Locate Your Nearest Exit: Mass Layoffs and Local Labor Market Response

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Abstract

Large shocks to local labor markets cause lasting changes to communities and their residents. In this paper, we examine four main components through which individuals exit the local labor force following large labor demand shocks: in-migration, out-migration, retirement, and enrollment in disability insurance. First, we document the magnitude of the response through these channels after a mass layoff event showing that, primarily through migration, they account for roughly three-fourths of labor force reductions. Additionally, we explore the residual difference between these channels and the labor force change, which we argue is due to labor force non-participation by individuals. We find that this residual is larger in the period following the Great Recession, which highlights the growing importance of non-participation as a response to labor demand shocks. Finally, we find evidence that mass layoff events cause individuals to undertake long-distance migration rather than migration to adjacent counties.

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1 Introduction

Over the course of the Great Recession, rates of job loss in the United States reached record highs. As the recovery continues, understanding the nature and speed of labor market adjustment is more important than ever. At the national level, much of the public attention and media coverage has been on overall levels of job creation and economic activity. Variation across local areas in the depth of the downturn points to a need to focus the policy discussion on re-allocating workers to jobs. Well-known work by Blanchard and Katz (1992) originally emphasized the importance of labor mobility in this adjustment process: local unemployment rates are primarily driven by workers moving to areas where there are more jobs, as opposed to local job creation. During the Great Recession, reports of significantly reduced mobility (Frey 2009) have added to concerns that housing market factors and low mobility may prolong recovery time.

In this paper, we examine the relationship between negative local labor market shocks—many of which occurred during the recent recession—and labor force changes. Specifically, we ask whether, and to what extent, internal migration and other exits from the local labor force follow negative shocks and facilitate adjustments in an area's labor supply. We measure changes in county population, labor force, migration, retirement and disability insurance enrollment that occur following large layoff events.

There are various benefits to use mass layoffs as the measure of local labor demand shocks. First, we avoid some of the endogeneity of local unemployment rates with respect to changes in labor supply and migration patterns. Second, the mass layoffs afford us the opportunity to analyze responses to local labor demand shocks that are discrete and do not occur over the course of several years. Relatedly, since mass layoffs are defined as the permanent release of at least 50 workers from a single establishment, they represent a permanent and concentrated shock to local labor demand.

We first measure the net change in the size of the local labor force in response to a mass layoff. There are a variety of causes for these labor force changes, we focus on four main channels of labor market exit—in-migration, out-migration, enrollment disability insurance, and retirement—and we estimate the relative importance of these channels as a exits from the labor force. These four exit channels jointly account for most of the observed net changes in labor force, and we argue that the residual is mainly composed of exits due to labor force non-participation. We show that while migration is the predominant channel of labor force exit, non-participation grew in importance during the Great Recession.

This paper makes several contributions to the literature. First, we unify and update observations about labor market adjustments following local labor market exit, and compare the relative importance of these channels. Second, we directly measure the role of migration as an adjustment mechanism in the aftermath of significant mass layoffs affecting an area's residents. While the relationship between unemployment rates and migration has been studied extensively, we are the first to directly and systematically link mass layoff events to mobility into and out of local areas. Finally, we document the rising importance of non-participation following local labor demand shocks in recent years, and discuss potential reasons for that change.

The remainder of this paper is organized as follows. First, in Section 2 we discuss the prior literature on labor demand shocks and labor market exit. In Section 3, we discuss the data sets that we use and present summary statistics, while in Section 4 we present our decomposition of net labor force changes, and discuss our estimation strategy. In Section 5, we present our reduced form estimates, and discuss our estimates of the non-participation channel. Finally, Section 6 concludes.

2 Literature Review

There is a substantial literature on the effect of labor demand shocks on migration. Blanchard and Katz (1992) show that after a negative employment shock, employment in a local labor market falls and then recovers somewhat, but never returns to its original level. They conclude that most of this effect is due to migration. Here, we update and extend their approach in order to more directly document the size of these flows out of labor markets following a negative labor demand shock.

Bound and Holzer (2000) measure the responsiveness of specific populations between the 1980 and 1990 Censuses to labor market shocks. They show that low-skilled workers, particularly low-skilled black workers, migrate relatively little in response to labor market shocks. We re-examine this issue using mass layoffs. We also include measures of population changes by age and race groups, which allow us to examine how labor force responses to mass layoffs affect an area's demographic composition.

Notowidigdo (2013) extends Bound and Holzer's (2000) analysis and employs a similar method, but argues that lower-skilled workers are less likely to migrate because they bear a smaller incidence of local labor demand shocks. He shows that following adverse labor demand shocks, public assistance program spending increases and housing costs decline, which both disproportionately impact low-skilled workers and make them less likely to migrate. He also notes that some of the decline in local employment is due to a decline in labor force participation, and cannot be entirely attributed to out-migration. Our work directly measures these channels, in order to assess the importance of non-participation.

Saks and Wozniak (2011) show that migration is pro-cyclical at the national level; in times of low national unemployment, the benefits to moving are higher, inducing more people to migrate for job-related reasons. Additionally, when controlling for national-level labor demand, they find that state-level labor demand is still a significant determinant of migration.

In this paper, we examine shocks that are more acute and localized than state-level unemployment changes, by measuring mass layoff events at the county level. In addition to migration, we explore how other channels of labor force exit are related to aggregate economic cycles. The first of these is Social Security Disability Insurance enrollment (hereafter DI), whose role as an alternative to job search in economic downturns has been documented in various contexts (Black et al. 2002, Burkhauser et al. 2004, Autor and Duggan 2003). The second additional channel of labor market exit is retirement, which we observe in takeup of Social Security retirement benefits. Workers displaced from jobs late in their careers have substantially lower employment rates than those who are not displaced, which suggests that poor re-employment prospects after mass layoffs cause many workers to opt for early retirement (Chan and Stevens, 1999, 2001; Stevens and Chan, 1999). Others suggest that different aspects of the recent economic downturn– the housing market crash, the stock market collapse, and rising unemployment–imply different incentives to either hasten or delay retirement (Coile and Levine, 2011; Bosworth and Burtless, 2010 and Goda et al. 2012).

Workers, especially those who have been laid off, may also exit the labor force without migrating or substituting their former income with participation in government programs. Especially in hard economic times, unemployed workers may become discouraged and stop looking for work (Erceg and Levin 2013). In the Great Recession, the labor market saw a surge in exits due to discouraged workers, only half of whom eventually reentered the labor market (Ravikumar and Shao 2014, Kwok et al. 2010). Workers are also more likely to become discouraged or take longer to reenter the labor force if part of a couple, since the other member of the couple may increase job search or enter the labor market, a phenomenon dubbed the added worker effect (Lundberg 1985, Mattingley and Smith 2010). In the Great Recession, as in other economic downturns, labor force participation among teenagers also decreased, as more pursued education or simply did not work or look for jobs (Kwok et al 2010).

Autor, Dorn and Hanson (2013) use differential exposure to import competition from China to identify areas with adverse labor demand shocks. They find that these shocks lowered labor force participation and increased unemployment, while also increasing transfer payments. While we use a different labor market shock, we come to similar conclusions, showing that non-participation is a key channel of adjustment following a labor demand shock. In contrast, we find effects on the mobility of individuals; however, our results may differ because they use labor demand shocks on lower-skilled workers, who are not as mobile.

3 Data

We compile various datasets to construct a panel of counties spanning the years 1996-2013. Our identification strategy relies on variation in county-level labor demand shocks, as measured by large mass layoff events. To measure the size of these shocks, we calculate the share of the county labor force in a given year that that was displaced due to a mass layoff. Between 1996 and 2013, the Bureau of Labor Statistics (BLS) compiled monthly reports on layoffs by observing the initial claims for unemployment insurance filed by workers. The BLS identified a mass layoff event when more than 50 workers file claims against a single establishment within any five-week period. For these events, the BLS contacted the establishment to determine whether these workers experienced a layoff of at least 31 days. We use data on these mass layoff events at the county level for 1996-2013, including the number of workers directly affected.[1] Our data are organized by the affected workers' county of residence, so that we measure the number of workers living in a given county who were part of a mass layoff at their past establishment (which could be located in a different county). To normalize the magnitude of these layoffs we use annual data on the size of the county labor force, compiled by the Local Area Unemployment Statistics program of the BLS.

Our main outcomes of interest are in-migration flows, out-migration flows, net changes in DI caseload, and net changes in the number of retirees. We use information on migration from the Internal Revenue Service (IRS) Statistics of Income files, which calculate inflows and outflows based on address changes of individual tax filers. As in other research, we use the number of tax returns in a county as an approximation for the number of households, and the number of exemptions for the number of individuals (Molloy, Smith and Wozniak, 2011). We use these data for 1996-2012 to construct measures of the number of individuals moving into and out of a particular county.

While these data are helpful in studying internal migration, they have a few limitations. First and foremost, individuals who do not file taxes (most often the poor and the elderly) do not appear in the data, nor do their households. Moreover, the data only include filers who complete their tax returns at most five months following the April 15 deadline, which excludes some late filers. The data are also limited in their ability to identify changes in filing status; for example, for a married couple that subsequently divorces and files two separate returns, only the migration behavior of the individual who was the primary taxpayer in the initial joint return will be recorded.[2]

To calculate the number of individuals at the county level enrolled in DI and retirement, we use data from the Social Security Administration's Old Age, Survivors and Disability Insurance (OASDI)

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[1] In March 2013, in order to abide by the sequestration imposed by the Balanced Budget and Emergency Deficit Control Act, the BLS eliminated the Mass Layoffs Statistics Program.

