The Geography of Worker Adaptation to Unanticipated Job Losses

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February 2022
Preliminary: Not for Citation

Abstract: This paper addresses the 21st century worker adaptation to a changing economy, using near-universal quarterly matched employee-employer microdata from the Longitudinal Employer Household Dynamics (LEHD). We focus on the geography of worker adaptation after dislocation from a mass layoff during the Great Recession in five Great Lakes states. We examine the implications of mass layoffs at the individual establishment level and focus on how these layoffs affect future employment and earnings for displaced workers. Following a large number of displaced workers over time, we focus on the impacts of involuntary job loss by industry, earnings, demographics, location, and labor market history on future employment prospects.

Results show that the likelihood that workers find new stable employment in the same MSA or a different MSA in which they lost their job is significantly affected by local and nearby job opportunities and housing costs. We also show that the earnings of these workers are, on average, still 15% below baseline after more than 4 years after displacement and these effects are strongest in the manufacturing sector.

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1. Introduction

Often overlooked in examining worker adaptation to the changing labor market are the change in the geographical distribution of job opportunities and how this change affects the outcomes of displaced workers. While we have a general sense of where displaced workers are located, effective policy construction requires a more thorough understanding of how geographically varying labor market conditions affect their ability to reintegrate into the labor force. Though workers in some industries and metropolitan areas have been able to adapt to changing conditions, others continue to struggle. In particular, it is important to address worker job opportunities and costs of housing both locally as well as in other labor markets.

The US economy continues to change from a manufacturing-based economy to a service-based one due, in large part, to automation and globalization. Since 1970, the share of American workers employed in manufacturing has shrunk from 30 percent to 13 percent while the share of workers employed in services has grown from 64 percent to 84 percent (Bureau of Labor Statistics). These numbers, however, do not fully portray the degree of change in the labor market. In both the manufacturing sector and the service sector, the distribution of needed skills has been dramatically modified. Equally important, the geographic distribution of job opportunities has changed. Workers leaving manufacturing in the Midwest, for example, typically are poorly located and under-skilled for new jobs in the growing technology-based industries in Silicon Valley and elsewhere.

This paper focuses on the geography of dislocated worker adaptation, finding striking effects of relative job opportunities and housing costs on mobility choice. We examine the implications of mass layoffs at the individual establishment level and focus on how these layoffs during a major disruption affect future employment and earnings for displaced workers. Following 143,000 workers displaced during the Great Recession, we focus on the impacts of involuntary job loss by industry, earnings, demographics, location, and labor market history on future employment prospects.

This work is made possible by use of the confidential files of the matched employee – employer Longitudinal Employer-Household Data (LEHD), which follow almost all U.S. employees on a quarterly basis. Using these data, we follow the economic and geographic mobility of involuntarily displaced workers over the short-term, such as one or two quarters, as well as over the medium- and long-term.
We begin by providing rich descriptive statistics for workers suffering from involuntary job loss through large-scale layoffs, including establishment closings. Compared to their non-displaced counterparts, younger workers and lower earning workers constitute somewhat larger shares of the displaced. Again, compared to their non-displaced counterparts, displaced workers have worked at the given establishment for a shorter time period, and are more likely to be Black.

Displaced workers found a new job in the same metropolitan area about two-thirds of the time. While about 60% found stable employment within one quarter, many displaced workers were jobless for considerable lengths of time. Almost one-half of displaced workers found new employment at greater than 90% of previous earnings, but again many fell short of this mark.

Relative to non-displaced workers, younger displaced workers are more mobile but lower earning workers are less so. Not surprisingly, higher income workers are over-represented in terms of moving. Lower earning workers are substantively over-represented in terms of remaining jobless, as are Blacks.
We employ a model of jobless duration and mobility at the worker level for workers who have experienced mass layoffs at the establishment level. We make use of a competing risks framework, where possible outcomes are

employment in the same MSA, employment in a different MSA in the same state, and employment in a different MSA and state. Using this model, we determine what factors affect finding a job in one of these labor markets including key characteristics of own-and competing-labor markets: a newly constructed job opportunity index and a measure of housing costs. Importantly, we find that jobless duration and mobility choice are strongly related to job opportunities at home vs. in other MSAs. We also find displaced workers responding to relative housing costs as hypothesized. Lower costs at home vs. other MSAs are related to the likelihood of not moving, while lower relative housing costs elsewhere make moving more likely. We also find plausible results for the effect of unemployment compensation levels. Heterogeneous results earnings group and industry are also presented.

Our second and complementary model examines the change in quarterly earnings at the worker level, comparing displaced workers at the establishment level with other workers at mass layoff establishments and other workers at non-mass layoff establishments. Here we find evidence not only of striking losses in earnings, but also the enduring nature of these losses out to 12 quarters post-displacement. We explore how these earnings losses relate to re-employment location, along with job opportunities and housing costs.

2. Background

Much public discussion of the changing workplace underestimates the wrenching decisions facing workers for whom neither their skill sets nor their locations fit with the altered labor market reality they face. The national unemployment rate masks the heterogeneity across local labor markets where (prior to the COVID-19 pandemic) metropolitan statistical area unemployment rates exceeded 10 percent and jobless rates were even higher (Austin, Glaeser, and Summers, 2018). In light of this, one of our key contributions is that we follow individual displaced workers over time as well as across states and link their decisions to individual and local characteristics. In the case of involuntarily displaced workers, the national unemployment rate does not reflect discouraged workers who drop out of the labor market, underemployment (part-time jobs), and the lower earnings received at full-time re-employment.

The US economy continues to change from a manufacturing-based economy to a service-based one due, in large part, to automation and globalization. Since 1970, the share of American workers employed in manufacturing has shrunk from 30 percent to 13 percent while the share of workers employed in services has grown from 64 percent to 84 percent (Bureau of Labor Statistics). These numbers, however, do not fully portray the degree of change in the labor market. In both the manufacturing sector and the service sector, the distribution of needed skills has been dramatically modified. There has been a hollowing-out of the middle of the job distribution (Autor, Katz, and Kearney 2006, 2008; Autor, 2019; Blinder and Bound, 2019) with many middle-skill jobs held by non-college graduates disappearing. While the service sector has grown substantially, an important part of this sector includes low-skill and low-wage jobs. These opportunities do not generally serve as appropriate replacements for jobs lost in other sectors that previously provided middle-skill employment. As a result, many non-college workers now perform less-skilled, lower-paying work. Equally important, the geographic distribution of job opportunities has changed. It is increasingly the case that significant job opportunities are available in a smaller set of metropolitan areas, not only for highly educated individuals, but also for low-skilled workers (Moretti, 2012). Workers leaving manufacturing in the Midwest, for example, typically are poorly located and under-skilled for new jobs in the growing technology-based industries in Silicon Valley and elsewhere.

3. Background Literature

We build on the foundation provided by existing work on job displacement. While this literature provides important background, it largely does not deal with the dimension of geography. One pathway through which workers can 'adapt' is by moving to a labor market with stronger opportunities. The role of labor mobility in the face of negative local employment shocks was brought to wider attention by Blanchard and Katz (1992). They used state-level data to show that local unemployment rates primarily adjust via workers moving to locations that have more jobs instead of by substantive increases in local jobs. Recent work, however, questions the ability of migration to address issues caused by low employment rates (Bartik, 2020). We focus on potential mobility as a key response to joblessness. We recognize that overall mobility has declined in recent decades. Cross-county migration has declined from approximately 6 percent per year in 1980 to 3 percent per year in 2010 (Molloy, Smith, and Wozniak, 2011). It is thus all the more important to understand how it is driven under varying circumstances. Previous migration research – usually based on state or county-level data – typically does not take into consideration involuntary job loss of individual workers, specific worker characteristics, or specific labor market conditions. Our work provides a better understanding of considerations leading to mobility, income losses and long-term joblessness.

Bound and Holzer (2000), using 1980 and 1990 Decennial Censuses, find that low-skilled workers (especially Black workers), when faced with local negative labor market shocks, are generally unlikely to migrate. We consider locations of origin and opportunities in other metropolitan areas. Additionally, we consider earnings levels along with metropolitan area characteristics such as housing costs. Saks, Smith and Wozniak (2011), using state- and county-level flows from the IRS, find that when benefits to moving are higher, more migration occurs. Molloy, et.al. (2011) also use IRS county-level data. Their data do not permit consideration of mass layoffs of individual workers. More recently, Foote, et. al. (2015), considered mass layoffs based on data including the Bureau of Labor Statistics (BLS) monthly reports on layoffs. Given the BLS definition of a mass layoff, the authors construct county-wide measures of mass layoffs by relating BLS mass layoffs to employment in the county. Unlike our approach with microdata, this analysis considers neither attributes of workers nor industry.

Denier (2017a) provides a recent example of using micro data to examine mobility following involuntary job loss. Controlling for demographics, the author finds a significant correlation between job loss and mobility. Denier acknowledges that the overall sample drawn from Canadian panel data is relatively small and that her result is thus based on a narrow set of mobile job losers. Additionally, job loss is self-reported, and the selection issue cannot be addressed. Denier (2017b) provides a similar approach using U.S. PSID data. In contrast, our work provides results based on a very large sample of dislocated workers drawn from employment records.

A substantial literature addresses the permanent earnings losses suffered by involuntarily displaced workers (see literature reviews by Fallick, 1996 and Kletzer, 1998). The most relevant work by Jacobson, LaLonde, and Sullivan (1993), Couch and Placzek (2010) and Davis and von Wachter (2011) estimates long term earnings losses in the 12 to 25 percent range. These studies, however, are each limited in several important dimensions. The first two are based on administrative unemployment insurance data for single states. This use of single states cannot distinguish between outmigration and joblessness. Jacobson, et. al., point out that they "lose" 25 percent of the workers they follow for this reason. Thus, their earnings loss estimates are limited to workers who remained in the state and found new jobs. As discussed below, our work covers job loss in five states along with moves to numerous other states, and we are able to accurately identify workers that remain unemployed

for the full time period. Davis and von Wachter's paper (2011) is closely related to our work. It relies on an early version of the LEHD to examine national impacts of displacement but is limited in its analysis of local labor markets, the geography of dislocated adaptation and individual worker characteristics. More recently, Yagan (2019) made use of IRS data, which provides estimates of earnings changes. While IRS data are quite helpful for annual earnings changes and mobility, this source cannot capture the shorter-term responses (less than one year) to involuntary job loss; our use of the quarterly LEHD data allows us to examine the substantial number of job changes that occur in less than one year. Yagan also cannot address mass layoffs or establishment closures as sources of job losses, as these data are not linked to establishments.

Given our focus on the Great Recession, this work also draws on studies examining impacts of this economic upheaval on labor market outcomes. Two recent papers use tax data to examine the long-term impacts of the Great Recession on employment and earnings. Song and von Wachter (2014) address a related issue of whether employment shocks lead to lasting declines in employment. Comparing the Great Recession to earlier economic shocks, they explore the extent to which displaced workers are less likely to find employment. Again Yagan (2019), finds evidence of a persistent decline in employment as a result of the Great Recession. He finds that the Great Recession imposed longer-term employment and income losses even after falling unemployment rates signaled recovery, and that it contributed to a long-run decline in labor force participation with larger impacts among lower-income workers. Our work differs in that we use quarterly employer/employee LEHD data, rather than annual tax data. This allows us to pinpoint the timing of large-scale layoffs and establishment closings along with the duration of joblessness over the short-, medium-, and long-term. These timing issues are especially relevant for lower-income workers.

There has also been work using the Current Population Survey (CPS) examining who was most strongly impacted by the Great Recession. Charles et al. (2016) find evidence that the long-run decline in labor force participation was most heavily concentrated among the lowest skilled workers. Both Autor (2011) and Jaimovich and Siu (2020) find a sharp decline in middle-skill jobs during the Great Recession and link this to the polarization of the U.S. labor market. The CPS, of course, does not provide deep longitudinal history; its relatively small sample size does not allow for the detailed analysis of displaced workers by skill-level and industry.

The LEHD has also been used to examine how the Great Recession has altered the labor market. Abowd, McKinney and Zhao (2018) find that it contributed to earnings inequality by shifting worker flows into and out of the labor market. They do not, however, follow individual workers displaced during that time to learn how they adjusted. Lachowska et al. (2018) examine sources of earnings losses using LEHD-type data for one state, Washington, and show that earnings losses are driven by declines in hourly rates after displacement followed by a sluggish recovery. Our analysis examines the pathways that mass laid off workers follow in five different Great Lakes states, to gain a deeper understanding of how characteristics of place shape worker adaptation.

