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

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June 2017
(pre-publication version)

Abstract
Large shocks to local labor markets can cause long-lasting changes to employment, unemployment and the local labor force. This study examines the relationship between mass layoffs and the long-run size of the local labor force. We consider four main channels through which the local labor force may adjust: in-migration, out-migration, retirement, and disability insurance enrollment. These channels, primarily out-migration, account for over half of the labor force reduction over the past two decades. However, we find that during and after the Great Recession, the labor force non-participation response grew to account for most of the local labor force exits following a mass layoff.

Rates of job loss in the United States reached record highs during the Great Recession (Farber, 2011; Elsby, Hobijn and Sahin, 2010). Much of the national attention and media coverage focused on overall levels of job creation and economic activity. However, variation in the severity of the downturn across labor markets points to the need to focus the policy discussion on the reallocation of workers to jobs and to understanding the nature and speed of labor market adjustment. Well-known work by Blanchard and Katz (1992) originally emphasized the importance of worker mobility in this adjustment process, showing that local unemployment rates primarily adjust by workers moving to areas where there are more jobs, as opposed to local job creation or recovery. In contrast, Bartik (1993) argued that there are lasting effects of local employment shocks on labor force participation rates, a finding confirmed in recent work by Notowidigdo (2013). This possibility of local shocks altering the labor force is an important part of understanding local area adjustments to shocks. This issue has been of even greater relevance recently, as the aftermath of the Great Recession, featured both a slow recovery and significantly reduced geographic mobility (Frey, 2009).

In this paper, we estimate the effect of adverse labor demand shocks on the local labor force and labor market exits, with particular emphasis on the different exit channels used by workers. This is a critical question that has often fallen between segments of closely related studies. A number of studies, many of which are reviewed in Bartik (1993), consider *either* employment, participation and unemployment responses to local shocks, or, examine migration responses and other labor force exits, but it is relatively rare for studies to combine both types of responses in a single study. We first show that mass layoffs provide a negative shock to local employment and labor force measures, and argue that they offer some advantages over more commonly used local unemployment rates. We then consider how and to what extent these mass layoffs cause individuals to exit the local labor market through alternative channels of migration, disability, retirement and non-participation.

Our paper makes three contributions to the literature. First, by jointly considering all labor force exit channels, including non-participation, we are able to measure their relative importance in driving local labor supply adjustments over time. Second, we use mass layoffs as our measure of changes in local labor demand, a novel approach within the local labor market shocks literature, which addresses potential problems with local labor markets or other common demand shocks in a migration-related setting. Finally, we measure the extent to which these responses differ before and during the Great Recession, and consider the meaning of such differences.

We have two main findings. First, we find that during most of the study period the predominant adjustment mechanism following a mass layoff event is migration. This finding coincides with much of the prior research. Second, we find that labor force exits from mass layoffs grew dramatically during and after the Great Recession, and the role of migration was muted during the same period. Instead, labor force non-participation grew during this period to account for half of the labor force response. The change in the size of the migration response during and after the Great Recession is statistically significant. Our estimates suggest that, after 2007, labor force non-participation replaced out-migration as the predominant channel of labor force adjustment.

We examine why non-participation has increased as a channel of labor force exit. We find no evidence of a greater non-participation response in areas more severely affected by the housing crisis. We also do not find any differential responses in areas with more generous safety net benefits, especially unemployment insurance. We note that the Great Recession occurred at a time when migration rates had already been in secular decline, thus accounting for lower mobility rates in our analyses. This likely combines with the facts established in prior literature, that overall migration rates fall during national recessionary periods. Few studies of local labor market adjustment have incorporated this finding by allowing differential migration responses based on the state of the national economy. The finding of a large response on the participation margin during the recessionary period is also consistent with a growing literature examining the recent, persistent drop in labor force participation rates.

The remainder of this paper proceeds as follows. In Section 1, we review the previous literature on labor market shocks and labor market exit, while Section 2 discusses our data, and how we measure each labor market exit channel. Section 3 motivates our measure of labor demand in more detail. Section 4 presents our decomposition of labor force changes and our estimation equation, and Section 5 shows results. Section 6 concludes with a discussion of our findings, with a particular focus on the rising importance of non-participation following local labor demand shocks.

1 Literature Review

Our interest here is in how the local labor force changes following a sizeable local labor demand shock. This issue has implications for understanding the broader effects on local areas of these shocks, and for understanding how best to respond to local downturns. In part, this question is motivated by earlier literature exploring the adjustment process following shocks to labor demand. Specifically, Blanchard and Katz (1992) show that following a negative labor demand shock, employment falls and recovers partially, but never returns to its original level, while wages and unemployment rates do return to their original level. Together, these findings suggest that most of the long-term effect of a local shock on employment comes through migration out of the local labor market. Topel (1986) considers the role of migration in responding to both temporary and permanent demand shocks, highlighting that the differences in mobility costs across groups may affect wages. However, Topel (1986) does not directly consider the participation margin.

Other studies conducted during this time frame, however, reach different conclusions about the importance of migration in the adjustment process. Notably, Bartik (1993) estimates that the effect of a local labor demand shock is mostly on the labor force participation of marginal workers. Bartik (1993) explores the reasons for the discrepancy between his findings (Bartik 1991, 1993) and those of Blanchard and Katz (1992). He notes that his use of MSA-level data versus state-level data by Blanchard and Katz is important, particularly when combined with discrepancies in employment data between place of work and place of residence. Bartik also notes important differences in the way dynamics are both conceptualized and empirically modeled between the two sets of authors. In particular, Bartik (1993) shows that when he simulates a once-and-for-all shock to job growth (in contrast to the Blanchard and Katz approach which allows an initial shock to have subsequent effects on growth) using the Blanchard and Katz (1992) data, there is robust evidence of lasting effects on participation.

Beyond these studies focused directly on the adjustment process, several distinct segments of the literature are also relevant here. First, a number of studies focus on migration in response to labor demand shocks, at both the national and local levels. A second body of work considers the response of labor force participation rates to local shocks, most recently in response to declining rates of labor force participation leading up to and after the Great Recession. Finally, other work examines more specific paths of exit from the labor force, including transitions to disability insurance and retirement. Here, we briefly summarize relevant work in each of these areas, and then position the current study within these distinct sets of work.