[2] A more extended discussion of these data, as well as their strengths and limitations, is in Gross (1999).

program from 1999 to 2012. While individuals can claim their retirement benefits almost immediately upon making the decision to retire, DI enrollment occurs long after an applicant files the initial claim. DI rules require that applicants have stopped working for five months before applying. Applications take many months to be accepted, and applicants can appeal decisions, extending the process. The process lasts around nine months for applications accepted on the first claim (Kreider, 1998), but often lasts more than a year when applicants appeal (Autor et al 2011).[3]

We express our four outcome variables—in-migration, out-migration, DI enrollment and retirement—as rates, which can be compared to the flows of newly displaced workers from mass layoffs. We define in-migration and out-migration rates as the number of in- or out-migrants to or from a county in a particular year as a share of that county's population that year. For both DI enrollment and retirement, we also divide the net change in new cases by the county's population the previous year, in order to not include the change in the labor force during the same year as the mass layoff.

We supplement these main sources of data with additional information on county demographics and median income. We use county level information on the age, gender, and racial composition of county populations as reported in the Surveillance, Epidemiology, and End Results (SEER) program of the National Cancer Institute, which includes annual data from 1969-2012, as well as county-level median income from the Bureau of Economic Analysis (BEA).

4 Methods

Our goal is to measure the effect of mass layoffs on changes in the labor force, and to quantify the channels of labor market exit and their relative importance. In this section, we describe the outcomes of interest, which are the various types of labor force exits, and how they relate to each

[3] Because of this attribute of the program, other studies that examine DI as a response to labor market shocks (eg. Autor and Duggan, 2003, Black et al., 2002) tend to focus on applications as opposed to acceptances. While application behavior is certainly the most immediate response, the purpose of this paper is to document labor force exits following economic downturns. If disability insurance applicants who are rejected decide to move, or to find a new job, using application data would lead us to double count these workers. We are currently in the process of obtaining application data from the Social Security Administration.

other. After this description, we explain the rationale for using mass layoffs as a measure of labor demand shocks. We discuss the limitations of using the unemployment rate by showing biased results when instrumenting for unemployment rate with the share of the labor force involved in a mass layoff. Second, we illustrate how mass layoffs act as well-defined shocks that are plausibly exogenous with respect to pre-existing trends.

4.1 Decomposing Changes in the Labor Force

Consider the following decomposition of a net labor force change from one year to the next:

$$LF_{ct} - LF_{c,t-1} = (inmigration_{ct} - outmigration_{ct}) - DI\ enroll_{ct} - retirement_{ct} + \varphi_{ct} \quad (1)$$

The term LF_{ct} is a county c's labor force in year t. The above equation shows that changes in the labor force can arise from five different channels. The first two terms on the right-hand side of equation (1) comprise the net migration of workers: in-migration minus out-migration. Any individuals that enroll in DI or retire also change the size of the labor force. The residual, φ_{ct}, includes all other flows into and out of the labor force not captured by migration, DI, or retirement. Foremost among these other exits from the labor force include individuals aging, workers dying, and new full-time students. Another important component of φ_{ct} is individuals of working age not participating in any of these explicit labor force exit channels.

In order to compare the effect of layoff events across labor markets of different sizes, we normalize the magnitude of these changes and express them as shares. Specifically, we divide both sides of equation (1) above by the size of the population in previous period:

$$\frac{LF_{ct} - LF_{c,t-1}}{popn_{c,t-1}} = \left(\frac{inmigration_{ct}}{popn_{c,t-1}} - \frac{outmigration_{ct}}{popn_{c,t-1}}\right) - \frac{DI\ enroll_{ct}}{popn_{c,t-1}} - \frac{retirement_{ct}}{popn_{c,t-1}} + \hat{\varphi}_{ct} \quad (2)$$

This equation above describes the relationship between our five outcome variables of interest. We estimate the effect of mass layoffs on the components of the right-hand side of equation (2), as well as on the net change in labor force (i.e. the left hand side of equation (2)). The residual $\hat{\varphi}_{ct}$ is just rescaled from the first equation. We normalize in this way in order to avoid scale-effect bias, as described in Peri and Sparber (2011).

Note that in equation (2) above, the in-migration and out-migration specifically refer to labor force participants. While the migration data we use do not separate out workers from non-workers, if we assume that labor force participants to non-participants migrate at the same rate, then those two terms do not have to be rescaled.

4.2 Concerns with County Unemployment Rates and Mass Layoff Counts as an Alternative

Understanding the relationship between local labor market shocks and labor force exits presents several challenges. First, a typical approach involves relating local area unemployment rates to local population changes or migration rates.[4] However, the unemployment rate is itself a function of current and past migration decisions, making causal inference difficult and interpretation of descriptive relationships challenging. Second, analyses are typically done at the state level, which may be too broad to capture a single labor market. One the other hand, local unemployment measures for smaller geographic areas raise serious measurement error concerns.

We begin our analysis by measuring the effect of the unemployment rate on labor force exit, knowing the limitations of such an approach. In our context, with local labor market changes measured at the county level, we estimate the following equation:

$$y_{ct} = \alpha + \beta URATE_{ct} + \delta_t + \gamma_c + \eta_c * t + \epsilon_{ct} \qquad (4)$$

where y_{ct} is a particular type of labor market exit measured at the county level, and $URATE_{ct}$ is the unemployment rate in the county. We also include time fixed effects δ_t and county fixed effects γ_c,, as well as county-specific time trends η_c*t.

Using the unemployment rate as above introduces three problems into the estimation. First, the unemployment rate is endogenous since it captures labor supply changes in addition to labor demand changes (Bartik 1996). Additionally, changes in the labor force in—the denominator of the unemployment rate—are clearly endogenous to migration rates in and out of a local area. Finally, for smaller geographic units the unemployment rate published by the BLS is measured with error (see Bartik, 1996; Hoynes, 2000; Lindo 2015).

[4] For examples of this, see Greenwood (1997) and Davies, Greenwood and Li (2001). Additionally, Wozniak (2010) uses both unemployment rates and Bartik instruments, while Saks and Wozniak (2011) instrument for unemployment rates with Bartik-type instruments and oil shocks; these instruments are discussed below.

For these reasons, researchers often rely on instruments for the unemployment rate. The ideal instrument would address both the endogeneity concerns and concerns with measurement error in the unemployment rate. One such instrument is the shift-share or Bartik instrument (Bartik, 1991) that utilizes pre-existing, area-specific industry structure and changes in industry outcomes at the national level. Such an approach been used successfully at the state and MSA level (Saks and Wozniak (2011); Bound and Holzer (2000)). However, using a Bartik instrument may be difficult at the county-level due to small samples for measuring county-level industry shares. Additionally, the Bartik instrument does not provide intuition on the relative size of the shock for a county, compared to the size of the labor force.

As an alternative, in this study, we use measures of mass layoffs at the county level as our indicator of local labor demand shocks. In our main results, we move to using mass layoff indicators in a reduced-form setting; this has a direct and substantively interesting interpretation of the effect of a major layoff event on a local area labor force. Mass layoffs are a good alternative to the unemployment rate because they resolve the two problems that arise when using the county unemployment rate. First, they clearly measure a change in labor demand, and thus are not hampered by endogenous labor supply responses, a claim for which we provide more evidence in the next section. While migration can mechanically reduce the unemployment rate over time, migration does not directly generate mass layoffs. Second, measurement error in the mass layoffs data is most likely uncorrelated with the measurement error in the county unemployment rate. The main source of measurement error in the mass layoffs data comes from establishments planning a certain number of layoffs and then changing these plans, and is not due a direct result of small sample sizes, since these represent a census of all layoffs of greater than 50 workers.

Mass layoffs are also of independent interest as an observable indicator of a shock to local labor markets that may concern policymakers. Focusing on mass layoffs allows us to directly address the question of how a series of mass layoffs may permanently change the size and composition of the local labor force. Similarly, we can examine how the number of lost jobs translates into individuals leaving a local area.

To establish that mass layoffs are strongly correlated with the unemployment rate, we begin by regressing the unemployment rate on mass layoffs; we include the contemporaneous mass layoff share and two lags. Table 1 summarizes the first-stage relationship between the county unemployment rate and mass layoffs (as a fraction of the county's labor force). This approach also conditions on county fixed effects, year fixed effects, and county-specific trends. The F-statistic on the mass layoffs is 30.68, and the results clearly show that mass layoffs are strongly correlated with the unemployment rate.

We next estimate both OLS and instrumental variables versions of equation 4. As in Saks and Wozniak (2011), we do not include lags because the unemployment rate is not a flow variable. We instrument the unemployment rate with a contemporaneous mass layoff rate as well as two lags.[5] Our results are in Table 2. Starting with the OLS results, we see small negative effects of the unemployment on rates of in-migration. A one percentage point increase in the unemployment rate leads to a 0.1 percentage point decrease in the in-migration rate, and the IV results are statistically indistinguishable.

For out-migration, both the OLS estimates suggest that a one percentage point increase in the unemployment rate increases the out-migration rate by about 0.07 percentage points. The IV results suggest a larger initial effect of the unemployment rate on out-migration, which is consistent with the unemployment rate being endogenous as well as with measurement error pushing the OLS estimate towards zero.

When we look at the effects of unemployment on flows into disability insurance and retirement, we find, as might be expected, smaller responses. This expectation is based on the fact that only a subset of workers in a local area will have an underlying medical condition or be in an age range that is consistent with entering disability insurance or retirement. Nevertheless, our results do show that higher unemployment is associated with small increases in the share of a county's labor force that is retired or using disability insurance, echoing much earlier work. We are the first, to our knowledge, to use mass layoffs to illustrate this connection between labor market

[5] In results not shown, we included different specifications of the number of lags of both the endogenous regressor and the instrument. All the results were similar as the ones shown.

shocks, disability insurance and retirement. In the remainder of the paper, we focus on the reduced form relationship between mass layoffs and labor force exits.

