEs. In column (6) we replace the double weighted state unemployment rate at graduation with the average unemployment rate between age 18 and 22 in the state of birth.

Table 13: Robustness, Economic and Family Outcomes

	Baseline (1)	Control for 15 division FEs # cohort trends (2)	cohort FEs (3)	Control for current conditions: Unempl. rate (4)	Manufact. share (5)	State-level cluster (6)	Use average unempl. rate age 18-22 (7)
Dep. var.: log earnings							
Age 19-29	-0.022***	-0.027***	-0.017***	-0.021***	-0.024***	-0.022***	-0.015***
	(0.002)	(0.004)	(0.004)	(0.003)	(0.003)	(0.005)	(0.002)
Age 30-40	-0.008***	-0.013***	-0.010***	-0.011***	-0.010***	-0.008***	-0.008***
	(0.002)	(0.003)	(0.004)	(0.002)	(0.002)	(0.002)	(0.002)
Age 41-52	-0.013***	-0.009***	-0.005	-0.013***	-0.012***	-0.013***	-0.010***
	(0.002)	(0.003)	(0.004)	(0.002)	(0.002)	(0.004)	(0.002)
Dep. var.: log HH income							
Age 19-29	-0.018***	-0.023***	-0.019***	-0.020***	-0.019***	-0.018***	-0.009***
	(0.002)	(0.004)	(0.005)	(0.004)	(0.004)	(0.004)	(0.002)
Age 30-40	-0.007***	-0.012***	-0.015***	-0.010***	-0.009***	-0.007***	-0.005***
	(0.002)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)
Age 41-52	-0.018***	-0.014***	-0.017***	-0.016***	-0.018***	-0.018***	-0.013***
	(0.002)	(0.003)	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)
Dep. var.: % married							
Age 19-29	0.343***	0.065	0.468**	0.120	0.498**	0.343	0.351**
	(0.092)	(0.173)	(0.200)	(0.224)	(0.199)	(0.427)	(0.139)
Age 30-40	-0.173*	-0.368**	-0.232	0.020	-0.204**	-0.173	-0.204**
	(0.089)	(0.146)	(0.167)	(0.109)	(0.099)	(0.118)	(0.080)
Age 41-52	-0.437***	-0.595***	-0.645***	-0.411***	-0.452***	-0.437**	-0.423***
	(0.084)	(0.134)	(0.157)	(0.123)	(0.109)	(0.171)	(0.081)
Dep. var.: number of children							
Age 19-29	0.014***	0.008**	0.018***	0.010*	0.017***	0.014*	0.013***
	(0.002)	(0.003)	(0.004)	(0.005)	(0.004)	(0.008)	(0.003)
Age 30-40	0.002	-0.005	-0.002	0.013***	0.0004	0.002	0.0013
	(0.002)	(0.003)	(0.004)	(0.003)	(0.0029)	(0.005)	(0.0023)
Age 41-52	-0.011***	-0.015***	-0.026***	-0.014***	-0.008**	-0.011	-0.012***
	(0.002)	(0.003)	(0.004)	(0.004)	(0.004)	(0.008)	(0.003)
Dep. var.: % with SS or Medicare							
Age 19-29	-0.003	0.072	-0.058	0.042	0.003	-0.003	-0.031
	(0.033)	(0.051)	(0.073)	(0.037)	(0.038)	(0.055)	(0.031)
Age 30-40	-0.007	0.054	0.005	-0.028	0.018	-0.007	-0.024
	(0.032)	(0.051)	(0.070)	(0.039)	(0.035)	(0.035)	(0.028)
Age 41-52	0.155***	0.237***	0.365***	0.125***	0.169***	0.155***	0.110***
	(0.030)	(0.052)	(0.079)	(0.038)	(0.037)	(0.046)	(0.030)

Notes: Column (1) shows the baseline estimates as reported in column (1) of Table 6. Column (2) adds 16 division FEs interacted with linear cohort trends, while column (3) interacts the division FEs with cohort FEs. In columns (4) and (5) regressions include the current unemployment rate and current manufacturing share, respectively, interacted with age FEs. In column (6) we replace the double weighted state unemployment rate at graduation with the average unemployment rate between age 18 and 22 in the state of birth (Census/ACS) or the state of current residence (CPS).