There is a large literature focusing on the time-patterns and cyclical determinants of migration. Saks and Wozniak (2011) show that migration is pro-cyclical at the national level; in times of low national unemployment, the benefits from moving are higher, inducing more people to migrate for job-related reasons. Even after controlling for local labor demand, national economic indicators are significant determinants of migration rates. This is an important finding to consider as we interpret how effects of a mass layoff may differ before and after a major national recession.

Bound and Holzer (2000) also study the responsiveness and mobility of specific populations between the 1980 and 1990 Censuses to labor market shocks. They show an important role for population adjustments in light of economic shocks, but also show that less educated and black workers have relatively limited mobility responses. 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. Most importantly in relation to our study, Notowidigdo (2013) shows that a substantial portion of the decline in local employment is due to a decline in labor force participation, and cannot be entirely attributed to out-migration.

Notowidigdo (2013) bridges to the second area of study relevant here, focused on understanding reductions in labor force participation rates over the past decade. Aaronson, et al. (2016) review a number of studies and investigate the role of demographic, structural and cyclical factors in explaining the lasting reductions in the labor force participation rate after 2007. They argue that the reduction in labor force participation rates was largely predicted by population aging trends, other cohort trends that pre-dated the recession, and a cyclical component that reflected the unusual severity of the great recession. Aaronson et al. (2016) focus on national patterns and cyclical conditions, but their findings are consistent with a substantial role for non-participation during the latter half of our sample period. Hall (2014) largely agrees with this finding, and also echoes the Notowidigdo (2013) findings of a potentially important role for safety net and social insurance programs in boosting non-participation rates in recent years.

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 examine a different type of labor market shock, we come to similar conclusions, showing that non-participation is a key channel of adjustment following a labor demand shock. They find that decreases in labor demand in manufacturing do not affect the population size of affected areas, which is suggestive of low migration responses; however, they do not directly measure migration flows.

Others have also argued that social insurance, including extended unemployment benefits, and safety net programs may further encourage non-participation in light of negative shocks. 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, Daly and Hobijn, 2010).

Separate strands of the economics literature have considered adjustment to labor demand shocks via more specific forms of non-participation. 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, Daniel and Sanders, 2002, Burkhauser, Butler and Gumus, 2004, Autor and Duggan 2003). An additional channel of labor market exit is retirement. 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, 2001). More recently, several authors have suggested that the recent economic downturn, including the housing market crash, the stock market collapse, and rising unemployment, implies different incentives to either hasten or delay retirement (Coile and Levine, 2011; Bosworth and Burtless, 2010; Goda, Shoven and Slavov, 2012).

Because we use a measure of mass layoffs as our measure of a demand shock, this project is connected to several other segments of the labor and macro literature. Many prior studies have used worker-level data to examine the effect of a mass layoff on earnings and employment (Jacobson, LaLonde and Sullivan, 1993; Stevens, 1997; von Wachter, Song and Manchester, 2009; Fallick, Haltiwanger and McEntarfer, 2012). Additionally, Jacobson et al. (1993) and von Wachter et al. (2009) compare workers separating during mass layoff events or during other times, and find evidence that the workers are similar in terms of earnings levels and age. This evidence suggests that workers involved in mass layoffs are not positively or negatively selected on worker quality.

Finally, there is an important literature that is concerned with the broader set of transitions between labor market states and how these contribute to movements in the aggregate unemployment rate. Notably, Elsby, Michaels, and Solon (2009) and Shimer (2012) explore the cyclicality of the labor market transitions that determine cyclical movements in the unemployment rates. While this is an important segment of the macroeconomics and labor literatures, an important implication for our purposes is that, while primarily focused on employment to unemployment transitions (and vice-versa), Shimer (2012) also shows a substantial role for transitions between employment or unemployment and "inactivity"—echoing our focus on non-participation as an important channel. This literature is focused at the national level and does not explore migration across local markets.

Many of these prior studies have focused on *either* the dynamics of employment and wages or, alternatively, on migration response to shocks. Our work directly measures these potentially competing adjustment channels, to simultaneously assess the importance of migration, disability insurance receipt, retirement, and non-participation. This approach aims to paint a picture of the lasting consequences of economic shocks by detailing and decomposing the ways in which the local labor force may be altered by a shock, and how these details may vary over time and across different cyclical conditions. Below, we show the extent to which labor market shocks lead to adjustments in the labor force through the alternative channels of migration and non-participation (including disability and retirement), and show that these differ before and after the Great Recession.

2 Data

In this section, we describe our measure of labor demand shocks, and then explain how we measure labor force exits. We also describe other demographic data that we use. Our sample spans the years 2000-2011, which are the years for which all the datasets overlap.

2.1 Mass Layoffs Data

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 filed claims against a single establishment within a 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 these data to quantify the size of a local labor demand shock at the county level. The data are reported by county of worker residence, even if a firm hires employs workers from multiple counties. This enables us to measure the number of workers residing in a county that were involved in a mass layoff in a given year. To compare the magnitude of mass layoffs across labor markets, we express the size of the shock as a share of the lagged size of the labor force in that county.

While we do not have additional information on the characteristics of workers involved in mass layoffs from our data, other work has compared workers in mass layoffs with workers in smaller layoffs or other types of separations. Handwerker (2012) explicitly considers the mass layoff statistics we utilize and compares them with broader measures of negative employment shocks. She shows that the reporting of a mass layoff (by the definition used in our data) is highly correlated with alternative reports of large employment reductions from the Quarterly Census of Employment and Wages which themselves tend to be highly correlated with administrative UI data commonly used in studies of displaced workers. Handwerker (2012) also shows that individuals covered in the mass layoff statistics tend to be older and more heavily concentrated in manufacturing, compared to all unemployed workers. These characteristics may be important in comparing our results with prior work, but do not reduce their validity as measures of local, permanent shocks.