4.3 Mass Layoffs and Labor Force Exits

Table 3 (Panel A) shows summary statistics for layoff variables in the full study period, as well as before and after the start of the Great Recession in 2007. On average, 0.7 percent of a county's labor force was laid off in a mass layoff event each year, which translates to an average of 379 workers. Not surprisingly, these shares differ substantially before and after 2007. Panel B of Table 3 shows the share of counties that experienced at least one year where the share of the labor force involved in a mass layoff surpassed a certain threshold. Most counties (61 percent) had at least one year where one percent of the labor force was laid off. A large number, however, also experienced an event of higher percentages. Panel C of Table 1 shows the key variables that comprise the decomposition of the change in labor force as a share of the population. On average, the change in the size of the labor force as a share of the population was 0.3 percent.

To motivate the analysis, we illustrate the relationships between labor force exits and layoffs using an event study approach. We focus first on counties that experienced large, discrete labor demand shocks, which allows us to examine county trends prior to a major layoff. For these counties, the event study analyses provide suggestive evidence that the large layoff events were unlikely to have been precipitated by long-term labor market decline.

We limit the data to the subset of counties in our sample that experience a large layoff event—of two, three, or four percent of the labor force—once between 2001 and 2007. We further limit the sample to counties for which this one-time event occurred before 2007: layoff rates increased dramatically during the Great Recession making it more difficult to isolate counties with only a single large layoff event after 2007. In this limited sample of 118 counties, these large and isolated layoff events were the most likely to have been unanticipated to local workers and unrelated to local economic trends.

We estimate the following model:

$$y_{ct} = \alpha + \sum_{\substack{i=-6 \\ i \neq -1}}^{6} \beta_i 1(t - T_c = i) + \delta_t + \gamma_c + \epsilon_{ct} \qquad (5)$$

The outcome variable y_{ct} is one of the following: in-migration rate, out-migration rate, new DI enrollment, and new retirement enrollment. We include county and time fixed effects, γ_c and δ_t, to control for fixed differences between counties and a non-parametric national time trend. We define T_c as the year the county experienced layoffs surpassing the relevant layoff threshold of two, three or four percent. The indicator $1(t - T_c = i)$, then, takes a value of one when the observation year is i years from T_c. For example, if the layoff event happened in 2004, then $1(t - T_c = i)$ would take value one in year 2005 for $i = 1$. Observations earlier than six or later than six years from the event are captured by dummies $1(t - T_c \leq -6)$ and $1(t - T_c \geq 6)$. We omit the dummy for i =-1, so all the coefficients are relative to the year before the major mass layoff occurred.

The top two graphs of Figure 1 display the coefficients of our event study analyses for in- and out-migration, as well as a 95 percent confidence interval. Appendix Figures A1 and A2 shows these results for other lower thresholds for defining large mass layoffs. Importantly, in neither the in-migration nor the out-migration case does there seem to be a noticeable trend in migration rates *before* the mass layoff event. In-migration and out-migration seem relatively flat in the years previous to the event. Following the event, there does appear to be an increase in out-migration rates. Similarly, there is a noticeable dip in in-migration, which is sustained in the years following mass layoffs.

The bottom half of Figure 1 displays the same analyses for DI and retirement. The estimates are noisier, but the trends prior to mass layoff events do not suggest that there were upward trends in exits to disability or retirement prior to the layoff events. Although the estimates are not statistically significant, DI enrollment seems to increase slightly three years after the layoff event. For retirement, the pattern is also not statistically significant but consistent with our hypotheses: two years of increased retirement are followed by a decline in the subsequent years.

This visual analysis shows that for the counties that experienced only one major mass layoff event in our time period, there were no pre-existing trends in labor force exit paths before the mass layoff event occurred. This further motivates and provides support for our statistical approaches below, which use mass layoffs both as an instrument for county unemployment rates, and more directly as an indicator of local labor market shocks. In the next sections we extend the analysis to all counties in the country—not just the ones that experienced particularly dramatic labor market shocks—and quantify the size of these adjustment processes.

5. Effects of mass layoffs on migration and labor force exits

The previous section estimated effects on a subsample of counties. Now, we estimate the effect for the full sample, using the following equation.

$$y_{ct} = \alpha + \sum_{i=0}^{2} \beta_i \, layoff_{c,t-i} + \delta_t + \gamma_c + \eta_c * t + \epsilon_{ct} \qquad (6)$$

Our key variable of interest is $layoff_{c,t-i}$, which we define as the share of the labor force of county c laid off in year t. We also include lagged values of the layoff indicators, since responses to labor demand shocks may take time. Our outcome variable, y_{ct}, is either the net labor force change or one of the components: out-migration rate, in-migration rate, new DI enrollment rate, and new retirement rate, all normalized by lagged county population.

We include county fixed effects, γ_c, to control for systematic differences between counties in their labor market, mobility of individuals, and the policy environment. We include year fixed effects, δ_t, to control for national trends. In our preferred specification, we also include county-specific trends, $\eta_c * t$, to take into account the fact that some counties have systematically growing or declining migration rates that may be correlated with trends in labor demand and labor market opportunities. Finally, to address the fact that mass layoffs may be correlated within a state over time, we cluster our standard errors at the state level.

Table 4 shows our main results for out-migration and in-migration. In column 1, we include only the contemporaneous effect of mass layoffs, while columns 2 and 3 add one and two lags, respectively. In Column 3, the effect of mass layoffs is large and significant for both out- and in-migration. Our estimates imply that when one percent of the county-level labor force is laid off in a mass layoff event, the out-migration rate increases by about 0.06 percentage points within three years. Additionally, for in-migration, a one percent mass layoff increase leads to a decrease in in-migration rates by about 0.09 percentage points.[6]

In column 4, we include county-specific trends, which shrinks the in-migration estimates significantly in magnitude, by about two-thirds. However, the total effect is still negative and significant. The out-migration estimates are relatively unchanged.

In the rest of the tables we focus on the total effect—that is, the sum of the contemporaneous, lagged, and twice-lagged coefficients displayed in Table 4. Table 5 displays our results for each outcome, in specifications both with and without county trends. The trends only change the estimates significantly for in-migration, and importantly our estimates for the overall change in the labor force barely change at all. In most of the following results we thus focus on estimates that control for county-specific trends. In column 1, we show the overall effect of layoffs on the net change in the labor force. Specifically, a mass layoff affecting 1 percent of a county's workers leads to a reduction of 0.15 percentage points in the size of the labor force over the next three years. The majority of this change is driven by increased out-migration and decreased in-migration (although the effect on in-migration is not statistically significant).

Summing up our effects across columns, we can explain about three-fourths of the change in the labor force with these four channels. To quantify all of the labor market exit channels, we also calculate the implied residual, given equation 2. In the results without trends, we find that the total effect is almost identical, and a bit larger, than the measured labor force change, with an implied residual of 0.0152. With trends, we find a residual of -0.038, which suggests that for a 1 percent mass layoff, the number of people that leave the labor force for other reasons increases by about 0.04 percentage points. This effect is likely due in large part to non-participation, since deaths net of labor force entrants is likely to be small.

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[6] In results not shown we include additional lags to the key explanatory variable. These additional lags are small and not statistically significant providing further evidence that the timeframe of adjustment to labor market shocks is relatively quick.

One important question in the wake of the Great Recession is whether non-participation, which we measure as the residual, has changed over time, suggesting changes in the role of non-participation in the labor force. A number of recent papers have sought to investigate this, noting that the labor force participation rate for 25-54 year olds in the Great Recession fell precipitously, and then has not recovered even in the face of an improving economy. Erceg and Levin (2013) show that the Great Recession contributed a large amount to the decline in labor force participation. Charles, Kroft, and Notowidigdo (2013) argue that despite being masked by the housing boom, non-employment has seen a secular rising trend starting in the 2000s, which only revealed itself after the housing market crash. Here, we examine whether labor force withdrawal following a negative demand shock in the form of mass layoffs follow this pattern as well.

To see how non-participation has changed during the Great Recession, we separate the study period in the years before and the years including and after the Great Recession: 1996-2006 and 2007-2011. Because the later period is so short, we do not include trends in these regressions; however, we have already shown in Table 5 that trends do not largely affect our results, except for in-migration. Table 6 shows these results, which Panel A showing the pre-Recession estimates and panel B showing the estimates for 2007-2011.

Our results show strikingly different patterns before and during the Great Recession. First, column 1 shows that the change in labor force in response to a 1 percent mass layoff was substantially larger following the Great Recession. However, at the same time both in- and out-migration are smaller in magnitudes, reflecting the secular decrease in migration over this time period. This shows that this decline in migration rates applies specifically to the mobility response to a negative labor market shock. Finally, the magnitudes and sign of DI and retirement are more positive although not significant in the later period.

Overall, during the pre-recession period, our estimates imply that we over-explain the labor force change, such that the residual— the labor force change not explained by migration or transitions to disability or retirement --- was positive. Summing up all the effects gives us a total effect of 0.1411, which is larger than the change in the labor force, and which suggests little role for non-participation as an important part of the change in labor force participation.

For the period that includes the Great Recession, the total effect across all exit channels is -0.0726, while the total change in the labor force is -0.1185, implying a residual of about -0.0459. This estimate is much larger than for the pre-period, where the residual was non-existent, and suggests that in the recent recession, non-participation became an increasingly important channel of labor market exit.

Another way we can estimate how this effect changes pre- and post-Great Recession is by interacting our measure of mass layoffs with a dummy for the year being after 2007. We do this in Table 7, allowing the effect of a mass layoff to be different before and after the Great Recession. In the table, below the coefficient estimates, we list the total effect for the time period before the recession and after the recession.

Our results show that the non-participation channel grew much larger during the Great Recession. The effect of a shock in the pre-recession period on net labor force was about 0.10 percentage points. Additionally, the effect of the mass layoff is large for both out-migration and in-migration, and all the estimates taken together imply a residual of approximately 0.0264, implying that our channels over-explain the labor force change.

