Socioeconomic Decline and Death: Midlife Impacts of Graduating in a Recession

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Abstract

This paper uses several large cross-sectional data sources and a new approach to estimate dynamic effects of entering the labor market in a recession from graduation to middle age 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 suffer increases in mortality that appear in their late 30s and further strengthen through age 50. We show these mortality impacts are driven by disease-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. They are also less likely to be married, more likely to be divorced, and experience higher rates of childlessness. Our findings demonstrate that temporary disadvantages in the labor market during young adulthood can have substantial dynamic impacts on lifetime outcomes and death until middle age, with implications of our understanding of how economic opportunities shape outcomes over the life-cycle.

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1 Introduction

Economists and policy makers have long been concerned that entering the labor market in a recession could worsen lifetime outcomes of young workers through no fault of their own.[2] A growing body of research has shown that entering the labor market in a recession leads to large initial losses in earnings and employment that typically fade after about ten years in the labor market (e.g., Oyer, 2006; Kahn, 2010; Wozniak, 2010; Oreopoulos et al., 2012; Schwandt and von Wachter, 2019; Rothstein, 2019). Yet, some evidence suggests that an unlucky start could have more persistent effects, with potential effects on longer-term earnings (Kahn, 2010), employment (Rothstein, 2019), job characteristics (Oyer, 2006, 2008; Oreopoulos et al., 2012; Altonji et al., 2016), health (Maclean, 2013), and fertility (Currie and Schwandt, 2014).[3]

Finding systematic effects of initial labor market conditions on broader life-cycle outcomes such as health and family formation would have important implications for our understanding of the cost of business cycle fluctuations and economic shocks . If past temporary downturns have substantial long-term effects, a larger economic shock such as triggered by the COVID-19 pandemic may also present substantial risks for young workers for a lifetime. Business cycles have been shown to affect a range of household decisions, including marriage, fertility and homeownership (e.g., Dehejia and Lleras-Muney, 2004; Kondo, 2011; Schaller, 2013). Analyses of dynamic, life-cycle effects of initial labor market conditions not only improve our understanding of how individuals respond to economic shocks, but also provide rich evidence to contrast with predictions from life-cycle models of consumption and family formation to better understand the mechanisms at play (e.g., Voena 2015; Chiappori and Mazzocco 2017). Finding dynamic consequences for health and mortality would further lead to a better understanding of the health effects of economic shocks as individuals age, an important and ongoing debate.

In this paper, we estimate the dynamic effects until age 50 of graduating during the large early 1980s recession on mortality, morbidity, economic outcomes, and family outcomes using several large cross-sectional data sources and a new approach addressing data limitations and potential selection bias. We find that cohorts that entered the labor market during economic downturns experience increases in mortality in middle age, chiefly driven by certain causes of death, including

[2]See, e.g., New York Times, 2006, "Hello Young Workers: One Way to Reach the Top is To Start There" ;Wall Street Journal, 2009, "The Curse of the Class of 2009"; Hearing of the Joint Committee of Congress, 2010, "Avoiding a Lost Generation: How to Minimize the Impact of the Great Recession on Young Workers"; The Economist, 2018, "Temporary economic downturns have long-lasting consequences"; Wall Street Journal, 2018, "Playing Catch-Up in the Game of Life,"; Financial Times, 2018, "The untold career value of a little bit of luck at the outset."

[3]Kahn (2010) finds that earnings college graduates in the 1982 recessions start declining again around 15 years after entry. Several studies have documented lasting changes in occupational choice (Oyer, 2006, 2008; Altonji et al., 2016) and employer characteristics (Oreopoulos et al., 2012). Currie and Schwandt (2014) show that recession exposure in early adulthood reduces women's lifetime fertility. There is also evidence that male college graduates from the 1982 recession experience worsening self-reported health in middle age (Maclean, 2013).

heart disease, lung cancer, liver disease, and drug poisoning. We further show that as they age these cohorts experience a rise in divorce rates, lower marriage rates, are married to less educated spouses, and have fewer children in the household. In middle age, they and their spouses experience a widening gap in earnings, lower home ownership rates, and a rising incidence of self-reported disability and receipt of disability insurance with respect to luckier labor market entrants. These findings are consistent with a range of predictions of recent life-cycle models of household formation.

Our approach focuses on fluctuations in the state-level unemployment rate, 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. To 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/ We use Vital Statistics data from 1979 to 2016 and population estimates from the Census and the ACS to construct mortality rates that are regressed on the state-level unemployment rate that a cohort faced at the time of graduation. Information on socioeconomic outcomes, including earnings, labor supply, marital status, divorce, and cohabitation is derived from the Decennial Census (Census), the American Community Survey (ACS), and the Current Population Survey (CPS).

The large sample sizes of our cross-sectional data sources are important to capture the effects we seek to measure. One complication is that these data do not contain information on the state and the year in which an individual entered the labor market. Furthermore, people might migrate to a different state before graduating or adjust their graduation year in response to local economic conditions. These selection responses can bias the analysis even if we had a perfect measure of the location and the time of graduation. We address these measurement and selection issues using a method introduced by Schwandt and von Wachter (2019). As explained in the paper, we re-weight unemployment rates to reflect the economic conditions a cohort would face at graduation if 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.

Using this approach, we find that entering the labor market during the 1980s recession had effects on the entire life cycle patterns of mortality and a several key socioeconomic outcomes from age 20 to age 50. Estimated changes in the lifecycle profile of several of our core outcomes due to a one point higher unemployment rate at labor market entry are shown in Figure 1.

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 mag-

nitude 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 important extent by increases in mortality related to lifestyle and health behaviors, such as lung cancer, liver disease, and drug poisoning (important elements of "deaths of despair" in the language of Case and Deaton (2015, 2017)). 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 (Figure 1C). 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 lower education, that also have similar long-run income losses (Figure 1C) and increased disability risk from adverse labor market entry.

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 gender and race. It appears harsher income losses in the short run, and additional labor supply and lower government support in the long run, may adversely affect mortality of the most vulnerable unlucky entrants.

For example, women and non-White individuals both experience long-term increases in the likelihood of working, a lower likelihood of claiming SNAP or SSDI, and a greater rise in deaths due to heart, liver and lung disease compared to men and White individuals, respectively. In the short run, young, unlucky non-White labor market entrants see larger initial earnings losses and increased poverty and an immediate rise (rather than no effect) in all cause mortality, and no change in short-run fertility or marriage rates, in contrast to non-Hispanic White labor market entrants. However, in the long run, both race groups suffer lower mortality, lower wages lower marriage rates, and lower fertility.

Our research design does not allow us to directly disentangle potentially complex causal channels between these outcomes and mortality. However, our many findings are well-described by predictions from economic life-cycle models of earnings, family formation, and mortality. In the

short-run, the lack of economic opportunities may lead unlucky White and more educated workers to increase family formation and fertility in a substitution effect (e.g., Dehejia and Lleras-Muney, 2004). Increased family formation may contribute to better health behaviors and lower mortality in the short run. Over time, worse matches from infra-marginal marriages and economic pressure leads to higher divorce rates. In contrast, for non-White and lower-educated workers substitution effects and a stronger negative income effect seem to balance in the short run, with no resulting changes in family formation or mortality. In the long run, lower permanent income, worse health, and increased family instability lowers fertility for all workers. A negative income effect further increases labor supply for women and non-White people, possibly contributing to worse health behaviors and higher mortality. At the same time, the observed dynamic mortality response suggests that unlucky cohorts may permanently reduce monetary or non-monetary health investments, consistent with lower permanent income, worse health behaviors, and more stressful work and family lives.

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 for young workers than typically thought. This extends important work documenting the range of costs of business cycles in the cross-section (e.g., Storesletten et al. 2001; Barlevy 2005) and underscores that dynamic effects are important in understanding the effects of recessions. They complement an increasing literature showing that other labor market shocks, such as a job displacement, can have short- and long-term effects on earnings, 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 2004; 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 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 the paper substantially extends a growing body of 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), and a smaller literature studying these effects on fertility and marital status (e.g., Dehejia and Lleras-Muney 2004; Kondo 2011; Currie and Schwandt

2014) and health (Maclean, 2013; Cutler et al., 2016).[4] Our findings imply that initial conditions have longer lasting, more pervasive, and more heterogeneous effects on labor market entrants than found previously. Studying dynamic, longer-term effects on a larger set of outcomes allows a better understanding of potential mechanisms through the lens of predictions from life-cycle models.

By studying the dynamic effect of economic conditions at labor market entry into middle age, the paper complements previous studies that analyze contemporaneous mortality effects of recessions and papers analyzing longer-term mortality effects of economic conditions at other ages.[5] We replicate the reverse, negative relationship of mortality and contemporaneous unemployment rates for young labor market entrants (e.g., Ruhm, 2000; Miller et al., 2009; Stevens et al., 2015; Ruhm, 2015; Hollingsworth et al., 2017). We find this relationship switches sign and becomes positive in the long run for these cohorts, connecting these short-run effects to papers analyzing the long-run effects of labor market conditions, such as Cutler et al. (2016) who use a large cross-country panel data set to analyze the long-term effect of labor market conditions at birth, adolescence, and early adulthood. Using predictions from a life-cycle model of mortality (Moreau and Lleras-Muney, 2019), our dynamic effects can be used to help infer about potential channels underlying long-term mortality effects of initial conditions.

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 leading 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 (e.g., Case et al., 2002; Currie and Stabile, 2003) 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 among cohorts at the core of recent increases in midlife mortality (Case and Deaton, 2015, 2017; Borella et al., 2019), 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, since we look only at initial labor market conditions orthogonal to the national unemployment rate, and neither address the effects of recessions for older worker nor the role of wider economic trends, e.g. reductions in manufacturing jobs (Pierce and Schott, 2020; Autor et al., 2019; Venkataramani

[4]Studies suggest other social outcomes that may be related to health worsen for cohorts entering the labor market in recessions as well, including increases in crime (e.g., Bell et al. 2018) and reductions in self-esteem (e.g., Maclean et al. 2016).

[5]Previous work has found persistent increases in mortality from labor market conditions around birth (Van den Berg et al., 2006), adolescence (Cutler et al., 2016), before retirement (Coile et al., 2014), and in old age (Schwandt, 2018).

et al., 2020).

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 is 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 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 displayed in 1. Since 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. While 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 into 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 work-horse model can explain both persistent losses from a temporary labor market shock and reappearing wage and earnings losses in middle age.[6] For example, Gibbons and Waldman (2006) extend their work-horse 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

[6]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.

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. Since luckier workers had more time to accumulate specific skills at the high-wage firm, earnings gaps can be persistent.[7]

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. An immediate reduction in economic opportunity during a recession is likely to trigger a reduction in fertility among young labor market entrants. 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 pro-cyclical 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 typically 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 the beginning of their working lives a recession would trigger a temporary positive substitution effect on fertility. In contrast, in the long run, the reduction in lifetime earnings due to entering the labor market in a recession would predict a reduction in total lifetime fertility.[8]

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

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

Recent life-cycle models of marriage choices with limited commitment have incorporated random fertility shocks, and hence 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 in so far that 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 in the presence of marital match quality. Since 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. An expansion in the rate of marriage is likely to occur among marriages that are on average of lower match quality, putting them at higher risk of dissolution. Persistent reductions in earnings and short-run increases in poverty are likely to put these marriage further under 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.

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, a short-time reduction in labor market opportunities and the resulting persistent reduction in earnings would lower health investments initially. If individuals realize their lifetime earnings are lower, health investments are predicted to permanently decline.

One central result from this model is that both temporary and permanent reductions in health investments lead to persistent incresaes 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 health of individuals towards 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.[9]

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 in response to lower lifetime wealth may raise stress and lower time spent on health improvement (CITE). 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. Existing research shows that graduating in a recession appears to worsen some health behaviors, suggesting this could be an additional channel of long-term mortality effects. In our empirical analysis, we will analyze difference 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

[9]While the qualitative prediction is the same for transitory and permanent investment differences, not surprisingly the divergence in mortality rates are predicted to be larger for permanent differences (Moreau and Lleras-Muney, 2019).

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 has 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, depressing 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 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. We obtain population estimates 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.[10]

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) and individuals of all other races (refereed to as non-White).

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. 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 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

[10]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).

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:

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

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 Equation (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.[11]

[11] 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.

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 $\overline{mig}^A_{b,s}$ 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 $\overline{edu}^A_{b,c}$, 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 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:

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

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:

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

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.[12] The data are collapsed at the state-of-birth by year-of-birth by age

[12]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, and hence we drop a second dummy from the birth cohort effects.

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.[13]

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 conditions. 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 ongoing trends in local economic conditions, such as division-cohort-specific trends and controls for the manufacturing trends.Moreover, we also show that potential endogeneous 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 unemplyoment rate between age 18 and 22 instead of hte double-weigthed 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 is often 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 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

Choosing alternative restrictions has no bearing on our main results.