In fact, for our purposes, the mass layoff data offer several advantages. First, the use of mass layoffs diminishes concerns with measurement error issues associated with unemployment rates from small areas. Second, layoff measures avoide some of the potential endogeneity of unemployment rates with respect to migration. Finally, these mass layoff notifications are used as official measures for the allocation of federal labor market adjustment programs and for "identifying the causes and scope of worker dislocation, especially in terms of the human and economic costs" and may be of independent interest as indicators of local shocks.[1]

2.2 Labor Force Exits

We have four main measures of the components of changes in the labor force: in-migration flows, out-migration flows, net changes in disability insurance enrollment, and net changes in retirees. To measure the migration flows, we use data from the IRS Statistics of Income files, which calculate inflows and outflows based on address changes of individual tax filers. Following other research, we measure the migration flow as the number of exemptions moving into or out of a county.[2] To count as a migration flow or as a non-migrant, two conditions need to be met. First, an individual must file taxes in two consecutive years. Second, both of these tax filings must be within five months of the initial tax filing date. Migrants are defined as individuals who file from an address in a different county in the following year, while non-migrants are those who file from an address in the same

[1] See https://www.bls.gov/mls/mlsover.htm#uses.
[2] Exemptions include spouse, children and elderly parents living with the primary filer, and so researchers typically use exemptions as a proxy for population.

county.[3] This methodology will under-represent the poor and elderly, since they are less likely to file tax returns.[4]

One final limitation is that the data are unable to identify changes in filing status; for a married couple filing jointly 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 is recorded.[5]

To measure the number of individuals in a county who enroll in disability insurance or retire, we use data from the Social Security Administration's Old Age, Survivors and Disability Insurance program from 1999 to 2011.[6] The data report total numbers of beneficiaries in each year by county. To measure the flow of new retirees and disability insurance enrollees, we calculate the net annual change in the number of beneficiaries of both programs. Both of these flows are subject to some measurement challenges. First, workers can retire without immediately collecting Social Security, in which case they are not counted as retiring with our data. Second, workers can begin to collect Social Security without retiring, in which case we would incorrectly count them as having retired. Some retirees never collect Social Security payments at all. For these reasons, our measure of flows into retirement is not precise.

We supplement these main sources of data with additional information on county demographics. We use the Surveillance, Epidemiology, and End Results (SEER) program of the National Cancer Institute to compile information on total population, as well as the age, gender, and racial composition at the county level. We also use the SEER data to calculate the size of the working age population, those aged 16 to 65. Additionally, to measure the size of the labor force and the unemployment rate in the county, we used the Local Area Unemployment Statistics (LAUS) from the BLS. The LAUS data are calculated using employment data from the Quarterly Census of Employment and Wages and commuting data from the American Community Survey. While there is admittedly measurement error in the LAUS data, they are the best estimate of employment and labor force size at the county level, and are often used for this purpose (e.g. Bratsberg, Barth and Raaum 2006; Ruhm 2007).

We do not directly measure labor force non-participation. Instead, we calculate the difference between a county's working age population in the SEER data and the size of its labor force in the LAUS data as our measure of non-participation in a given year. We then measure the number of individuals transitioning from the labor force to non-participation as the change in the population of non-participants between years.

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[3] Non-migrants thus include those who file in two different addresses within the same county in subsequent year.

[4] Migration data also do not count emigration or immigration of foreign nationals, since they would not have filed taxes in one of the two years. However, the migration data do consider individuals who file from an address outside the United States; in this paper, we only consider migration within the United States.

[5] In results not shown, we show that the bias from this type of measurement error is minimal, and cannot explain our results. For a more extended discussion of the IRS migration data, see Gross (1999).

[6] We use 1999 data in order to calculate the net caseload in 2000.

We express all of our outcome variables as rates, which can be compared to the flows of newly displaced workers from mass layoffs. We define in- and out-migration rates as the number of migrants to or from a county in a particular year as a share of that county's population. For both DI applications and enrollment, retirement, and non-participation, we divide the flows by the county's population the previous year, to avoid the endogeneity due to coincident changes in population size caused by migration.

2.3 Geographical Definition of Local Labor Markets

In our preferred specifications, we use the county as our geographic unit of observation. All of the key measures of labor force exit we use as outcomes are reported by county of residence. Thus, focusing on counties allows us to more precisely assign job loss rates and labor force exits such as migration, retirement and enrollment in disability insurance to the residents of a county.

Other geographical units are commonly used in the literature. A commonly used definition of local labor markets is the commuting zone, as first defined by Tolbert and Sizer (1996) (Autor, Dorn and Hanson, 2013; Yagan, 2016). Commuting zones are useful when labor demand shocks are measured at the place of work, since the local area must account for commuting in order to identify those affected. This issue is not as severe in our case because we know county of residence for our labor demand shock. However, for completeness, we also present our main results at the commuting zone level. We do not use Metropolitan Statistical Areas (MSAs) because they do not include rural counties, which experience large mass layoffs at the same or higher rates as urban counties.[7]

2.4 Summary Statistics

Panel A of Table 1 shows summary statistics for mass layoff variables in the full study period, as well as before and after the start of the Great Recession in 2007 (the second and third columns, respectively). 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 378 workers, but these shares differ substantially before and after 2007, as job separation rates jumped during the Great Recession.

Panel B of Table 1 shows the percentage of counties that experienced at least one year where the share of the labor force involved in a mass layoff surpassed a certain threshold. Sixty-one percent of counties had at least one year where one percent of the labor force was laid off, while five percent of counties experienced a year where more than five percent of their labor force was involved in a mass layoff.

Panel C of Table 1 shows means for our outcome variables that contribute to the decomposition of the change in labor force. On average, the change in the size of the labor force as a share of the

[7] In any given year during our sample, 11% of urban counties experienced a mass layoff of larger than 2% of their labor force, compared with 16% of rural counties.

population was 0.3 percent. Migration flows are an order of magnitude larger than flows into disability insurance and retirement, suggesting that adjustments on these margins are much more prevalent.[8]

3 Mass Layoffs as a Local Labor Demand Shock

To motivate the use of mass layoffs as a labor demand shock, in this section, we illustrate the relationship 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 not preceded by long-term labor market declines.