Appendix

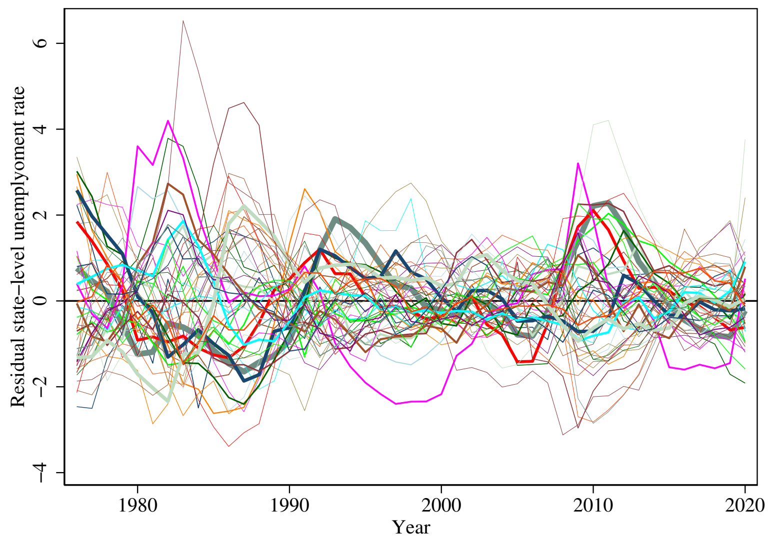
11 Sample Weights

The analysis of socioeconomic outcomes combines three different population surveys and there are alternative ways of determining how much weight to assign to observations from each survey. The Census and the ACS are much larger than the CPS but only the CPS provides data across all years. Giving each observation the same weight would maximize efficiency but it would strongly down-weight sample years with CPS data only. Giving zero weight to Census and ACS observations, on the other hand, would provide the greatest consistency across years. A third factor is representativeness that can be achieved using survey weights provided by the surveys (in year 2000 that contains both the Census and the ACS, survey weights for these surveys are divided by two). For our baseline specification, we choose a sample weight that balances efficiency and consistency but alternative weights are described in Appendix Table A.3 and results using these weights are shown in Appendix Tables A.3 - A.6.

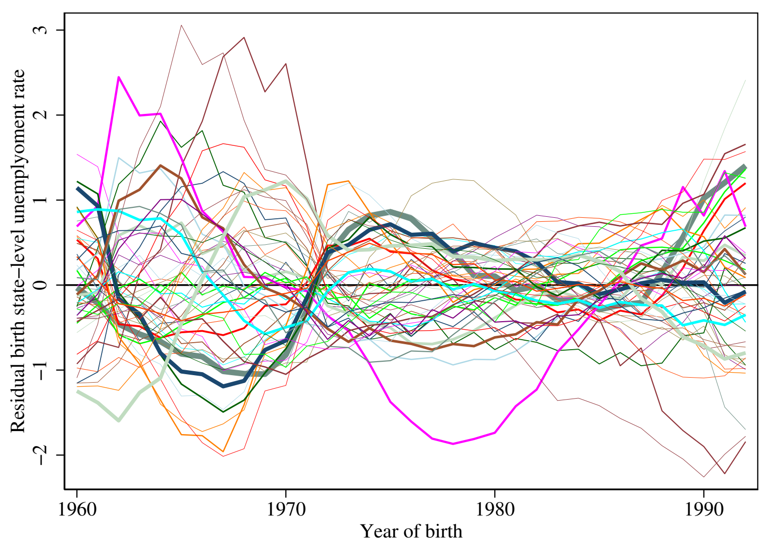
12 Appendix Figures

Figure A.1: Variation in Labor Market Entry Conditions Across States (Deviations From State and Year Means)