The results are much different for the years after 2007. First, the labor force response to a one percent mass layoff is about twice as large as before 2007. Second, the out-migration response is muted, about half as large, while the point estimate on disability insurance is over twice as large, although not significant. Taken together, our estimates suggest that migration, retirement, and disability explain only about 40 percent of the total change in the labor force during the recession years, with the residual (non-participation) explaining 60 percent of the net labor force change. This is not consistent with a story of migration providing the major channel for labor market adjustment to local shocks. One possibility is that the Great Recession was due the role of the housing crisis, which impeded mobility. Another possibility is that during a recession, mobility plays a more limited role in local labor market adjustment than in a non-recessionary period(Saks and Wozniak, 2010). Results showing a limited role for migration are generally consistent with the findings of Notowidigdo (2013), who suggests that migration is not the primary mechanism in the adjustment of local labor markets.

5.1 Geography of labor force exits

In addition to exploring heterogeneity before and after the Great Recession, we expect there to be geographic heterogeneity in the response to labor demand shocks. In particular, we expect that responses in counties in more urban settings may be different because of differences in the density of job opportunities, distance to other potential jobs in adjacent counties, or attitudes toward and availability of public assistance. Additionally, some counties that are not near cities may be more dependent on a single firm or industry, leading mass layoff events to have an outsized effect.[7]

We categorize counties by whether they were part of a metropolitan statistical area (MSA) as defined in the 1990 Census. We use 1990 MSA definitions in order to fix these definitions before the start of the study period. The results in Table 8 show a marked difference in the labor market response by this distinction. Out-migration is large and significant for MSA counties, such that a one percent mass layoff leads to an increase in 0.11 percentage points in the out-migration rate, a response twice as large as for non-MSA counties. In both urban and rural counties, the response in terms of disability enrollment and retirement is insignificant. Totaling the responses, the residual is roughly 6 percent of the overall labor force change for urban counties, while it is over 20 percent for rural counties, which suggests that non-participation is a more important labor market exit channel in counties outside of metropolitan areas.

When looking at these effects pre- and post-Great Recession, the results are even more striking; these results are in Table 9. Non-MSA counties saw much larger changes in labor force in the years including the Great Recession, while the response in urban counties is relatively similar across time periods. Additionally, while the residual in MSA counties did not change much, the residual in rural

[7] For instance, the economy of rural Greenlee County, Arizona depends on one of the largest copper mines in the world, which in 2001 and 2008 laid off a large number of workers and, thus, a substantial fraction of the county's labor force. Likewise, a series of lumber mill closings in northern Idaho in 2000, especially in Benewah County, devastated the local economy, directly affecting four percent of the labor force.

counties grew from about 20 percent to over 60 percent. These results are suggestive that much of the change in non-participation arose from counties outside of metropolitan areas.

Finally, in results not shown, we also estimate effects by region. We find that the Midwest experienced the largest responses to mass layoffs in terms of labor force change, and that the Midwest also had the largest residual (almost 75 percent of the total change in labor force). We also find that most of these effects are concentrated in the Great Recession period.

One possibility for the different results for rural and urban counties might be that populous counties react differently to these events than sparsely populated counties. Our estimates so far measure the effect for an average county, and thus do not account for these differences. When we weight the regressions by population prior to the study period, our results do not change substantially. A more in-depth discussion of this issue of weighting is in Appendix A.

In addition to categorizing counties by their population, we also examine the distance of movement for individuals who migrate. Fogli et al. (2012) argue that individuals displaced from work in one county may migrate to an adjacent county, mechanically increasing its unemployment rate. One advantage of the IRS migration dataset is that it allows us to decompose the migration response in more detail and thus estimate the size of this effect.

We explore whether workers undertake moves across state lines or to adjacent counties. Table 10 shows the results of these decompositions. Column 1 displays the main result from Table 5, while columns 2-5 examine the responses of the four types of migration flows. The results suggest that the majority of people leaving the county following layoffs tend to leave the state (82 percent). Similarly, 99 percent of moves are to non-adjacent counties. These findings suggest that individuals seek moves to a different market, rather than simply relocating to reduce housing arrangements or costs.

5.2 Effects Moderated by County Features

We find that the labor force exit response, as well as the relative size of different channels, varies by whether a county is in an MSA. Following Notowidigdo (2011) we also expect these responses to be moderated by the strength of income supports in the local safety net. Counties vary dramatically in take-up and usage rates of different social programs, but these differences are often endogenous to other local economic conditions. However, there is little cross-sectional variation in safety net generosity. One notable exception is unemployment insurance (UI), since states are able to adjust the replacement rate of UI benefits (Kuka 2015, Lalumia 2013). To this end, we use the UI benefit calculator developed by Lalumia (2013) and rank states by their generosity in a year prior to our study period, expressed as the maximum benefit level. Panel A of Table 11 shows that counties in states with lower UI benefits see lower drops in labor force: -0.127 and -0.209 respectively. However, out-migration in the low UI eligibility counties is not substantially lower than in other counties (0.069 and 0.081), suggesting that the residual non-participation is higher in high UI counties.

One of our key storylines is that the pattern of labor force adjustment changed during the Great Recession. This recession was driven in large part by subprime lending and foreclosures. We expect heightened subprime and predatory lending to be associated with higher rates of out-migration for a labor market shock of equal size. Using county data from the Home Mortgage Disclosure Act (HMDA),[8] which compiles detailed information on loan originations, we ranked counties as high or low in terms of the share of home purchase loans that were high-cost (the di_erence between its APR and a Treasury security with the same maturity was at least 3 percent). These are loans most likely to enter foreclosure. HMDA only began tracking this information in 2004, however, so we can only categorize counties in terms of the share of high-cost loans in the Recession period, from 2007 onwards. Panel B of Table 11 shows these results. We find that, overall, counties with above-median rates of high-cost loans also saw large rates of labor force exit following mass layoffs. On the other hand, these did not necessarily have higher rates of out-migration,

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[8] *These HMDA data files (www.metrotrends.org/natdata/hmda/hmda_download.cfm) and the procedures for constructing them were initially developed by the Urban Institute to support DataPlace (www.dataplace.org). The data are licensed under the Open Database License (http:/www.metrotrends.org/natdata/ODbL.cfm).*

suggesting instead a larger residual. This suggests that counties that were more leveraged in terms of their risk in the impending housing market collapse also saw higher rates of labor force exit due to non-participation, but not necessarily due to migration.

5.3 Robustness Checks

Here, we briefly discuss a number of robustness checks to our basic specification. First, we re-estimate equation 6, but also include a lead of the layoff share. If the lead is significant, it would suggest that counties experiencing mass layoffs were generally declining in a way that was predictable to individuals, suggesting that mass layoffs are not an unexpected labor demand shock. As shown in Table 12, we find that most of the lead coefficients are small and statistically insignificant. The one exception is that we estimate a statistically significant *decrease* in new disability claims one year prior to mass layoffs. This is surprising, but the fact that the direction of this effect is opposite of that expected in the aftermath of layoffs suggests that it is not driven by a standard endogeneity story.

Additionally, we also aggregated all of our outcomes to the commuting zone level, which is a more natural definition of a local labor market, and includes all counties in the United States. Our estimates for those regressions are in Table 13. The total change in the labor force for a 1% mass layoff is approximately 0.21 percentage points, which is larger than our main estimates. Overall, our results are very similar, and the four labor market exit channels we consider can account for about three-fourths of the change in the labor force due to mass layoffs.

The analyses so far quantify the channels of labor market exit and compared their magnitudes, with migration being the predominant type of exit. Bound and Holzer (2000) find that different segments of the population adjust to labor market changes to different extents. With this heterogeneity in mind, we measure the extent to which an area's demographic composition changes with mass layoff events. We use the share of the population in various age and race categories as the dependent variable in equation 6. Table 14 displays the results. While the effects are not statistically significant, the signs of the coefficients are consistent with previous literature on migration propensities, as well as our key result that migration is the predominant labor market exit. The effects imply that following a mass layoff, the share of youth and adults early career age decrease, suggesting that they are more likely to migrate in response to a mass layoff. On the other hand, the positive coefficients for the share of people ages 45-59 implies that older workers are less likely to migrate in response to a mass layoff. We also find that the share of the county that is white decreases, while the share that is black increases, suggesting differential likelihood of migration by race found by Bound and Holzer (2000).

6 Conclusion

Researchers have long been interested in how individuals respond to adverse labor market conditions, and how these responses serve to equilibrate the labor market. Blanchard and Katz (1992) was the first paper to suggest that labor mobility was central to this adjustment process. However, in the years since the Blanchard and Katz study, relatively little work has directly examined mobility in the aftermath of specific local labor market shocks,[9] while mobility rates have been in secular decline. Additionally, the role of mobility in labor market adjustment has taken center stage as we emerge from the Great Recession and see evidence that labor mobility seems to be lower than at any time in recent history. This study attempts to bring these two lines of literature together, examining mobility and other labor force adjustments to county-level mass layoff measures.

We find that a layoff of one percent of a county's labor force leads to a decrease in the county labor force of 0.15 percentage points, and further find that migration accounts for a large share of this change. In all, our four exit channels—in-migration, out-migration, retirement, and DI—account for three-fourths of the net labor force change following a mass layoff.. Additionally, we show that non-participation has increased in the Great Recession, and is also more predominant in rural areas.

Our finding of increased non-participation during and following the Great Recession raises a number of important questions for further research. First, while there is anecdotal evidence of what non-participants do with their time, to our knowledge there is no empirical work quantifying the

[9] A notable exception is Zou (2015).

specific nature of non-participation. These former workers may be working in informal markets, or they may be members of households with multiple earners. Additionally, it is unclear to what extent the non-participation we observe in the Great Recession is temporary or permanent, and whether we should expect these former workers to return to the labor force after labor market conditions improve. As with the long-term unemployed, it is likely that the skills of these non-participating individuals have decayed, and therefore will be less productive upon re-entering the labor force.

Second, our results on non-participation do not speak to the more aggregate effects of non-participation on the aggregate labor market. While some researchers have tried to address this issue broadly (Smith, 2014), much more research needs to be done on the margin of non-participation. In particular, many job search models do not consider non-participation as a separate state from unemployment. However, this paper shows that non-participation is an important contributor to the adjustment process following an adverse labor demand shock.

