Displaced Workers during the Great Recession: Understanding the Role of Local Labor Markets and Outside Options[1]

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Abstract This paper examines how features of both local labor markets and competing labor markets affect the employment and earnings experiences of displaced workers during the Great Recession. Motivated by a concentration of job losses, we study five Midwestern states using linked employer-employee panel data. We focus on two measures of labor markets, job opportunities and housing costs, with a new measure of job opportunities called the Job Opportunities Index (JOI). To address the question of how labor markets shape jobless duration after a mass layoff event, we estimate a competing risks model of exiting to a stable job in either the same or an outside MSA and find that the benefits (job opportunities) and costs (housing) in both local and outside MSAs have substantial effects on outcomes. To examine how labor markets shape earnings trajectories after mass layoff, we estimate an earnings model following workers for five years post-displacement. We find that workers in the top decile of labor markets, in terms of job opportunities, experience half the level of earnings losses of those in the bottom decile.

Keywords: Displaced workers; Great Recession; Local labor markets

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1. Introduction

The wide-spread and devastating long-term impacts of the Great Recession on American workers have been well documented (e.g. Finkelstein, Schilbach and Zhang, 2024; Rinz, 2022; Rothstein, 2023; Yagan, 2019), with strong evidence showing the particularly detrimental impacts of this economic crisis on individuals residing in the Midwest as well as those working in manufacturing (Charles, Hurst and Schwartz, 2019). This study contributes to our existing knowledge of the mechanisms driving these impacts by focusing on features of local labor markets and outside options, specifically looking at job opportunities and housing costs, which have received less attention in the work examining outcomes of displaced workers. Our primary research question is: how do these features of both local labor markets and competing labor markets affect the employment experiences of workers displaced by a mass layoff, in terms of both the duration of unemployment and earnings post-mass layoff?

To address this research question, we create a location-specific worker-level longitudinal data set that combines near-universal quarterly matched employee-employer microdata from the LEHD with measures of local labor market conditions. Our integrated data allow us to observe displaced workers' MSA, industry, employment history, and demographic information. The longitudinal dimension of the data allows us to capture the labor market experiences of displaced workers including the mass layoffs that begin their initial jobless spell, their subsequent labor market earnings, and their geographic mobility for up to five years after job loss.

We use the LEHD to develop and estimate an earnings model for displaced workers, contributing to existing knowledge in a few dimensions. Critically given our research question, we allow earnings paths to differ by initial job opportunities and housing costs, location of initial employment after displacement, as well as industry. We are also the first to construct two separate comparison groups, including workers who were in the same establishment and not released during the mass layoff as well as workers at other non-mass layoff establishments but still in the same labor market. We see this as an important contribution as it allows for a comparison of the displaced workers with those at the same establishment and with workers not directly impacted by the mass-layoff event. The former are a good control group since the workers in both sets select into the same mass layoff establishment.

While most of the literature on mass-layoffs focuses on earnings history after displacement, we follow Fallick et al. (2025) and also examine duration until first employment after displacement given the critical role of length of job spells in a worker's recovery. Our paper is currently the first to estimate unemployment duration post-mass-layoff in the context of local labor market features. To address this issue we develop and estimate a model of joblessness duration with competing risks of exiting to a stable job[2] in the same MSA where the worker lost their job or in a competing MSA.[3] In this model we include two measures of both local and competing labor market conditions: a job opportunity index (JOI), which we create ourselves, and an index of housing costs (HCI). For each displaced worker, we specify potential MSA destinations based on the five most likely MSAs in terms of flows of workers between the MSAs.[4] A worker is seen as choosing between their origin MSA and these top five MSAs as a group. This model allows us to directly compare the impacts of both local and competing MSA characteristics on the likelihood that a worker becomes re-employed. We consider this to be an important contribution, given the results can be used to develop policies that look to limit nonemployment duration post displacement which are complementary to those based on the results for the earnings models. Furthermore, we look at mobility which has received a lot of recent attention given the secular decline in moving (Saks et al. (2011)), particularly in areas with significant persistence of high unemployment (Austin et al. (2018)), many of which are in the Midwestern states that we analyze in this study.

To date, research on the role of local and competing labor market conditions on the economic recovery of displaced workers has been relatively limited. Most closely related to our work, Moretti and Yi (2023), who use the LEHD to examine city size and re-employment patterns for displaced workers, find that workers in larger labor markets experience higher earnings post mass-layoff. Our work builds on this approach, examining how specific features of local and competing labor markets, job opportunities and housing costs, shape both duration of unemployment and earnings post mass-layoff.