(A) State-level unemployment rate

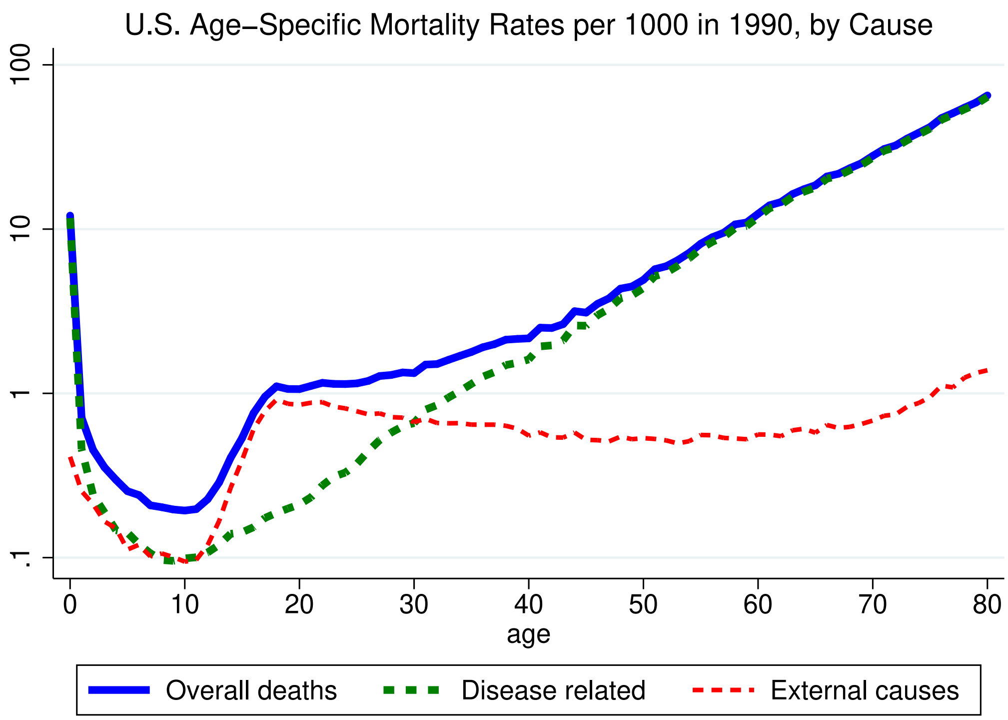


(B) Double-weighted graduation year unemployment rate



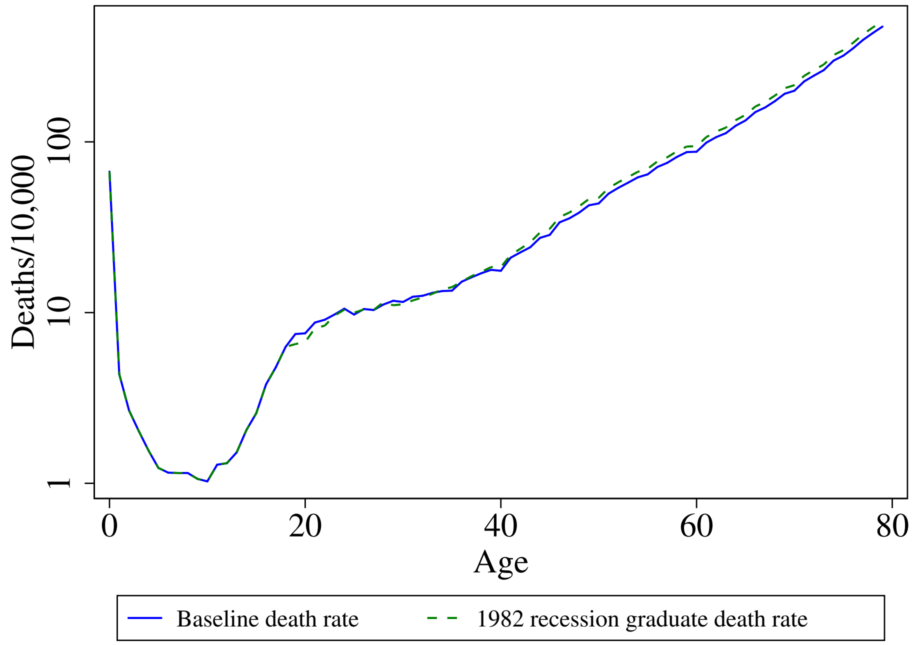
Notes: State-level unemployment rates as deviations from state and year means are plotted. Line width is proportional to state population. The double-weighted graduation year unemployment rate refers to the average unemployment rate across cohorts' typical graduation ages and across the states to which cohorts typically migrate before graduation. See the Data Sections for further details.