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

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. While 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, i.e., 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 Stats 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 **??** 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 specification

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 1976–2015 that are studied in Schwandt and von Wachter (2019), using the Mincerian and the double-weighted specification.

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 percent 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.[14]

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 minus one percent 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 percent 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 percent 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

[14] 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.

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 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 benchmark, we include the mortality trend at age 40 across cohorts as black straight lines. For overall mortality, this line has a negative slope, suggesting 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, indicating that cohorts facing higher unemployment rates at age 18 experienced higher mortality rates 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 plots the coefficients (with 95 percent 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 Equation (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.

Appendix Figure **??** compares results for mortality rates in levels to results using log mortality rates. The age profile is also increasing for log-mortality with a flattening out of the effect profile

at around 2 percent after age 45. As described above in Section 2, an increasing age profile in log mortality gaps is in line with persistent rather than temporary reductions in health investments. Calibrating the Moreau and Lleras-Muney (2019) model to our estimates suggests that our effect patterns can be generated by a permanent 1 percent reduction in health investments (Figure 7).

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 for an increasingly larger number of cohorts, including only the age effects that can be identified with all cohorts present. Effects are similar when we shorten the analyzed age window in order to include additional birth cohorts.

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 is driven by disease-related deaths.

In order 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 suicides is remarkably flat. However, deaths of despair, which include drug overdose, liver disease, and suicides, 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, 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 one percent reduction in health investments ("levels" and "logs" extrapolations illustrated in Figure 7). 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 percent 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 percent 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.[15]

Another benchmark is the contemporaneous mortality effect of business cycle fluctuations (Ruhm, 2000; Miller et al., 2009; Stevens et al., 2015). We use the contemporaneous impacts by single year of age reported in Miller et al. (2009) to calculate the effect of a 3.9 percentage point increase in the unemployment rate on life expectancy (this refers to the impact on the length of life for an individual that experiences a strong local recession at every year of age throughout life), resulting in an increase in life expectancy by 1.9 months. In other words, the negative longevity impacts of entering the labor market during a recession is three to 4.5 times larger than the positive contemporaneous mortality impacts.[16]

[15]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.

[16]Another way to benchmark our estimates is to compare them the overall increases in deaths of despair studied in

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, in we have explored the robustness of our findings to including regional trends, controls for the contemporaneous unemployment rate, and controls for cohort-specific shocks. Table 12 shows that neither the inclusion of cohort fixed effects interacted with dummies for 15 U.S. divisions nor the inclusion of cohort-trends interacted with division dummies substantively alters our main results. 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. While 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. The final column of the table show 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).

In the Appendix, we further explore the impact of dropping annual ACS population estimates (Figure A.4) and using the unemployment rate at specific ages instead of the double weighted unemployment rate (Figure **??**). Finally, we show that our findings are robust to the choice 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.

the literature. Between 1990 and 2010, deaths of despair increased by around 3.4 per 10,000 at age 50 to 54 (Case and Deaton, 2017). These cohorts entered the labor market in the late 1960s to the late 1970s, with recessions occurring during a total of two years and three months of that period. Even in the hypothetical case that all of these cohorts were fully impacted by a strong recession (experiencing a 4 percentage point increase in the entry unemployment rate), deaths of despair would only increase by 0.4 per 10,000.

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 hence 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 and Figure 8 show the impact on log earnings in the pooled sample, along with further labor market outcomes, 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. 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 (5) and (6) 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 at 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 percent in midlife. Home ownership, an indicator of wealth accumulation reported in all three included data sets, is increasingly impacted with lower rates among unlucky recession cohorts as they age past their mid-30s.

7.2 Effects on family outcomes

Table 9 and Figure 10 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 (10). 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 percent in middle age marriage rates relative to the mean, and a rise of about 5 percent in middle-age divorce rates relative to the mean.

Children. Columns (3) and (4) of Table 9 and the second row of Figure 10 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.[17] 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 percent relative to the mean. We cannot distinguish whether this effect is driven by adolescent children moving out, younger children living with a divorced partner, or lower overall fertility rates. Given that Currie and Schwandt (2014) show increased unemployment rates during women's early 20s lower their completed fertility, it is likely that at least part of our findings is 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 the Great Recession.

Transfers. Turning to household transfers in columns (5) and (6), 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 percent 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.

The last two columns of Table 9 show strong evidence of assortative mating: unlucky recession graduates marry partners with slightly lower education than graduates from more lucky cohorts.

[17] 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.

These partners experience very similar impacts on log earnings and the likelihood of Social Security / Medicare receipt as the focal spouse him or herself.

7.3 Robustness Analysis

Table 13 summarizes an extensive robustness analysis accounting for economic conditions workers may face over the life-cycle that might be correlated with initial conditions for selected outcomes. 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. To control for potential pre-existing trends, columns 2 and 3 of Table 13 show results when we add an interaction between dummies for 15 Census divisions with cohort fixed effects and cohort-specific time trends to our main regression model. To control for ongoing economic conditions, columns 4 and 5 control for the current state unemployment rate and the current share of manufacturing employment within a state. Overall, our findings across socioeconomic outcomes are remarkably robust throughout specifications. Among others, they confirm that the long-term effect of initial conditions derives from exposure to the initial unemployment rate in the labor market, not due to prolonged adverse economic conditions correlated with adverse labor market entry (e.g., Oreopoulos et al. 2012). Finally, column 6 of Table 13 replicates our main estimates using the average unemployment rate at ages 18 to 22. The findings again confirms our main findings. As in the case of mortality, some coefficient are slightly attenuated, consistent with the view that the double-weighted unemployment rate provides a more accurate representation of a cohorts exposure to initial labor market conditions.

8 Discussion: mechanisms and heterogeneity

We find broad long-term effects of entering the labor market in a recession cutting across causes of death and measures of socioeconomic status. These patterns are consistent with key predictions from economic life-cycle models discussed in the conceptual Section 2. 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. Throughout the following discussion, we mainly focus on differences between groups that are statistically significantly different from zero, and interpret broad patterns informed by the conceptual discussion to avoid putting weight on results that may have been significantly different from zero by chance.

Overall, the dynamic impact of early labor market has some important differences by race and by gender. On average, for White people entering a labor market in a recession leads to short-run rise in family formation and a reduction in mortality due to drug overdoses and heart, liver and lung disease.

In contrast, non-White people see little short-run effects on family outcomes, larger earnings losses that result in poverty, and increases in overall mortality. Consistent with the impact of lower life time resources, in middle age both race groups experience reductions in fertility, increases in family stability, and a rise in mortality. The impact of initial conditions also differs by gender, with women and non-White people both experiencing long-term increases in the likelihood of working, a lower likelihood of claiming SNAP or SSDI, and a greater rise in deaths due to heart, liver and lung disease compared to men and White people, respectively.

Following the organization of the results section, we first discuss mechanisms and heterogeneity for mortality and morbidity before turning to labor market and family formation outcomes.

8.1 Mortality and morbidity

Mechanisms. Several potential mechanisms could lead to persistent reductions in health investments, and possibly to direct effects on health, such as lasting reductions in income or socioeconomic status, lasting changes in health habits, or worse family outcomes. Our finding that the causal impact of initial conditions increases steadily with age allows a better understanding of potential mechanisms leading to long-run mortality effects of initial economic conditions. Figure 7 shows a simulated version of the life-cycle mortality model by Moreau and Lleras-Muney (2019) discussed in Section 2. The figure shows that a permanent reduction in health investments of an order of magnitude compatible with our long-term earnings effects would capture the evolution of the impact of an initial shock on mortality by age quite well.[18] In particular, 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 investments between lucky and unlucky cohorts.

As discussed in Section 2, our finding of a permanent reduction in earnings and income would lead to permanent reductions in health investments in a life-cycle model in which health is a normal good. There is a range of other potentially relevant mechanisms.[19] For example, lower earnings could affect health also via a reduction in socioeconomic status, living conditions, and social environment, consistent with our finding that the mortality increases are driven by causes linked to health behaviors, such as drinking, diet, and smoking.[20] The effect on causes of death linked to health behaviors could also arise if adverse initial conditions lead young workers to adopt unhealthy behaviors or fail to eliminate those acquired in high school or college (Kessler et al., 2005). There

[18]Figure 7 shows the effect of a 1 percent temporary or permanent reduction in health investments, using our 1% decline in long-term earnings as a benchmark. Appendix Figure A.7 shows a simulation based on a 10 percent reduction in health investments. We are thankful to Adriana Lleras-Muney for providing us with these simulation results.

[19]In Moreau and Lleras-Muney (2019), changes in the variance of health shocks, changes in the rate of depreciation, or changes in the health threshold of death can affect how mortality evolves over the life-cycle.

[20]The observed response in behavior-related causes of death speak also against the presence of a direct, non-health effect on mortality via, for instance, a rise in accidents.

is some evidence that the effect of entering the labor market in a recession occurs at an impressionable age and a vulnerable transition period when many health habits are formed. The initial shock may also trigger persistent behavioral or psychological responses, such as lower self esteem or depression, that themselves could worsen health and health behaviors, consistent with the rise in drug deaths we find.

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 drag down health sufficiently to raise mortality in midlife (Steptoe et al., 2013). Likely lifelong employment in lower occupations and lower quality jobs would trigger a rise in the incidence of self-reported disability and in the receipt of SSDI we find. Poor health might in turn reinforce socioeconomic impacts, lowering an individual's labor market productivity and socioeconomic status and worsening social isolation. Our results provide empirical support for the hypothesis that persistent effects of socioeconomic decline could explain part of the recent increases in mortality rates among middle-aged non-Hispanic White people (Case and Deaton, 2015, 2017). The dimensions of this socioeconomic decline include family formation and cohabitation, whose full impact may only occur over a longer time horizon (Case and Deaton, 2018).[21] Consistent with our results, Lleras-Muney (2017) concludes that midlife increases in 'deaths of despair' must relate to "a permanent deterioration in one or more factors that affect health, starting at about the time of labor market entry."

Heterogeneity. We find different long- and short-term effects of initial labor market conditions by broad race categories, shown in Table 6. In the short term, White individuals experience no rise in overall mortality, and a reduction in drug deaths and in deaths due to heart, liver, and lung disease. In contrast, there is a substantial short-term increase in mortality for non-White labor market entrants, which is driven to a large degree by an increase in disease-related deaths. The long-term increase in drug deaths is present for both race groups, but stronger for White people (with a p-value for the difference across racial groups of 11%). In contrast, non-White people experience larger long-term increases in in deaths due to heart, liver, lung and other diseases.

Together with findings on the incidence of poverty below suggests fundamentally different mechanisms might be at play in the short runfor young labor market entrants of different race, with White people experiencing a temporary rise in family formation and no mortality impact in the first years after labor marke entry, while non-White people are affected by a rise in poverty and increases in mortality. In the long run, all groups suffer higher mortality for causes related to lower socioeconomic status and family instability.

[21] While our analysis is able to identify drivers of deaths of despair linked to market entrants' exposure to local short-term business cycle fluctuations, Pierce and Schott (2020), Autor et al. (2019), and Venkataramani et al. (2020) document impacts of structural changes, such as reductions in manufacturing jobs induced by globalization and import competition.

We also 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 life-time labor supply as documented below.

8.2 Career outcomes

Mechanisms. Extended models of career development involving job choice and skill investment discussed in Section 2 can explain how earnings losses arise and how they evolve with age. While our data does not allow us to distinguish between different models, our findings point to additional channels that are likely to depress productivity and hence wages and earnings in middle age.[22] Reductions in health associated with the mortality increases we document are likely to also reduce earnings capacity as workers age, consistent with a rise in work-related disability and receipt of Social Security Disability Insurance benefits. 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 a renewed widening of wage and earnings losses around age 40 coincides with timing of our mortality effects and the timing of the persistent negative effects on marriage and family size.

Several channels could explain the interesting temporary increase in labor supply we find. While as discussed in Section 2 a reduction in wages has ambiguous effects on labor supply, the negative wealth effect from a reduction in the present discounted value (PDV) of earnings is likely to raise employment. 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. Furthermore, it implies that there is less scope for economic insurance within the family. Hence, labor supply may rise for a precautionary motive as well. Yet, the gap in labor supply closes with age, in line with with the limiting impact of worsening health with age due to the increasing adverse effect of initial conditions.

Heterogeneity. For economic and family outcomes, besides studying differences by gender and race, we can also analyze differences in impacts by education. While we do not have sufficient coverage of education in the data to extend this analysis to mortality, we briefly discuss the results 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

[22] 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.

are also interesting in their own right, and require additional steps in the empirical analysis.[23] The heterogeneity results by gender, race, and education are shown in Table 10.