4. Data, Sample Construction, and Summary Statistics

The primary data employed in this paper are drawn from the Census' confidential Longitudinal Employer-Household Dynamics (LEHD) data. The matched employee – employer LEHD follows most U.S. employment over time. It covers over 150 million private-sector employees, and as of 2011 considerable federal and state employment. This data source has been built at the Census Bureau and draws on several administrative sources, surveys, and censuses. The primary source is confidential information from state Unemployment Insurance (UI)

earnings data. It begins in 1999 for most states (earlier for several) and provides quarterly information on where workers live and work, their earnings/joblessness history, industry, race, gender, county of birth, and imputed education. This data source has been widely used, but not for the purpose of this paper (Abowd et al., 2009; Pollakowski, et al. 2022; Haltiwanger, et al. 2021). Our sample of workers displaced in the Great Recession includes 143,000 workers from five Great Lakes states. The five states we study are drawn from the 28 states for which we have full detailed LEHD data. The availability of these additional states allows us to follow displaced workers who move to these locations.[1]

In addition, we know whether and when a displaced worker takes a new job in one of the 22 nonparticipating states (Vilhuber 2018). This is useful for studying geographic mobility, since we can be certain that individuals we identify as unemployed are truly unemployed and not employed in a state outside of our 28-state sample. We thus can separate displaced workers into four destination groups: (1) obtaining a job in the same MSA, (2) obtaining a job in a different MSA in the same state, (3) obtaining a job in another state, and (4) not finding a job with another employer at any given length of non-employment spell. Workers who are identified as employed in a different state, and for whom we thus cannot identify earnings, are not included in this version of the paper.

We also employ important local labor market and state measures in our analysis of worker outcomes. Most importantly, we rely on a location-specific job opportunity index. This index measures the proportion of jobs available to workers in local and nearby labor markets. Workers will have an incentive to move if the job opportunities in other labor markets are higher than opportunities at their current location. We generate job opportunity indices for MSAs in the same state and for other states. For the latter, we weight the nearby job opportunity indices by the flow of workers between the MSAs based on the Census' J2J data. We are not aware of any other spatially specific examples of measures of job opportunity in the literature on displacement and hence believe that this index is an important value-added of our research.

Along with job opportunities, we consider relative housing costs. Displaced workers may be deterred from moving to other labor markets if the cost of housing is significantly higher than housing costs at their current location. We measure housing costs by using MSA-level house price indices from the Federal Housing Finance Agency (FHFA), updating house price levels obtained from the 2000 Decennial Census. Additionally, we use average weekly unemployment insurance benefits by state from the UI Data Summary published by the Department of Labor as a measure of the generosity of the unemployment insurance system in each state. MSA-level measures are averages of the county components of an MSA.

4.1 Displaced Workers: Mass Layoffs and Establishment Closures

Unlike ordinary separations, mass layoffs provide us with a first step towards obtaining an exogenous source of displacement. Mass layoffs are more likely to capture involuntary separations that we may see as consequences of changes in economic conditions or changes in industry composition. We thus define involuntarily displaced workers as those who have lost jobs due to a mass layoff, including an establishment closure. As discussed below, a major contribution of our work is to consider mass layoffs at the establishment level. We define a mass layoff as one in which 30 percent of an establishment's workers let go within a four-quarter period, considering establishments with greater than 50 workers. We require that workers have a relatively strong labor force

[1] This project is being carried out at the Boston Census Research Data Center (RDC). For such projects, each individual state must choose whether its data can be used. In our case, 28 states agreed.

attachment (a minimum tenure of 4 quarters with an establishment prior to the beginning of the mass layoff).[2] While this concept has been widely used, the LEHD/Census data we employ provide the necessary worker and establishment information including quarterly employment status needed to carry out our research. In addition to following workers quarterly, the LEHD employer data allow us to define mass layoffs. While there has been work with LEHD using mass layoffs, it has been for purposes other than ours.[3]
We take numerous steps to correctly determine mass layoffs. We require that the mass layoffs occur after consecutive quarters of employer stability; that is, 4 quarters with either employment gains or employment losses less than 30%. In addition, it is important to establish that the workers involved did not move along with numerous others to a different establishment. This would be the case, for example, if the establishment was purchased by another firm, if a substantial number of workers were moved by the firm to another establishment, or if a firm's identification number changed due to bankruptcy or buyout. We take care not to consider these cases as mass layoffs. Another problem occurs when employment data are missing; in these cases, we have made sure that these are not recorded as establishment deaths.

We limit our analysis to "prime age" workers who are between 25 and 55 years of age, who have earned at least $15,000 over the previous year. As we are trying to identify the impacts of the changing structure of the economy or economic conditions, we view these more permanent workers as those most likely experiencing layoffs that are not tied to personal circumstances.

We consider mass layoffs at the establishment level. To our knowledge, all previous literature considering mass layoffs has considered them at the firm level only. We believe this establishment level choice makes it more likely that we are capturing the effects of exogenous events than if we proceeded at the firm level. Specifically, workers at one establishment of a firm may experience a mass layoff while workers at another establishment do not, and this may or may not show up at the firm level as a mass layoff. Additionally, a problem with looking at mass layoffs at the firm level is that firms can have establishments in multiple states; thus focusing on mass layoffs at the firm level with data on a limited number of states requires defining mass layoffs based only on establishments within the state.

There are, however, technical issues that we have faced in considering activity at the establishment level. They stem from the fact that states provide the Census with worker-level data for LEHD at the firm level. We then must determine the establishment in the firm where the workers are employed. This is not a problem, of course, at firms that only have one establishment. For multi-establishment firms, the Census uses a probabilistic method to allocate specific workers to establishments within the firm. This method was developed by the Census using results from Minnesota, where unemployment insurance data are reported at both the firm and establishment level. The Census provides 10 "imputed establishments." Thus, an establishment that is a great distance from the firm's other establishments would have 10 identical imputes, and we will be certain that it is the correct one for a given worker. However, in a very high-density urban setting where the firm may have several establishments a worker may have several "imputes" since they are based on distance from worker home address. However, it is important to recall that we only consider establishments with at least 50 workers; thus, we do not have cases with a large number of establishments. After exploration, we have chosen a cautious approach to minimize measurement error in identifying an appropriate establishment for a given displaced

[2] We do not consider workers who are rehired to the same firm within 8 quarters of this separation to be counted as displaced. In addition, we also only consider a worker's first mass layoff spell because later mass layoff spells are less likely to be exogenous given that they can be affected by the first mass layoff spell.
[3] For example, Andersson, et al. (2018) consider duration of joblessness for 8 quarters for lower-income workers in a number of large metropolitan areas but do not consider new job destination or detailed demographics of workers. Hellerstein, et.al. (2014, 2017) explore the role of local labor market networks in finding new jobs.

worker: we require 7 or more imputes to a given establishment. Workers that have fewer than 7 imputes to the same firm are dropped from our analysis. We believe that this introduces minimal error and is far better than carrying out our analysis at the firm level.

4.2 Generating Control Groups

We begin our analysis with the set of workers who experienced mass layoffs and compare their outcomes to those of both non-displaced workers at the mass layoff establishment as well as non-displaced workers at non-mass-layoff establishments in the same labor market. To be clear, workers displaced from mass layoffs are not randomly selected (for example, Gibbons and Katz (1991) in "Lemons and Layoffs" noted this with respect to layoffs in general). On one hand, the workers who are laid off from establishments that suffer mass layoffs may very well be the least productive in the establishment, with their productivity being related to unobserved worker characteristics. These workers may also be ones with less seniority (as we see in the tenure measures in Table 1 below) or ones the employer believes to be less likely to stay with the firm in the face of decline. On the other hand, workers who select into firms that suffer mass layoffs may be less productive than workers who choose other firms. Thus, both our key control groups are somewhat biased. We therefor report results for both groups as one way to bound our source of bias.

A key advantage of the control group that consists of the non-displaced workers at the mass layoff establishments is that it controls for selection into the establishment. The disadvantage is that these remaining workers are likely to be more productive than the laid-off workers. The advantage of the control group that consists of non-displaced workers at non-mass-layoff establishments is they do not suffer from the selection bias of the first control group, but the types of workers that are employed at the non-mass-layoff firms might be different in observable and unobservable ways from those who work at mass-layoff firms. In the next section we take a more detailed look at these different sets of workers.

4.3 Descriptive Statistics

We begin our empirical analysis by generating a rich set of descriptive statistics for our sample of workers displaced by mass layoffs. The first summarize who these workers are in terms of basic demographics, worker history, industry, and establishment size (Table 1). We then an overview of destimations of new jobs, time until re-employment and earnings at new jobs (Table 2). Next we summarize destinations of new jobs by demographics, industry and establishment size (Table 3). After summarizing metropolitan area characteristics (Table 4), we present the number of establishments with mass layoffs by quarterly by industry for the longer time period 2002-2014 (Table 5).

Table 1 answers the question "who are the displaced workers at mass layoff establishments?" To do so, we compare these workers with non-displaced workers at both mass layoff and non-mass layoff establishments. Displacement increases with age: workers over 45 account for about 40 percent of mass layoffs. However, when we compare the ages of displaced workers with the non-displaced, and we see that younger workers are over-represented among the displaced. With respect to earnings, displaced workers fall heavily in the lower earnings groups: over 60 percent earn less than $45,000. From columns 2 and 3 we see that non-displaced workers have higher earnings. Compared to their non-displaced counterparts, displaced workers have worked at the given establishment for a shorter time period, with about 38 percent have greater than eight quarters of tenure, while for our two non-displacement comparison groups prior tenure is 50 and 56 percent, respectively. Displaced workers are less likely to be White and more likely to be Black. . Within mass layoff establishments females are

more likely to be displaced, although this is not the case when compared to workers at other establishments. Compared to their non-displaced counterparts, displaced workers are more likely to be found in the largest establishments but compared to workers at other establishments the opposite result holds.
Table 2 explores where and when displaced workers find new employment. We look at whether a worker has found a new job in the same metropolitan area (67.5%), in a different metropolitan area in the same state (17.1%), or in a different state. The percentages for workers finding a job out of state and remaining jobless are preliminary. The share of displaced workers finding a job in another state is currently somewhat underestimated because our current sample only includes those finding a job in states (28) for which we have earnings data. Likewise, the share remaining jobless at a given point of time in the future is somewhat overestimated since some of these workers will have found jobs in the states for which we do not have earnings information. We nonetheless present our current results because they capture qualitatively our findings. Fortunately, we do have sufficient information that lets us estimate those finding stable jobs in the non-earnings states.[4]

The statistics for length of time until re-employment in a "permanent" job (earnings greater than $15,000) provide an important overview of this issue. 59% find a job either in less than one quarter or within the subsequent quarter. There is, however, a substantial "tail" to this distribution, with many workers jobless for some time. For the distribution of new employment by the share of previous earnings, we find that almost one-half of displaced workers earn greater than 90% of previous earnings, but the remainder do not – again, a highly relevant statistic.

Table 3 provides descriptions of displaced workers in terms of their new job locations. The first column of this table, carried forward from Table 1, provides benchmark numbers for the distribution of displaced workers by characteristics. The distributions in columns 2 – 5 should thus be viewed relative to this basic distribution. Younger workers are over-represented in terms of taking a job in another state, while older workers are under-represented. Lower earning workers are under-represented in terms of finding a job in another state, while higher income workers are over-represented. Lower earning workers are substantively over-represented in terms of remaining jobless. This result is worthy of further investigation – are they "secondary" workers or working in industries that "churn" through many part-time workers (although recall that we require one year of prior job tenure and require that a new job have earnings of at least $15,000)? With respect to prior job tenure, workers with the longest tenure are under-represented in terms of taking a new job in another MSA. For race, Black workers are over-represented among the long-term jobless. Men are over-represented among those finding jobs in different MSAs, while women are under-represented – a statistic consistent with married/partnered men being more likely to be primary household earners. For industry, displaced workers in manufacturing are strikingly over-represented among the long-term jobless. In real estate/professional, displaced workers are considerably over-represented in terms of finding new jobs in MSAs in other states. This presumably reflects the higher mobility of professionals.

Table 4 presents the means and distribution of our job opportunity index, as well as the MSA-level median house price and the state level weekly unemployment benefits that we include in our analysis.

[4] The revised percentages for out-of-state job finders and the long-term jobless will be released subsequent to our next round of Census disclosure review. We define out-of-state job finders for states without earnings information as follows: we require that a worker obtain and hold of job for four consecutive quarters.

Table 5 presents counts of mass layoff events in in our 5-state sample by industry. Figure 1 presents a graph of these results. This figure highlights the fact that our study period does capture a period of rising and elevated mass layoffs, particularly within manufacturing. It also supports our extending by two quarters beyond the accepted window for the Great Recession given that we continue to see elevated mass layoffs during these quarters.