Figure A.2: Average Mortality by Age (log scale)



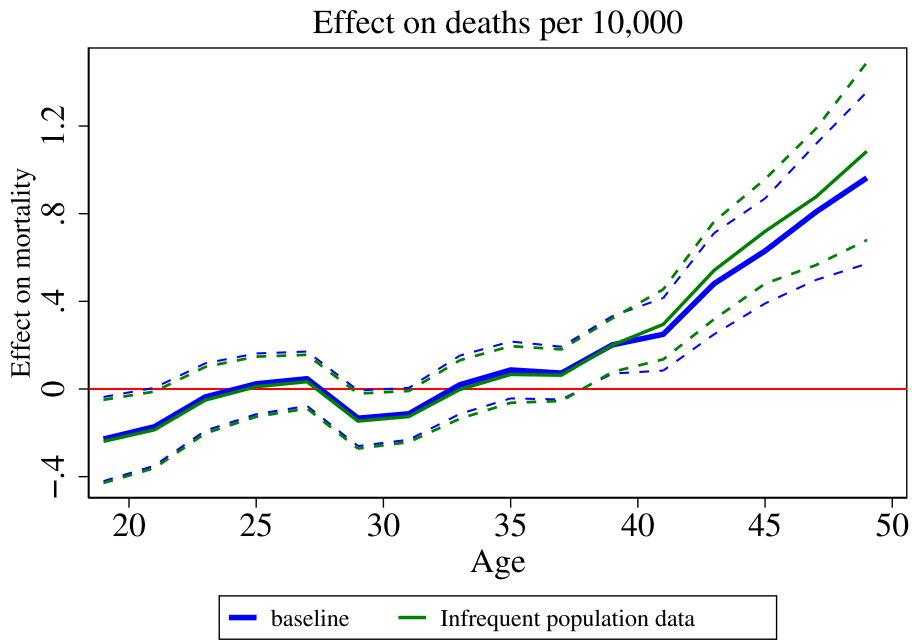
Notes: life-cycle mortality profiles are shown by cause, based on Vital Stats and Census data for 1990. External causes include all deaths that are not disease-related.

Figure A.3: Mortality Profile of Baseline and 1982 Graduate Death Rate (+3.9 Percentage Point Entry Unemployment Rate), Using a Constant 2 Percent Extrapolation



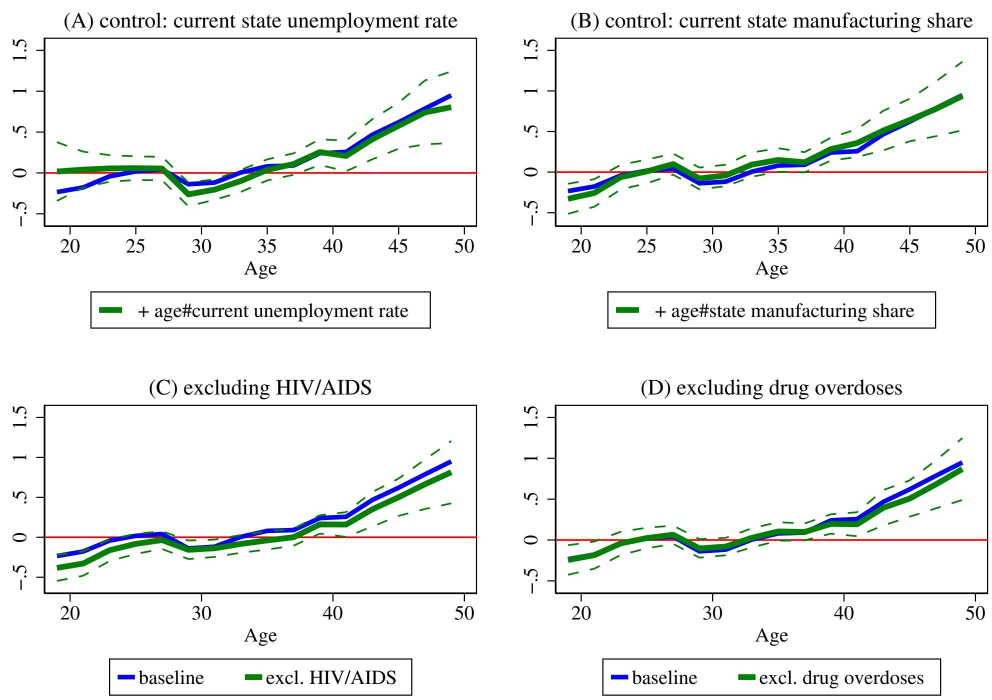
Notes: Baseline death rate calculated based on cross-sectional mortality data for 2010. The Great Recession–graduate death rate is constructed by adding the effect of a five percentage point increase in the graduation year unemployment rate. A constant 2 percent effect is assumed for ages above age 50 (i.e. 10 percent is added to the age specific mortality rate).