Finally, another important question that follows from our paper is the extent to which the effects we find may vary by the industrial composition of a local area and of the layoffs themselves. Laid off workers may in some areas readily find work in a similar industry, while in other areas similar jobs may not be available. While there is some work on the mismatch of workers to jobs (Sahin et al., 2014), this area is generally understudied, and we hope that future research delves into this question and the other questions discussed above.

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Appendix A: Issues of Weighting, Trends, and the Year 2000

This appendix serves to justify why we have opted to display un-weighted estimates in the main results throughout. We show first that the estimates for net labor force are unchanged if we weight, but do not include county-specific trends. Then we discuss differences in the results when including both weights and trends.

The first column of Table A1 shows the estimate of the total effect of a mass layoff (including lags) on net labor force change. Comparing the first and third rows, weighting does not affect our estimates. However, including weights and trends causes our estimate to shrink considerably. One reason why the estimate changes so much when we include both weights and trends is that the labor force changes in 2000 have some error built into them. The Bureau of Labor Statistics incorporated major changes and revisions to the employment and labor force numbers, which were adjusted between December 1999 and January 2000, and December 2002 and January 2003. The former adjustment is the largest of these adjustments, and also has the largest impact on our estimates.[10] This suggests that the year 2000 is problematic. To show why this would affect our estimates, we seek to demonstrate two main facts: (1) This adjustment differentially affected different sizes of counties (which would affect estimates with **weighting**); and (2) This adjustment would have affected the county-specific detrending of the estimates (which would be affect estimates with **trends**). Taken together, this would suggest that dropping the year 2000 should mitigate these problems. We show how this affects the estimates in the second column of Table A1, which shows that omitting the year 2000 for net labor force changes our estimates only when weighted with trends.

Fact 1: The BLS adjustment differentially affected different sizes of counties.

In order to see this fact, consider Figure A1. Each panel shows the distribution of net labor force changes, by quartile of county size in 1996. Most years (1999, 2001, and 2002) the distributions are rather tight, and similar across county size. However, in 2000, everything is much more disbursed,

[10] (http://www.bls.gov/cps/cpscomp.pdf),

and importantly, becomes more disbursed for smaller counties than for larger counties. While we know this is true in other years as well, it is much more stark in 2000. Therefore, this adjustment by the BLS differentially affected different sizes of counties.

Fact 2: The BLS adjustment affects county-specific trends, differentially by size of county

The previous fact showed that the adjustment the BLS made had different effects on changes between large and small counties. Now I want to show how that can affect estimates that include trends. Figure A2 graphs the average net LF changes over time, once again by quartile of county population in 1996. Notice that while the time series for counties in the fourth quartile of population evolves smoothly over time from 1996 to 2010, counties in the other quartiles do not follow the same smooth pattern. In fact, in 2000, the average for these counties spikes, and then falls back to its normal level the year before (the numbers in 1999 and 2001 are almost identical). For the smallest quartile, you can see the effect of the 2003 adjustment as well; but the other quartiles are unaffected. If we are including trends, then these changes for counties will change the value of the η_c in equation 6 of our paper, and adjust the slope of the county-specific trend. However, because this effect is differential by county size, it will really only affect our estimates when we also weight.

One additional comment is warranted here. If only the smallest counties were affected by this problem, then weighting would diminish of the issue; however, Figure A2 shows that the bottom three quartiles of counties were affected, and so weighting does not mitigate the problem.

Table 1: IV Results, First Stage

	Unemployment Rate, t
Layoffs, t	32.01***
	(4.838)
Layoffs $t-1$	29.44***
	(4.848)
Layoffs $t-2$	6.36
	(4.848)
N	35353

Standard errors in parentheses, clustered on state. Dependent variable is the unemployment rate. Each regression includes county and year fixed-effects, and county-specific trends. * p <.10, ** p < .05, *** p < .01

Table 2: IV Results: Effect of unemployment rate on labor force exits

	Net LF		Work-Age Population	
	OLS	IV	OLS	IV
URATE, t	-0.00255***	-0.00142	-0.000754***	-0.00104
	(0.000389)	(0)	(0.000139)	(0)
Observations	38,302	35,353	38,302	35,353
Adjusted R-squared	0.085	0.080	0.469	0.474
	In-Mig		**Out-Mig**	
	OLS	IV	OLS	IV
URATE, t	-0.00120***	-0.000924***	0.000738***	0.000885***
	(0.000220)	(0.000217)	(0.000127)	(0.000169)
Observations	38,217	35,275	38,217	35,275
Adjusted R-squared	0.861	0.861	0.876	0.876
	DI		**Ret**	
	OLS	IV	OLS	IV
URATE, t	3.16e-05***	3.60e-05	0.000139***	0.000133
	(1.16e-05)	(0)	(2.15e-05)	(0)
Observations	32,404	32,404	32,404	32,404
Adjusted R-squared	0.230	0.230	0.326	0.326

Standard errors in parentheses, clustered on state. Dependent variables are listed at the headings of each sub-panel. The first column is the OLS result, the second column is instrumenting the unemployment rate in year t with mass layoff share in years t, $t-1$, $t-2$. Each regression includes county and year fixed-effects, and county-specific trends. * p <.10, ** p < .05, *** p < .01

Table 3: Summary Statistics, 2000-2010

	All Years	2000-2006	2007-2010
Panel A: Summary Statistics			
Layoffs per Labor Force	0.0070	0.0059	0.0087
	(0.0098)	(0.0084)	(0.0118)
Layoffs Number	378.9123	314.1393	492.4453
	(1935.5590)	(1390.7880)	(2627.3110)
N	33794	21518	12276
Panel B: Incidence of Mass Layoffs			
1% of LF	0.6059	0.4562	0.5269
	(0.4887)	(0.4982)	(0.4994)
2% of LF	0.3351	0.2007	0.2663
	(0.4721)	(0.4006)	(0.4421)
3% of LF	0.1772	0.0913	0.1354
	(0.3819)	(0.2881)	(0.3422)
4% of LF	0.0932	0.0368	0.0717
	(0.2908)	(0.1882)	(0.2580)
5% of LF	0.0504	0.0174	0.0387
	(0.2188)	(0.1309)	(0.1929)
N	3154	3154	3154
Panel C: Components of Labor Force Change			
Net Labor Force change	0.0031	0.0040	0.0016
	(0.0195)	(0.0216)	(0.0151)
Work-age Population change	0.0041	0.0050	0.0025
	(0.0108)	(0.0112)	(0.0099)
Inmigration-rate	0.0063	0.0064	0.0060
	(0.0229)	(0.0230)	(0.0223)
Outmigration-rate	0.0061	0.0062	0.0059
	(0.0199)	(0.0193)	(0.0206)
New DI	0.0012	0.0012	0.0013
	(0.0046)	(0.0056)	(0.0017)
New Retired	0.0022	0.0017	0.0030
	(0.0163)	(0.0199)	(0.0063)
Implied Residual	0.0016	0.0001	0.0042
	(0.0336)	(0.0399)	(0.0177)
N	33794	21518	12276

Incidence of mass layoffs refers to the share of counties that experienced at least one year where layoffs affected the noted percentage of the labor force. Work-age population is the population aged 15-65. The implied residual is calculated as described in the text, equation 3.

Table 4: Effect of Layoff Events on Migration

	(1)	(2)	(3)	(4)
Dependent Variable:Out-migration Rate				
Layoffs	0.0473***	0.0464***	0.0455***	0.0439***
	(0.0137)	(0.0130)	(0.0133)	(0.0120)
L.Layoffs		0.0139**	0.0170**	0.0165**
		(0.00599)	(0.00634)	(0.00684)
L2.Layoffs			-0.000614	0.00505
			(0.00564)	(0.00732)
Dependent Variable:In-migration Rate				
Layoffs	-0.0435***	-0.0393***	-0.0416***	-0.0237*
	(0.0139)	(0.0130)	(0.0142)	(0.0128)
L.Layoffs		-0.0310***	-0.0265**	-0.00979
		(0.0115)	(0.0110)	(0.0104)
L2.Layoffs			-0.0233***	-0.00362
			(0.00748)	(0.00860)
County FEs	YES	YES	YES	YES
Year FEs	YES	YES	YES	YES
Trends				YES
N	45972	42907	39841	39841

Standard errors in parentheses, clustered on state. Dependent variables are listed at the headings of each panel. $Layoffs$ is the number of extended mass layoffs, divided by the lagged labor force. In-migration and out-migration rates are number of migrants divided by the sum of out-migrants and non-migrants. Each regression includes county and year fixed-effects; county specific trends are included in column 4. * p <.10, ** p < .05, *** p < .01

Table 5: Total Effects of Mass Layoffs on Labor Market Exits

	(1) LF	(2) In-Mig	(3) Out-Mig	(4) DI	(5) Ret
Without Trends	-0.1548***	-0.0914***	0.0619***	0.0066*	.0101
	(0.048)	(0.0283)	(0.0185)	(0.0029)	(0.0048)
With Trends	-0.1475**	-0.0371	0.0655***	0.001	0.0056
	(0.0566)	(0.0282)	(0.0182)	(0.0038)	(0.0038)
Y-Mean	0.004	0.058	0.058	0.001	0.002
Observations	42990	39841	39841	39919	39919

Dependent variables are listed at the head of the column. The Total Effect displayed are the sum of the contemporaneous and lagged effects, from estimates of equation 5. The first panel displays estimates without trends, while the second panel displays estimates including county-specific trends. Standard errors in parentheses, clustered on state. Each regression also includes county and year fixed-effects. * p <.10, ** p < .05, *** p < .01