5. Empirical Approach

Our analysis examines outcomes for workers who lose their jobs in a mass layoff (including establishment closures) and how this relates to their location options, including employment opportunities, housing costs, and unemployment compensation. Also included for each worker are age, prior earnings, prior job tenure, race, gender, and industry. We focus on outcomes that relate to jobless duration, mobility, and future earnings paths.

5.1 A Competing Risks Model of Jobless Duration and Mobility

Since geography is a key element of our analysis, we specify a jobless duration/mobility model with three potential re-employment outcomes: employment in the same (MSA) labor market, employment in a different MSA labor market in the same state, or an out-of-state location. To achieve this, we specify a competing risks model, which we describe in more detail below (van der Berg, et al. 2008). We distinguish between in-state and out-of-state moves to investigate whether different factors affect these types of moves.
To measure jobless duration and mobility, we use LEHD to observe future employment of displaced workers at the quarterly level. We consider three potential re-employment outcomes: employment in the same (MSA) labor market, employment in a different labor market in the same state, or employment in an out-of-state location. The existing literature is not always clear on how to characterize new employment. One option is to look for the first instance of positive earnings, then classify this new job as yielding earnings as a percent of previous earnings (Andersson, et al. 2018). Our approach is to look for 4-quarter periods during which a minimum ($15,000) is earned. We take this approach in an effort to capture workers finding stable or enduring jobs. Thus for workers who find jobs in the 28 states for which we have full labor market information, we consider re-employment to occur when we observe a 4-quarter period during which at least $15,000 is earned. We drop any worker for whom we have evidence that they worked out of state but do not observe their earnings in one or more quarters.

We focus on displaced workers who were employed up to 8 quarters prior to a mass layoff, and assume that the worker is subject to a mass layoff in period 1. Let Y_{imdt} = 1 if jobless, = 2 if employed in same MSA, and = 3 if employed in a different MSA in the same state, = 4 if employed in a different state for individual i in MSA m at the time of the mass layoff, industrial sector s, and time t. Then the competing risk (multinomial logit) model is specified as follows:

$$\text{Prob}\left(Y_{imsdt} = 1 | X_{i,0}, MSA^{0}_{m,t}, MSAN^{0}_{m,t}\right) = \frac{1}{1 + \sum_{j=2}^{4} \exp\left(X_{i,0}\beta_j + MSA^{0}_{m,t}\alpha_j + MSAN^{0}_{m,t}\gamma_j + \nu_{kt} + \eta_{ks,0} + h_k(d)\right)} \quad (1)$$

and

$$\text{Prob}\left(Y_{imsdt} = k | X_{i,0}, MSA^{0}_{m,t}, MSAN^{0}_{m,t}\right) = \frac{\exp\left(X_{i,0}\beta_k + MSA^{0}_{m,t}\alpha_k + MSAN^{0}_{m,t}\gamma_k + v_{kt} + \eta_{ks,0} + h_k(d)\right)}{1 + \sum_{j=2}^{4} \exp\left(X_{i,0}\beta_j + MSA^{0}_{m,t}\alpha_j + MSAN^{0}_{m,t}\gamma_j + v_{jt} + \eta_{js,0} + h_j(d)\right)} \quad k = 2,3,4 \qquad (2)$$

where $X_{i,0}$ is a vector of individual characteristics in period 0 (prior to the mass layoff), $MSA^{0}_{m,t}$ is a vector of MSA characteristics in MSA *m* in period 0 and observed in period t t *0,* $MSAN^{0}_{m,t}$ is a weighted average (based on migration rates of workers) of characteristics in nearby MSAs, v_{kt} and $\eta_{ks,0}$ are time and industry (prior to mass layoff) fixed effects, and $h_k(d)$ captures duration dependence where d is spell duration. The parameters β_k, α_k, and γ_k are used to determine the probability of being in outcome 2, 3 or 4 versus outcome 1 (joblessness) conditional on worker and metropolitan area characteristics.

MSA represents three factors, the Job Opportunity Index (JOI), an index of house prices (HPI), and the average monthly unemployment insurance payment (UI). This corresponds to the MSA the worker was in at the time of mass layoff. MSAN includes these same three factors corresponding to the other two competing risks: other MSAs in the same state and MSAs in nearby states. For the latter two measures, we take weighted averages based on the frequency of job-to-job flows (J2J) that we obtain from the aggregated J2J data set (publicly available measures based on LEHD). For the out-of-state measures, we take a weighted average of the five out-of-state MSAs with the highest J2J values. Consider exit to employment in the same MSA. We expect that as the JOI in the same MSA increases, the likelihood of exiting joblessness will increase. We expect that an increase in HPI in the same MSA will decrease the likelihood of exiting joblessness in the same MSA as this makes the cost of living higher. We expect that an increase in UI in the same MSA will decrease the likelihood of exiting joblessness in the same MSA as this makes the cost of exiting joblessness higher. On the other hand, we expect that an increase in JOI/HPI/UI in other MSAs in the same state or MSAs in other states increases will have the opposite effect as an increase in these factors in the same MSA: this makes this option of exiting joblessness in the same MSA less/more/more desirable relative to the other two competing risks of an in-state move or an out-of-state move.

5.2 A Model of Long-Term Earnings Changes for Displaced Workers

We next examine the changes in earnings for workers since the mass layoff. We include the displaced workers we analyzed using the above hazard model. And we now add in non-separated workers in mass layoff firms as we expect their earnings will also be affected by the mass layoff even though they remain at the establishment. We also add in a control group of workers at non-mass layoff firms (Table 1). Both groups of workers must meet the same selection criteria as the displaced workers; they must have been at the firm for 8 quarters prior to mass layoff and have earned at least $15,000 in the 4 quarters leading up to the mass layoff period. For the control groups, of course, there is no specific mass layoff event: there are 9 quarters that make up our Great Recession + 2 period. For each quarter, we choose workers in non-mass layoff establishments in the same MSA as the mass layoff establishments to be in the control group and we set the relative timing for these workers based on this quarter to be 1.

We specify the following model:

$$Y_{imst} = \beta_0 + \sum_{k=-4}^{23} D_{kit}\delta_k^j + \alpha_i + \gamma_{st} + \varepsilon_{imst} \quad (3)$$

where Y_{ismt} represents the (real) earnings of worker i, in metropolitan area m, state s, at time t, k indexes a set of dummy variables, D_{kit}, which identify the number of quarters before and after displacement. As above, we focus on workers employed for up to 8 quarters prior to a mass layoff in period 1, and then follow them for 23 quarters. α_i and γ_{st} represent individual and state by quarter fixed effects.

Again, the definition of a mass layoff establishment is one that loses 30% of its workforce over 4 quarters, with the mass layoff event is designated to take place in the 4th of these quarters. For non-separated workers at mass layoff establishments and control group workers, we need to consider how to define time relative to displaced workers: we need to "line-up" initial times for all 3 groups. Thus in presenting our results in Section 6, we need to portray the initial impact on earnings when it is the same for all displaced workers, regardless of the actual quarter in which they lose their job. Thus for non-separated workers at mass layoff establishments and control group workers, relative time 0 is the quarter before the first of the 4 quarters that determine this mass layoff designation. Thus, the mass layoff event occurs in period 4 in relative time. We do this because the earnings of non-separated workers are likely to affected starting in period 1 when layoffs begin, and we consider this to be the initiation of the treatment for these workers. The designation of relative time of displaced workers is different. Consider a worker displaced in quarter 3 of the 4-quarter period that defines the mass layoff event. While it is the case that their earnings could be affected in quarters 1 and 2, the major impact on earnings will be in period 3 when they are laid off. Thus, relative time is set to 0 in quarter 2 (rather than in the period before quarter 1). For a worker who was laid off in quarter 2, their major impact will occur in this quarter rather than quarter 3. Thus, relative time is set to 0 in quarter 1 in this case. We find that the figures of earnings impacts that we display in Section 6 better portray this initial major impact on earnings when it is the same for all displaced workers, regardless of the actual quarter they lose their job.

Next, we consider four factors that might affect these earnings paths. We interact the relative time dummies in equation (3) with JOI and HPI at the time of mass layoff to see how these MSA-level characteristics affect earnings. We also interact these dummies with the location of earnings. This will measure the potential benefits to workers who move to find a job. To do so, we define dummies that indicate if a worker ever had earnings from out of state, if not, whether they ever had earnings in another MSA in the same state, and if they only had earnings from the same MSA at the time of the mass layoff. Finally, we interact the relative time dummies with industry sector dummies to see how the earnings paths differ by what sector the workers' job are in. We expect that since the Great Recession had the largest impact on employment in the manufacturing sector, that the impact on initial earnings will be larger and the recovery slower for workers in this sector.

There are important differences between Jacobson, et.al. (1993), Couch and Plazcek (2010) and Davis and von Wachter (2011) and our analysis. Our first substantive contribution is that we examine mobility following displacement. In equation (3), we include the interaction of D_{imt}^k with $MOB_{im,}$, which is a vector of two indicators - whether individual i ends up working in another MSA in the same state or in another state. Second, going beyond Davis and von Wachter, we also interact the displacement indicators, D_{imt}^k, with a rich set of worker and metropolitan area characteristics (included the job opportunity index) to allow for heterogeneous impacts. This is a crucial feature, as it allows us to contribute to a richer understanding of how the local labor market shapes the outcomes for displaced workers.

6. Results

6.1 Joblessness Hazards

Table 6 presents our primary results for the joblessness hazard model (equations 1 and 2). We also estimate this model considering separate worker skill levels (earnings) and industry sectors. Thus Table 7 presents results with high and low earnings interactions, and Table 8 presents results with industry interactions. Our results include separate sets of parameters estimates for the three re-employment outcomes; employed in same MSA, employed in a different MSA in the same state, and employed in an MSA in a different state. This allows us to examine the differential impacts of factors that affect re-employment on the location of the re-employment. The key variables of interest are JOI, HPI, and UI. And we include measures of these variables at the same MSA, other MSA in the same state, and other states. This allows us to see how changes in the variables in different locations affect the likelihood of exiting joblessness in each competing risk outcome.

We estimate two models, one that only considers two competing risks, re-employment in the same MSA and in another MSA in the same state (Model 1), and a second that also includes re-employment in another state (Model 2). (For Model 2, we have obtained partially counter-intuitive results when we consider an increase in the out-of-state JOI: there is a positive and significant impact on the likelihood of re-employment in the same MSA or another MSA in the same state. This may occur due to workers who are re-employed in the same state not considering, to a large extent, out-of-state options – we are continuing to explore this issue).
Our preliminary results are generally in line with our intuition. Consider first the Job Opportunity Index (JOI) results for Model 1 presented in columns 1-2 in Table 6. For the JOI: Origin MSA row, the coefficient estimate in column 3 indicates that an increase in the JOI in the worker's origin MSA has a positive and highly significant impact on re-employment in the same MSA; this is what we would expect if the probability of finding a higher paying job locally increases versus other locations. In column 4, the JOI estimate is negative and highly significant; again, this is what we would expect if job opportunities in other MSAs in the same state decrease relative to those in the same MSA.

As expected, we obtain the opposite results in the next row from an increase in the JOI in other MSAs in the same state: a decrease in the likelihood of re-employment in the same MSA and an increase in the likelihood of re-employment in another MSA in the same state. There is actually a decrease in the likelihood of re-employment in another MSA in the same state, but the impact is not significant. We conclude that job opportunities do matter to displaced workers.

Our results for housing costs are likewise striking. Looking at the impact of an increase in HPI in the same MSA and in other MSAs in the same state, we get the expected (and opposite) results as we did for the JOI. An increase in HPI in the same MSA will result in a decrease in the likelihood of re-employment in the same MSA and an increase in the likelihood of re-employment in another MSA in the same state. since relative costs of housing increase in the same MSA. And an increase in HPI in the other MSAs in the same state will result in an increase in the likelihood of re-employment in the same MSA and a decrease in the likelihood of re-employment in another MSA in the same state since the relative costs of housing increase in the other MSAs in the same state. Finally, an increase in out-of-state housing costs will result in a decrease in the likelihood in out-of-state re-employment. We thus present important evidence that housing costs matter to displaced workers. These results are important, of course, since we are capturing the core tradeoff between job opportunities and housing costs facing displaced workers.

We also obtain plausible results for UI benefits. Recall that UI is measured at the state level, so for Model 1, we only have a measure of in-state UI benefits. We see that an increase in weekly UI benefits results in a decrease in the likelihood of re-employment in the same MSA. This is expected since it increases the benefits of remaining jobless. The impact of an increase in weekly UI benefits results in an increase in the likelihood of re-employment in another MSA in the same state. This seems counter-intuitive but note that the coefficient estimate is half the magnitude of one for the impact of re-employment in the same MSA and is small in an economic sense (as seen in the column that displays the standardized coefficient).