We first estimate effects on the subset of counties in our sample that experience a layoff event of four percent of the labor force once between 2001 and 2007.[9] Layoff rates increased dramatically during the Great Recession, making it more difficult to isolate counties with only a single large layoff event after 2007. We limit the sample in this way to isolate a clear "event" for a county, which is conducive to the event-study framework.[10] In this limited sample of 118 counties, these large and isolated layoff events were discrete, unanticipated shocks to local workers and unrelated to local economic trends.

We estimate this relationship using the following event-study model:

$$y_{ct} = \alpha + \sum_{\substack{i=-3 \\ i\neq -1}}^{3} \beta_i \, \mathbb{1}(t - T_c = i) + \delta_t + \gamma_c + \epsilon_{ct} \qquad (3)$$

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 four percent of the labor force. The indicator $\mathbb{1}(t - T_c = i)$ 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 $\mathbb{1}(t - T_c = i)$ would take value one in year 2005 for $i = 1$. Observations earlier than three or later than three years from the event are captured by dummies $\mathbb{1}(t - T_c \leq -3)$ and $\mathbb{1}(t - T_c \geq 3)$. We omit the dummy for $i = -1$, so all the coefficients are relative to the year before the event occurred.

[8] Note that the relatively low rate of new retirements is due to the denominator in Table 1 being the entire population, not those in age ranges more prone to retirement.
[9] Figures in the Online Appendix show results for the thresholds of 3 and 2 percent, respectively.
[10] Mass layoffs happen in all years, and thus we cannot isolate one year as the event for all counties. We focus on counties that had one very large layoff event. This is admittedly a selected group, but the purpose of this exercise is to motivate the main findings in the next section.

Figure 1 displays the coefficients for our event study analysis using our restricted sample. The top two graphs of Figure 1 display the coefficients for in- and out-migration, as well as a 95 percent confidence interval. Importantly, for neither in-migration nor out-migration does there seem to be a noticeable trend in migration rates *before* the mass layoff event. There does appear to be an increase in out-migration rates following the layoff event, and a noticeable dip in in-migration.

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.[11] For retirement, the pattern is also not statistically significant but suggestive of an increase in retirement.

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 directly as an indicator of local labor market shocks. Finally, these results preview the findings of our more detailed statistical analysis below, showing that in- and out-migration respond noticeably to local labor demand 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.

4 Estimation approach

In the previous section, we demonstrated that counties that experience large mass layoffs are similar before the event than counties that do not experience large mass layoffs, suggesting that mass layoffs are unanticipated by residents. In this section, we first demonstrate how we decompose changes in the labor force into each type of labor force exit. We then estimate the effect of mass layoffs on each of these components of labor force change, and also estimate the implied size of non-participation.

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

$$\Delta LF_{ct} = (inmig_{ct} - outmig_{ct}) - DI_{\ ct} - retired_{ct} + \Delta NILF_{ct} + \varepsilon_{ct} \qquad (4)$$

The term ΔLF_{ct} is the change in a county c's labor force from year t-1 to 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 4 comprise the net domestic migration of workers: in-

[11] We also graphed responses of disability applications; these are available upon request.

migration minus out-migration. Any individuals that enroll in DI or retire also change the size of the labor force. $\Delta NILF_{ct}$ includes flows into and out of non-participation (beyond those due to retirements and disability), while ε_{ct} includes all other flows into and out of the labor force, including aging into the workforce, deaths, and net migration from abroad. When we explicitly measure ε_{ct} we find it is empirically negligible, so we drop it from further discussion.[12]

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 4 above by the size of the population in previous period:

$$\frac{\Delta LF_{ct}}{popn_{c,t-1}} = \left(\frac{inmig_{ct}}{popn_{c,t-1}} - \frac{outmig_{ct}}{popn_{c,t-1}}\right) - \frac{DI_{\ ct}}{popn_{c,t-1}} - \frac{retired_{ct}}{popn_{c,t-1}} + \frac{\Delta NILF_{ct}}{popn_{c,t-1}} \qquad (5)$$

The equation above describes the relationship between our outcome variables of interest. We estimate the effect of mass layoffs on the four components of the right-hand side of equation 5, as well as on the net change in labor force size. We normalize the flows using population to avoid scale-effect bias, as described in Peri and Sparber (2011).

Note that in equation 5, 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 and non-participants migrate at the same rate, then those two terms do not have to be rescaled. Our preferred specification to estimate the effect of a mass layoff is below:

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

Our key regressor 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 its components: out-migration rate, in-migration rate, new DI enrollment rate, new retirement rate, or change in the non-participation 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; year fixed effects, δ_t, to control for national trends; and county-specific linear trends, $\eta_c * t$, to control for trends in a county's

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[12] While Sullivan and von Watcher (2009) show that job separations such as mass layoffs increase mortality rates for those involved by approximately 50-100% in the few years following, this effect in aggregate would be negligible; taking their reported baseline mortality, a 1 percent mass layoff would increase mortality rates from 6.76 to 6.83 per 1000. For this reason, we do not expect our measure of non-participation to be impacted by mortality following job loss.

labor market and demographic structure. By including county-specific trends, we do not identify our effects from long-run trends in declining areas, but from unanticipated deviations away from those trends. 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.[13] We do not weight our estimates, since our key variables are expressed in rates. Thus, our analysis incorporates the size of the county population. We discuss other reasons for not weighting, as well as related robustness exercises, in the Online Appendix.

5 Results

This section shows our results estimating equation 6 for a number of outcomes. In all the results that follow, we estimate equation 6 including a contemporaneous effect and two lags of mass layoffs, as well as county-level trends. We display the total effect, which is the sum of the coefficients on the contemporaneous effect and the two lags.[14]

We first motivate our main analysis in the context of the broader literature in order to better understand the size of an employment shock following a mass layoff. The following identity from Bartik (2015), directly relates the overall change in employment following a shock to changes in the employment rate, plus the components we focus on here—the labor force participation rate, and population.

$$\ln E_{mt} - \ln E_{mt-1} = \left[\ln\left(\frac{E_{mt}}{L_{mt}}\right) - \ln\left(\frac{E_{mt-1}}{L_{mt-1}}\right)\right] + \left[\ln\left(\frac{L_{mt}}{P_{mt}}\right) - \ln\left(\frac{L_{mt-1}}{P_{mt-1}}\right)\right] + \left[\ln(P_{mt}) - \ln(P_{mt-1})\right] \quad (7)$$

where E_{mt}, L_{mt}, and P_{mt} are the employment, labor force, and population of county m in year t, respectively. To relate our focus to the broader effect of a local shock, we first estimate equation 6 using employment and employment rates as the dependent variable.