Our data include 162,000 displaced and 227,000 non-separated workers at mass layoff establishments and 238,000 workers at non-mass layoff establishments in the same MSA. We find

[2] We define a stable job as one where the worker is employed at least four quarters of positive earnings.
[3] We define labor markets to be MSAs and use these terms interchangeably.
[4] See Section 3.1 for a more detailed discussion of defining competing MSAs. These are the five most likely destination MSAs for workers departing each sample MSA as measured by the Job-to-Job aggregate LEHD data.

that just over one-half of these displaced workers find stable jobs by the end of the following quarter, but 18 percent take at least two years to become re-employed in a stable job, and 9 percent have not found stable employment after five years. Strikingly, 24 percent of these workers move to a different MSA to obtain their next stable job.

Examining the re-employment results from estimating our competing risk hazard model, we find that displaced workers respond to labor market characteristics in both their origin MSA and in competing MSAs. Specifically, we find that both JOI and HCI affect duration and location outcomes as hypothesized. An increase in the JOI in the worker's origin MSA leads to a substantive increase in the likelihood of finding re-employment in the same MSA and a smaller decrease in finding a stable job in a competing MSA, and a symmetric (but opposite) impact of an increase in the JOI in the competing MSA on the likelihood of exiting joblessness in the home and competing MSAs To provide context, given the average duration of unemployment in the US is 24 weeks, with a standard deviation of approximately 13 weeks (BLS, 2024) our estimates predict that a one standard deviation increase in the job opportunities of a labor market can reduce time non-employed by 0.2 standard deviations or about 2.7 weeks. The impacts of HCI, as hypothesized, are opposite in sign to the JOI impacts since this is an increase in costs (housing) versus benefits (job opportunities).

Estimation of our earnings model shows that the earnings of displaced workers are 15 percent lower, on average, after five years relative to workers at non-mass layoff establishments. Non-separated workers at mass layoff establishments also experience long-term earnings losses, of approximately 8 percent. The results highlight important heterogeneity in post-mass layoff earnings losses across labor and housing market conditions and industries. Most importantly, when looking at MSAs with the strongest labor markets, the top decile according to JOI, workers displaced in these areas experience half the long-term earnings losses experienced by workers employed in MSAs in the bottom decile of the JOI distribution. Overall, our results demonstrate the critical role that local and competing labor market conditions play in the post-mass layoff employment and mobility behavior of displaced workers.

The paper proceeds as follows. Section 2 provides details of the framework and literature that are relevant to our study. Section 3 describes our data. Section 4 lays out our empirical approach and Section 5 describes our estimation results. Section 6 concludes with a discussion about policy implications.

2. Conceptual Framework/Literature

This work contributes to the long history in urban economics of examining whether Marshallian externalities shape a worker's job search (Marshall, 1890). Marshallian externalities are generally described as the benefits afforded by dense concentrations of firms or the thickness of a local labor market (Neffke et al, 2018). We extend our measures to the role of competing labor market characteristics in addition to local features. We are also focused on a particularly difficult economic moment for a hard hit region in the United States, thus bringing together many strands of inquiry.

Broadly, our work connects three distinct and inter-related bodies of knowledge to address the question: how do features of local labor markets and outside options shape the employment and earnings trajectories of displaced workers? The first draws from a broader set of impacts of the Great Recession on workers. The second area examines the employment and earnings impacts of job displacement on individual workers. And the third operationalizes Marshallian externalities in several ways, examining a variety of characteristics of local labor markets and outside options on employment and earnings.

There is a large body of work documenting how damaging the Great Recession was for workers over the long term. Foote et al. (2019) examine how aggregate local labor markets respond to mass layoffs in the long run, highlighting one reason why longer term outcomes during the Great Recession were so large and persistent. Isolating four channels through which the local labor force may adjust: in-migration, out-migration, retirement, and disability insurance enrollment, they show that out-migration accounts for more than half of the labor force reduction in the past two decades, but that during and after the Great Recession, instead of out-migration, non-participation accounts for more of the exits following a mass layoff. There has also been work examining the long-term impacts of the Great Recession on individual employment. Song and von Wachter (2014) and Yagan (2019) examine whether employment shocks lead to lasting declines in employment. Both find evidence of a persistent decline in employment as a result of the Great Recession. Yagan shows 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. Relatedly, Abowd, McKinney and

Zhao (2018) use the LEHD to examine longer term individual employment impacts of the Great Recession, focusing on the role of the employer in explaining earnings differences. They find that while differences between working at a bottom- or middle-paying firm are small, gains from working at a top-paying firm are relatively large. Our work contributes to this literature by examining the mediating role of local labor market conditions on the ability of workers displaced during the Great Recession to re-enter the labor market and their subsequent wages.