Now consider the results for Model 2. Here we focus on the results in column 5 which capture the impact of JOI, HPI, and UI on the probability of re-employment in another state. As expected, an increase in JOI in the same MSA or in another MSA in the same state have a negative impact on the likelihood of re-employment in another state as this decreases the relative benefits of taking an out-of-state job. Furthermore, an increase in the out-of-state JOI has a positive impact on the likelihood of re-employment in another state but the effect is not significant.

And as expected, an increase in HPI in the same MSA or in another MSA in the same state has a positive impact on the likelihood of re-employment in another state as this decreases the relative costs of taking an out-of-state job. An increase in the out-of-state HPI has a negative (and this time significant) impact on the likelihood of re-employment in another state.

Finally, the impact of an increase in in-state weekly UI benefits results in a decrease in the likelihood of re-employment in another state. Again, this is expected since it increases the benefits of remaining jobless in the same state. The impact of an increase in out-of-state weekly UI benefits results in an increase in the likelihood of re-employment in another state. One can interpret this result as an increase in benefits from moving out-of-state as it increases the benefits of joblessness if workers lose their out-of-state jobs.
Overall, this is strong evidence about the impact of these 3 key variables, JOI, HPI, and UI on the geography of re-employment. And looking at the standardized coefficients, the impact of JOI seems particularly large though HPI is also economically significant in certain case.

The primary takeaway from the results for age is that probabilities of finding a job in any location decreases with age, with the likelihood of moving also decreasing with age. Older workers take longer to find a job and are less likely to move both in-state and out-of-state for re-employment. The earnings results indicate that as prior earnings increase, the probabilities of finding a job increase, especially for jobs in different MSAs or in different states.

With respect to tenure, we see that those with longer prior tenure appear to have higher probabilities of finding a job in their origin MSA, though the reason for this is unclear. Relative to Whites, the race/ethnicity results indicate that Black, Hispanic Non-Black, and Other displaced workers have lower probabilities of finding a job. Women are more likely than men to choose remaining in their home MSAs. This probably reflects the presence of an income-earning spouse or partner, which we cannot identify in our dataset.

With respect to the base industry of construction, those from manufacturing have a somewhat higher probability of finding a job, while for other industries the probability is quite a bit higher. This fits with our understanding of the severity by industry of the Great Recession.

Table 7 presents results for the joblessness hazard model with separate coefficient estimates for the JOI, HPI, and UI variables interacted with either low or high pre-separation earnings. Here we define low-income as

having less than $45,000 over the 4 quarters before the mass layoff event, and high-income as having at least $45,000 in earnings over the same reference period. As earnings before mass layoff is shown to impact workers' time in nonemployment and in the geography of their re-employment in Table 6, these interactions are useful for showing how previous earnings shapes the impacts of JOI, HPI, and UI on jobless duration and geography of re-employment. We again estimate two models as in Table 6, wherein Model 1 only considers the two competing risks of re-employment in the same MSA and in other same-state MSAs and Model 2 also considers the third risk of re-employment in an MSA in a non-origin state.

Consider first the Job Opportunity Index (JOI) results for Model 1 presented in the first two columns of Table 7. For the JOI: Origin MSA low-income row, the coefficient estimate in column (1) indicates that an increase in the JOI in the low-income worker's origin MSA has a positive and highly significant impact on re-employment in the same MSA; this is what we would expect if the probability of finding a higher paying job locally increases versus other locations. For the JOI: Origin MSA high-income row, the coefficient estimate in column (1) indicates a similarly positive and highly significant impacts on same-MSA re-employment, although the magnitude of the standardized coefficient is smaller for the high-income estimate. In column 2, the JOI estimates for both low-income and high-income are negative and highly significant; again, this is what we would expect if job opportunities in other MSAs in the same state decrease relative to those in the same MSA. In the JOI: Other-in-state MSAs low-income row, we find expected results where the coefficient estimate for JOI in other MSAs is positive and the estimate for JOI in the origin MSA is negative. These indicate that for low-income earners, they are more likely to move to another MSA when their origin MSA JOI is low and other in-state MSA JOIs are high. However, the results for the JOI: Other-in-state MSAs for high-income indicate that re-employment both at origin and in other MSAs decrease with higher JOIs, which suggests that higher earners are more likely to move to other MSAs with lower JOIs.

Next, the differential impacts across earnings groups of increases HPI in the same MSA and other same-state MSAs in Model 1 fit the expectations better than those for JOI. For low-income, higher HPI in the origin MSA lowers the likelihood of re-employment in the origin MSA and raises the probability of re-employment in another MSA. For high-income, a higher HPI in the origin MSA is unrelated to the probability of employment in the origin MSA but makes a move to another MSA more likely. Increases in the HPI of other same-state MSAs lead to increased probability of finding re-employment in the origin MSA and decreased probability for other same-state MSAs for both the low- and high-income groups.

The UI results by earnings groups in Model 1 indicate that higher UI benefits decrease the likelihood of low-earners gaining re-employment in the origin MSA but is unrelated to the likelihood of low-earners gaining job in another MSA in the state. For high earners, high UI is unrelated to re-employment in the origin MSA but raises the likelihood of gaining employment in another MSA in the state. This finding is somewhat counterintuitive. The differential high- and low-income results for Model 2 include the third outcome of gaining employment in a non-origin state after displacement. We focus on column (5) which captures the income interacted effects of JOI, HPI, and UI on gaining employment in another state. JOI impacts largely fit expectations. For the low-income group, origin MSA JOI and same-state MSA JOIs are unrelated to moves to a different state but increases in out-of-state MSA JOIs lead to higher probability of moving to another state for re-employment. For the high-income group, increases in the origin MSA JOI and same-state MSA JOIs lead to decreases in the probability of finding a job in another state, and increases in the out-of-state MSA JOIs do not impact the probability of finding a job in another state.

For the impact of HPI by income group, the estimated coefficients fit expectations fairly well. For the low-income group, higher HPI in the origin and same-state MSAs do not affect the probability of out-of-state employment but increases in out-of-state HPIs lead to decreases in the probability of out-of-state employment. For the high-income group, an increase in origin MSA HPI raises the probability of out-of-state employment, which may be related to wealth as higher earners may be more likely to own homes and better afford to move. The high-income group's out-of-state moving is unaffected by same-state HPIs and decreases with out-of-state HPI.

The UI estimates indicate for both income groups that higher origin state UI leads does not impact the probability of moving to another state, but that higher out-of-state UI increases the probability of moves out-of-state.

Taken together, these results indicate that there are a few primary differences in the effects of JOI, HPI, and UI on joblessness and geographic mobility across high- and low-income groups. Low-income workers are more sensitive to JOI at origin, in-state, and out-of-state. Differences in HPI estimates indicate that both groups tend to be more likely to move to MSAs with lower HPI and avoid moving to MSAs with higher HPI, with low-income workers being more sensitive to HPI.

Table 8 presents results for the joblessness hazard model with separate coefficient estimates for the JOI, HPI, and UI variables interacted with pre-displacement employment in the industry groups of Manufacturing, Finance (inclusive of Information and Real Estate), Accommodation (inclusive of Food Services, Arts, and Entertainment), and Other (inclusive of all other NAICS categories). In Model 1, the JOI: Origin MSA estimates are positive for same MSA employment and negative for same-state other MSA employment for all industries, except for Finance, which is unaffected by same MSA JOI for re-employment in the origin MSA. The coefficient estimates the same-state MSA JOIs tell a more complicated story with other same-state MSA JOI leading to higher probability of employment both in the origin and other same-state MSAs for Manufacturing workers. The coefficient estimates for other same-state MSA JOI are as expected for Finance and Accommodation with larger non-origin MSA JOI leading to lower probability of origin re-employment and higher probability of re-employment in another MSA in-state. Counterintuitively the coefficient estimate for the Other industry group indicates that increase in other in-state MSA lead to lower probabilities of employment in both the origin and non-origin MSAs.

The HPI results for Model 1 in Table 8 are like those for JOI. When there is an increase in the origin MSA HPI, manufacturing workers are more likely to find re-employment in their origin MSA and in other in-state MSAs. When there is a similar increase in origin MSA HPI, finance, accommodation, and other workers are less likely to be re-employed in their origin MSA and finance and accommodation workers are more likely to find employment in another MSA.

UI Benefits in Model 1 in Table 8 show variable effects of UI by industry. Across both origin and in-state MSAs, higher in-state UI leads to reduced employment probability for manufacturing workers, increased employment probability for finance workers, and does not impact the employment probability for accommodation workers.

Model 2 in Table 8 provides results when including an additional outcome of employment out-of-state with differential effects for different industries. We focus on column (5) which provides the industry interacted effects of JOI, HPI, and UI. The JOI results largely fit expectations and are similar across industries. JOI in the origin MSA does not impact the likelihood of moving to a different state for manufacturing, accommodation, and other industries, and it reduces the likelihood of moving to a different state for finance workers. JOI in other

in-state MSAs does not impact the likelihood of moving to a different state for manufacturing, finance, and accommodation, and it reduces the likelihood of moving to a different state for workers in other industries. JOI in out-of-state MSAs does not impact the probability of employment for workers in any industry group. The estimates for HPI's effect on out-of-state moving is also similar across industries. Higher origin MSA HPI increases the probability of moving out-of-state for workers in manufacturing and finance, but not in accommodation or other industries. Higher in-state other MSA HPI does not significantly impact the probability of moving out-of-state for workers in any industry, but higher out-of-state MSA HPI leads to reductions in out-of-state moves for workers in all industries.

The estimates for UI's effect on out-of-state moving indicate that higher out-of-state UI increases the probability of an out-of-state move for manufacturing, finance, and other industry workers while not affecting the probability for accommodation workers.

These industry results suggest that workers' origin industries shift only the magnitude of the impacts of JOI, HPI, and UI on jobless duration and mobility, with few exceptions.

5.2 Earnings Regressions

We display the results from estimating the earnings regression (3) and then with the relative time dummies interacted with 4 factors: JOI, HPI, job location and industry indicators. Figure 2A shows the change in real quarterly earnings for the three worker groups: those displaced after a mass layoff, those not separated during the mass layoff, and those in the control group (non-mass layoff establishments). Note that earnings are relative to those in period 0, the quarter before the initiation of the mass layoff. Figure 2B provides the treatment effect for the groups of dislocated and non-separated workers. That is, the percent difference in relative earnings between these two groups and the control group. First note that the displaced workers experienced a significant decline in earnings in the first quarter of job loss. This was an average $2,000 or 30% decline in earnings. This average obscures the heterogeneity of displaced worker experiences. Some found a new full-time job in this first quarter, some had earnings from continuing secondary jobs, while others were jobless. There was a gradual increase in earnings after this initial shock, but average earnings were still 1% below baseline after more than 5 years.

The non-separated workers suffered earnings losses but not nearly to the extent as those of the displaced workers. By month 4 (when the actual mass layoff event occurred), their average earnings had declined by nearly 10% and gradually increased but were still 5% below baseline more than 4 years later. Finally note that the relative real earnings of the control group were very stable over the time period covered in this analysis. This is reassuring since we know that for the bulk of workers, real earnings have been constant since the 1970s. Figure 3 displays the percent change in relative real earnings for displaced workers based on job location. We expected that workers who moved to another state did so to take advantage of higher earnings and hence they would experience the lowest decline in earnings. What is surprising is that these workers suffered the largest initial decline in earnings though eventually their earnings caught up to those in the other two categories. What might explain this result is that the workers who suffered the largest initial decline in earnings where the ones who gained the most by moving to another state to take a job. One thing to notice is that these workers had lower relative earnings before the mass layoff, so they are probably not a random subset of all displaced workers.

Figures 4 and 5 display the earnings paths for workers in MSAs with different levels of the JOI and HPI. These paths are evaluated at the 10^{th}, 25^{th}, 50^{th}, 75^{th}, and 90^{th} percentiles of the JOI and HPI indices. One might expect

that workers in MSAs with higher JOIs would fare better after displacement. While this does appear to be the case, there is relatively little difference in the earnings paths at these different percentiles of the JOI distribution. In the case of house prices, one might expect that workers in lower priced MSAs might fare better as they might be less likely to be evicted from their residences and that such displacement might make it harder to find work. But as shown in Figure 5, there is very little difference in the earnings paths of workers in MSAs with HPIs ad different percentiles of the HPI index distribution.