Table 2 shows estimates of the effect of a mass layoff on each of the components of equation 7. The first column shows that a mass layoff event affecting one percent of the local labor force is associated with a reduction in employment growth of 1.24 percentage points. The coefficient on employment of greater than one captures the fact that mass layoffs in an area represent only one type of separation, and are associated with other separations, such as smaller scale layoffs that may follow an initial downturn. The next three columns show the effects of mass layoffs on the other three components of the above decomposition: the employment rate, labor force participation rate, and population. Roughly one-third of the adjustment of employment following a mass layoff comes from the population and labor force participation responses, of around 0.20 percentage points each, while

[13] Clustering our standard errors by state may actually overstate our standard errors, since mass layoff events are likely correlated with nearby counties, but not faraway counties.
[14] A table in the Online Appendix, available on the authors' personal websites, shows the individual coefficients for the migration results, as well as the sum of the coefficients.

the rest is due to a change in the employment rate. The effect of a mass layoff on the unemployment rate has the same magnitude as the coefficient on the employment rate, with the opposite sign. Our main results for the remainder of this paper will focus on the effect that mass layoffs have on the labor force participation and population change margins, and how these magnitudes may have changed during the Great Recession. These responses in the labor force and population are particularly critical to understanding effects on a local area since they may be associated with lasting changes in the area's future labor force.

As we discussed in the previous section, we focus on four main components of the change in the local labor force: in- and out-migration, which measure how the population changes in response to a mass layoff; and disability and retirement, which measure how workers adjust on the participation margin. Additionally, as discussed in the previous section, we also include an estimated residual of the change in the labor force which is not accounted for by these components, which we attribute to non-participation.

Table 3 summarizes estimates of the effect that mass layoffs had on each of these components of labor force change.[15] Most of the change in the labor force size is driven by increased out-migration and decreased in-migration (although the effect on in-migration is not statistically significant). There are positive effects on both DI claims and new retirements, but the estimates are small and not statistically significant. Combined, the point estimates on DI and retirement suggest that these channels account for roughly 5 percent of the overall change in the size of the labor force following mass layoffs. Throughout the analysis, while we find suggestive evidence that disability insurance enrollment and retirement respond in the expected direction to mass layoffs, these results are much smaller than the migration responses and not statistically significant.[16]

These four labor force exit flows account for 53 percent of the decline in the labor force following a mass layoff of one percent of the labor force; out-migration alone accounts for almost 41 percent of the labor force change after three years.[17] In the sixth column, we estimate the effect of mass layoffs on the change in non-participation.[18] We find that for a one percent mass layoff, the

[15] The coefficients on labor force participation in tables 2 and 3 are slightly different due to how the variables are constructed: as logs in table 2 and in changes in table 3. We use logs to replicate the exact estimates in the broader related literature, as reviewed in Bartik (2015).

[16] There is a large and growing literature that documents the strong link between economic conditions and disability insurance. To investigate this further we used data on county-level disability insurance applications from the Disability Research File. Overall we find positive though statistically insignificant results. There is, however, a statistically significant response among older workers over 55 years old: a one percent mass layoff increases application rates by about 0.007 percentage points. These results are in the Online Appendix.

[17] To calculate this, we summed the effects in the second through fifth columns. In-migration is subtracted, while the others are added. This gives a sum of –0.1054, which we then divide by the total result in the first column of –0.1975 to arrive at 53 percent.

[18] The difference between the effect on the labor force and the sum of the next four components provides an alternative estimate of the effect of mass layoffs on non-participation. Assuming that other sources of population change, primarily differences in births versus deaths across counties, are quite small, this residual calculation will primarily reflect the movement into and out of the labor force. In most cases, this calculation suggests an effect very close to our directly (but imprecisely) estimated effect on non-participation. The results on non-participation

number of people that remain in the area but stop participating in the labor force increases cumulatively by 0.10 percentage points. Roughly half of the decline in the labor force following a mass layoff is due to migration and half is due to increases in non-participation.

5.1 The Great Recession

Labor force participation for working-age adults decreased considerably during the Great Recession, and has not recovered 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, while Charles, Hurst, and Notowidigdo (2013) argue that despite being masked by the housing boom, non-employment had been secularly increasing in the 2000s, which only revealed itself after the housing market crash.

To estimate whether the effect of a mass layoff differentially affected labor market exit during and after the Great Recession, we extend our estimates in Table 3 to allow the effect of a mass layoff to be different before and after the start of the Great Recession. We add an interaction between mass layoffs and a dummy for the years after 2007.[19]

Our results differ before and after the start of the Great Recession. First, the labor force response to a one percent mass layoff is more than twice as large in the years after 2007. Second, the out-migration response after 2007 is about half as large as the response before 2007. Taken together, our estimates suggest that migration (and very small effects on retirement and disability) explains only one-third of the total change in the labor force during the recession years, while our estimate of the flow into the non-participation channel (0.12), accounts for more than half of the net labor force change. During the Great Recession, workers exited the labor force through non-participation rather than migrating out of the area. These results suggest that the non-participation channel was larger during the Great Recession, although neither estimate of the effect on non-participation result is statistically different from zero.

One possible reason for the reduced effect of migration, discussed in the prior literature, is the contemporaneous shock to house prices during the Great Recession, which may have caused some homeowners to be locked-in. To test this hypothesis, we use county-level data from the Home Mortgage Disclosure Act (HMDA), which compiles detailed information on loan originations.[20] We then rank counties as high or low based on the share of home purchase loans that were high-cost, since these loans were at a higher risk to enter foreclosure, and allow the effect of mass layoffs to differ by these categories. We find no evidence of difference in migration rates based on exposure to

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are much less precise because non-participation is calculated using the LAUS labor force data and the SEER population estimates, which are both less precise than the migration data, which is calculated using administrative data.