Our work draws heavily from the body of literature describing the long run impacts of displacement. Looking at the set of papers examining unemployment duration, our work poses a novel question and contributes methodologically. Gray and Grenier (1998) provide an early example of estimation of a hazard model of jobless duration using self-reported data from the Canadian and American Displaced Worker Surveys, finding that higher unemployment rates in Canada seem to play an important role in increasing the length of unemployment spells. The authors acknowledge the well-known weaknesses of their data, which are based on retrospective responses. In addition, there is no link to employer data and thus no way of establishing whether a mass layoff occurred. More recently, Andersson, et al. (2018) use LEHD to estimate jobless duration for displaced lower-earning workers and provide evidence on the role of spatial mismatch. They find evidence that better job accessibility within the metropolitan area decreases the duration of joblessness among lower-paid displaced workers. Our project addresses a related but distinct research question, examining unemployment duration in the context of inter-metropolitan choice. More closely related, Hellerstein et al. (2019) use the LEHD to consider intra-metropolitan jobless duration as it relates to personal and neighborhood connections. They find that stronger residence-based labor market networks facilitate re-employment by matching displaced workers to vacancies. Hellerstein et al. (2019), however, do not consider the role of outside options or directly measure mobility. Fallick, et al. (2025) consider duration and earnings of displaced workers relative to the full set of job changes in an attempt to reconcile these disparate literatures, showing that the growth rate of a firm does not shape the probability of exiting non-employment, but their study does not consider the role of local labor market characteristics and outside options in shaping a worker's post-displacement outcomes.

A substantial literature addresses the permanent earnings losses suffered by involuntarily displaced workers (Fallick, 1996; Kletzer, 1998; Farber, 2017). The most relevant work by Jacobson, LaLonde, and Sullivan (1993), Couch and Placzek (2010), Davis and von Wachter (2011), Lachowska et al. (2020), and Schmieder et al. (2023) estimates long- term earnings losses in the 12 to 25 percent range. Three of these papers focus on earnings impacts during recessions. Davis and von Wachter (2011) rely on an early version of the LEHD to examine national impacts of job displacement during recessions and expansions, finding long term losses are nearly twice as high for displacements during recessions as for displacements during expansions. Similarly, Schmieder et al. (2023) use administrative data to study costs of job displacement in Germany, also finding that earnings impacts nearly double during recessions. Lachowska et al. (2020) examine sources of earnings losses for displaced workers using LEHD-type data for Washington state during the Great Recession and show that losses are largely driven by declines in hourly rates. Importantly, none of these papers examine the role of local labor market characteristics or outside options on displaced workers earnings pathways.

A few papers do examine features of local labor markets and how they shape the recovery patterns of displaced workers. Bleakley and Lin (2012) find that there is less churn in the labor market in more densely populated areas, and that these results hold for displaced workers as well. Neffke et al. (2018) examines the local industry mix and its impact on earnings losses for displaced workers using German administrative data, finding that in metropolitan areas with a larger share of employment in the worker's pre-displacement industry, workers find employment relatively more quickly and suffer small earnings losses. Kosteas (2019) uses the Displaced Workers Survey (DWS) supplement of the Current Population Survey (CPS) to examine the occupational distance of a worker from their local labor market in comparison to the impact of agglomeration (which they measure as population density). He finds evidence that smaller occupational distances are associated with the increased probability of being employed post-displacement, but he finds no impact of density. Most recently Macaluso (2024) constructs a measure of 'skill remoteness,' or how representative a worker's skill set is of their broader labor market, using the National Longitudinal Survey of Youth 1979 (NLSY79) and finds that workers laid-off in skill-remote jobs are less likely to be re-employed at jobs with similar skill sets and experience lower wages upon re-employment. Most closely related to our work, Moretti and Yi (2023) examine how the size of the local labor market affects the duration of unemployment and earnings impacts for displaced workers, as measured by the set of workers who leave establishments that close. They find that when comparing labor markets in the 90th percentile of the size distribution to those in the 10th percentile, high school and college graduates, respectively, enjoy a 6.7 and 10.4 percentage point higher probability of finding a job within 12 months of displacement. Similarly, they find an earnings impact of 7.1 and 12.5 percent 12 months after displacement, when comparing these same sets of workers. Our work provides a nice complement to these papers as we examine the overall strength of a labor market rather than its size or industry composition, specifically examining the role of local job opportunities and housing costs in both the MSA where an individual is displaced as well as a set of outside options.