Figures 6A and 6B display the earnings paths for non-separated and displaced workers for separate sectors: manufacturing, finance, accommodations and food service. For the latter, as expected, earnings losses are greatest for workers in manufacturing whereas Arts and Entertainment workers experienced the smallest impact. The results are mixed for non-separated workers.

6. Implications

Our goal is to provide findings that support the policy community's evidence-based policy initiatives. It is important to distinguish between policies that address the immediate impact of a crisis such as the current one (for humanitarian and demand support purposes) along with longer-term approaches addressing structural problems in matching workers to demand for labor. In the former case, we have the recent policies of employee and employer subsidies. Also relevant is the proposal to use federal government projects to increase re-employment. While we cannot address these directly, what our research can do is provide good estimates of the costs to workers of continued joblessness - that is, both immediate costs in terms of lost income and longer-term costs in terms of re-employment earnings levels.

Much has been written, of course, on the structural issues of mismatch between worker skills and the changing skills sought by employers. Our relevance here can take several forms. Related to worker mobility, we outline a highly detailed understanding of which types of workers are more likely to move for job opportunities. Identifying their characteristics could be relevant to designing mobility subsidy policies.

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Table 1. Displaced Workers by Age, Earnings, Previous Job Tenure, Race/Ethnicity, Gender, Industry, and Establishment Size

	Displaced Workers at Establishments with Mass Layoffs	Non-Displaced Workers at Establishments with Mass Layoffs	Non-Displaced Workers at Establishments without Mass Layoffs
Age			
25-29	0.124	0.099	0.103
30-34	0.146	0.132	0.135
35-39	0.162	0.161	0.159
40-44	0.174	0.181	0.174
45-49	0.189	0.203	0.200
50-55	0.206	0.225	0.228
Earnings			
$15,000-$29,999	0.318	0.209	0.230
$30,000-$44,999	0.301	0.311	0.288
$5,000-$59,999	0.162	0.213	0.213
$60,000-$74,999	0.090	0.124	0.123
$75,000-$89,999	0.053	0.062	0.061
$90,000+	0.078	0.082	0.085
Tenure			
4 Quarters	0.281	0.206	0.176
5-8 Quarters	0.336	0.283	0.262
9-16 Quarters	0.145	0.175	0.192
16+ Quarters	0.239	0.337	0.371
Race			
White Non-Hispanic	0.817	0.867	0.876
Black	0.109	0.071	0.075
Hispanic Non-Black	0.044	0.037	0.025
Other	0.030	0.025	0.023
Gender			
Male	0.589	0.673	0.483
Female	0.411	0.327	0.518
Industry			
Extraction/Utilities/ Construction	0.058	0.114	0.030
Manufacturing	0.352	0.474	0.180
Wholesale Trade/Retail Trade/Transportation/	0.186	0.105	0.137
Information/Finance/ Real Estate/ Professional	0.228	0.193	0.196

Education/Health	0.132	0.067	0.335
Arts/Entertainment/ Accommodation/Food	0.030	0.016	0.024
Other Industry	0.014	0.031	0.098
Establishment Size			
50-499 Employees	0.697	0.709	0.579
500-1999 Employees	0.191	0.213	0.255
2000+ Employees	0.112	0.079	0.167
Number of Observations	143000	227000	238000

Table 2. Transitions Back to a Permanent Job after Displacement from a Mass Layoff

	Percent Share
Employment Status	
Re-employed Same MSA	0.675
Re-employed Different MSA & Same State	0.171
Re-employed in Different State	0.021
Still Non-employed in 2014Q4	0.133
Jobless Spell	
<1 Quarter	0.358
1 Quarter	0.232
2-3 Quarters	0.083
4-7 Quarters	0.102
8+ Quarters	0.093
Never Re-employed	0.133
New Earnings Share	
>90%	0.483
75%-90%	0.155
25%-75%	0.224
<25%	0.138
Number of Observations	143000

Table 3. Sample Characteristics by Final Employment State

	Displaced Workers at Establishments with Mass Layoffs	Employed			Non-employed
		Same MSA	Other MSA, Same State	Other State	
Age					
25-29	0.124	0.123	0.139	0.162	0.107
30-34	0.146	0.146	0.159	0.182	0.123
35-39	0.162	0.165	0.170	0.165	0.132
40-44	0.174	0.178	0.178	0.175	0.147
45-49	0.189	0.191	0.181	0.159	0.191
50-55	0.206	0.196	0.173	0.158	0.300
Earnings					
$15,000-$29,999	0.318	0.294	0.274	0.217	0.511
$30,000-$44,999	0.301	0.304	0.319	0.274	0.264
$45,000-$59,999	0.162	0.169	0.177	0.177	0.106
$60,000-$74,999	0.090	0.094	0.095	0.122	0.057
$75,000-$89,999	0.053	0.056	0.054	0.084	0.028
$90,000+	0.078	0.084	0.081	0.126	0.034
Tenure					
4 Quarters	0.281	0.256	0.329	0.345	0.333
5-8 Quarters	0.336	0.322	0.397	0.364	0.320
9-16 Quarters	0.145	0.154	0.112	0.135	0.143
16+ Quarters	0.239	0.268	0.162	0.156	0.205
Race					
White Non-Hispanic	0.817	0.831	0.808	0.805	0.761
Black	0.109	0.103	0.105	0.102	0.146
Hispanic Non-Black	0.044	0.038	0.057	0.045	0.059
Other	0.030	0.028	0.031	0.048	0.033
Gender					
Male	0.589	0.572	0.654	0.692	0.575
Female	0.411	0.428	0.346	0.308	0.425
Industry					

Extraction/Utilities/Construction	0.058	0.052	0.075	0.062	0.069
Manufacturing	0.352	0.340	0.320	0.375	0.447
Wholesale Trade/Retail Trade/Transportation	0.186	0.157	0.326	0.218	0.148
Information/Finance/Real Estate/Professional	0.228	0.245	0.178	0.237	0.202
Education/Health	0.132	0.158	0.078	0.074	0.083
Arts/Entertainment/Accommodation/Food	0.030	0.033	0.017	0.023	0.030
Other Industry	0.014	0.014	0.007	0.012	0.021
Establishment Size					
50-499 Employees	0.697	0.701	0.623	0.720	0.765
500-1999 Employees	0.191	0.214	0.126	0.187	0.160
2000+ Employees	0.112	0.085	0.252	0.093	0.074
Number of Observations	143000	96500	24500	3000	19000

Table 4. Metropolitan Area Characteristics at Baseline, 2006

	Mean	Std. Dev
Job Opportunity Index: Origin MSA	805	156
Job Opportunity Index: Other In-State MSAs	904	90
Job Opportunity Index: Out-of-State MSAs	1080	62
Median Housing Price: Origin MSA	112	42
Median Housing Price: Other In-State MSAs	133	41
Median Housing Price: Out-of-State MSAs	170	28
Weekly Unemployment Benefits: Origin State	287	22
Weekly Unemployment Benefits: Other States	261	12

Table 5 Number of Establishments with Mass Layoffs by Quarter

	Count Measure	Mass Layoff Events	Mass Layoff Events	Mass Layoff Events	Mass Layoff Events	Mass Layoff Events	Mass Layoff Events	Mass Layoff Events	Mass Layoff Events
	Industry	All Industries	Construction	Manufacturing	Trade	Finance_Professional_RealEstate	Management_ Administrative	Education_ Health	Arts_Accommodation
	State	All States	All States	All States	All States	All States	All States	All States	All States
qtime	yq	masslayoff	masslayoff_t1	masslayoff_t2	masslayoff_t3	masslayoff_t45	masslayoff_t6	masslayoff_t7	masslayoff_t8
69	2002	5200	300	1400	1200	650	750	500	150
70	2002.25	3800	350	1000	600	500	550	400	100
71	2002.5	3500	400	850	550	450	550	350	60
72	2002.75	3300	350	800	600	450	500	300	70
73	2003	3800	300	950	600	550	650	350	150
74	2003.25	3200	300	800	500	400	550	250	70
75	2003.5	3100	300	700	450	350	550	250	70
76	2003.75	2900	300	650	450	350	550	250	70
77	2004	3900	250	750	650	450	550	900	100
78	2004.25	2600	300	500	350	300	400	300	80
79	2004.5	2700	250	550	500	300	400	250	90
80	2004.75	2600	300	500	500	300	450	250	70
81	2005	3300	300	650	600	400	500	600	100
82	2005.25	2800	300	450	400	300	450	400	100
83	2005.5	2800	250	550	450	300	450	350	100
84	2005.75	2700	300	500	400	300	450	300	100
85	2006	3200	200	650	600	400	550	450	150
86	2006.25	2800	250	550	450	300	450	450	80
87	2006.5	2700	250	450	450	300	450	400	60
88	2006.75	2700	200	550	450	300	450	400	60
89	2007	3400	250	700	600	400	550	500	150
90	2007.25	3200	300	600	650	300	500	500	90
91	2007.5	2600	250	450	400	300	400	400	80
92	2007.75	2900	300	550	500	300	450	400	80
93	2008	3500	300	750	650	450	600	450	150
94	2008.25	3100	300	600	500	350	600	400	100
95	2008.5	3200	300	700	500	350	600	350	80
96	2008.75	3700	350	950	700	350	800	250	100

97	2009	5300	400	1700	900	450	1100	400	150
98	2009.25	5100	500	1800	700	400	1000	300	90
99	2009.5	4700	500	1600	650	450	900	300	80
100	2009.75	3600	400	1100	500	400	650	250	60
101	2010	3100	300	750	550	400	450	400	100
102	2010.25	2400	250	450	400	300	350	250	60
103	2010.5	2200	250	400	350	250	300	250	60
104	2010.75	2100	250	400	300	250	300	300	60
105	2011	2400	200	450	350	300	350	450	80
106	2011.25	2200	200	350	300	250	350	400	90
107	2011.5	2000	200	350	250	250	350	350	60
108	2011.75	2100	150	300	250	300	400	350	60
109	2012	2400	150	400	350	350	400	450	90
110	2012.25	2400	200	350	300	250	450	500	150
111	2012.5	2300	250	350	300	250	450	400	100
112	2012.75	2200	250	350	300	300	450	300	50
113	2013	2600	200	500	400	300	450	450	100
114	2013.25	2400	200	400	300	250	450	350	150
115	2013.5	2200	250	350	300	250	450	350	90
116	2013.75	2000	250	350	300	250	350	300	60
117	2014	2500	200	400	400	300	450	450	100
118	2014.25	2100	150	300	350	250	400	350	80
119	2014.5	2100	150	300	300	250	350	300	150
120	2014.75	2000	150	300	350	250	350	300	80

Table 6: Duration/Mobility Model Results: Probability of Finding New Employment by Geography

	Estimates					Standardized Coefficients				
	Model 1		Model 2			Model 1		Model 2		
VARIABLES	Same MSA	Same State	Same MSA	Same State	Different State	Same MSA	Same State	Same MSA	Same State	Different State
Mass Layoff Spell	-0.473***	-0.154***	-0.473***	-0.152***	0.109***					
	(0.00421)	(0.00689)	(0.00421)	(0.00693)	(0.0188)					
Mass Layoff Spell 2	0.0106***	-0.00118***	0.0107***	-0.00103**	-0.0111***					
	(0.000254)	(0.000425)	(0.000254)	(0.000426)	(0.00121)					
Job Opportunity Index: Origin MSA	0.00100***	-0.00233***	0.000992***	-0.00275***	-0.000401*	0.138	-0.250	0.137	-0.254	-0.059
	(4.61e-05)	(8.70e-05)	(5.00e-05)	(9.40e-05)	(0.000239)					
Job Opportunity Index: Other In-State MSAs	-0.00195***	0.000311	-0.00200***	-0.000199	-0.00162**	-0.283	0.029	-0.290	-0.016	-0.228
	(0.000133)	(0.000244)	(0.000133)	(0.000249)	(0.000685)					
Job Opportunity Index: Out-of-State MSAs			0.00123***	0.00842***	0.000557			0.196	0.823	0.093
			(0.000125)	(0.000235)	(0.000582)					
Housing Price: Origin MSA	-0.00180***	0.00255***	-0.00175***	0.00484***	0.00395***	-0.049	0.047	-0.048	0.077	0.112
	(0.000232)	(0.000459)	(0.000287)	(0.000568)	(0.00133)					
Housing Price: Other In-State MSAs	0.0114***	-0.0120***	0.0113***	-0.0119***	0.00142	0.473	-0.402	0.469	-0.340	0.058
	(0.000578)	(0.00105)	(0.000580)	(0.00108)	(0.00278)					
Housing Price: Out-of-State MSAs			-0.00317***	-0.0226***	-0.00568***			-0.156	-0.696	-0.312
			(0.000369)	(0.000689)	(0.00171)					
Weekly Unemployment Benefits: Own State	-0.00300***	0.00144**	-0.00233***	0.00688***	-0.00288	-0.077	0.026	-0.060	0.105	-0.083
	(0.000393)	(0.000656)	(0.000406)	(0.000690)	(0.00176)					
Weekly Unemployment Benefits: Out-of-State			-0.000763**	-0.00597***	0.0124***			-0.016	-0.092	0.270
			(0.000334)	(0.000560)	(0.00139)					
						Semi-Elasticities				
Age										
30-34	-0.0730***	-0.0443*	-0.0704***	-0.0405	-0.151**	-0.047	-0.038	-0.046	-0.033	-0.149
	(0.0147)	(0.0247)	(0.0146)	(0.0248)	(0.0635)					
35-39	-0.0951***	-0.0867***	-0.0849***	-0.0811***	-0.423***	-0.062	-0.074	-0.056	-0.066	-0.417