Consistent with findings in Schwandt and von Wachter (2019), non-White and lower-educated workers experience the largest short-term effects on economic outcomes, where earnings and wage losses are largest and the incidence of poverty increases despite a rise in receipt of SNAP and family welfare income. For lower-educated workers, long-term effects in earnings are larger than for higher-educated workers in middle age. We show that the 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. The higher-educated do not experience a long-run reduction in family income, possibly related to more stable family formation.

Interestingly, relative to more lucky cohorts, women and non-White people experience a rise in extensive labor supply, whereas no such effects are present for men or White people. As a result non-White people experience smaller long-term earnings losses than White people, despite seeing similar sized wage losses. Women see both smaller earnings and wage losses than men. Consistent with these findings, the long-term rise in the incidence in work-related disability and claiming SSDI benefits is only present for White people and lower-educated workers, who are also the only groups seeing an increase in the receipt of SNAP. These patterns may reflect both different baseline trajectories (with men and White people having higher labor supply supply and earnings than women and non-White people, respectively) and differential access to programs that may prevent non-White people affected by economic conditions from accessing SNAP or SSDI benefits.

8.3 Family outcomes

Mechanisms. The rise in the incidence of marriage and children at earlier ages occurring with partners of lower education, the subsequent rise in divorce rates, and the lower rates of long-term marriage and household size we find are well described by models emphasizing the role of short-term earnings opportunities, long-term average income, and the quality of the match between spouses described in Section 2. For example, the initial rise in divorces and the reduction in household size occurs when workers are in their 30s and could be triggered by a rise in mismatch resulting from an increase in early, infra-marginal marriages and by the stress caused by adverse initial economic conditions. Subsequently, 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

[23] Since the double-weighted unemployment rate is averaged across both migration destinations and the education distribution, we regenerated a single-weighted unemployment rate separately by broad education group which only averages across migration destinations. We use this single-weighted unemployment rate to compare the effects by age vs. potential labor market experience (to assess whether it is the end of schooling rather than age that matter for the onset of 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.

divorces we document and ensuing search for a partner likely further reduces childbearing and lifetime fertility. Our findings on long-term mortality and disability, and their likely associated health behaviors and outcomes, point to potential additional channels of marital instability and reductions in family size. Health reductions lowers spouses' ability to contribute to the public good of marriage and to provide economic resources. The long-term rise in spousal disability rates we find speaks to this channel. Adverse health behaviors and economic stress may further destabilize marriages, lower success in the marriage market, and reduce fertility.

Heterogeneity. As shown in Table 11, we find salient differences in the dynamic effect of family outcomes by race and education that provide further insight into the economic channels at play. The short-term rise in marriage rates and fertility is clearly visible for White and higher-educated individuals, but not for non-White or lower-educated individuals. This confirm the interpretation of Dehejia and Lleras-Muney (2004) that in the short-run the substitution effect dominates over the income effect for higher earning mothers.[24] In the long run, our findings show that the short-run effects are reversed, and unlucky White people and higher-educated labor market entrants have fewer children in the household in middle age, as would be predicted by a long-term decline in earnings, among others. Non-White people also experience a reduction in the number of children in the households in middle age.[25] All groups but the high educated experience a long-term rise in divorces and reduction in marriage rates, confirming that initial conditions have a broad adverse effect on marriage rates.

Overall, our finding clearly indicate that early labor market entry has a broad effect on individuals' lives up until age 50, affecting health and mortality as well as family formation and labor market outcomes throughout the life cycle. Our main findings and our heterogeneity analysis point to a range of potential mechanisms running from economic outcomes to health to family outcomes and vice versa, showing how initial labor market shocks can have a series of complex effects that are well described by economic life-cycle models.

9 Conclusion

In this paper we have used several large cross-sectional data sources and a new approach to estimate midlife effects of entering the labor market in a recession on mortality by cause and various measures of socioeconomic status. This is the first paper to study adverse labor market entry on mortality and on socioeconomic status effects going beyond age forty. To obtain such longer-term effects, we focus on cohorts coming of age in the late 1970s to mid-1980s, a period of particularly pronounced

[24] Women experience a larger increase in the number of children in the household than men. Men experience a higher effect on marriage rates.

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

labor market swings. To estimate the unemployment rate in the state of labor market entry based on cross-sectional data despite data limitations and selection concerns, we implement a new approach based on a double-weighted unemployment rate introduced by Schwandt and von Wachter (2019).

We obtain several key findings. For cohorts coming of age during the early 1980s recession, a temporarily higher state unemployment rate at the age of labor market entry leads to precisely estimated increases in mortality that appear in the late thirties and increase until age 50. These increases in mortality are driven to an important extent by a rise in both disease-related and "external" causes, including lung cancer, liver disease, and drug poisoning. We also find entering the labor market during a recession has a substantial impact on a broad range of measures of socioeconomic status in middle age, including a decline in marriage rates, a rise in divorce rates, and a decline in family size. We also find that after initial recovery in their mid-thirties, adversely affected entry cohorts suffer a reduction in wages and earnings as they reach their mid-forties. Finally, while all demographic groups suffer these long-term consequences, the initial impacts vary, with White people experiencing a rise in fertility and marriage and a reduction in mortality from drug deaths and heart, liver, and drug disease, while non-White people experiencing an immediate rise in mortality, no change in family formation, and a rise in poverty.

These findings suggest long-term costs of entering the labor market in a recession may be greater than previously understood in the related economic literature. In particular, our finding that adverse initial labor market conditions raise long-term mortality implies that the costs of recessions go beyond initial earnings effects documented in the literature. They confirm findings from a growing body of literature that labor market shocks more generally can have long-term consequences for health and mortality (e.g., Sullivan and von Wachter (2009); Cutler et al. (2016)). Our result that various socioeconomic outcomes also worsen in midlife further underscores that initial labor market conditions have effects that can last beyond the initial adjustment period typically studied. Moreover, mortality can be viewed as an extreme health outcome, not capturing all impacts on latent health. Our estimates are therefore likely to provide a lower bound of the full long-term health effects of initial economic conditions for the cohorts we study.

Addressing a broader literature on trends in health inequality and the relationship of socioeconomic status and health, our results provide evidence of a positive causal pathway from economic conditions to health and mortality that becomes relevant as individuals age. We find more than a decade needs to pass before these effects are measured in the data. These results suggest that some of the roots of the trends in health inequality observed in midlife and old-age might be found in earlier periods of life, consistent with evidence in Case et al. (2002) and Currie and Stabile (2003) and predictions of a life cycle models of mortality in Moreau and Lleras-Muney (2019). Mortality can be viewed as an extreme health outcome, not capturing all impacts on latent health. Hence, our estimates may provide a lower bound of the full long-term health effects of initial economic

conditions for the cohorts we study.

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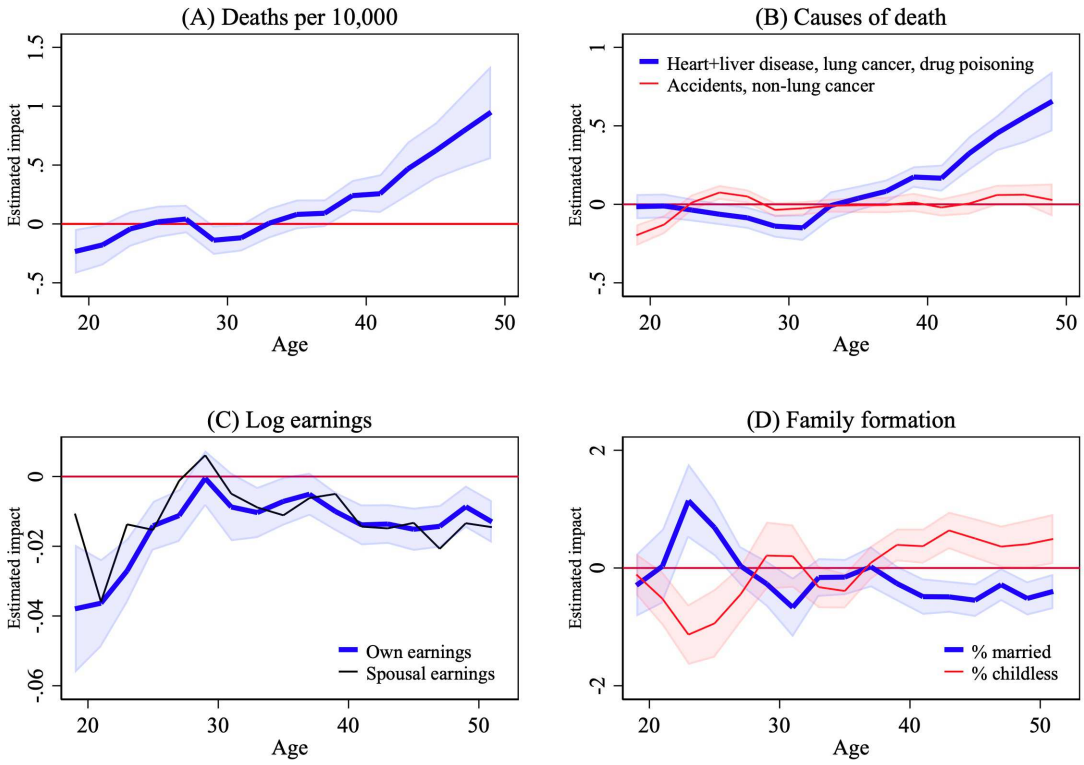
VENKATARAMANI, A. S., E. F. BAIR, R. L. O'BRIEN, AND A. C. TSAI (2020): "Association Between Automotive Assembly Plant Closures and Opioid Overdose Mortality in the United States: A Difference-in-Differences Analysis," *JAMA Internal Medicine*.

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10 Figures and Tables

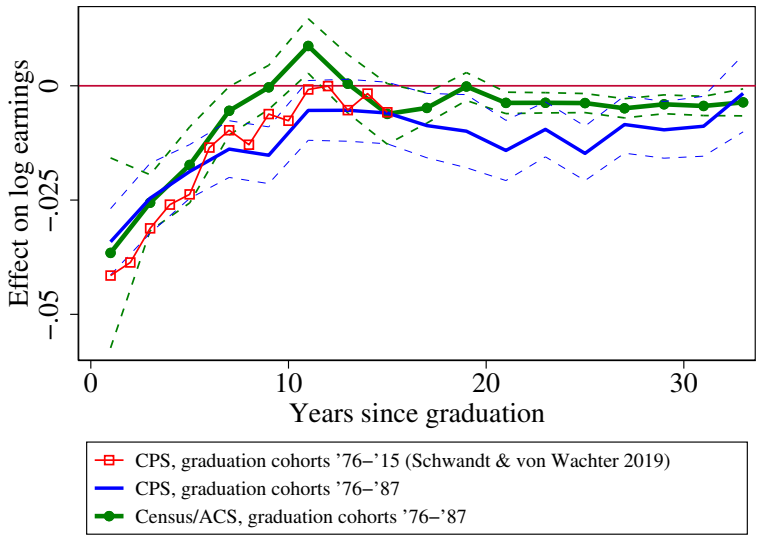
Figure 1: Effect of State Unemployment Rate at Labor Market Entry on Mortality and SES outcomes by age



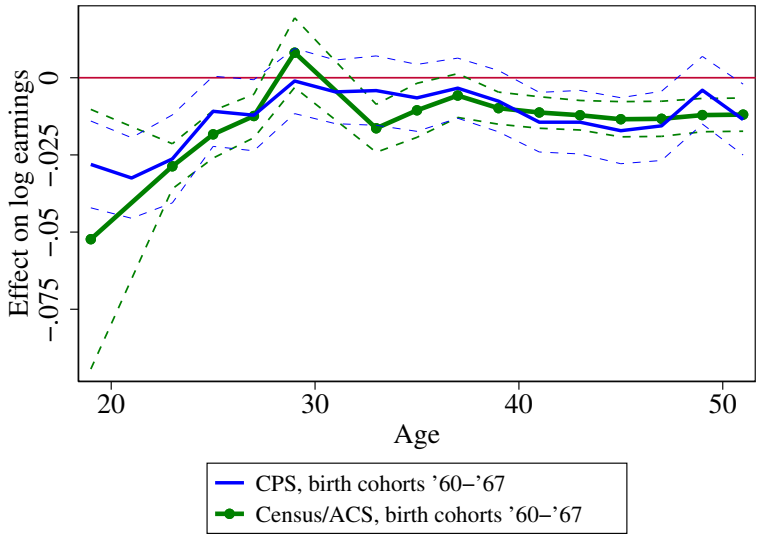
Note: This figure shows coefficients and 95 percent confidence intervals from regressions of death rates in levels (left) and in logs (right) on the double-weighted labor market entry unemployment rate interacted with 2-year age group dummies (Eq. (3)), including fixed effects for age groups, cohort, 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