Table 6: Effects of Mass Layoffs, Before and During Great Recession

	(1) LF	(2) In-Mig	(3) Out-Mig	(4) DI	(5) Ret
Total Effect, 1996-2006	-0.0619	-0.0532	0.0857***	-0.0018	0.004
	(0.0577)	(0.0328)	(0.0291)	(0.0046)	(0.0083)
Y-Mean	0.005	0.06	0.059	0.001	0.001
Observations	27645	27590	27590	24574	24574
Total Effect, 2007-2011	-0.1185	-0.0222	0.0339*	0.0076*	0.0089
	(0.0689)	(0.0425)	(0.0187)	(0.0048)	(0.0096)
Y-Mean	0.002	0.054	0.054	0.001	0.003
Observations	15345	12251	12251	15345	15345

Dependent variables are listed at the head of the column. The coefficient estimates come from estimating equation 5. The total effect the sum of the three main layoffs coefficients. The first panel is the total effect for the years 1996-2006, while the second panel is the total effect for the years 2007-2011. Standard errors in parentheses, clustered on state. Each regression also includes county and year fixed-effects. * p <.10, ** p < .05, *** p < .01

Table 7: Effect of Layoff Events, Interaction, Trends

	(1) LF	(2) In-Mig	(3) Out-Mig	(4) DI	(5) Retired
Layoffs, t	0.0633	-0.0108	0.0500***	0.000236	0.00536
	(0.0449)	(0.0167)	(0.0174)	(0.00241)	(0.00419)
Layoffs, $t-1$	-0.0985***	-0.0103	0.0276***	0.00140	0.0100
	(0.0272)	(0.0112)	(0.00774)	(0.00414)	(0.0131)
Layoffs, $t-2$	-0.0612*	-0.00825	0.00767	-0.00106	-0.00788
	(0.0323)	(0.00957)	(0.00895)	(0.00223)	(0.00520)
Layoffs, $t\times$ Post-2007	-0.121*	-0.0251	-0.0131	0.00127	0.00250
	(0.0648)	(0.0227)	(0.0172)	(0.00294)	(0.00405)
Layoffs, $t-1\times$ Post-2007	0.00297	-0.000601	-0.0249**	-0.00125	-0.0143
	(0.0339)	(0.0237)	(0.0114)	(0.00462)	(0.0167)
Layoffs, $t-2\times$ Post-2007	0.0146	0.0143	-0.00936	0.000835	0.00939
	(0.0447)	(0.0238)	(0.0112)	(0.00346)	(0.00715)
Total Effect, Pre	-.0963*	-.0294	.0852***	.0006	.0075
	(0.0524)	(0.0315)	(0.0211)	(0.0054)	(0.0138)
Total Effect, Post	-.1995*	-.0407	.0378	.0014	.0051
	(0.0969)	(0.054)	(0.0231)	(0.0041)	(0.0065)
Y-Mean	.004	.058	.058	.001	.002
Observations	42990	39841	39841	39919	39919

Dependent variables are listed at the head of each column. The coefficient estimates come from estimating equation 5, while allowing the effect to differ before and after 2007. Standard errors in parentheses, clustered on state. Each regression also includes county and year fixed-effects, as well as county-specific trends. * p <.10, ** p < .05, *** p < .01

Table 8: Effect of Layoff Events, Differences by Metropolitan Area Status

	(1) LF	(2) In-Mig	(3) Out-Mig	(4) DI	(5) Ret
MSA Counties	-0.1098	0.0127	0.1132**	-0.0039	0.0061
	(0.0825)	(0.0771)	(0.0539)	(0.0051)	(0.0107)
Y-Mean	.004	.057	.057	.001	.002
Adjusted R-Squared	0.332	0.952	0.955	0.454	0.217
Observations	10144	9441	9441	9419	9419
Non-MSA Counties	-0.1548**	-0.0491*	0.0542***	0.0021	0.0062
	(0.0592)	(0.0243)	(0.0166)	(0.0042)	(0.0105)
Y-Mean	.003	.062	.06	.001	.002
Adjusted R-Squared	0.0465	0.871	0.882	-0.141	-0.147
Observations	32846	30400	30400	30500	30500

Dependent variables are listed at the head of each column. The estimates come from estimating equation 5. The first panel estimates it only using counties that were in an MSA in 1990, while the second panel estimates it using all other counties. The total effects are the sum of the layoffs coefficients. Standard errors in parentheses, clustered on state. Each regression also includes county and year fixed-effects, as well as county-specific trends. * p <.10, ** p < .05, *** p < .01

Table 9: Effect of Layoff Events, MSA and Non-MSA, Interaction with Recession

	(1) LF	(2) In-Mig	(3) Out-Mig	(4) DI	(5) Ret
MSA Counties					
Total Effect, 1996-2006	-0.095	0.022	0.1268*	-0.0079	-0.0105
	(0.0696)	(0.1003)	(0.0639)	(0.005)	(0.0119)
Total Effect,1997-2011	-0.1146	0.0199	0.105	-0.0007	0.0211
	(0.1342)	(0.1374)	(0.073)	(0.0067)	(0.0129)
Y-Mean	0.004	0.057	0.057	0.001	0.002
Observations	10144	9441	9441	9419	9419
Non-MSA Counties					
Total Effect, 1996-2006	-0.1018*	-0.0447*	0.0733***	0.0026	0.0113
	(0.0569)	(0.0229)	(0.0194)	(0.006)	(0.0174)
Total Effect, 2007-2011	-0.2109*	-0.0498	0.0259	0.0017	0.0028
	(0.0976)	(0.049)	(0.0186)	(0.0043)	(0.0069)
Y-Mean	0.003	0.062	0.06	0.001	0.002
Observations	32846	30400	30400	30500	30500

Dependent variables are listed at the head of each column. The estimates come from estimating equation 5. The first panel estimates it only using counties that were in an MSA in 1990, while the second panel estimates it using all other counties. The total effects are the sum of the layoffs coefficients; the effects are allowed to be different before and after 2007, as in Table 7. Standard errors in parentheses, clustered on state. Each regression also includes county and year fixed-effects, as well as county-specific trends. * p <.10, ** p < .05, *** p < .01

Table 10: Decomposition of Migration Rates

	(1) Total Migration Rate	(2) In-State	(3) Out-of-State	(4) Adjacent	(5) Non-Adjacent
Panel A: Out-Migration					
Total Effect	0.0859***	0.01559	0.0703***	0.0005	0.0854***
	(0.0210)	(0.0105)	(0.0151)	(0.0076)	(0.0184)
Y-Mean	0.058	0.03	0.028	0.023	0.035
Panel B: In-Migration					
Total Effect	-0.0357	-0.0058	-0.0300	-0.0072	-0.0285
	(0.0286)	(0.0141)	(0.0207)	(0.0086)	(0.0251)
Y-Mean	0.059	0.03	0.028	0.023	0.036
N	39845	39845	39845	39845	39845

Each panel is a different migration rate - the first is out-migration, and the second is in-migration. Dependent variables are listed at the head of each column, and are components of the migration rate listed at the head of the panel. The total effects come from the coefficients that come from estimating equation 5. Standard errors in parentheses, clustered on state. Each regression also includes county and year fixed-effects, as well as county-specific trends. * p <.10, ** p < .05, *** p < .01

Table 11: Differences by County Features

	(1) LF	(2) In-mig	(3) Out-mig	(4) DI	(5) Ret
Panel A: State UI Replacement Rate					
Below Median	-0.1268	-0.0124	0.0696**	0.0053	0.0063
	(0.0743)	(0.0559)	(0.029)	(0.008)	(0.0164)
Above Median	-0.209*	-0.0314	0.0809***	0.0008	0.0026
	(0.1152)	(0.0203)	(0.0221)	(0.0037)	(0.0045)
Panel B: High-Cost Loan Exposure, 2004					
Below Median	-0.0597	0.0245	0.0443**	0.0066	-0.0086
	(0.0884)	(0.0538)	(0.0204)	(0.0058)	(0.0105)
Above Median	-0.124	-0.0393	0.0409	0.0159*	0.026
	(0.1031)	(0.0407)	(0.0349)	(0.0092)	(0.0246)

Dependent variables are listed at the head of each column. The estimates come from estimating equation 5, and the coefficients displayed are the sum of the layoffs coefficients. Panel A splits the sample below and above median replacement rate, according to the calculations of Lalumia (2013) and Kuka (2015). Panel B splits the sample according to the share of high-cost mortgages in 2004, using HMDA data. Regressions in Panel A include county and year fixed effects, as well as county-specific trends, while regressions in Panel B only include county and year fixed effects. Standard errors in parentheses, clustered on state. * $p < .10$, ** $p < .05$, *** $p < .01$

Table 12: Effect of Layoff Events, Including Leads

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	In-migration Rate		Out-Migration Rate		New Disabled Share		New Retired Share	
Layoffs t	-0.0171	-0.0191	0.0507***	0.0446***	0.00146	0.00116	0.0144*	0.0143*
	(0.0155)	(0.0150)	(0.0144)	(0.0127)	(0.00382)	(0.00431)	(0.00803)	(0.00842)
Layoffs $t-1$	-0.00955	-0.0113	0.0266***	0.0243***	0.000887	0.000905	0.00696	0.00801
	(0.0109)	(0.0111)	(0.00732)	(0.00641)	(0.00529)	(0.00569)	(0.0120)	(0.0134)
Layoffs $t-2$	-0.00908	-0.0107	0.00857	0.00704	-0.00118	-0.000830	-0.00558	-0.00945
	(0.00906)	(0.00917)	(0.00719)	(0.00743)	(0.00309)	(0.00325)	(0.00588)	(0.00682)
Layoffs $t+1$		-0.0123		0.00203		-0.00596**		0.000152
		(0.0123)		(0.00657)		(0.00282)		(0.00589)
Y-Mean	.059	.059	.058	.058	.002	.002	.004	.004
N	39845	39838	39845	39838	39960	36877	39960	36877