[19] According to the NBER definitions, the recession officially began in December 2007. De la Rica and Rebello-Sanz (2016) and Couch, Fairlie and Xu (2016) employ a similar strategy as ours.

[20] 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).

sub-prime mortgages. We also allow a mass layoff to have a different effect based on the size of the house price decline, as measured in the county-level Zillow house price data, and find no evidence of a different response.

Another possibility is that the individuals laid off during the Great Recession were older, and thus less geographically mobile. The share of laid off workers who were above the age of 55 increased during the Great Recession, but only from 18.4 percent to 20 percent, which is unlikely to explain the large decrease in migration. It may also be the case that the effects of a mass layoff are non-linear. In results not shown, we tested for this by allowing the effect to differ if a mass layoff is above 2 percent, and do not find any support for this hypothesis.

A final explanation, supported by much earlier work, is that during recessions more broadly, mobility plays a less important role in local labor market adjustment than in a non-recessionary period. Saks and Wozniak (2011) show that individuals move less frequently when the national unemployment rate is higher, possibly because there are less opportunities for employment changes that require geographic mobility. Finally, mobility rates for individuals were trending downward over this period (Molloy et al. 2010), and this secular decline may explain the lower migration response during the Great Recession, individuals exited the labor force rather than moving. We view the evidence on the procyclicality of mobility as strong, and interpret our results as both confirming that finding, and emphasizing the importance of bringing that finding into the literature on labor market adjustments to shocks. This shows that it may be very important to distinguish between recessions and expansions, or between positive and negative shocks, in examinations of labor force adjustment channels.

5.2 Heterogeneity of effects by distance and county characteristics

Fogli, Hill and Perri (2012) argue that individuals displaced from work in one county may migrate to an adjacent county, mechanically increasing its unemployment rate in the receiving county. One advantage of the IRS migration data is that they allow us to decompose the migration response in more detail and thus estimate the size of the different migration types.

We explore whether workers undertake moves across state lines or to adjacent counties. Table 4 shows the results of these decompositions. Column 1 displays the main result from Table 3, while columns 2-5 examine the responses of the four types of migration flows, where type is a function of the migration destination (out-migration) or origin (in-migration). The results suggest that the change in out-of-state migration following a mass layoff accounts for 82 percent of the increased out-migration. Furthermore, the change in migration to non-adjacent counties accounts for almost all the increase, suggesting that following a mass layoff, individuals undertake longer distance moves. These findings suggest that individuals seek moves to a different labor market, rather than simply relocating to reduce housing arrangements or costs.

In addition to exploring heterogeneity before and after the Great Recession, we explore the potential for the effect to differ by permanent features of the affected county. First, we consider the possibility that responses in urban counties 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.[21]

We categorize counties by whether they were part of a metropolitan statistical area (MSA) as defined in the 1990 Census and use 1990 MSA definitions to fix these definitions before the start of the study period.[22] We find similar effects for MSA and non-MSA counties, and suggestive evidence that non-participation is higher in rural counties, although the differences are not statistically significant. Additionally, we test whether the effects differ before and after the Great Recession for urban and rural counties, and find similar patterns, but our results have large standard errors.[23]

Following Notowidigdo (2013), we may also expect the response to a mass layoff to be moderated by the strength of income supports in the local safety net. However, estimating these effects is difficult; while counties vary dramatically in take-up rates of different social programs, these differences are often endogenous to other local economic conditions. Additionally, there is very 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 divide our sample into counties that are in states with UI replacement rates above or below the median in 1996. We find that there are no statistically significant differences between these counties, suggesting that higher UI replacement rates do not affect labor market exit.

5.3 Additional Robustness Checks

This section includes several robustness checks. First, we re-estimate equation 6, including 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. We find that the lead coefficients are small and statistically insignificant.

Up to this point, our representation of the local labor market has been the county. However, many individuals commute across county lines for work, and so the county is a somewhat restrictive measure of the local labor market. To address this issue, we aggregated our outcomes to the commuting zone level, which is another possible definition of a local labor market, and includes all

[21] 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.

[22] Overall, in 1996, about 25% of the US population resided in "non-MSA" counties, a share that decreased only slightly during our study period.

[23] These results are available upon request.

counties in the United States. Our estimates for those regressions are in Table 5, allowing the effect to differ before and after the Great Recession. Our results at the commuting zone level are very similar to our main results in Table 3 despite being aggregated to a larger geography. In particular, labor force effects of a mass layoff are larger after 2007 and a smaller share of the effect is driven by out-migration. After 2007, there is a sizeable increase in the role of non-participation in reducing the labor force after mass layoffs.

A potential threat to our research design is that we measure labor demand changes using mass layoffs across all industries, rather than those in tradeable industries, which would be arguably more exogenous. However, the BLS does not publish mass layoff statistics by industry at the county level, so we cannot directly measure the local shock in a particular industry.

The BLS does publish consistent data on mass layoffs at the state level by industry for some industries, such as manufacturing. While the tradeable sector is not limited to manufacturing, other industries are much less reliably reported or only available for a few states. Overall, 38 percent of all mass layoffs in a given year are in the manufacturing sector. We estimate a version of equation 6, aggregating all variables to the state level. We then instrument overall mass layoffs with manufacturing sector layoffs. We find that the estimates using instrumental variables are in line with our main estimates, although they are noisier.[24] Overall, these results suggest that using aggregate counts of mass layoffs still capture exogenous shifts in labor demand, rather than reflecting decreases in local demand for non-tradeable goods.

5.4 Comparisons with Previous Estimates

There are a number of ways our approach is distinct from previous work in the literature. Rather than a Bartik-style demand index to measure the shock, we use mass layoffs, and rather than the state or MSA as our unit of observation, we use county-level variation. Because of these differences, it is instructive to set our estimates in context of the broader literature on these topics. Since most of the previous literature uses a Bartik measure for labor demand changes, in results not shown we estimated the correlation between a Bartik shock and a mass layoff. We find that a one standard deviation decrease in labor demand as measured by the Bartik-type instrument and a one percent mass layoff are roughly equivalent in terms of their effects on local unemployment.