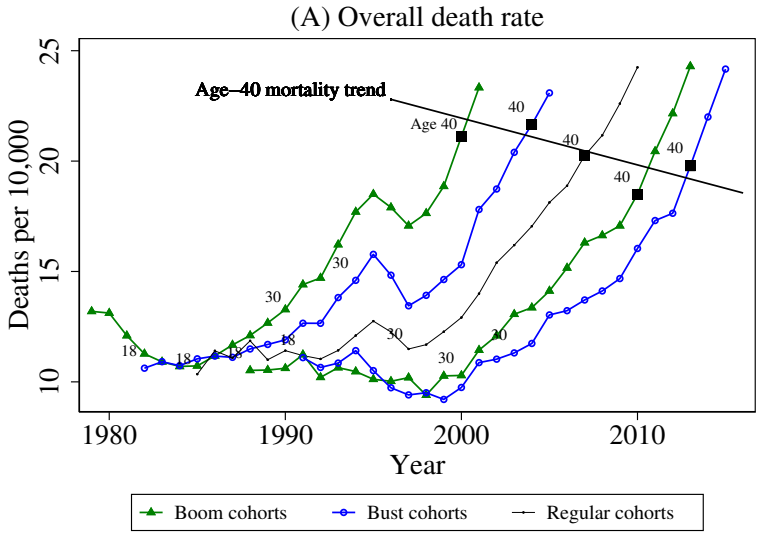
(B) Double-weighted specification — effects by age



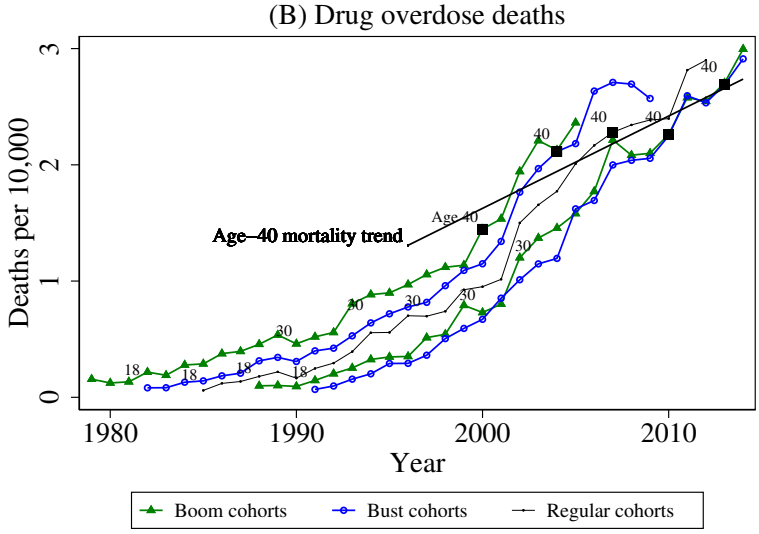
Notes: Coefficients and 95 percent confidence intervals are plotted from regressions of log earnings on labor market entry unemployment rates interacted with 2-year experience / age group dummies. Results in panel (A) and panel (B) are based on the Mincerian specification (Eq. (2)) and double-weighted 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

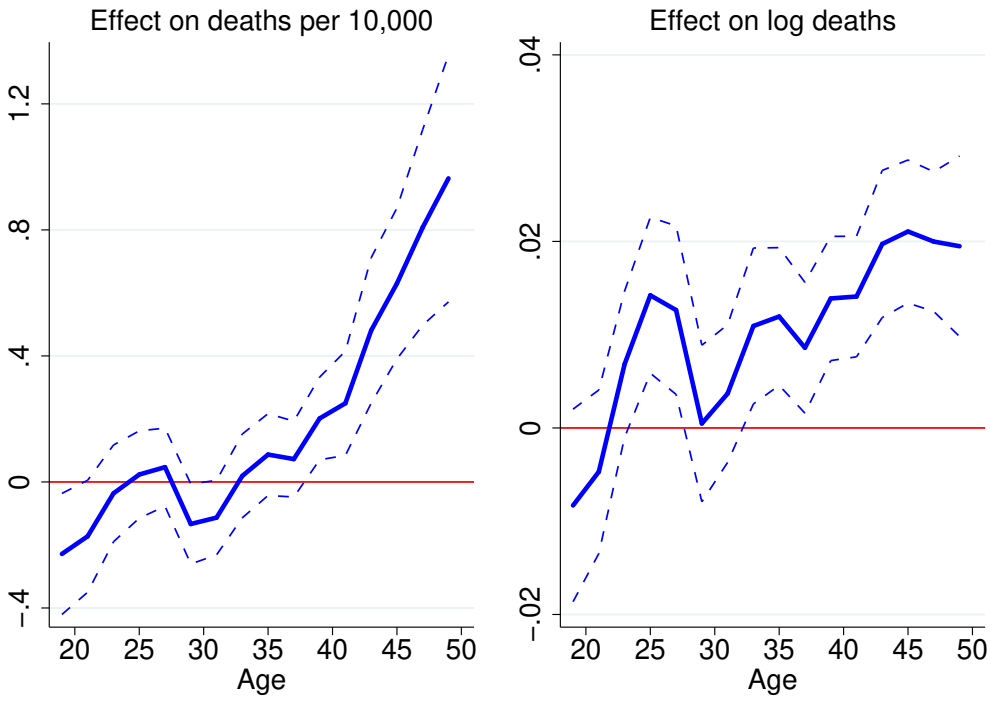


(B) Drug overdose deaths



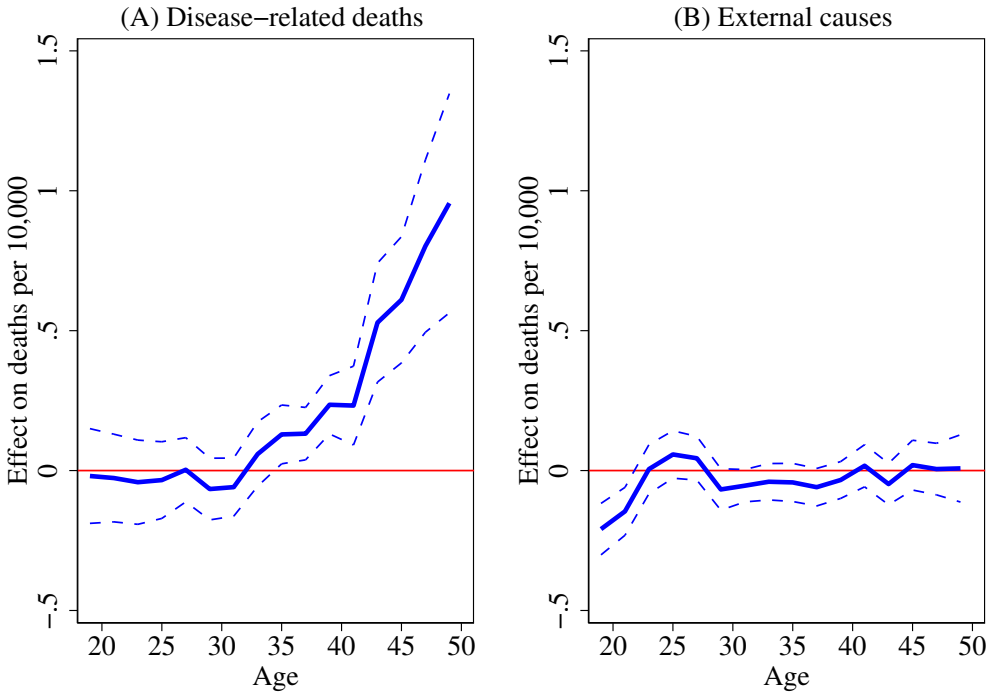
Notes: Mortality profiles from age 18 up to age 43 are shown for selected cohorts. Boom/bust/regular cohorts refer to cohorts experiencing low/high/medium national unemployment rates at age 18. Dashed red lines fitted through the mortality rates of boom cohorts at age 40. Deaths of despair include deaths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

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



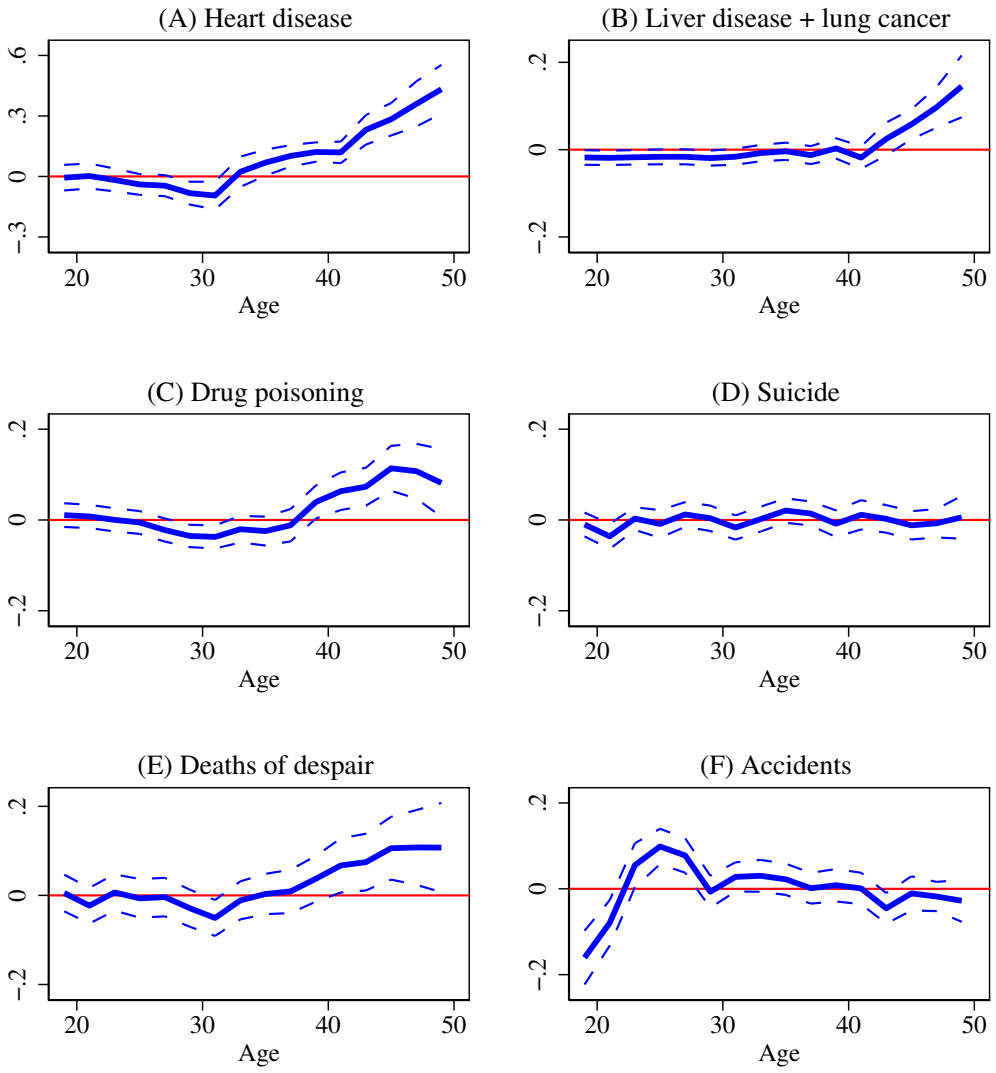
Note: This figure shows coefficients and 95 percent confidence intervals from regressions of death rates in levels (left) and in logs (right) on the double-weighted labor market entry unemployment rate interacted with 2-year age group dummies (Eq. (3)), including fixed effects for age groups, cohort, 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