Figure A.4: Mortality Effects Without Annual ACS Population Estimates



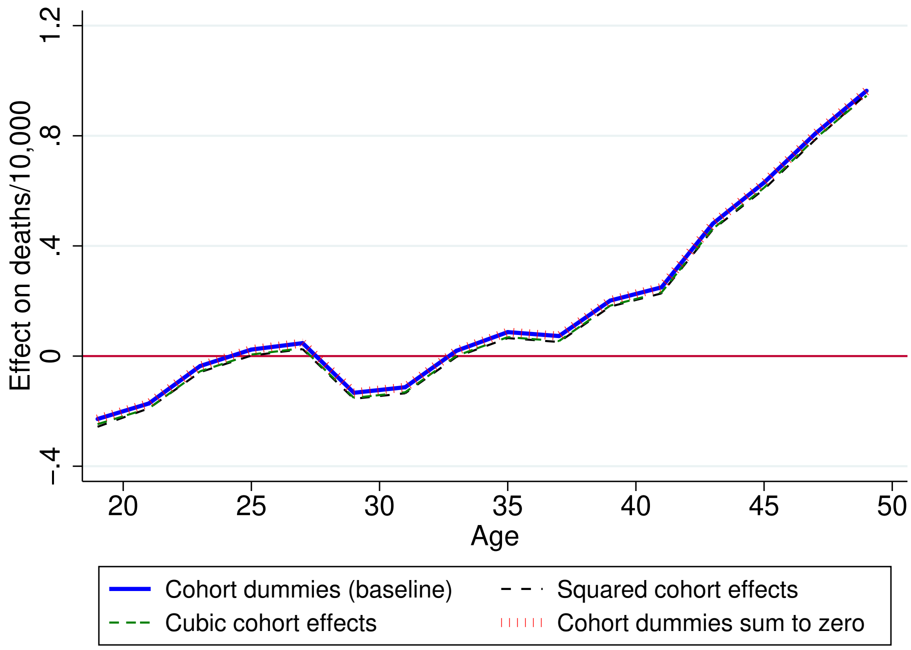
Notes: The blue line shows baseline results based on mortality rates using population estimates derived from the 1990, 2000, and 2010 Census as well as the 2001-2016 American Community Survey. The green line shows results that do not use the 2001-2015 American Community Survey.

Figure A.5: Robustness: Controlling for potentially correlated shocks



Notes: Specifications in Panel (A) and (B) include age fixed effects interacted with the current state-level unemployment rate and the current state-level manufacturing employment share, respectively. Panels (C) and (D) shows specifications that exclude HIV/AIDS deaths and deaths of despair, respectively.

Figure A.6: Baseline Mortality Results With Alternative Cohort Effects



Notes: The blue solid line replicates the baseline results as shown in Figure 4. The dashed lines show results from specifications that replace cohort fixed effects with squared and cubic cohort effects. The red dashed line shows coefficients from a specification in which we restrict cohort effects to sum to zero (as suggested by Deaton (1997)).

13 Appendix Tables

Table A.1: Count of population aged 25-65 in 2019 ACS, by year of graduation and recession status

Graduation year	Recession year	Cohort size	Graduation year	Recession year	Cohort size
1970	Y	240,018	1991	Y	3,921,376
1971		298,421	1992		3,946,441
1972		384,457	1993		3,952,100
1973	Y	1,925,628	1994		3,942,310
1974	Y	2,482,801	1995		3,983,960
1975	Y	2,965,170	1996		3,935,949
1976		2,989,810	1997		4,058,930
1977		3,838,173	1998		3,994,343
1978		3,832,025	1999		4,116,417
1979		4,284,132	2000		4,060,963
1980	Y	4,211,973	2001	Y	4,082,506
1981	Y	4,235,083	2002		4,191,220
1982	Y	4,248,809	2003		4,243,258
1983		4,173,092	2004		4,264,547
1984		4,120,890	2005		4,286,374
1985		3,978,982	2006		4,363,195
1986		3,907,552	2007	Y	4,498,934
1987		4,032,618	2008	Y	4,545,955
1988		3,911,668	2009	Y	4,617,404
1989		3,977,708	2010		4,578,893
1990	Y	3,922,080			
Recession cohorts total: 45,897,736 (30.29% of overall population age 25-64)					

Notes: The graduation year refers to “Mincerian” year of labor market entry (year of birth, plus six, plus years of education). Recession years are years in which a recession occurred.