	(0.0145)	(0.0245)	(0.0144)	(0.0246)	(0.0657)					
40-44	-0.120***	-0.146***	-0.109***	-0.137***	-0.483***	-0.078	-0.124	-0.072	-0.112	-0.476
	(0.0144)	(0.0245)	(0.0143)	(0.0245)	(0.0654)					
45-49	-0.207***	-0.245***	-0.191***	-0.232***	-0.713***	-0.134	-0.208	-0.126	-0.189	-0.702
	(0.0142)	(0.0245)	(0.0142)	(0.0245)	(0.0673)					
50-55	-0.408***	-0.519***	-0.387***	-0.498***	-0.979***	-0.265	-0.440	-0.255	-0.406	-0.965
	(0.0142)	(0.0248)	(0.0141)	(0.0249)	(0.0682)					
Earnings										
$30,000-$44,999	0.373***	0.516***	0.362***	0.492***	0.728***	0.242	0.438	0.238	0.401	0.717
	(0.00977)	(0.0177)	(0.00975)	(0.0177)	(0.0540)					
$45,000-$59,999	0.567***	0.771***	0.545***	0.726***	1.199***	0.368	0.653	0.359	0.592	1.182
	(0.0120)	(0.0212)	(0.0120)	(0.0213)	(0.0613)					
$60,000-$74,999	0.669***	0.906***	0.637***	0.840***	1.626***	0.434	0.768	0.419	0.685	1.603
	(0.0150)	(0.0263)	(0.0149)	(0.0263)	(0.0690)					
$75,000-$89,999	0.747***	0.968***	0.710***	0.894***	1.859***	0.485	0.821	0.467	0.729	1.832
	(0.0185)	(0.0327)	(0.0184)	(0.0328)	(0.0786)					
$90,000+	0.799***	1.034***	0.754***	0.941***	1.951***	0.519	0.876	0.496	0.767	1.923
	(0.0163)	(0.0285)	(0.0162)	(0.0286)	(0.0705)					
Tenure										
2-4 Years	0.0777***	-0.0475***	0.0831***	-0.0554***	-0.166***	0.050	-0.040	0.055	-0.045	-0.164
	(0.00988)	(0.0160)	(0.00984)	(0.0161)	(0.0443)					
4-6 Years	0.228***	-0.277***	0.237***	-0.247***	-0.248***	0.148	-0.235	0.156	-0.202	-0.245
	(0.0122)	(0.0230)	(0.0122)	(0.0230)	(0.0596)					
6 Or More Years	0.376***	-0.295***	0.393***	-0.252***	-0.384***	0.244	-0.250	0.258	-0.206	-0.379
	(0.0109)	(0.0208)	(0.0109)	(0.0209)	(0.0583)					
Race										
Combined Race and Ethnicity = 2	-0.196***	-0.175***	-0.202***	-0.219***	-0.0416	-0.127	-0.149	-0.133	-0.179	-0.041
	(0.0124)	(0.0222)	(0.0124)	(0.0223)	(0.0624)					
Combined Race and Ethnicity = 3	-0.209***	0.0262	-0.217***	-0.0214	-0.0167	-0.136	0.022	-0.143	-0.017	-0.017
	(0.0190)	(0.0295)	(0.0190)	(0.0297)	(0.0904)					
Combined Race and Ethnicity = 4	-0.151***	-0.118***	-0.170***	-0.166***	0.285***	-0.098	-0.100	-0.112	-0.135	0.281
	(0.0225)	(0.0388)	(0.0224)	(0.0389)	(0.0870)					
Gender										
Female	0.0346***	-0.0739***	0.0375***	-0.0773***	-0.212***	0.022	-0.063	0.025	-0.063	-0.209

	(0.00838)	(0.0151)	(0.00835)	(0.0151)	(0.0426)					
Industry										
Manufacturing	0.151***	-0.357***	0.136***	-0.392***	0.308***	0.098	-0.303	0.090	-0.320	0.304
	(0.0174)	(0.0276)	(0.0174)	(0.0277)	(0.0818)					
Wholesale and Retail Trade, Transportation	0.309***	0.607***	0.283***	0.512***	0.761***	0.201	0.515	0.186	0.417	0.750
	(0.0188)	(0.0280)	(0.0188)	(0.0282)	(0.0858)					
Information, Finance, Real Estate, Professional, Management, Administrative Services	0.515***	-0.0104	0.503***	-0.0305	0.472***	0.334	-0.009	0.331	-0.025	0.465
	(0.0182)	(0.0297)	(0.0181)	(0.0297)	(0.0851)					
Education and Health	0.997***	0.216***	0.988***	0.207***	0.586***	0.647	0.183	0.650	0.169	0.577
	(0.0201)	(0.0358)	(0.0200)	(0.0358)	(0.105)					
Arts, Entertainment, Accommodation and Food	0.666***	-0.234***	0.656***	-0.228***	0.539***	0.432	-0.199	0.431	-0.186	0.532
	(0.0269)	(0.0565)	(0.0268)	(0.0565)	(0.143)					
Other industry	0.252***	-0.624***	0.241***	-0.664***	0.18	0.164	-0.529	0.159	-0.542	0.177
	(0.0348)	(0.0799)	(0.0347)	(0.0799)	(0.186)					
Constant	-0.212	-0.213	-0.909***	-4.613***	-5.745***					
	(0.164)	(0.279)	(0.199)	(0.360)	(0.888)					
Observations	827000	827000	841000	841000	841000					
Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1										

Table 7. Duration/Mobility Model Results: High Income and Low Income

	Estimates					Standardized Coefficients				
	Model 1		Model 2			Model 1		Model 2		
VARIABLES	Same MSA	Same State	Same MSA	Same State	Different State	Same MSA	Same State	Same MSA	Same State	Different State
Mass Layoff Spell	-0.470***	-0.147***	-0.471***	-0.147***	0.117***					
	(0.00422)	(0.00693)	(0.00422)	(0.00697)	(0.0189)					
Mass Layoff Spell 2	0.0104***	-0.00158***	0.0105***	-0.00139***	-0.0117***					
	(0.000255)	(0.000427)	(0.000255)	(0.000428)	(0.00122)					
Job Opportunity Index: Origin MSA (low income)	0.00125***	-0.00214***	0.00123***	-0.00226***	0.0000488	0.568	-0.634	0.563	-0.570	0.022
	(5.60e-05)	(0.000108)	(6.08e-05)	(0.000118)	(0.000322)					
Job Opportunity Index: Origin MSA (high income)	0.000664***	-0.00270***	0.000660***	-0.00349***	-0.000768**	0.300	-0.772	0.300	-0.849	-0.340
	(6.72e-05)	(0.000129)	(7.49e-05)	(0.000144)	(0.000320)					
Job Opportunity Index: Other Instate MSAs (low)	-0.00157***	0.000905***	-0.00158***	0.000827***	-0.00118	-0.741	0.288	-0.750	0.223	-0.549
	(0.000139)	(0.000256)	(0.000145)	(0.000273)	(0.000793)					
Job Opportunity Index: Other Instate MSAs (high)	-0.00241***	-0.000681**	-0.00251***	-0.00186***	-0.00206***	-1.116	-0.216	-1.167	-0.502	-0.952
	(0.000145)	(0.000267)	(0.000166)	(0.000314)	(0.000791)					
Job Opportunity Index: Out-of-State MSAs (low)			0.00123***	0.00786***	0.00140**			0.724	2.592	0.797
			(0.000136)	(0.000258)	(0.000690)					
Job Opportunity Index: Out-of-State MSAs (high)			0.00147***	0.00935***	0.000182			0.846	3.011	0.103
			(0.000158)	(0.000287)	(0.000673)					
Housing Price: Origin MSA (low)	-0.00311***	0.00285***	-0.00333***	0.00310***	0.00214	-0.188	0.111	-0.201	0.102	0.120
	(0.000289)	(0.000572)	(0.000363)	(0.000727)	(0.00201)					
Housing Price: Origin MSA (high)	0.0000201	0.00176***	0.000296	0.00644***	0.00476***	0.001	0.068	0.018	0.210	0.277
	(0.000333)	(0.000638)	(0.000434)	(0.000883)	(0.00178)					
Housing Price: Other Instate MSAs (low)	0.0117***	-0.0151***	0.0114***	-0.0139***	-0.000552	0.853	-0.754	0.833	-0.589	-0.037
	(0.000595)	(0.00107)	(0.000604)	(0.00112)	(0.00299)					
Housing Price: Other Instate MSAs (high)	0.0110***	-0.00784***	0.0110***	-0.00779***	0.00318	0.768	-0.413	0.770	-0.346	0.225
	(0.000619)	(0.00111)	(0.000635)	(0.00118)	(0.00297)					

Housing Price: Out-of-State MSAs (low)			-0.00284***	-0.0207***	-0.00852***			-0.280	-1.103	-0.773
			(0.000401)	(0.000753)	(0.00204)					
Housing Price: Out-of-State MSAs (high)			-0.00422***	-0.0252***	-0.00369*			-0.409	-1.306	-0.352
			(0.000467)	(0.000841)	(0.00196)					
Weekly Unemployment Benefits: Own State (low)	-0.00464***	-0.000525	-0.00426***	0.00392***	-0.00294	-0.771	-0.059	-0.712	0.374	-0.482
	(0.000423)	(0.000714)	(0.000450)	(0.000773)	(0.00209)					
Weekly Unemployment Benefits: Own State (high)	-0.000628	0.00498***	0.00047	0.0120***	-0.00219	-0.105	0.565	0.079	1.157	-0.361
	(0.000442)	(0.000756)	(0.000494)	(0.000865)	(0.00204)					
Weekly Unemployment Benefits: Out-of-State (low)			-0.00133***	-0.00360***	0.0135***			-0.220	-0.340	2.190
			(0.000386)	(0.000649)	(0.00182)					
Weekly Unemployment Benefits: Out-of-State (high)			0.000156	-0.00949***	0.0113***			0.026	-0.884	1.832
			(0.000490)	(0.000825)	(0.00184)					
Constant	-0.159	0.0932	-0.631***	-4.963***	-6.819***					
	(0.172)	(0.296)	(0.222)	(0.400)	(1.049)					
Observations	827000	827000	841000	841000	841000					
Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1										