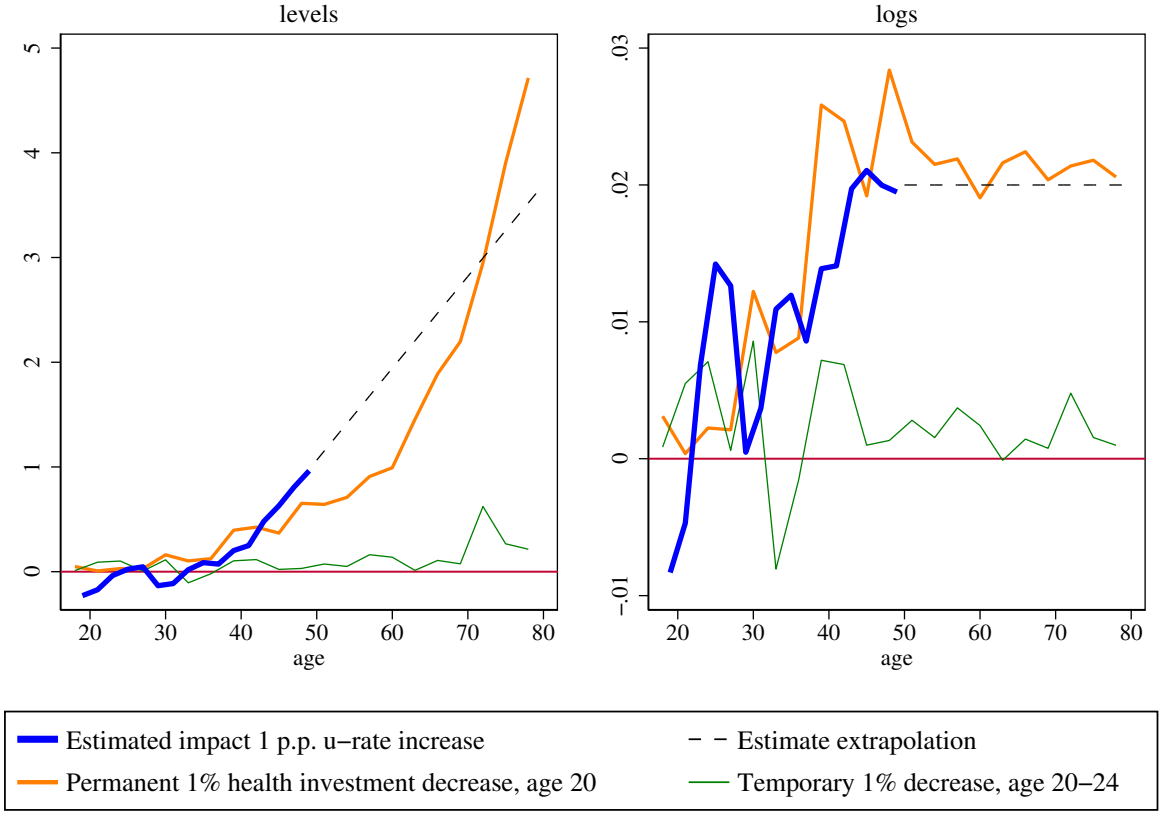
Notes: Coefficients and 95 percent confidence intervals are plotted from regressions of cause-specific death rates on the double-weighted labor market entry unemployment rate interacted with 2-year age group dummies (Eq. (3)), including fixed effects for age groups, cohort, year, and state of birth. 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)



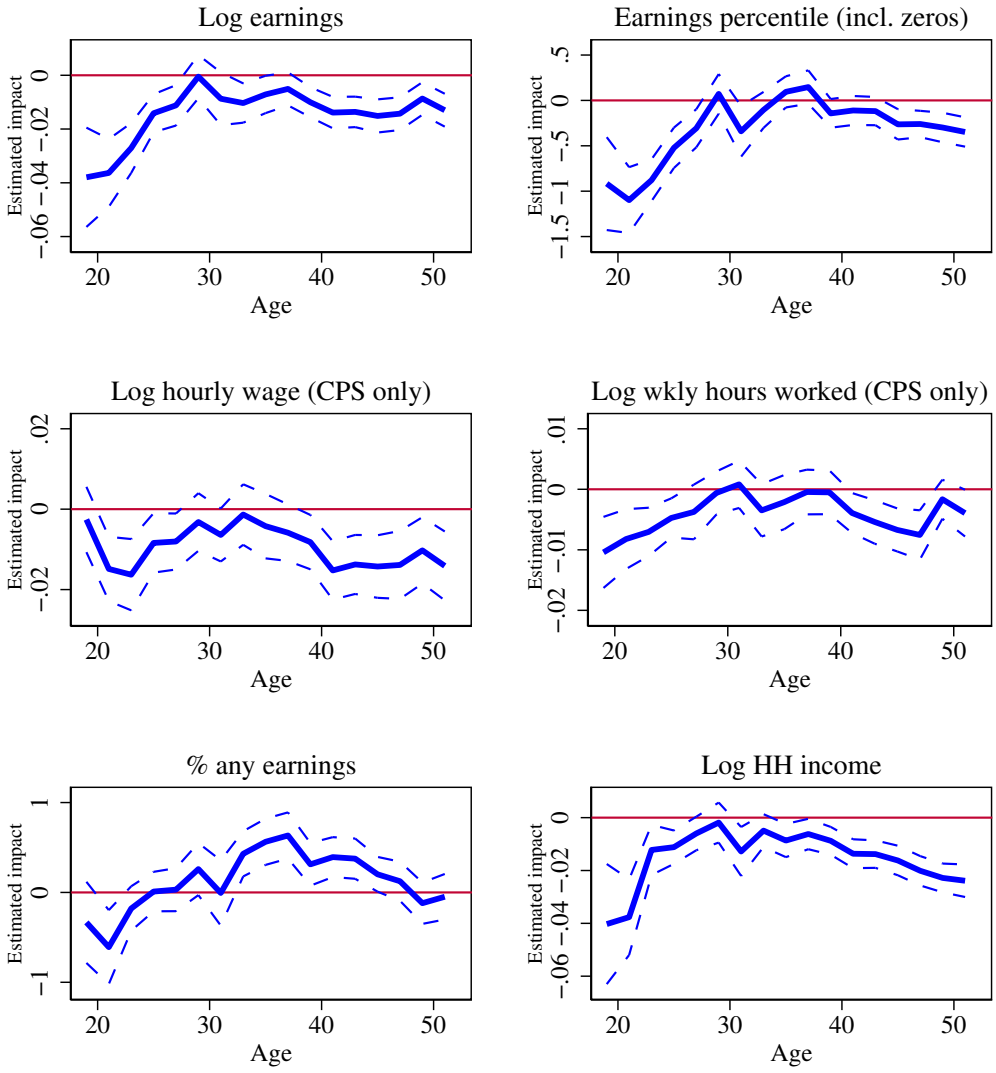
Notes: Coefficients and 95 percent confidence intervals are plotted from regressions of cause-specific death rates on the double-weighted labor market entry unemployment rate interacted with 2-year age group dummies (Eq. (3)), including fixed effects for age groups, cohort, year, and state of birth. 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 deaths, liver disease, and suicide. Further regression and sample details as in Table 4.

Figure 7: Regression Estimates in Comparison to Permanent and Temporary 1 Percent Health Investment Shocks in Simulated Mortality Model (Moreau and Lleras-Muney, 2019)



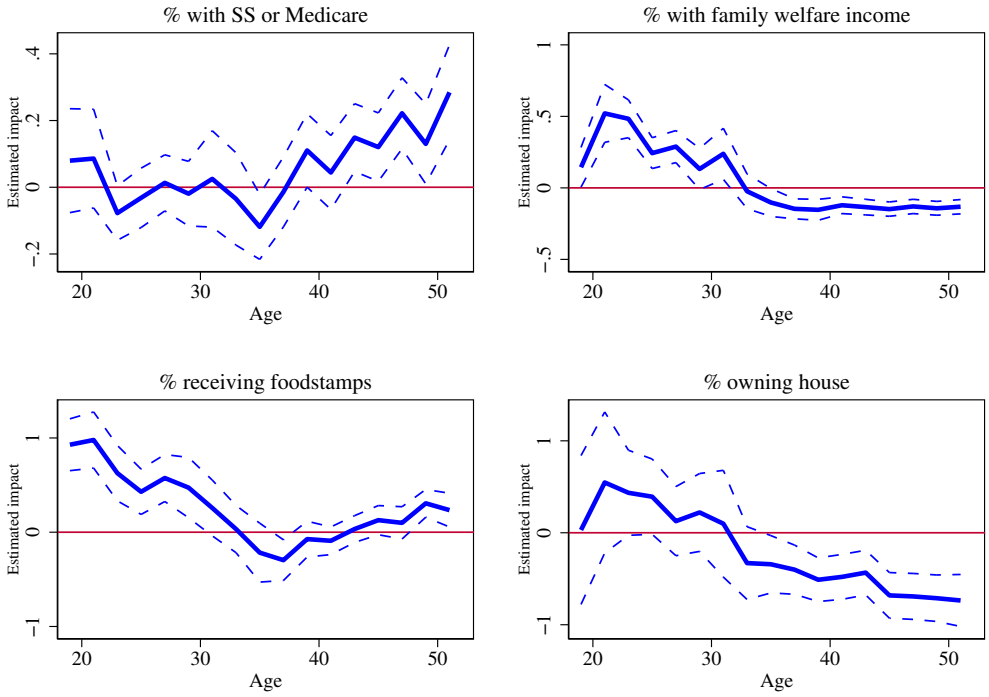
Notes: This figure compares the estimated impact of a 1 percentage point increase in the graduation year unemployment rate on mortality in levels and logs with the simulated impact of a 1 percent reduction in health investments at age 20, based on the mortality model in Moreau and Lleras-Muney (2019).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

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



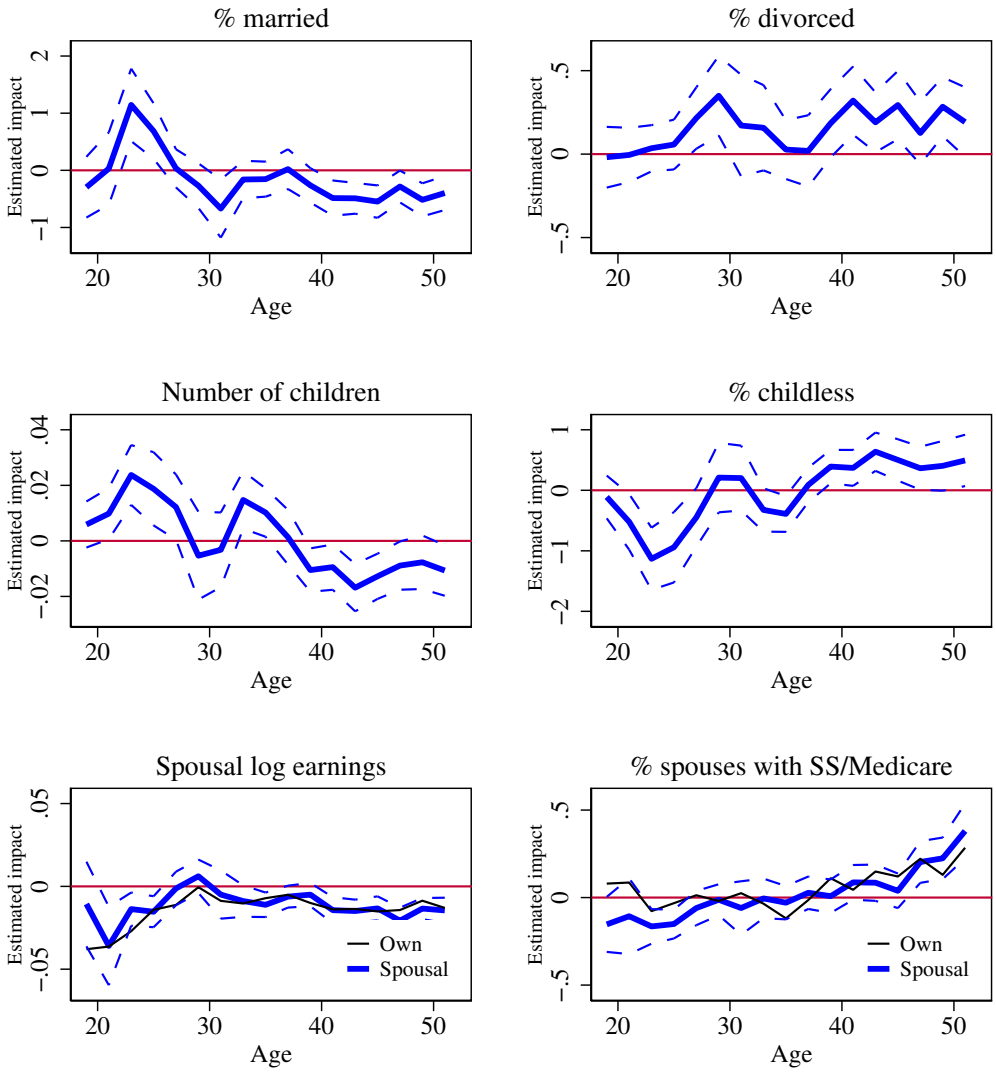
Coefficients and 95 percent confidence intervals are plotted from regressions of economic outcomes on the double-weighted labor market entry unemployment rate interacted with 2-year age group dummies (Eq. (3)), including fixed effects for age groups, cohort, year, and state of birth. Data from Census, 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 Transfers and Housing Wealth



Notes: Coefficients and 95 percent 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.