Our work also draws from and contributes to a growing body of research examining how outside options shape labor market prospects for workers. Caldwell and Danieli (2024) use the dispersion of a varied set of workers across jobs as a proxy for outside options. Using German administrative data, they find that higher outside options are associated with higher wages. Olivares (2023) uses growth in hiring in other MSAs and historic job-to-job flow rates as measures of nonlocal outside options and also finds that higher nonlocal labor demand causes increased wage growth for job stayers. Our work contributes to this literature by addressing a distinct but related issue. Specifically, we use a unique dataset and empirical approach to examine the role of local labor markets and outside options in shaping the time to re-employment and the earnings trajectory of displaced workers.

3. 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 includes state and local government employees. 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 by 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, often to answer related research questions (Abowd et al., 2009; Andersson et al. 2018; Pollakowski et al, 2022; Haltiwanger et al. 2020; Moretti and Yi, 2024).

We construct two samples of displaced workers for our analysis. For both samples, 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 in the same establishment. As we are trying to identify the impacts of the changing structure of the economy on workers, we view these more tenured workers as those most likely experiencing layoffs that are not tied to personal circumstances.

The first sample is our full sample of 162,000 workers displaced from mass layoffs during the Great Recession, which we define as 2007 Q4 through 2009 Q4.[5] We rely on this first sample for our descriptive analysis and competing risks model. The five Great Lakes states we study, Indiana, Wisconsin, Ohio, Pennsylvania (excluding Philadelphia) and New York (excluding New York City) are drawn from the 28 states for which we have full detailed LEHD data.[6] We access detailed earnings records for all the workers in our five states including those who move into one of our participating states. For workers who take a new job in one of the 22 nonparticipating states (plus the District of Columbia), we fortunately know whether and when a displaced worker takes a new job in one of these locations (Vilhuber, 2018), although without future earnings. This is highly useful for our competing risks model results, since we can be certain when displaced workers who move to any other state become re-employed. Since we cannot observe the earnings of workers who become re-employed in one of these locations, we define a worker to be re-employed with a stable job when they have achieved four consecutive quarters of employment. We can therefore separate displaced workers in this sample into three groups: (1) obtaining a job in their origin MSA, (2) obtaining a job in a different MSA, and (3) not finding a stable job at any given length of non-employment spell.

The second sample includes 143,000 of these displaced workers for whom we are able to follow their complete earnings history; that is, those who remain in our 28 states. This sample is drawn to enable us to estimate our earnings model.

3.1 Local Labor Market Measures

One of our key contributions is a focus on labor market characteristics that theory suggests are important determinants of how displaced workers respond to job loss, specifically job opportunities and housing costs. To do this, we have constructed a *job opportunity index (JOI)*. This index measures the expected employment benefits to workers residing in the market and is the product of the

[5] The Great Recession is considered to have 'officially' ended in 2009 Q2 but we include these additional two quarters in our analysis as they encompass a period of elevated layoffs, which we display further in the paper.
[6] 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.

expected wages once employed and the likelihood of obtaining a job. The comparison of the origin and the destination JOI is shown in Zabel and Chance (2023) where costs and benefits of moving for all workers are seen as determinant of the residential mobility of all workers.

We use the Job-to-Job (J2J) aggregate LEHD data to calculate our JOI. For a given MSA, the JOI is equal to the average earnings of J2J job switchers who obtain a new job in that MSA multiplied by the proportion of recent hires and divided by employment in that MSA. To allow for the fact that workers of different skill levels face different job opportunities, we estimate separate JOIs for the three education groups[7] in the J2J data[8]: at most a high school degree, some college, and at least a BA degree. When using the worker-level data, we then generate a composite JOI index that assigns the appropriate education-based JOI index given each worker's education level. An increase in JOI represents an increase in labor market opportunities and should increase the local employment success of displaced workers. We generate quarterly JOI indices for 383 MSAs in the U.S.