Dependent variables are listed at the head of each column. The estimates come from estimating equation 5. Columns 2, 4, 6, and 8 include a lead of layoffs share. Standard errors in parentheses, clustered on state. Each regression also includes county and year fixed-effects, as well as county-specific trends. * $p < .10$, ** $p < .05$, *** $p < .01$

Table 13: Effect of Layoff Events at Commuting Zone Level

	(1) LF	(2) In-Mig	(3) Out-Mig	(4) DI	(5) Retirement
Layoffs t	-0.0403	-0.0498***	0.0496***	0.00155	0.0143
	(0.0278)	(0.0117)	(0.0142)	(0.00311)	(0.0107)
Layoffs $t-1$	-0.146***	-0.0180	0.0212***	0.00349**	0.00633*
	(0.0288)	(0.0126)	(0.00767)	(0.00159)	(0.00353)
Layoffs $t-2$	-0.0242	0.00138	0.0102	-0.00528	-0.0143
	(0.0279)	(0.0112)	(0.00789)	(0.00500)	(0.0163)
Total Effect	-0.2107***	-0.0664**	0.0811***	-0.0002	0.0063
(se)	0.0528	0.0270	0.0199	0.0027	0.0064
Y-Mean	0.0042	0.0581	0.0574	0.0009	0.0019
Observations	10108	9386	9386	10108	10108

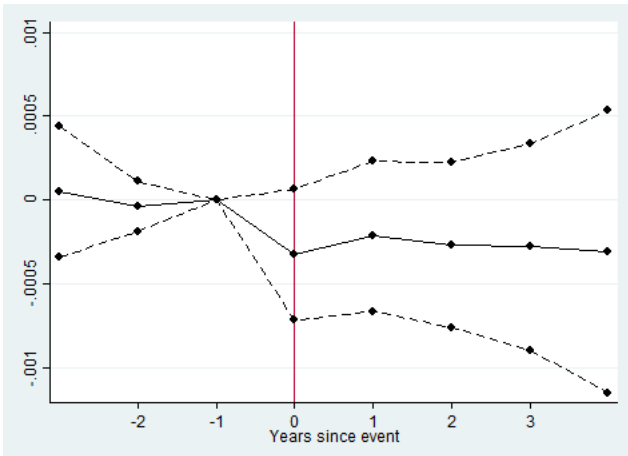
Dependent variables are listed at the head of each column. The estimates come from estimating equation 5, but the observation is the commuting zone-year. The total effects are the sum of the layoffs coefficients. Standard errors in parentheses, clustered on state. Each regression also includes commuting zone and year fixed-effects, as well as CZ-specific trends. * p <.10, ** p < .05, *** p < .01

Table 14: Effect of Layoff Events on Demographic Shares

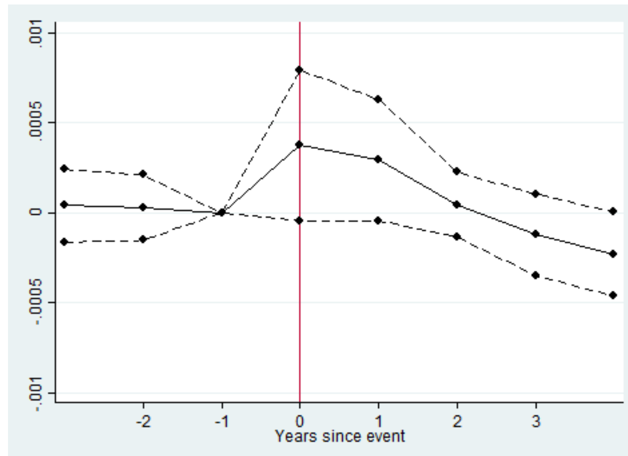
	(1) Age 0-18	(2) Age 19-44	(3) Age 45-59	(4) Age 60 plus	(5) Black	White
Total Effect	-.0131	-.0165	.0157	.0139	.0068	-.0045
	(0.0157)	(0.0166)	(0.0171)	(0.0152)	(0.0058)	(0.0075)
Y-Mean	0.26	0.331	0.205	0.203	0.091	0.88
Observations	39926	39926	39926	39926	39926	39926

Dependent variable for each column is the share of the population fitting the description at the head of the column. The three panels are separate estimates for the whole time period, the effect before 2007, and the effect after 2007 The estimates come from estimating equation 5. Standard errors in parentheses, clustered on state. Each regression also includes county and year fixed-effects, as well as county-specific trends. * p <.10, ** p < .05, *** p < .01

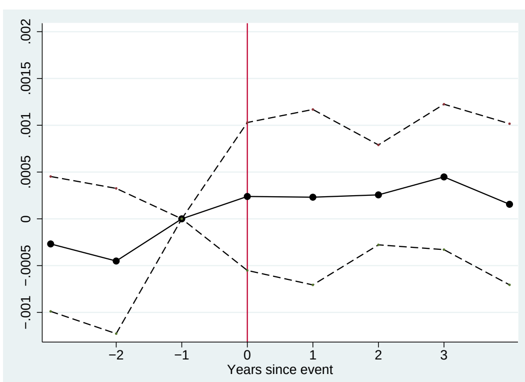
Figure 1: Event Studies, 4% Mass Layoff Event (N=118 counties)



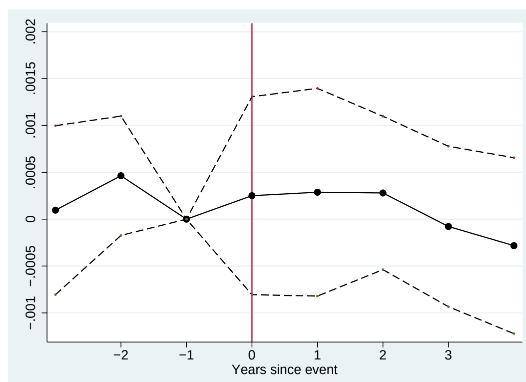
In-migration



Out-migration



Disability

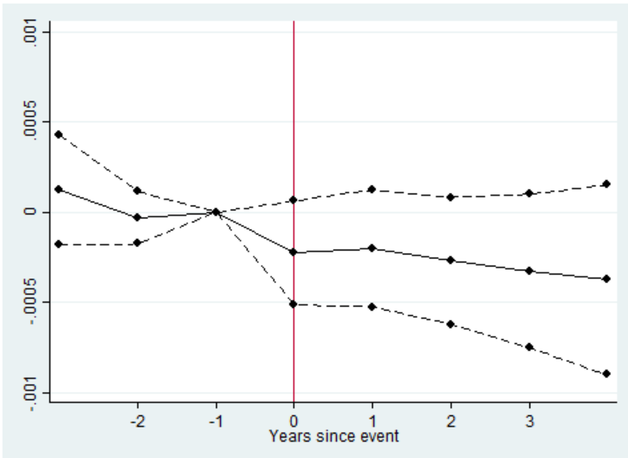


Retirement

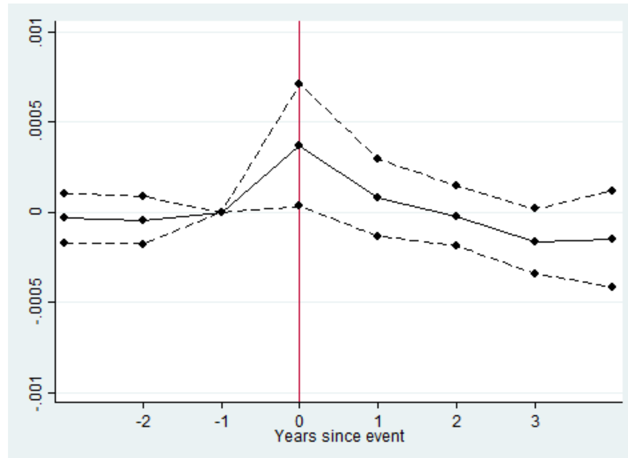
Figures display coefficients from equation (5) in text, and a 95% point-wise confidence interval is shown, with standard errors clustered at the state level. Outcome variables listed below each sub-figure. Event study methodology is described in greater detail in the text. Sample is restricted to counties that experienced just one layoff event surpassing four percent of the labor force in the years 2000-2007. Specifications include county and year fixed effects.

Appendix Figures and Tables

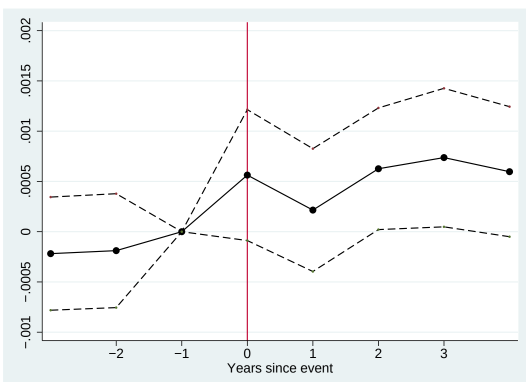
Figure A1: Event Studies, 3% Mass Layoff Event (N=196 counties)