Figure 10: Effect of State Unemployment Rate at Labor Market Entry on Family Formation Outcomes



Notes: Coefficients and 95 percent 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 US 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 U.S. 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 parenthesis) 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 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 parenthesis) 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	Male	Female	Non-White	White
	(1)	(2)	(3)	(4)	(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 percent and the 10 percent 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 percent, 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)	% owning house (9)	% in poverty (10)
Age 19-29	-0.022***	-0.131	-0.009***	-0.006***	0.692***	-0.003	-0.276***	-0.018***	0.302*	0.798***
	(0.003)	(0.096)	(0.003)	(0.001)	(0.147)	(0.038)	(0.086)	(0.003)	(0.159)	(0.118)
Age 30-40	-0.008***	0.426***	-0.006**	-0.0011	0.264**	-0.007	-0.262***	-0.007***	-0.326***	0.214***
	(0.002)	(0.092)	(0.002)	(0.0012)	(0.130)	(0.035)	(0.088)	(0.002)	(0.100)	(0.067)
Age 41-52	-0.013***	0.156**	-0.014***	-0.005***	0.322**	0.155***	0.197**	-0.018***	-0.618***	0.286***
	(0.002)	(0.078)	(0.003)	(0.001)	(0.130)	(0.037)	(0.089)	(0.002)	(0.096)	(0.064)
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	63.30	10.57
R^2	0.913	0.411	0.847	0.603	0.453	0.380	0.355	0.844	0.898	0.533

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 parenthesis) 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 (1)	% divorced (2)	Number of children (3)	% childless (4)	% with family welfare income (5)	% receiving foodstamps (6)	Spousal minus own education (7)	Spousal log earnings (8)	% with spousal SS/ Medicare (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 parenthesis) 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	-0.024***	-0.017***	**-0.037***	**-0.019***	**-0.025***	**-0.009***
		(0.004)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)
Age 30-40		*-0.009***	*-0.003*	-0.0009	-0.008***	**-0.009***	**0.0012**
		(0.002)	(0.003)	(0.0042)	(0.002)	(0.003)	(0.0022)
Age 41-52		*-0.016***	*-0.009***	**0.0006**	**-0.016***	**-0.014***	**-0.004****
		(0.003)	(0.003)	(0.0038)	(0.003)	(0.002)	(0.002)
Mean dep. var.		10.17	9.68	9.69	9.98	9.61	10.24
Dep. var.: % any earnings							
Age 19-29		0.002	-0.224*	**-0.518****	**-0.079**	-0.203**	-0.030
		(0.115)	(0.131)	(0.225)	(0.091)	(0.084)	(0.079)
Age 30-40		0.365***	0.466***	0.502***	0.352***	0.166*	0.085
		(0.089)	(0.133)	(0.189)	(0.088)	(0.089)	(0.079)
Age 41-52		**-0.025**	**0.302*****	**0.455****	**0.042**	0.020	0.042
		(0.085)	(0.107)	(0.181)	(0.080)	(0.080)	(0.064)
Mean dep. var.		84.71	76.14	75.01	81.73	75.34	84.34
Dep. var.: log hourly wage (CPS only)							
Age 19-29		-0.011***	-0.006*	**-0.018***	**-0.006****	**-0.011***	**-0.005****
		(0.003)	(0.003)	(0.004)	(0.003)	(0.002)	(0.002)
Age 30-40		-0.006**	-0.002	-0.004	-0.003	-0.003	-0.003
		(0.003)	(0.003)	(0.004)	(0.002)	(0.002)	(0.002)
Age 41-52		**-0.018***	**-0.008****	-0.008*	-0.013***	-0.011***	-0.007***
		(0.003)	(0.003)	(0.005)	(0.003)	(0.003)	(0.002)
Mean dep. var.		2.59	2.35	2.31	2.51	2.25	2.71
Dep. var.: log HH income							
Age 19-29		-0.018***	-0.016***	**-0.031***	**-0.016***	**-0.018***	**-0.002**
		(0.004)	(0.004)	(0.005)	(0.004)	(0.003)	(0.002)
Age 30-40		-0.009***	-0.004	-0.002	-0.008***	**-0.008***	**0.005*****
		(0.002)	(0.003)	(0.004)	(0.002)	(0.002)	(0.002)
Age 41-52		-0.020***	-0.016***	**-0.009****	**-0.021***	**-0.016***	**-0.003**
		(0.003)	(0.003)	(0.004)	(0.002)	(0.002)	(0.002)
Mean dep. var.		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 percent and the 10 percent 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	Male	Female	Non-White	White	<= 12 yrs	>12 yrs
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dep. var.: % married							
Age 19-29	0.435**	0.282	**-0.280**	**0.426****	**-0.157**	**0.627*****
		(0.196)	(0.232)	(0.248)	(0.195)	(0.128)	(0.162)
Age 30-40	-0.164	-0.148	0.036	-0.244**	*-0.165**	*0.089*
		(0.116)	(0.135)	(0.200)	(0.099)	(0.093)	(0.112)
Age 41-52	-0.517***	-0.354***	**-0.099**	**-0.573*****	-0.247***	-0.111
		(0.124)	(0.126)	(0.197)	(0.108)	(0.096)	(0.094)
Mean dep. var.	54.54	58.52	42.75	60.37	50.78	62.77
Dep. var.: % divorced							
Age 19-29	0.164**	0.004	**-0.225***	**0.199*****	**0.126****	**-0.100***
		(0.071)	(0.080)	(0.128)	(0.059)	(0.058)	(0.060)
Age 30-40	**0.301*****	**-0.109**	-0.069	0.166**	**0.125***	**-0.107**
		(0.081)	(0.091)	(0.146)	(0.070)	(0.075)	(0.077)
Age 41-52	**0.410*****	**0.031**	0.116	0.281***	**0.241*****	**-0.054**
		(0.078)	(0.079)	(0.123)	(0.064)	(0.072)	(0.060)
Mean dep. var.	12.86	16.43	16.69	14.16	16.46	13.74
Dep. var.: number of children							
Age 19-29	**0.008****	**0.018*****	**0.003**	**0.016*****	-0.0002	0.006*
		(0.004)	(0.005)	(0.005)	(0.004)	(0.0025)	(0.004)
Age 30-40	0.0014	0.0008	-0.002	0.0014	-0.003	0.0006
		(0.0032)	(0.0038)	(0.005)	(0.0032)	(0.003)	(0.0028)
Age 41-52	-0.010***	-0.011**	-0.017***	-0.010***	**0.0001**	**-0.011*****
		(0.004)	(0.004)	(0.005)	(0.004)	(0.0025)	(0.003)
Mean dep. var.	0.90	1.13	1.00	1.03	0.89	1.04
Dep. var.: % with SS or Medicare							
Age 19-29	-0.008	-0.007	0.040	-0.011	0.054*	-0.007
		(0.045)	(0.048)	(0.066)	(0.039)	(0.031)	(0.036)
Age 30-40	-0.014	-0.014	-0.010	-0.010	0.005	-0.045
		(0.043)	(0.050)	(0.080)	(0.036)	(0.037)	(0.035)
Age 41-52	0.185***	0.112**	0.120	0.160***	**0.158*****	**-0.004**
		(0.046)	(0.047)	(0.079)	(0.037)	(0.038)	(0.035)
Mean dep. var.	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

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

		Control for 15 division FEs		Control for current conditions		Use average
	Baseline	# cohort trends	# cohort FEs	unempl. rate	manufact. share	unempl. rate 18-22
	(1)	(2)	(3)	(4)	(5)	(6)
Dep. var.: log earnings						
Age 19-29	-0.022***	-0.017***	-0.017***	-0.021***	-0.024***	-0.015***
	(0.003)	(0.004)	(0.004)	(0.003)	(0.003)	(0.002)
Age 30-40	-0.008***	-0.010***	-0.010***	-0.011***	-0.010***	-0.008***
	(0.002)	(0.004)	(0.004)	(0.002)	(0.002)	(0.002)
Age 41-52	-0.013***	-0.005	-0.005	-0.013***	-0.012***	-0.010***
	(0.002)	(0.004)	(0.004)	(0.002)	(0.002)	(0.002)
Dep. var.: log HH income						
Age 19-29	-0.018***	-0.019***	-0.019***	-0.020***	-0.019***	-0.009***
	(0.003)	(0.005)	(0.005)	(0.004)	(0.004)	(0.002)
Age 30-40	-0.007***	-0.015***	-0.015***	-0.010***	-0.009***	-0.005***
	(0.002)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)
Age 41-52	-0.018***	-0.017***	-0.017***	-0.016***	-0.018***	-0.013***
	(0.002)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)
Dep. var.: % married						
Age 19-29	0.343*	0.468**	0.468**	0.120	0.498**	0.351**
	(0.199)	(0.200)	(0.200)	(0.224)	(0.199)	(0.139)
Age 30-40	-0.173*	-0.232	-0.232	0.020	-0.204**	-0.204**
	(0.097)	(0.168)	(0.167)	(0.109)	(0.099)	(0.080)
Age 41-52	-0.437***	-0.645***	-0.645***	-0.411***	-0.452***	-0.423***
	(0.106)	(0.158)	(0.157)	(0.123)	(0.109)	(0.081)
Dep. var.: % childless						
Age 19-29	-0.632***	-0.993***	-0.993***	-0.424*	-0.813***	-0.585***
	(0.188)	(0.214)	(0.214)	(0.228)	(0.188)	(0.137)
Age 30-40	0.004	-0.060	-0.060	-0.441***	0.063	0.039
	(0.093)	(0.161)	(0.161)	(0.098)	(0.099)	(0.077)
Age 41-52	0.443***	0.788***	0.788***	0.580***	0.331**	0.498***
	(0.141)	(0.166)	(0.166)	(0.168)	(0.142)	(0.109)
Dep. var.: % with SS or Medicare						
Age 19-29	-0.003	-0.058	-0.058	0.042	0.003	-0.031
	(0.038)	(0.073)	(0.073)	(0.037)	(0.038)	(0.031)
Age 30-40	-0.007	0.005	0.005	-0.028	0.018	-0.024
	(0.035)	(0.070)	(0.070)	(0.039)	(0.035)	(0.028)
Age 41-52	0.155***	0.365***	0.365***	0.125***	0.169***	0.110***
	(0.037)	(0.079)	(0.079)	(0.038)	(0.037)	(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

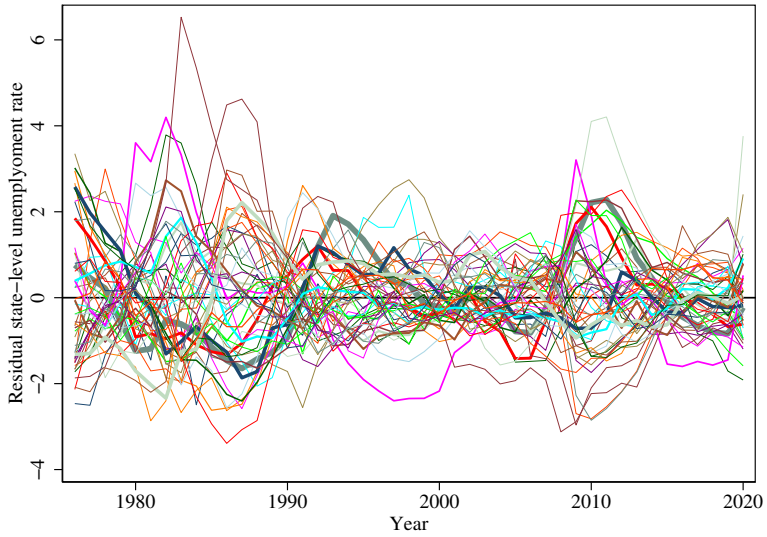
11 Sample Weights

The analysis of socioeconomic outcomes combines three different population surveys and there are alternative ways 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 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.2 and results using these weights are shown in Appendix Table A.3.