A number of papers have estimated how changes in labor demand increase the out-migration rate from an area. From Table 3 of this paper, we find that a 1 percent mass layoff increases out-migration by about 0.08 percentage points and decreases in-migration by about 0.01 percentage points, leading to a net migration decrease of 0.09 percentage points. These estimates are slightly larger than the net population changes found by Bound and Holzer (2000), who found that a 10

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[24] We also estimated results omitting California, which has a much larger share of employment in Information Technology and Agriculture, and our results are stronger. We do not include Agriculture and Information Technology in our measure of "tradeable industry" mass layoffs because neither are reliably reported in the BLS Mass Layoff Statistics, and Information Technology includes both tradeable and non-tradeable components.

percent decrease in labor demand led to a decrease in population of between 0 to 5 percent, depending on the skill group. Notowidigdo (2013) finds that a one standard deviation decrease in labor demand leads to a 15 percent decrease in net population change, which is smaller than our estimates for net migration rates. Autor, Dorn and Hanson (2013) also find smaller effects on population changes, but as we mention in Section 2, that result may be specific to their setting, where low-skilled workers are the most affected by trade competition, and also have lower baseline mobility. Importantly, all of these papers use net population changes to measure migration flows, rather than directly using gross migration flows, which may cause them to underestimate the migration impact.

Finally, Bartik (2015) finds that labor force participation decreases by 0.2 percent in the short-run following a 1 percent decrease in employment, which is similar to our results in Tables 2 and 3. Additionally, Bartik (2015) shows that changes in labor force participation are even larger when a local labor market has a high unemployment rate, which is consistent with our findings regarding differences before and during the Great Recession. While we argue that our paper combines elements of local labor market adjustment, migration, and non-participation that have not been previously combined, our findings are consistent with many of these separate parts of the prior literature. We show the importance of looking not just at multiple paths of labor force change, including migration and non-participation, but also at allowing these paths to vary over time, or with the state of the national economy.

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) were the first to suggest that labor mobility was central to this adjustment process. However, relatively little work since has directly examined mobility in the aftermath of specific local labor market shocks, while mobility rates have been in secular decline.[25] Additionally, the role of mobility in labor market adjustment has taken center stage as the country emerges from the Great Recession and there is evidence that labor mobility seems to be lower than at any time in recent history.[26]

This paper contributes to this literature by bringing these two strands of literature together, jointly estimating the effect of labor demand shocks on all possible labor force exits. We are also the first to use mass layoffs to look at labor force adjustments, and our methodology enables us to also estimate the effect of labor demand shocks on non-participation.

We find that layoffs of one percent of a county's labor force (sustained for three years) leads to a decrease in the county labor force of 0.19 percentage points, and further find that migration accounts for a large share of this change. Out-migration accounts for approximately 40 percent of the change in

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

[26] This decline in mobility is not restricted to geographic mobility (Molloy, Smith and Wozniak (2010); Kaplan and Schulhofer-Wohl (2012)); it is also true of job turnover rates (Hyatt and Spletzer (2013,2016)).

the labor force, with rising non-participation accounting for most of the remaining change. During and after the Great Recession we see an even larger role for non-participation, and less evidence that out-migration is a key part of adjustment. These results add to previous findings on the cyclicality of various types of responses, and emphasize the likelihood of cyclicality and potential asymmetries in the extent and nature of adjustment to shocks.

Our finding of increased non-participation during and following the Great Recession raises important questions for further research. It is unclear to what extent the non-participation we observe following 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, a question explored in other recent work (see Aarsonson, et al. 2016). As with the long-term unemployed, it is likely that the skills of these non-participating individuals have decayed, and they may be less productive upon re-entering the labor force.

Second, our results do not speak to the effects that increased non-participation rates have on the local labor market in later years, and whether researchers should think of non-participants as slack labor supply or permanent exits. While some researchers have tried to address this issue (Smith, 2014), the rise of non-participation in recent years makes this a more critical research question. Most critically, it will be important to continue to study non-participation following the Great Recession to understand whether this is a temporary or permanent feature of the U.S. labor market.

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Table 1: Summary Statistics, 2000-2010

	All Years	2000-2006	2007-2010
Panel A: Summary Statistics			
Mass Layoffs as Share of Labor Force (%)	0.70	0.59	0.87
	(0.98)	(0.84)	(1.18)
Workers in Mass Layoffs	378	314	492
	(1,935)	(1,390)	(2,627)
N	33,794	21,518	12,276
Panel B: Incidence of Mass Layoffs (%)			
1% of LF	60.59	45.62	52.69
	(48.87)	(49.82)	(49.94)
2% of LF	33.51	20.07	26.63
	(47.21)	(40.06)	(44.21)
3% of LF	17.72	9.13	13.54
	(38.19)	(28.81)	(34.22)
4% of LF	9.32	3.68	7.17
	(29.08)	(18.82)	(25.80)
5% of LF	5.04	1.74	3.87
	(21.88)	(13.09)	(19.29)
N	3,154	3,154	3,154
Panel C: Components of Labor Force Change			
Net Labor Force change	0.3%	0.4%	0.2%
In-migration rate	6.3%	6.4%	6.0%
Out-migration rate	6.1%	6.2%	5.9%
New DI	0.1%	0.1%	0.1%
New Retired	0.2%	0.2%	0.3%
N	33,794	21,518	12,276

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. Standard deviations in parentheses.