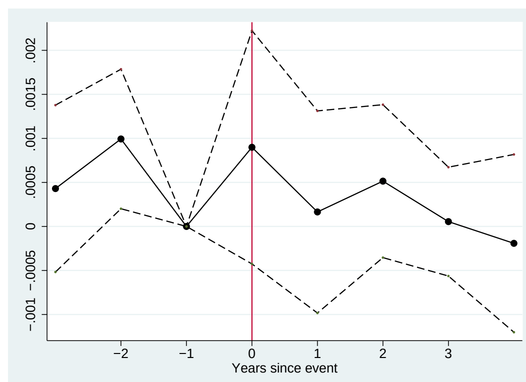
In-migration



Out-migration



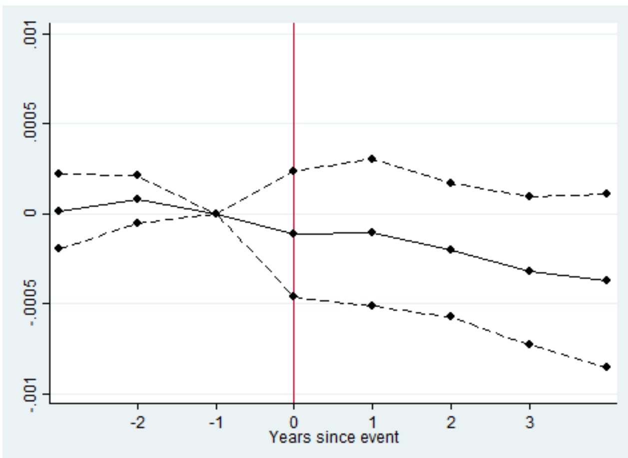
Disability



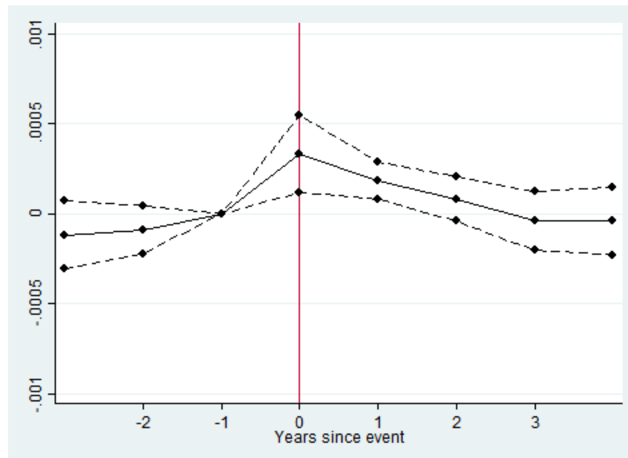
Retirement

Figures display coefficients from equation (5) in text, and a 95% point-wise confidence interval is shown, with standard errors clustered at the state level. Outcome variables listed below each sub-figure. Event study methodology is described in greater detail in the text. Sample is restricted to counties that experienced just one layoff event surpassing three percent of the labor force in the years 2000-2007. Specifications include county and year fixed effects.

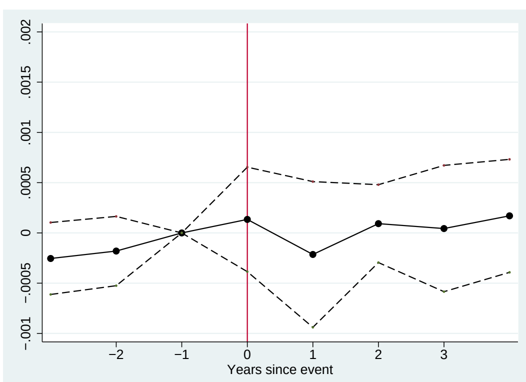
Figure A2: Event Studies, 2% Mass Layoff Event (N=254 counties)



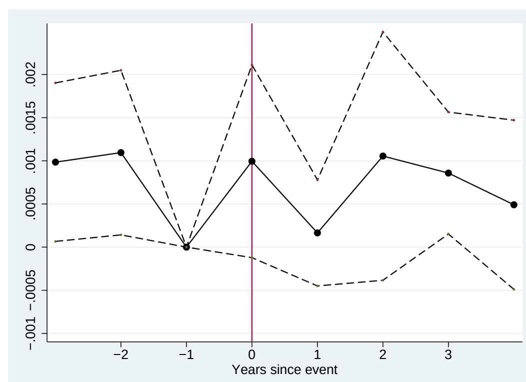
In-migration



Outmigration



Disability



Retirement

Figures display coefficients from equation (1) in text, and a 95% point-wise confidence interval is shown, with standard errors clustered at the state level. Outcome variables listed below each sub-figure. Event study methodology is described in greater detail in the text. Sample is restricted to counties that experienced just one layoff event surpassing two percent of the labor force in the years 2000-2007. Specifications include county and year fixed effects.

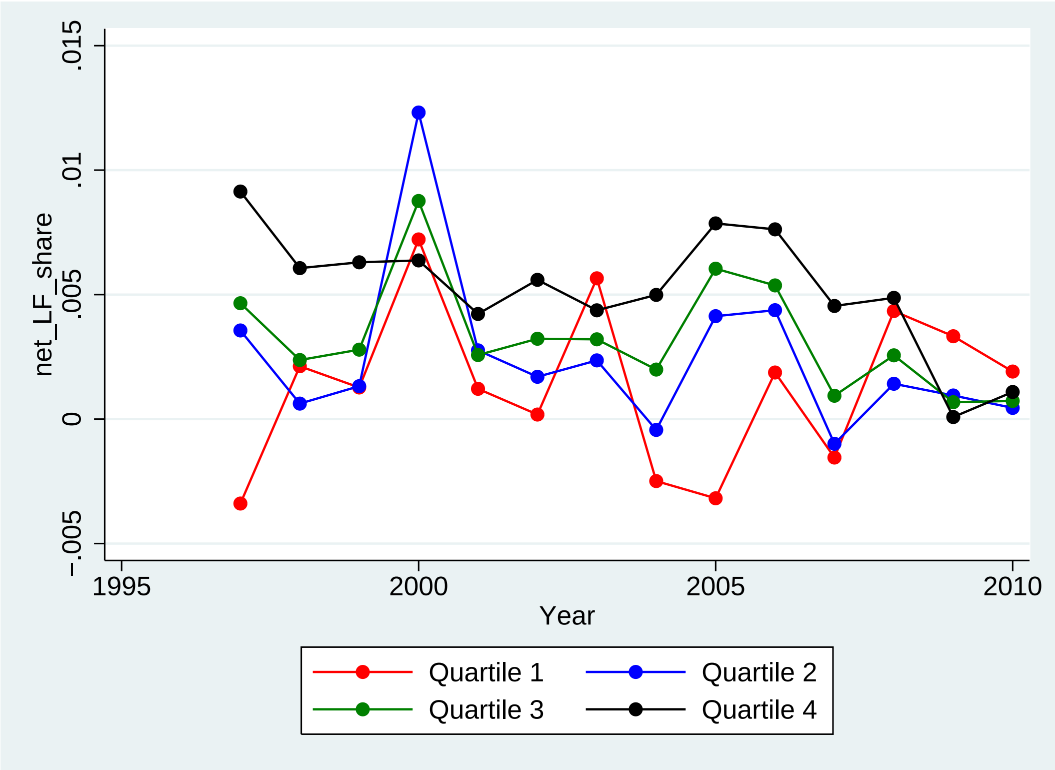


Figure A3: Average net LF changes over time, by quartile of county population

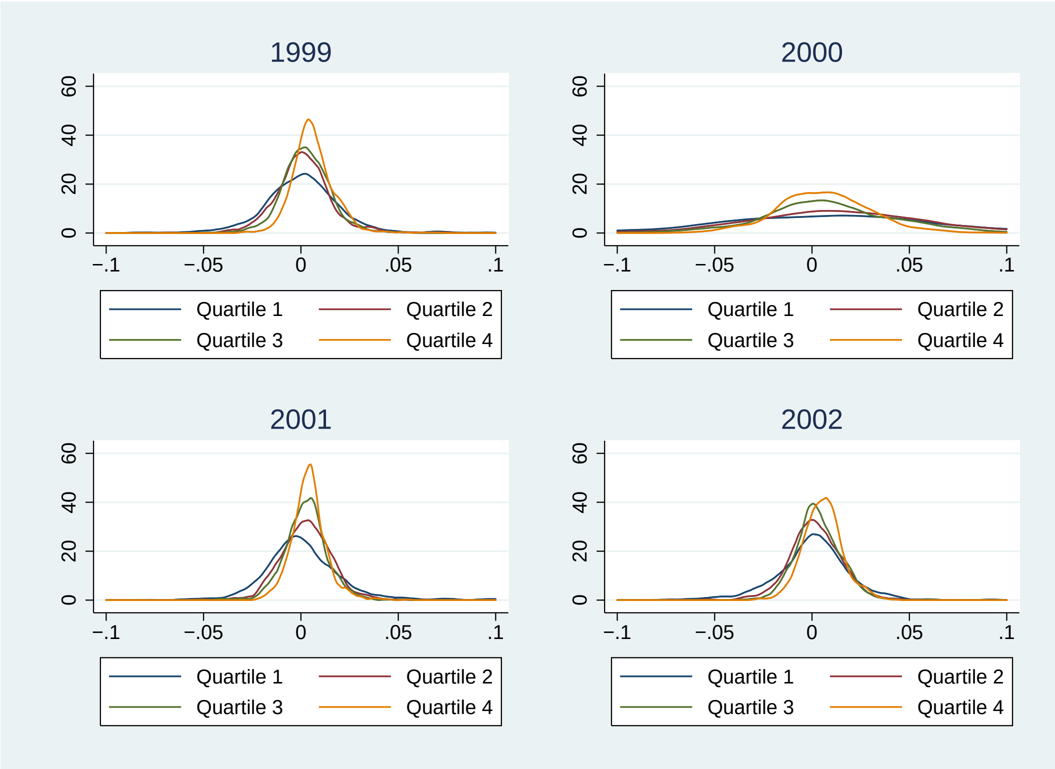


Figure A4: Distributions of Net Labor Force Change, by Quartile and Year

Table A1: Effect of Layoff Events on Net Labor Force

	All years	Omitting 2000
Panel A: Un-weighted		
No Trends	-0.1513	-0.2107
	(0.0486)	(0.0436)
Trends	-.1501	-0.2055
	(0.0610)	(0.0602)
Panel A: Weighted		
No Trends	-0.1463	-0.1812
	(0.0681)	(0.0606)
Trends	-0.0527	-.0999
	(0.0757)	(0.0784)

Dependent variable for each column is the share of the population fitting the description at the head of the column. The three panels are separate estimates for the whole time period, the effect before 2007, and the effect after 2007 The estimates come from estimating equation 5. Standard errors in parentheses, clustered on state. Each regression also includes county and year fixed-effects, as well as county-specific trends. * p <.10, ** p < .05, *** p < .01