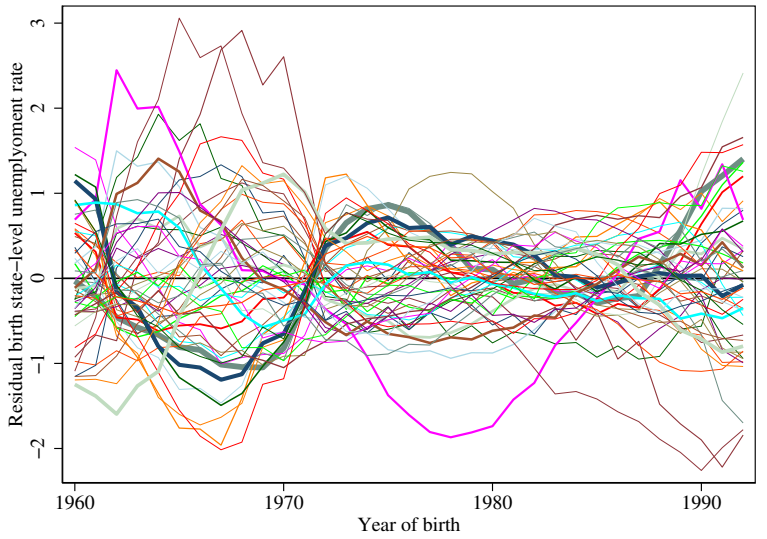
12 Appendix Figures

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

(A) State-level unemployment rate

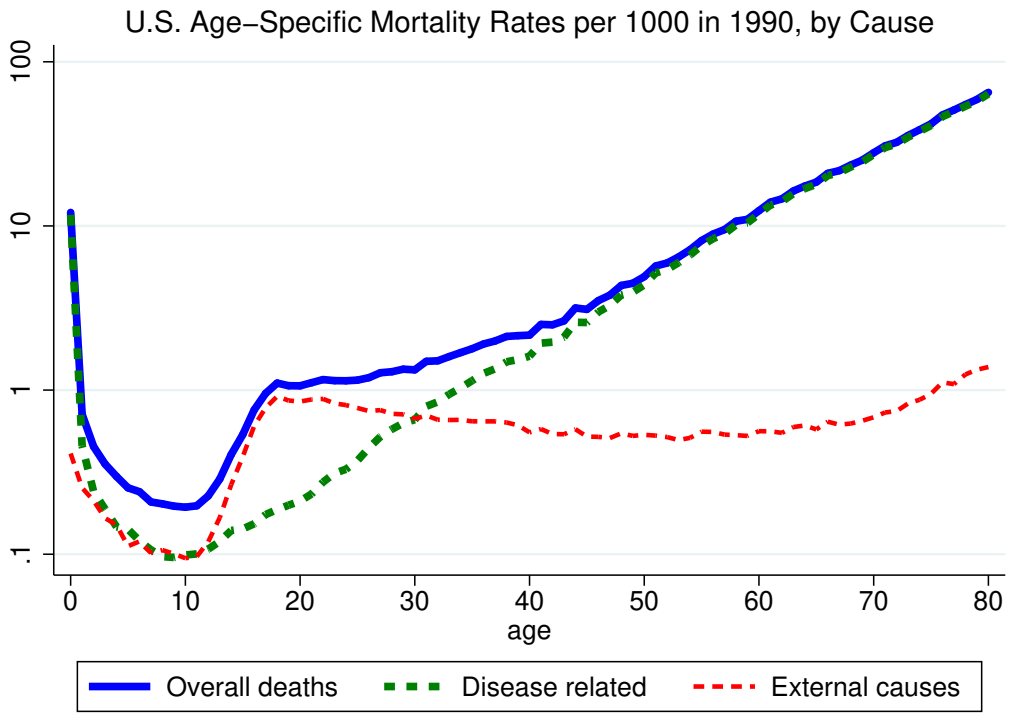


(B) Double-weighted graduation year unemployment rate



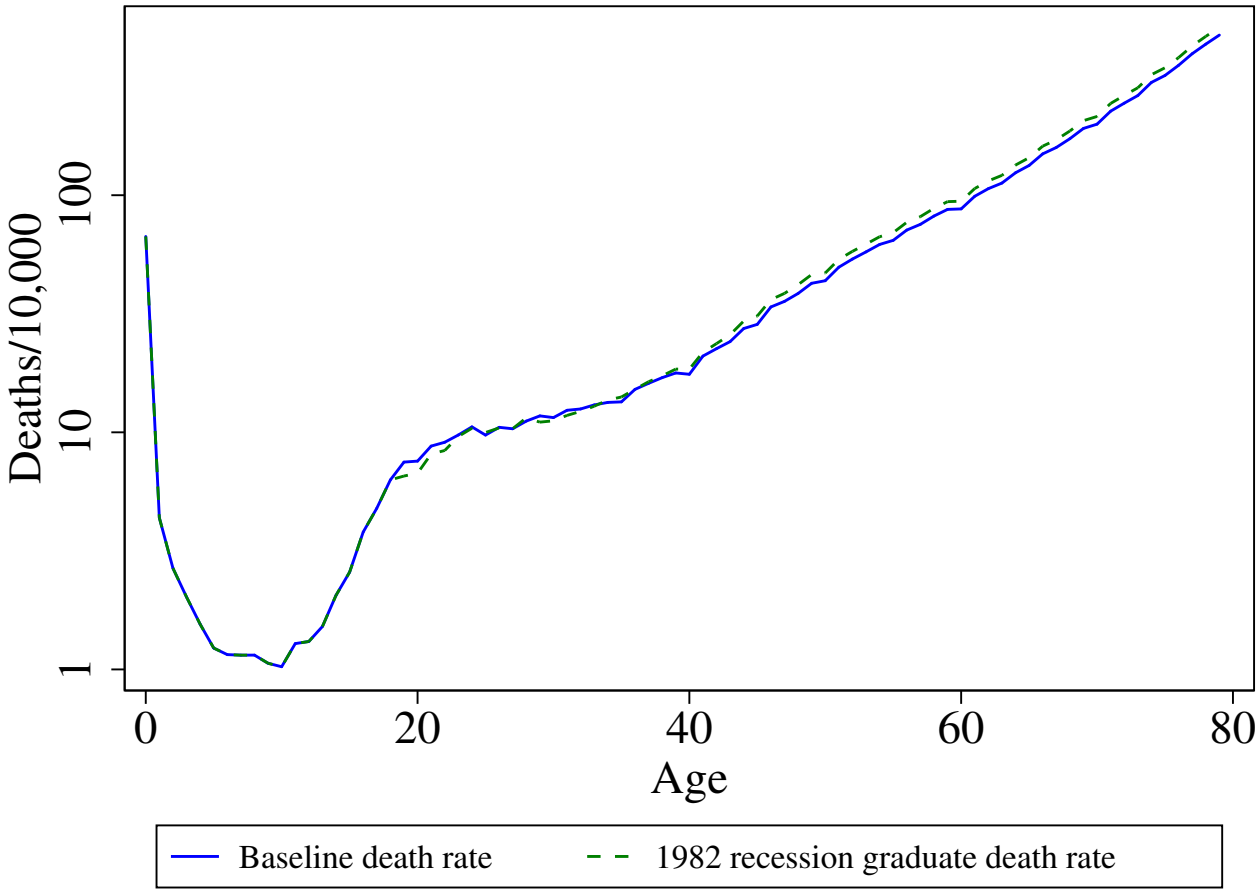
Notes: State-level unemployment rates as deviations from state and year means are plotted. Line width is proportional to state population. The double-weighted graduation year unemployment rate refers to the average unemployment rate across cohorts' typical graduation ages and across the states to which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

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



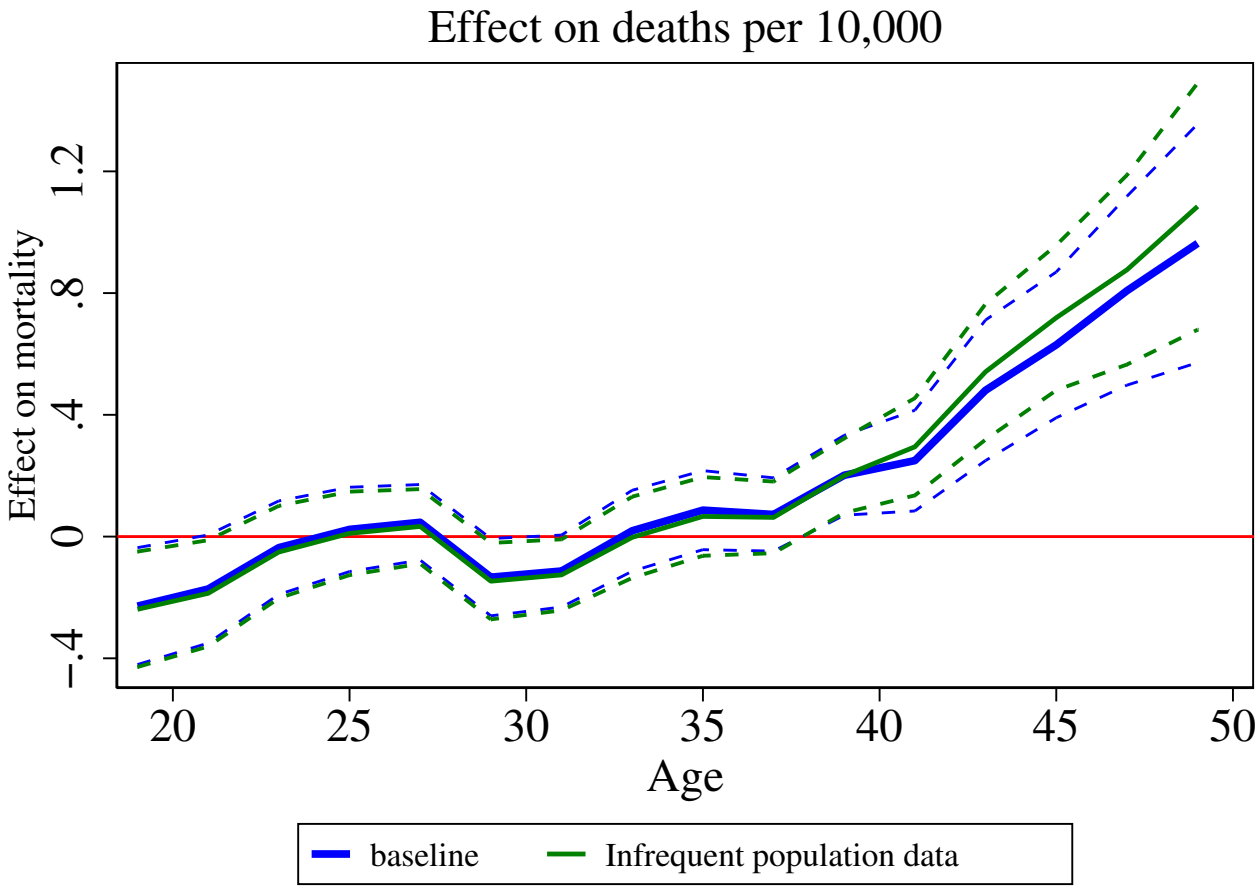
Notes: life-cycle mortality profiles are shown by cause, based on Vital Stats and Census data for 1990. External causes include all deaths that are not disease-related.

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



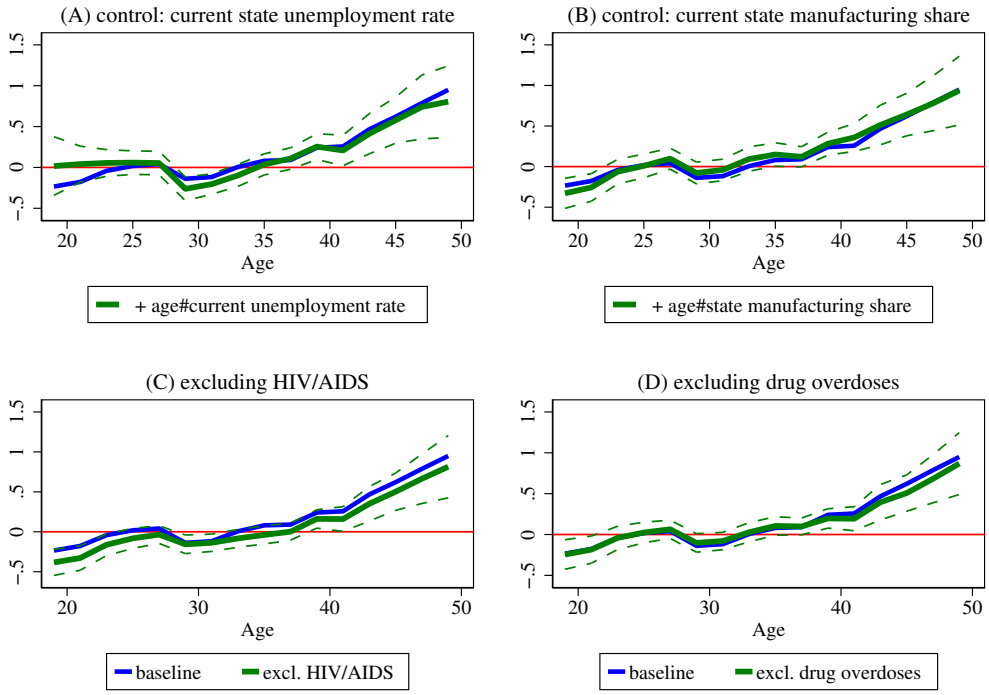
Notes: Baseline death rate calculated based on cross-sectional mortality data for 2010. The Great Recession–graduate death rate is constructed by adding the effect of a five percentage point increase in the graduation year unemployment rate. A constant 2 percent effect is assumed for ages above age 50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

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



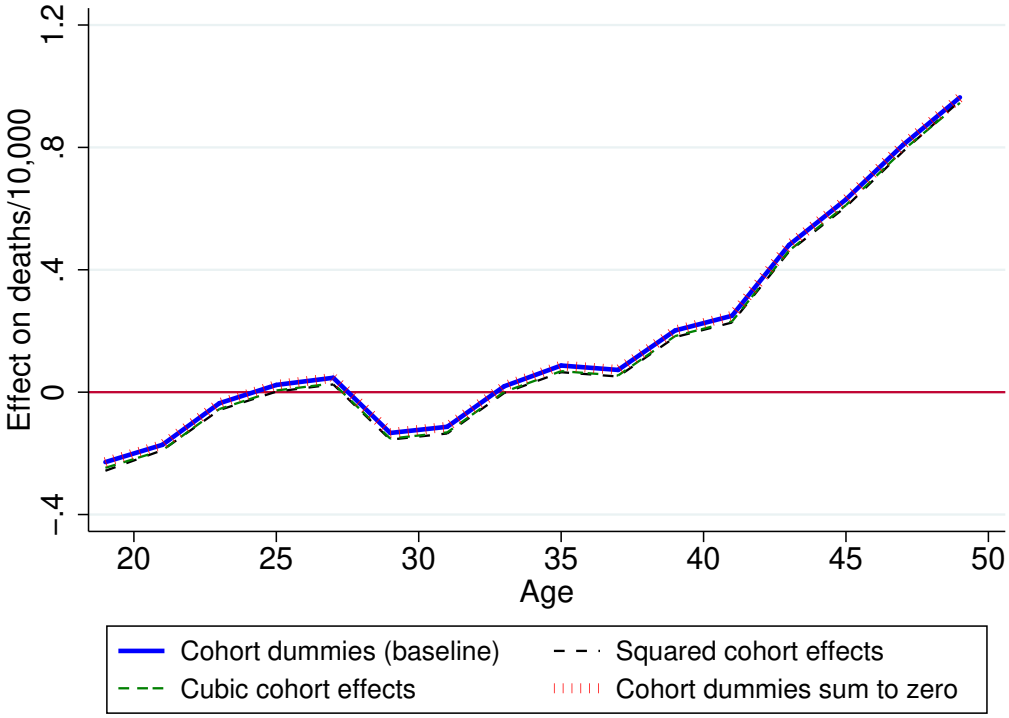
Notes: The blue line shows baseline results based on mortality rates using population estimates derived from the 1990, 2000, and 2010 Census as well as the 2001-2016 American Community Survey. The green line shows results that do not use the 2001-2015 American Community Survey.