Table 2: Total Effects of Mass Layoffs on Employment, Labor Force, and Population

	(1) ln(Emp)	(2) Emp. Rate	(3) LFP	(4) ln(Pop)
Total Effect	-1.242***	-0.775***	-0.218	-0.157***
	(0.26)	(0.12)	(0.169)	(0.067)
Y-Mean	12.03	0.94	0.49	12.79
Observations	30,566	30,566	30,566	30,566

Dependent variables, expressed in logs, are listed at the head of the column and correspond to the components of equation 7. The Total Effect displayed is the sum of the contemporaneous and lagged effects, from estimates of equation 6. Standard errors in parentheses, clustered on state. Each regression includes county and year fixed-effects, as well as county-specific trends. * p <.10, ** p < .05, *** p < .01

Table 3: Total Effects of Mass Layoffs on Labor Market Exits

	(1) LF	(2) In-	(3) Out- Migration	(4) DI	(5) Ret	(6) Non-
Total Effect	-0.1975***	-0.0139	0.0809***	0.0072	0.0034	0.1024
	(0.0718)	(0.0323)	(0.0192)	(0.0052)	(0.0122)	(0.0668
Up to 2007	-0.1076	-0.0163	0.1025***	0.0088	0.0062	0.0359
	(0.0836)	(0.0369)	(0.0285)	(0.0095)	(0.0297)	(0.0835)
After 2007	-0.2266*	-0.0027	0.0594***	0.0068*	0.006	0.1181
	(0.1232)	(0.0498)	(0.0207)	(0.0040	(0.0058)	(0.1081
Y-Mean	0.004	0.058	0.058	0.001	0.002	0.003
Observations	30,566	30,566	30,566	30,566	30,566	30,566

Dependent variables are listed at the head of the column. The Total Effect displayed is the sum of the contemporaneous and lagged effects, from estimates of equation 6.

Standard errors in parentheses, clustered on state. Each regression includes county and year fixed-effects, as well as county-specific trends. * $p < .10$, ** $p < .05$, *** $p < .01$

Table 4: Geographic Decomposition of Migration Rates

	(1)	(2)	(3)	(4)	(5)
	Total Migration	In-State	Out-of-State	Adjacent	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	39,845	39,845	39,845	39,845	39,845

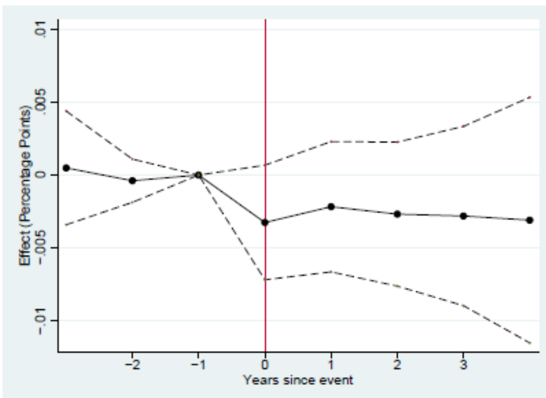
Each panel is a different migration rate - the first is out-migration, and the second is in-migration. Dependent variables are listed at the head of each column, and are components of the migration rate listed at the head of the panel. The total effects come from the coefficients that come from estimating equation 6. 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 5: Effect of Layoff Events, Interaction with Start of Great Recession, at Commuting Zone Level

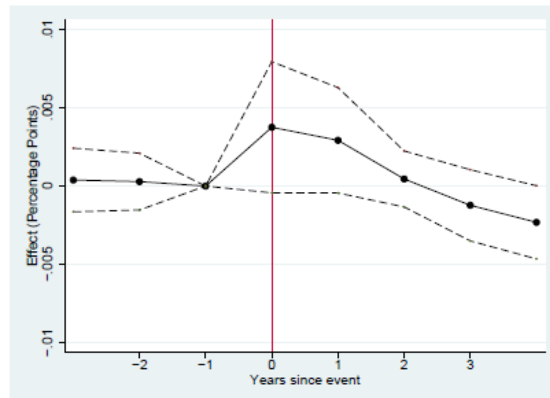
	(1) LF	(2)	(3) Out-Mig	(4) DI	(5) Retire	(6) Non-
Total Effect, Pre-2007	-0.1302	-0.0476	0.1668***	0.0120	0.0072	-0.0118
	(0.0976)	(0.0529	(0.0496)	(0.0077)	(0.0232	(0.1819)
Total Effect, Post-2007	-0.3850***	0.0016	0.1070***	0.0140**	0.0035	0.2624
	(0.0952)	(0.0488	(0.0329)	(0.0056)	(0.0146	(0.1693)
Y-Mean	0.004	0.058	0.057	0.001	0.002	0.007
Observations	8,664	8,664	8,664	8,664	8664	8,664

Dependent variables are listed at the head of each column. The estimates come from estimating equation 6, but the observation is the commuting zone-year. The total effects are the sum of the layoffs coefficients. Standard errors in parentheses, clustered on commuting zone. Each regression also includes commuting zone and year fixed-effects, as well as CZ-specific trends. * $p < .10$, ** $p < .05$, *** $p < .01$

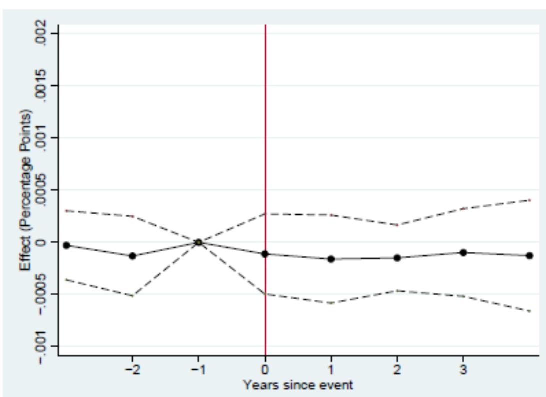
Figure 1: Event Studies, 4% Mass Layoff Event (N=118 counties)



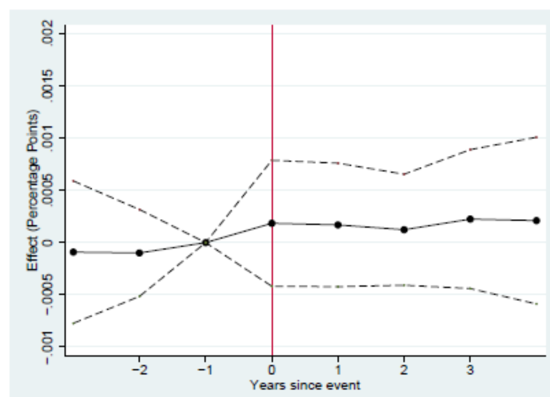
In-migration



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.