Table A.2: Effects of State Unemployment Rate at Labor Market Entry on Poverty, Welfare, and Disability by Gender, Race, and Education

		Gender		Race		Education	
	Baseline (1)	Male (2)	Female (3)	Non-White (4)	White (5)	<= 12 yrs (6)	>12 yrs (7)
Dep. var.: % in poverty							
Age 19-29	0.798***	0.772***	0.752***	**1.612*****	**0.658*****	**0.587*****	**-0.013**
	(0.118)	(0.153)	(0.154)	(0.243)	(0.117)	(0.167)	(0.092)
Age 30-40	0.214***	0.226**	0.133	*-0.071*	*0.253****	**0.159**	**-0.081**
	(0.067)	(0.091)	(0.089)	(0.173)	(0.068)	(0.102)	(0.056)
Age 41-52	0.286***	*0.381****	*0.191***	0.107	0.341***	**0.320*****	**-0.007**
	(0.064)	(0.090)	(0.081)	(0.159)	(0.067)	(0.091)	(0.053)
Mean dep. var.	10.57	8.65	12.33	19.93	8.03	15.04	5.33
Dep. var.: % with family welfare income							
Age 19-29	0.314***	**0.145*****	**0.426*****	**0.844*****	**0.198*****	**0.185*****	**0.060*****
	(0.035)	(0.028)	(0.061)	(0.143)	(0.032)	(0.045)	(0.023)
Age 30-40	-0.070**	-0.063***	-0.072	-0.109	-0.047**	-0.022	-0.011
	(0.028)	(0.022)	(0.048)	(0.100)	(0.023)	(0.037)	(0.022)
Age 41-52	-0.132***	**-0.055*****	**-0.185*****	**-0.321*****	**-0.072*****	-0.055**	-0.030*
	(0.021)	(0.016)	(0.037)	(0.089)	(0.019)	(0.027)	(0.016)
Mean dep. var.	2.46	1.06	3.81	5.52	1.64	3.41	0.96
Dep. var.: % receiving foodstamps							
Age 19-29	0.696***	0.552***	0.754***	**1.579*****	**0.454*****	**0.432*****	**0.021**
	(0.076)	(0.095)	(0.117)	(0.217)	(0.078)	(0.084)	(0.051)
Age 30-40	-0.090	-0.068	-0.125	-0.351	-0.052	-0.064	-0.081
	(0.075)	(0.093)	(0.100)	(0.219)	(0.072)	(0.095)	(0.049)
Age 41-52	0.120**	0.188**	0.076	**-0.169**	**0.197*****	0.123*	0.059
	(0.054)	(0.075)	(0.078)	(0.152)	(0.056)	(0.071)	(0.039)
Mean dep. var.	8.21	6.68	9.60	16.53	5.87	12.33	3.93
Dep. var.: % with work disability (CPS only)							
Age 19-29	-0.276***	-0.225*	-0.310***	-0.149	-0.268***	-0.043	-0.170**
	(0.086)	(0.118)	(0.103)	(0.182)	(0.096)	(0.097)	(0.077)
Age 30-40	-0.262***	*-0.130*	*-0.407****	-0.193	-0.275***	0.013	-0.167**
	(0.088)	(0.118)	(0.116)	(0.173)	(0.091)	(0.098)	(0.071)
Age 41-52	0.197**	**0.363*****	**0.036**	-0.020	0.228**	0.171*	-0.010
	(0.089)	(0.128)	(0.101)	(0.174)	(0.096)	(0.102)	(0.074)
Mean dep. var.	7.22	7.24	7.21	9.54	6.53	10.47	5.23

Notes: Data and specification as in Table 8. White refers to non-Hispanic White. Non-White refers to all other race groups. Coefficients that differ across subgroups at the 5 percent and the 10 percent level are printed in bold and italics, respectively.