Table 8. Duration/Mobility Model Results with Industry Interactions

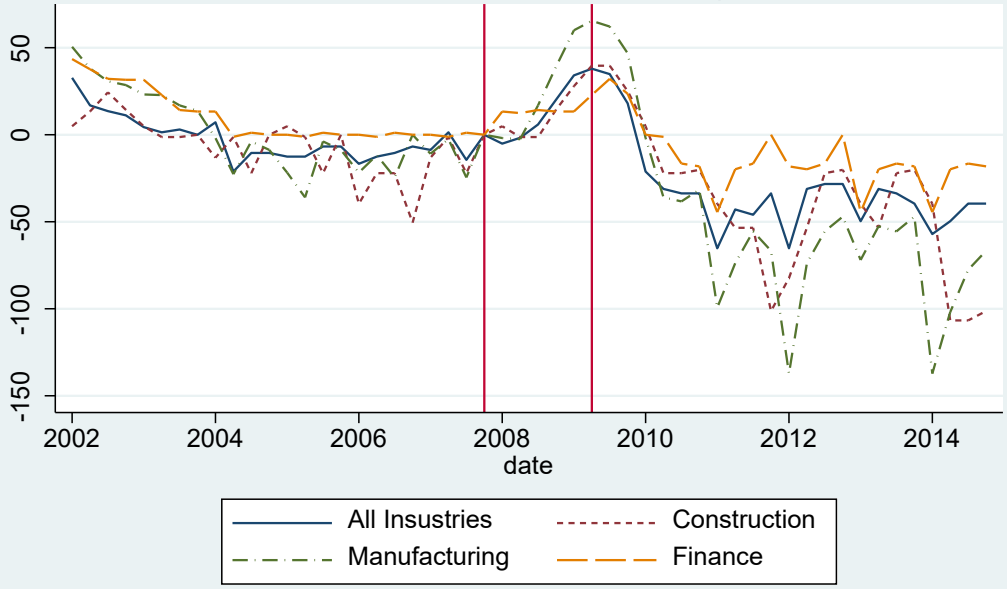
	Estimates					Standardized coefficients				
	Model 1		Model 2			Model 1		Model 2		
VARIABLES	Same MSA	Same State	Same MSA	Same State	Different State			Same MSA	Same State	Different State
Mass Layoff Spell	-0.475***	-0.162***	-0.478***	-0.161***	0.101***					
	(0.00422)	(0.00697)	(0.00422)	(0.00702)	(0.0188)					
Mass Layoff Spell 2	0.0109***	-0.00043	0.0113***	-0.000214	-0.0108***					
	(0.000256)	(0.000429)	(0.000256)	(0.000431)	(0.00121)					
Job Opportunity Index: Origin MSA (manufacturing)	0.000524***	-0.00239***	0.0000148	-0.00209***	-0.000334	0.216	-0.575	0.006	-0.423	-0.140
	(6.26e-05)	(0.000121)	(6.86e-05)	(0.000134)	(0.000331)					
Job Opportunity Index: Origin MSA (finance, information, real estate)	0.00100***	-0.00381***	0.00120***	-0.00268***	-0.00231***	0.394	-0.783	0.473	-0.466	-0.924
	(9.54e-05)	(0.000193)	(0.000108)	(0.000219)	(0.000502)					
Job Opportunity Index: Origin MSA (accommodation, food services, arts, entertainment)	0.000197	-0.00364***	0.000584**	-0.00290***	-0.000808	0.031	-0.255	0.093	-0.172	-0.115
	(0.000250)	(0.000623)	(0.000268)	(0.000678)	(0.00139)					
Job Opportunity Index: Origin MSA (other)	0.00139***	-0.00222***	0.00198***	-0.00368***	0.000544	0.605	-0.550	0.865	-0.772	0.238
	(7.76e-05)	(0.000140)	(8.72e-05)	(0.000151)	(0.000408)					
Job Opportunity Index: Other In-State MSAs (manufacturing)	0.000939***	0.00232***	-0.000905***	0.00248***	-0.000231	0.408	0.592	-0.394	0.536	-0.104
	(0.000152)	(0.000279)	(0.000171)	(0.000332)	(0.000850)					
Job Opportunity Index: Other In-State MSAs (finance, information, real estate)	-0.00338***	0.00152***	-0.00219***	0.00455***	-0.000243	-1.323	0.326	-0.857	0.827	-0.098
	(0.000167)	(0.000314)	(0.000209)	(0.000394)	(0.00100)					
Job Opportunity Index: Other In-State MSAs (accommodation, food services, arts, entertainment)	-0.00305***	0.00176**	-0.00184***	0.00342***	-0.000287	-0.515	0.133	-0.312	0.219	-0.042
	(0.000313)	(0.000713)	(0.000438)	(0.000991)	(0.00265)					
Job Opportunity Index: Other In-State MSAs (other)	-0.00330***	-0.00449***	-0.00200***	-0.00675***	-0.00348***	-1.484	-1.252	-0.900	-1.592	-1.580
	(0.000145)	(0.000272)	(0.000166)	(0.000313)	(0.000881)					
Job Opportunity Index: Out-of-State MSAs (manufacturing)			0.00413***	0.00611***	0.000445			2.227	1.634	0.240
			(0.000161)	(0.000313)	(0.000753)					
Job Opportunity Index: Out-of-State MSAs (finance, information, real estate)			0.000145	0.00267***	0.000827			0.071	0.599	0.418
			(0.000189)	(0.000347)	(0.000843)					

Job Opportunity Index: Out-of-State MSAs (accommodation, food services, arts, entertainment)			0.000313	0.00395***	-0.000883			0.065	0.313	-0.154	
			(0.000412)	(0.000901)	(0.00234)						
Job Opportunity Index: Out-of-State MSAs (other)			-0.000369**	0.00928***	0.000925			-0.206	2.589	0.518	
			(0.000159)	(0.000288)	(0.000742)						
Housing Price: Origin MSA (manufacturing)	0.00287***	0.0109***	0.00557***	0.00853***	0.00714***	0.153	0.325	0.298	0.215	0.370	
	(0.000355)	(0.000713)	(0.000450)	(0.000892)	(0.00218)						
Housing Price: Origin MSA (finance, information, real estate)	-0.00411***	0.0122***	-0.00360***	0.00772***	0.00949***	-0.210	0.331	-0.185	0.177	0.492	
	(0.000432)	(0.000855)	(0.000588)	(0.00118)	(0.00256)						
Housing Price: Origin MSA (accommodation, food services, arts, entertainment)	-0.00960***	0.0149***	-0.00915***	0.00877***	0.00764	-0.203	0.150	-0.194	0.075	0.132	
	(0.00112)	(0.00243)	(0.00141)	(0.00314)	(0.00664)						
Housing Price: Origin MSA (other)	-0.00291***	-0.00761***	-0.00582***	0.000135	-0.0026	-0.168	-0.256	-0.337	0.004	-0.148	
	(0.000360)	(0.000655)	(0.000480)	(0.000915)	(0.00236)						
Housing Price: Other In-State MSAs (manufacturing)	0.00870***	-0.0212***	0.0105***	-0.0166***	0.0049	0.546	-0.730	0.661	-0.482	0.312	
	(0.000630)	(0.00115)	(0.000648)	(0.00122)	(0.00309)						
Housing Price: Other In-State MSAs (finance, information, real estate)	0.0148***	-0.0170***	0.0119***	-0.0165***	-0.00388	0.872	-0.544	0.704	-0.449	-0.231	
	(0.000675)	(0.00125)	(0.000728)	(0.00138)	(0.00339)						
Housing Price: Other In-State MSAs (accommodation, food services, arts, entertainment)	0.0147***	-0.0179***	0.0128***	-0.0153***	-0.011	0.389	-0.213	0.339	-0.154	-0.225	
	(0.00117)	(0.00260)	(0.00135)	(0.00298)	(0.00773)						
Housing Price: Other In-State MSAs (other)	0.0138***	0.00433***	0.0116***	0.00336***	0.00609*	0.943	0.210	0.796	0.137	0.412	
	(0.000640)	(0.00117)	(0.000658)	(0.00127)	(0.00323)						
Housing Price: Out-of-State MSAs (manufacturing)			-0.0127***	-0.0154***	-0.00816***			-1.092	-0.631	-0.687	
			(0.000482)	(0.000928)	(0.00228)						
Housing Price: Out-of-State MSAs (finance, information, real estate)			-0.000471	-0.00774***	-0.00642***			-0.039	-0.284	-0.532	
			(0.000541)	(0.00102)	(0.00240)						
Housing Price: Out-of-State MSAs (accommodation, food services, arts, entertainment)			-0.00159	-0.00655**	-0.0136**			-0.056	-0.087	-0.369	
			(0.00123)	(0.00268)	(0.00675)						
			0.00288***	-0.0254***	-0.00417*			0.271	-1.139	-0.385	

Housing Price: Out-of-State MSAs (other)			(0.000468)	(0.000827)	(0.00218)					
Weekly Unemployment Benefits: Own State (manufacturing)	-0.00609***	-0.00377***	0.000849*	0.000521	-0.0021	-0.936	-0.342	0.131	0.040	-0.335
	(0.000463)	(0.000806)	(0.000504)	(0.000912)	(0.00230)					
Weekly Unemployment Benefits: Own State (finance, information, real estate)	0.00102**	0.00346***	-0.000838	0.000618	-0.00385	0.146	0.264	-0.120	0.040	-0.554
	(0.000503)	(0.000890)	(0.000599)	(0.00107)	(0.00264)					
Weekly Unemployment Benefits: Own State (accommodation, food services, arts, entertainment)	0.000918	0.00352	-0.000122	-0.000839	0.00986	0.055	0.092	-0.007	-0.019	0.516
	(0.00103)	(0.00230)	(0.00133)	(0.00291)	(0.00747)					
Weekly Unemployment Benefits: Own State (other)	-0.00219***	0.00452***	-0.00653***	0.0144***	-0.00363	-0.350	0.452	-1.042	1.213	-0.588
	(0.000451)	(0.000750)	(0.000515)	(0.000864)	(0.00224)					
Weekly Unemployment Benefits: Out-of-State(manufacturing)			-0.000611	0.00255***	0.0147***			-0.095	0.198	2.353
			(0.000465)	(0.000842)	(0.00196)					
Weekly Unemployment Benefits: Out-of-State(finance, information, real estate)			-0.000727	0.00745***	0.00866***			-0.102	0.479	1.229
			(0.000667)	(0.00119)	(0.00300)					
Weekly Unemployment Benefits: Out-of-State(accommodation, food services, arts, entertainment)			0.00435***	0.000723	-0.00471			0.255	0.016	-0.239
			(0.00152)	(0.00331)	(0.00920)					
Weekly Unemployment Benefits: Out-of-State(other)			0.00200***	-0.0179***	0.0137***			0.316	-1.437	2.178
			(0.000498)	(0.000845)	(0.00215)					
Constant	0.137	1.976***	-0.312	1.197***	-5.673***					
	(0.184)	(0.313)	(0.251)	(0.463)	(1.072)					
Observations	827000	827000	841000	841000	841000					

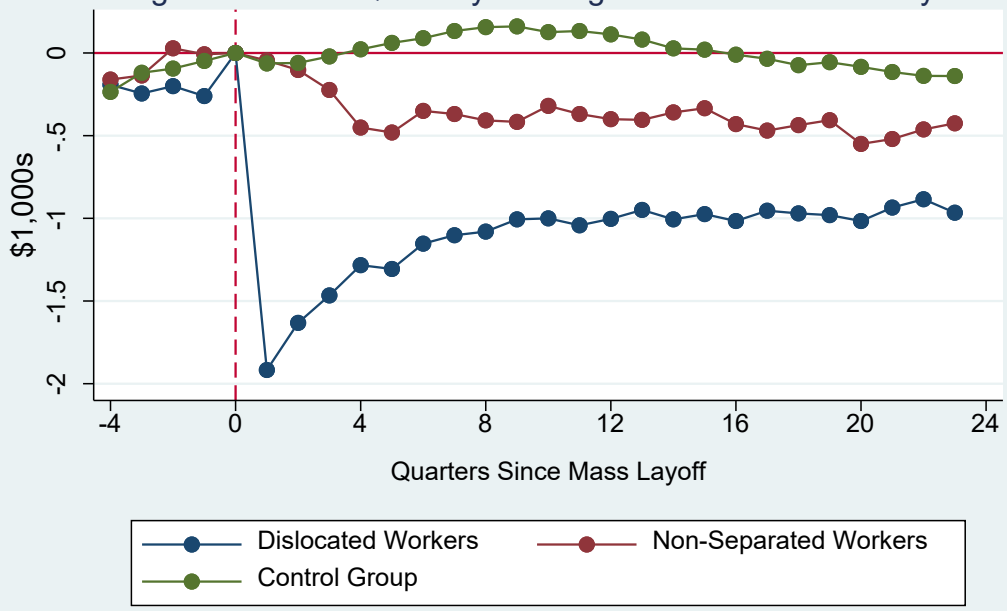
Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Figure 1: New Mass Layoffs: Quarterly, Selected Industries
Percent Difference from 2007q4