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



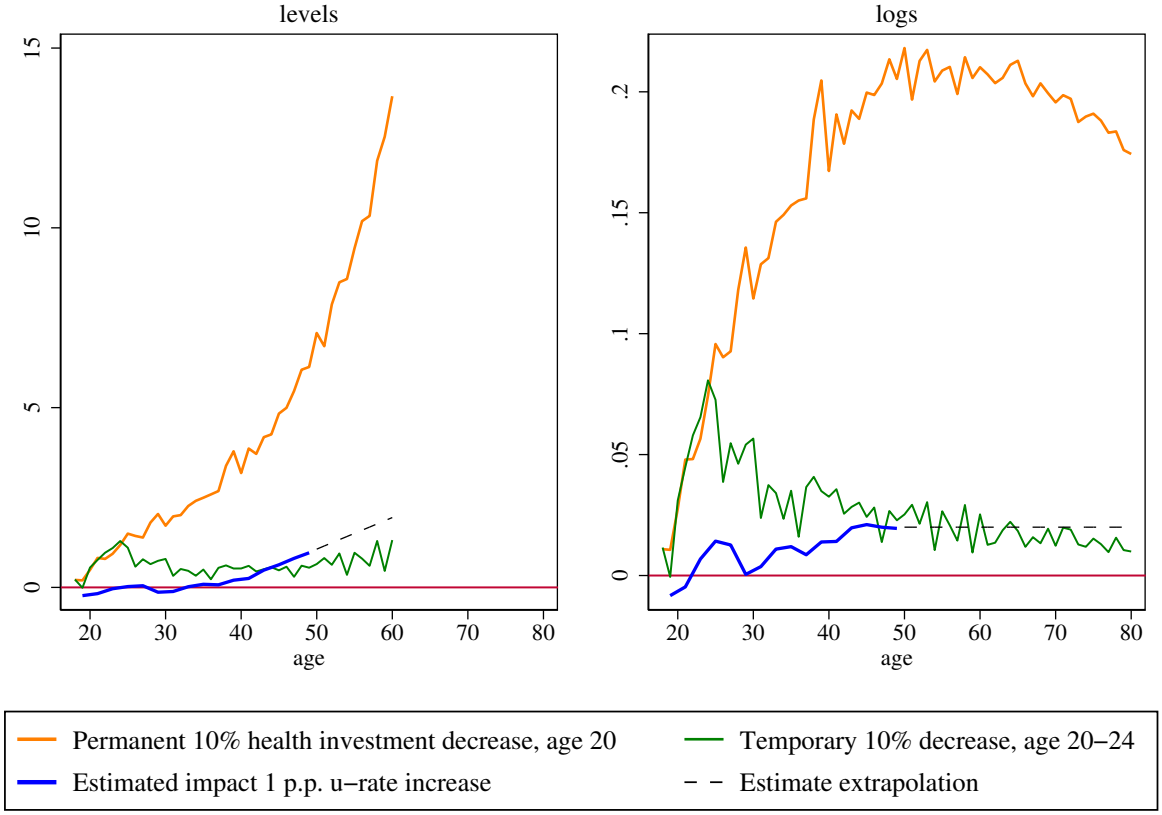
Notes: Specifications in Panel (A) and (B) include age fixed effects interacted with the current state-level unemployment rate and the current state-level manufacturing employment share, respectively. Panels (C) and (D) shows specifications that exclude HIV/AIDS deaths and deaths of despair, respectively.

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)).

Figure A.7: Regression Estimates in Comparison to Permanent and Temporary 10 Percent 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 10 percent 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 10 percent reduction starting at age 20 and lasting for the rest of life. The green line shows a temporary 10 percent reduction, lasting from age 20–24. The dashed line shows estimate extrapolations that are used in Table 7.

13 Appendix Tables

Table A.1: Effects of State Unemployment Rate at Labor Market Entry on Poverty, Welfare, and Disability 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.: % in poverty							
Age 19-29	0.772***	0.752***	**1.612*****	**0.658*****	**0.587*****	**-0.013**
		(0.153)	(0.154)	(0.243)	(0.117)	(0.167)	(0.092)
Age 30-40	0.226**	0.133	*-0.071*	*0.253****	**0.159**	**-0.081**
		(0.091)	(0.089)	(0.173)	(0.068)	(0.102)	(0.056)
Age 41-52	*0.381****	*0.191***	0.107	0.341***	**0.320*****	**-0.007**
		(0.090)	(0.081)	(0.159)	(0.067)	(0.091)	(0.053)
Mean dep. var.		8.65	12.33	19.93	8.03	15.04	5.33
Dep. var.: % with family welfare income							
Age 19-29	**0.145*****	**0.426*****	**0.844*****	**0.198*****	**0.185*****	**0.060*****
		(0.028)	(0.061)	(0.143)	(0.032)	(0.045)	(0.023)
Age 30-40	-0.063***	-0.072	-0.109	-0.047**	-0.022	-0.011
		(0.022)	(0.048)	(0.100)	(0.023)	(0.037)	(0.022)
Age 41-52	**-0.055*****	**-0.185*****	**-0.321*****	**-0.072*****	-0.055**	-0.030*
		(0.016)	(0.037)	(0.089)	(0.019)	(0.027)	(0.016)
Mean dep. var.		1.06	3.81	5.52	1.64	3.41	0.96
Dep. var.: % receiving foodstamps							
Age 19-29	0.552***	0.754***	**1.579*****	**0.454*****	**0.432*****	**0.021**
		(0.095)	(0.117)	(0.217)	(0.078)	(0.084)	(0.051)
Age 30-40	-0.068	-0.125	-0.351	-0.052	-0.064	-0.081
		(0.093)	(0.100)	(0.219)	(0.072)	(0.095)	(0.049)
Age 41-52	0.188**	0.076	**-0.169**	**0.197*****	0.123*	0.059
		(0.075)	(0.078)	(0.152)	(0.056)	(0.071)	(0.039)
Mean dep. var.		6.68	9.60	16.53	5.87	12.33	3.93
Dep. var.: % with work disability (CPS only)							
Age 19-29	-0.225*	-0.310***	-0.149	-0.268***	-0.043	-0.170**
		(0.118)	(0.103)	(0.182)	(0.096)	(0.097)	(0.077)
Age 30-40	*-0.130*	*-0.407****	-0.193	-0.275***	0.013	-0.167**
		(0.118)	(0.116)	(0.173)	(0.091)	(0.098)	(0.071)
Age 41-52	**0.363*****	**0.036**	-0.020	0.228**	0.171*	-0.010
		(0.128)	(0.101)	(0.174)	(0.096)	(0.102)	(0.074)
Mean dep. var.		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.2: 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
Survey weights across years, observation weights within years	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.3: Effect on Socioeconomic Outcomes with Alternative Weights

	Baseline weight (1)	Observation weight (2)	Equal survey weight (3)	CPS only weight (4)
A. Labor market outcomes				
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

Continuation of Table A.3

	Baseline weight (1)	Observation weight (2)	Equal survey weight (3)	CPS only weight (4)
	[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
B. Household finances and transfers				
Dep. var.: Log household income				
Age 19-29	-0.018***	-0.019***	-0.017***	-0.015***
	[0.003]	[0.004]	[0.004]	[0.004]
Age 30-40	-0.007***	-0.002	0.000	0.003
	[0.002]	[0.003]	[0.003]	[0.004]
Age 41-52	-0.018***	-0.008***	-0.011***	-0.015***
	[0.002]	[0.003]	[0.003]	[0.004]
R^2	0.844	0.832	0.811	0.796
Dep. var.: Owning house (percent)				
Age 19-29	0.302*	0.452**	0.472**	0.466**
	[0.159]	[0.207]	[0.203]	[0.211]
Age 30-40	-0.326***	-0.301*	-0.258	-0.203
	[0.100]	[0.162]	[0.164]	[0.186]
Age 41-52	-0.618***	-0.835***	-0.727***	-0.562***
	[0.096]	[0.156]	[0.153]	[0.180]
R^2	0.898	0.885	0.877	0.870
Dep. var.: With family welfare income (percent)				
Age 19-29	0.314***	0.350***	0.368***	0.387***
	[0.035]	[0.059]	[0.057]	[0.057]
Age 30-40	-0.070**	-0.042	-0.034	-0.027
	[0.028]	[0.055]	[0.054]	[0.057]
Age 41-52	-0.132***	-0.185***	-0.183***	-0.184***
	[0.021]	[0.045]	[0.044]	[0.046]
R^2	0.443	0.351	0.379	0.407
Dep. var.: With Social Security income or Medicare (percent)				
Age 19-29	-0.003	0.106**	0.072	0.030

Continuation of Table A.3

	Baseline weight (1)	Observation weight (2)	Equal survey weight (3)	CPS only weight (4)
	[0.038]	[0.046]	[0.051]	[0.063]
Age 30-40	-0.007	0.017	-0.003	-0.024
	[0.035]	[0.041]	[0.053]	[0.072]
Age 41-52	0.155***	0.107***	0.146***	0.198**
	[0.037]	[0.036]	[0.051]	[0.080]
R^2	0.380	0.348	0.342	0.333

C. Family formation

Dep. var.: Married (percent)				
Age 19-29	0.343*	0.032	0.074	0.106
	[0.199]	[0.207]	[0.209]	[0.228]
Age 30-40	-0.173*	-0.232*	-0.187	-0.143
	[0.097]	[0.119]	[0.138]	[0.186]
Age 41-52	-0.437***	-0.358**	-0.474***	-0.604***
	[0.106]	[0.143]	[0.153]	[0.203]
R^2	0.841	0.848	0.825	0.804
Dep. var.: Number of children				
Age 19-29	0.014***	0.006	0.007	0.008
	[0.004]	[0.004]	[0.004]	[0.005]
Age 30-40	0.002	0.002	0.003	0.005
	[0.003]	[0.003]	[0.004]	[0.005]
Age 41-52	-0.011***	-0.011***	-0.015***	-0.020***
	[0.004]	[0.004]	[0.005]	[0.006]
R^2	0.864	0.877	0.851	0.825
Dep. var.: Childless (percent)				
Age 19-29	-0.632***	-0.317*	-0.341*	-0.368*
	[0.188]	[0.184]	[0.191]	[0.211]
Age 30-40	0.004	0.057	0.008	-0.052
	[0.093]	[0.120]	[0.131]	[0.164]

Continuation of Table A.3

	Baseline weight (1)	Observation weight (2)	Equal survey weight (3)	CPS only weight (4)
Age 41-52	0.443***	0.497***	0.618***	0.782***
	[0.141]	[0.174]	[0.190]	[0.237]
R^2	0.866	0.880	0.853	0.827
Dep. var.: Spousal education minus own education				
Age 19-29	-0.014**	-0.028***	-0.026***	-0.025***
	[0.006]	[0.008]	[0.008]	[0.009]
Age 30-40	-0.011**	-0.019***	-0.016**	-0.013
	[0.004]	[0.006]	[0.007]	[0.008]
Age 41-52	-0.012***	-0.017***	-0.018***	-0.019**
	[0.004]	[0.005]	[0.006]	[0.008]
R^2	0.044	0.048	0.039	0.034