Table A.3: Alternative sample weights

Weight type	Description	Construction
Baseline weight	Observations in the Census/ACS receive the same total weight as observations in the CPS, effectively down-weighting Census/ACS observations to achieve greater consistency across years.	Each observation is weighted by the inverse of the total number of observations in each survey
Observation weight	Each data year receives one full population weight but within years each observations receives the same weight. This implies that years containing both data sets will be dominated by the Census/ACS data.	In years with only CPS data, observations are weighted by the ratio of the sum of survey weights divided by the sum of observations. In years with both CPS and ACS/Census data, observations are weighted by the ratio of the sum of survey weights divided by twice the sum of observations.
Equal weights across surveys in each year, survey weights within surveys	Each data year receives one full population weight which is equally split among the surveys contained in that year. Observations within surveys are weighted relative to their survey weight.	Survey weights are divided by the number of surveys contained in a given year
CPS weights (CPS only)	Observations in the Census/ACS receive zero weight. CPS observations are weighted using survey weights.	Using CPS survey weights

Table A.4: Effects of State Unemployment Rate at Labor Market Entry on Economic Outcomes with Alternative Weights

	Baseline weight (1)	Observation weight (2)	Equal survey weight (3)	CPS only weight (4)
Dep. var.: Log earnings				
Age 19-29	-0.022***	-0.021***	-0.019***	-0.017***
	(0.003)	(0.003)	(0.004)	(0.004)
Age 30-40	-0.008***	-0.009***	-0.008***	-0.007**
	(0.002)	(0.003)	(0.003)	(0.003)
Age 41-52	-0.013***	-0.006**	-0.010***	-0.015***
	(0.002)	(0.003)	(0.003)	(0.004)
R^2	0.913	0.921	0.906	0.893
Dep. var.: Any earnings (percent)				
Age 19-29	-0.131	-0.247*	-0.167	-0.068
	(0.096)	(0.129)	(0.132)	(0.145)
Age 30-40	0.426***	0.311**	0.380***	0.471***
	(0.092)	(0.125)	(0.135)	(0.161)
Age 41-52	0.156**	0.231**	0.296**	0.370**
	(0.078)	(0.111)	(0.118)	(0.150)
R^2	0.411	0.397	0.350	0.317
Dep. var.: Log hourly wage				
Age 19-29	-0.009***	-0.014***	-0.010***	-0.007***
	(0.003)	(0.003)	(0.003)	(0.003)
Age 30-40	-0.006**	-0.012***	-0.009***	-0.006**
	(0.002)	(0.003)	(0.002)	(0.002)
Age 41-52	-0.014***	-0.020***	-0.019***	-0.016***
	(0.003)	(0.003)	(0.003)	(0.003)
R^2	0.847	0.836	0.856	0.854
Dep. var.: Log weekly hours worked				
Age 19-29	-0.006***	-0.007***	-0.007***	-0.006***
	(0.001)	(0.001)	(0.001)	(0.001)
Age 30-40	-0.001	-0.002	-0.002	-0.001
	(0.001)	(0.002)	(0.001)	(0.001)
Age 41-52	-0.005***	-0.006***	-0.004***	-0.003***
	(0.001)	(0.002)	(0.001)	(0.001)
R^2	0.603	0.680	0.657	0.628

Notes: Regressions of socioeconomic outcomes on the double-weighted labor market entry unemployment rate interacted with age group dummies (Eq. (3)) are shown. Data from Census, ACS, and CPS, years 1979–2019. Columns (3) - (5) only CPS. Regressions include fixed effects for age groups, cohort, year, and state of birth. Standard errors (in parentheses) clustered at the state-of-birth by year-of-birth level. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. For a detailed description of the different weights see Appendix Table A.3.

Table A.5: Effects of State Unemployment Rate at Labor Market Entry on Household Outcomes and Transfers with Alternative Weights