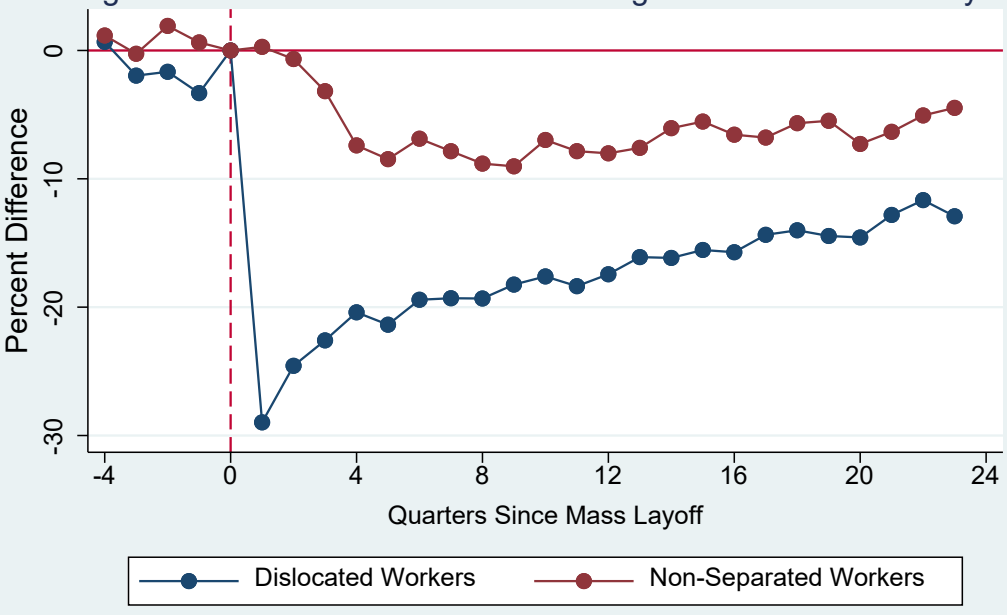
Seasonally Adjusted. The time between the two vertical red lines is the Great Rcession + 2
Includes Indiana, New York (not NYC), Ohio, Pennsylvania (Not Philladelphia), and Wisconsin

Figure 2A: Real Quarterly Earnings: Relative to Mass Layoff



Differences are relative to earnings in the quarter prior to Mass Layoff

Figure 2B: Percent Difference in Earnings: Relative to Mass Layoff



Differences are relative to the Control Group

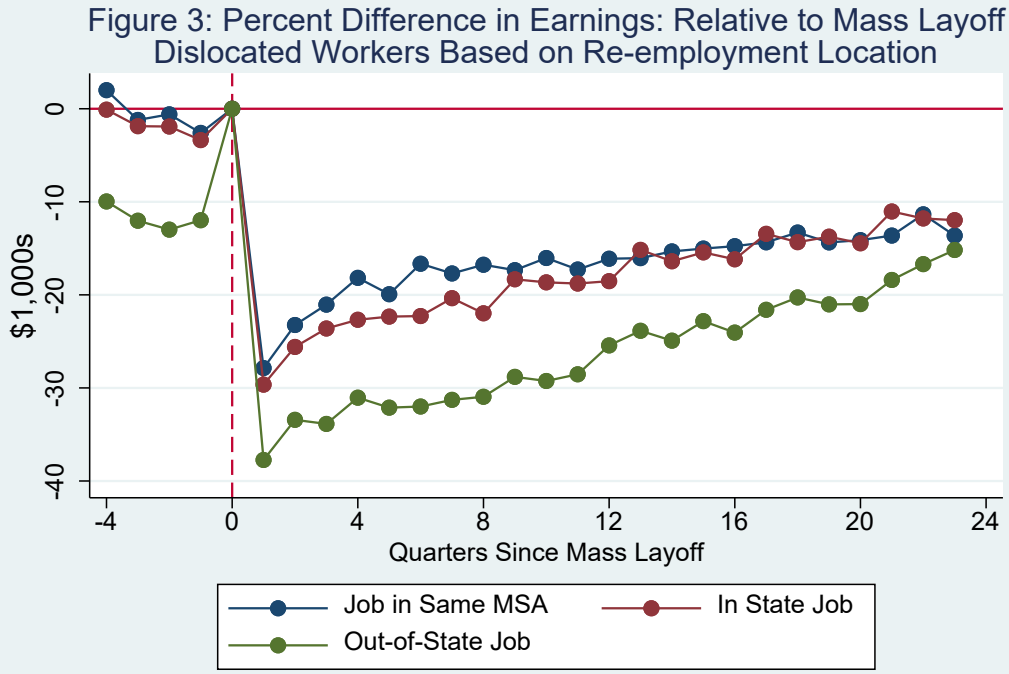
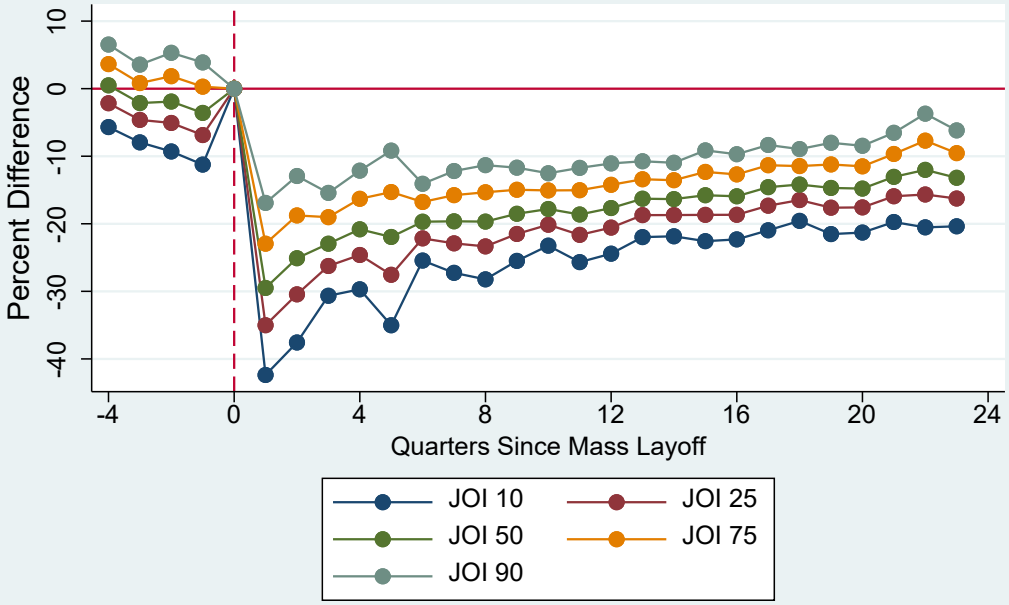


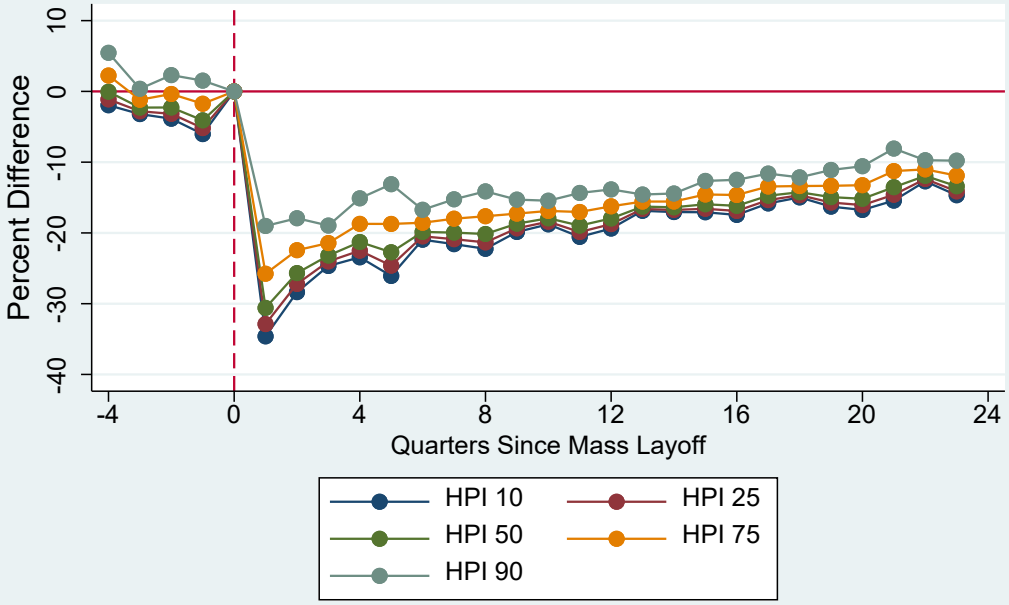
Figure 3: Percent Difference in Earnings: Relative to Mass Layoff
Dislocated Workers Based on Re-employment Location
$1,000s
0
-10
-20
-30
-40
-4
0
4
8
12
16
20
24
Quarters Since Mass Layoff
Job in Same MSA
In State Job
Out-of-State Job
Differences are relative to the Control Group

Figure 4: Percent Difference in Earnings: Relative to Mass Layoff Interacted with JOI Percentiles



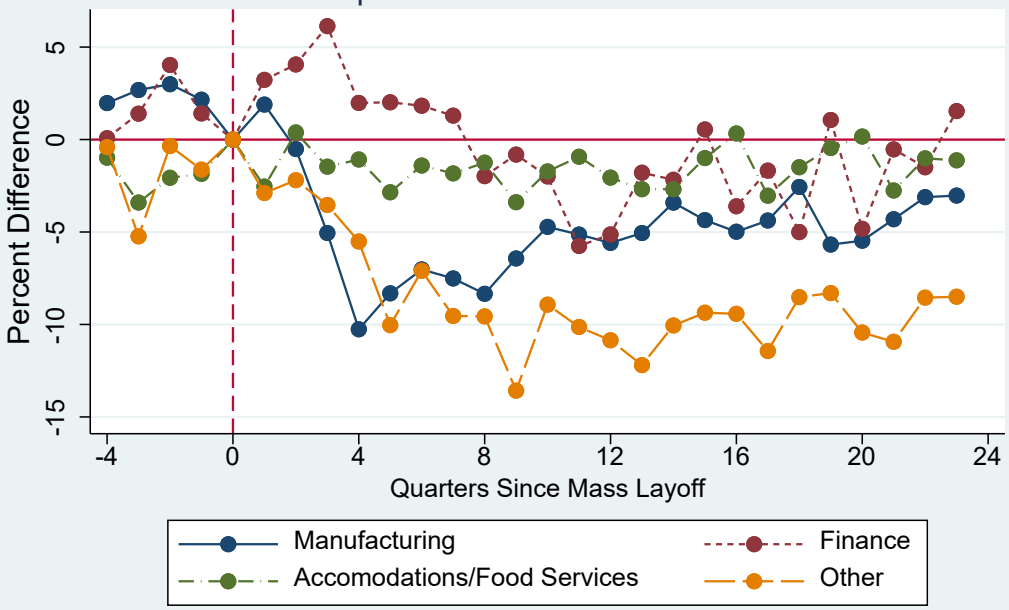
Differences are for dislocated workers and are relative to the Control Group

Figure 5: Percent Difference in Earnings: Relative to Mass Layoff Interacted with HPI Percentiles



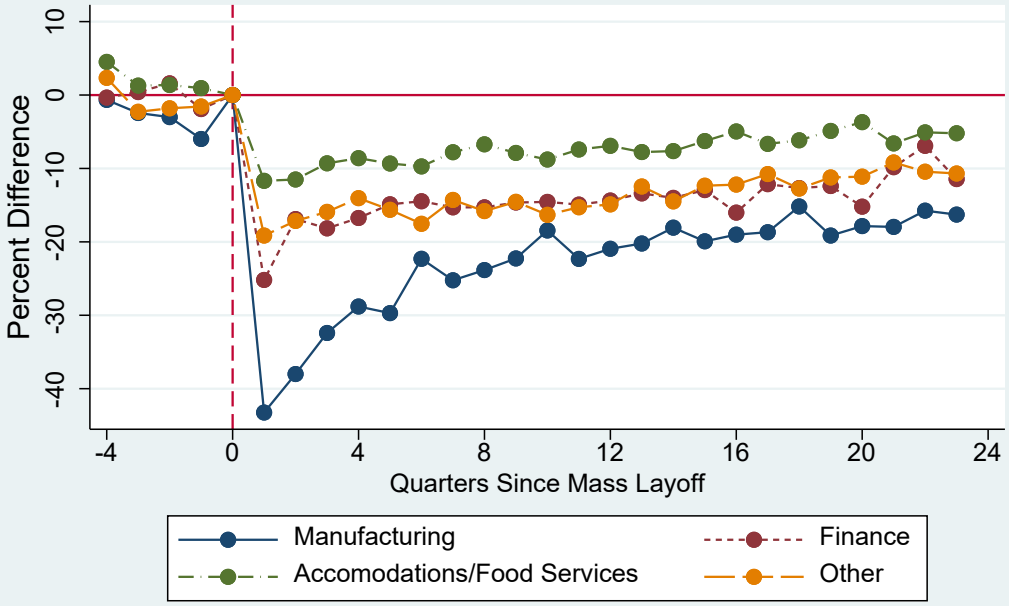
Differences are for dislocated workers and are relative to the Control Group

Figure 6A: percent Difference in Earnings: Relative to Mass Layoff
Non-Separated Workers: Select Industries



Differences are relative to the Control Group in Same Insustry

Figure 6B: Percent Difference in Earnings: Relative to Mass Layoff
Dislocated Workers: Select Industries



Differences are relative to the Control Group in Same Industry