	Baseline weight (1)	Observation weight (2)	Equal survey weight (3)	CPS only weight (4)
Dep. var.: Log household income				
Age 19-29	-0.022***	-0.021***	-0.019***	-0.017***
	(0.003)	(0.003)	(0.004)	(0.004)
Age 30-40	-0.008***	-0.009***	-0.008***	-0.007**
	(0.002)	(0.003)	(0.003)	(0.003)
Age 41-52	-0.013***	-0.006**	-0.010***	-0.015***
	(0.002)	(0.003)	(0.003)	(0.004)
R^2	0.913	0.921	0.906	0.893
Dep. var.: Owning house (percent)				
Age 19-29	-0.131	-0.247*	-0.167	-0.068
	(0.096)	(0.129)	(0.132)	(0.145)
Age 30-40	0.426***	0.311**	0.380***	0.471***
	(0.092)	(0.125)	(0.135)	(0.161)
Age 41-52	0.156**	0.231**	0.296**	0.370**
	(0.078)	(0.111)	(0.118)	(0.150)
R^2	0.411	0.397	0.350	0.317
Dep. var.: With family welfare income (percent)				
Age 19-29	-0.009***	-0.014***	-0.010***	-0.007***
	(0.003)	(0.003)	(0.003)	(0.003)
Age 30-40	-0.006**	-0.012***	-0.009***	-0.006**
	(0.002)	(0.003)	(0.002)	(0.002)
Age 41-52	-0.014***	-0.020***	-0.019***	-0.016***
	(0.003)	(0.003)	(0.003)	(0.003)
R^2	0.847	0.836	0.856	0.854
Dep. var.: With Social Security income or Medicare (percent)				
Age 19-29	-0.006***	-0.007***	-0.007***	-0.006***
	(0.001)	(0.001)	(0.001)	(0.001)
Age 30-40	-0.001	-0.002	-0.002	-0.001
	(0.001)	(0.002)	(0.001)	(0.001)
Age 41-52	-0.005***	-0.006***	-0.004***	-0.003***
	(0.001)	(0.002)	(0.001)	(0.001)
R^2	0.603	0.680	0.657	0.628

Notes: Regressions of socioeconomic outcomes on the double-weighted labor market entry unemployment rate interacted with age group dummies (Eq. (3)) are shown. Data from Census, ACS, and CPS, years 1979–2019. Columns (3) - (5) only CPS. Regressions include fixed effects for age groups, cohort, year, and state of birth. Standard errors (in parentheses) clustered at the state-of-birth by year-of-birth level. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. For a detailed description of the different weights see Appendix Table A.3.

Table A.6: Effects of State Unemployment Rate at Labor Market Entry on Family Formation with Alternative Weights

	Baseline weight (1)	Observation weight (2)	Equal survey weight (3)	CPS only weight (4)
Dep. var.: Married (percent)				
Age 19-29	-0.022***	-0.021***	-0.019***	-0.017***
	(0.003)	(0.003)	(0.004)	(0.004)
Age 30-40	-0.008***	-0.009***	-0.008***	-0.007**
	(0.002)	(0.003)	(0.003)	(0.003)
Age 41-52	-0.013***	-0.006**	-0.010***	-0.015***
	(0.002)	(0.003)	(0.003)	(0.004)
R^2	0.913	0.921	0.906	0.893
Dep. var.: Number of children				
Age 19-29	-0.131	-0.247*	-0.167	-0.068
	(0.096)	(0.129)	(0.132)	(0.145)
Age 30-40	0.426***	0.311**	0.380***	0.471***
	(0.092)	(0.125)	(0.135)	(0.161)
Age 41-52	0.156**	0.231**	0.296**	0.370**
	(0.078)	(0.111)	(0.118)	(0.150)
R^2	0.411	0.397	0.350	0.317
Dep. var.: Childless (percent)				
Age 19-29	-0.009***	-0.014***	-0.010***	-0.007***
	(0.003)	(0.003)	(0.003)	(0.003)
Age 30-40	-0.006**	-0.012***	-0.009***	-0.006**
	(0.002)	(0.003)	(0.002)	(0.002)
Age 41-52	-0.014***	-0.020***	-0.019***	-0.016***
	(0.003)	(0.003)	(0.003)	(0.003)
R^2	0.847	0.836	0.856	0.854
Dep. var.: Spousal education minus own education				
Age 19-29	-0.006***	-0.007***	-0.007***	-0.006***
	(0.001)	(0.001)	(0.001)	(0.001)
Age 30-40	-0.001	-0.002	-0.002	-0.001
	(0.001)	(0.002)	(0.001)	(0.001)
Age 41-52	-0.005***	-0.006***	-0.004***	-0.003***
	(0.001)	(0.002)	(0.001)	(0.001)
R^2	0.603	0.680	0.657	0.628

Notes: Regressions of socioeconomic outcomes on the double-weighted labor market entry unemployment rate interacted with age group dummies (Eq. (3)) are shown. Data from Census, ACS, and CPS, years 1979–2019. Columns (3) - (5) only CPS. Regressions include fixed effects for age groups, cohort, year, and state of birth. Standard errors (in parentheses) clustered at the state-of-birth by year-of-birth level. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. For a detailed description of the different weights see Appendix Table A.3.