Other researchers have used the unemployment rate as a measure of labor market conditions (e.g. Schmieder and von Wachter 2010 and Valleta 2013). This is comparable to the likelihood of obtaining a job, but it does not take into consideration expected wages. Furthermore, the MSA-level unemployment rate that is disaggregated at the education/skill level does not appear to be available (we obtained the MSA-level unemployment rate from the BLS). We view the JOI as an improved measure of labor market status relative to the unemployment rate. Zabel and Chance (2023) show that it is obtained naturally from a model of worker mobility. We generate the quarterly JOI and unemployment rate for 364 CBSAs for 2001 to 2018. The median within CBSA correlation for these two statistics is -0.79. Across all CBSAs, after controlling for CBSA and time fixed effects, the correlation is -0.94. Thus, these two indicators are strongly related.

For each worker, we also generate JOIs for competing MSAs. To choose an appropriate set of competing MSAs, we weight the JOIs in all other MSAs by the flow of workers between the MSAs based on the Census' J2J data for 2001. We consider the top five MSAs based on these worker flows. These are the five most likely destination MSAs for workers departing from each sample MSA. A

[7] Education data is imputed in the LEHD.
[8] Neither worker skill levels nor their occupations are provided in the J2J/LEHD data.

worker is viewed as choosing between her/his origin MSA and these competing MSAs. All else equal, we anticipate that workers will be motivated to move if the job opportunities in competing labor markets increase.

Along with job opportunities, we consider housing costs as a major cost-of-living consideration when selecting a given MSA. Our measure of housing costs is based on MSA-level house prices. We use data from the 2000 Decennial Census to estimate an MSA-level house price from a hedonic price equation that includes observable structural characteristics. We then update this price (in $2001q1) each year using MSA-level house price indices from the Federal Housing Finance Agency (FHFA). Displaced workers will be more likely to move if the cost of housing increases in their MSA of residence; and they should be less likely to move to competing labor markets if the cost of housing increases in these locations.

3.2 Defining Mass Layoffs

We study mass layoffs during the Great Recession, as these separations are highly likely to be the direct consequence of changes in economic conditions. Unlike ordinary separations, mass layoffs represent a more structural source of displacement. We define involuntarily displaced workers as those who have lost jobs due to a mass layoff, including an establishment closure. We consider mass layoffs at the establishment level, rather than at the firm level, which we believe is a contribution of this work. By defining mass layoffs at the establishment level we are more directly capturing a mass layoff event, as firms with multiple establishments could downsize or close a particular branch rather than spread layoffs evenly across an organization. In the case of an even distribution of layoffs, our measure will still be able to capture these broad layoffs, but in the case of more targeted layoffs at specific establishments our approach will better capture these events. 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.

We define a mass layoff as one in which 30 percent of an establishment's workers are let go within a four-quarter period, considering establishments with more than 50 workers (Jacobson, et. al., 1993). We require that workers have a relatively strong labor force attachment. We follow Hellerstein et al.

(2019) and require that workers have a minimum tenure of four quarters with an establishment and that they have at least $15,000 in earnings prior to the beginning of the mass layoff).[9]

We take numerous steps to correctly determine initial establishment level mass layoff events. We require that the mass layoffs occur after four consecutive quarters of employer stability; that is, four quarters with either employment gains or with employment losses less than 30 percent. In addition, it is important to ensure 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 a specific year; in these cases, we have made sure that these are not recorded as establishment deaths (and hence mass layoffs).

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, for most 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. Details concerning this procedure and our use of it are provided in the Appendix.

Figure 1 presents a graph of mass layoffs in the five states in our sample over the period 2002-2014. This figure highlights that our study period captures a time of rising and elevated mass layoffs, particularly within manufacturing. It also supports our decision to extend by two quarters beyond the accepted window for the Great Recession (2007 Q4 to 2009 Q4) given that we continue to see elevated mass layoffs during these last two quarters.

To assess the representativeness of the workers subjected to a mass layoff, we consider early

[9] We do not consider workers who are rehired to the same establishment within 8 quarters of this separation 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.

leavers. There may be workers who see that the establishment is not doing well and leave just prior to the mass layoff event. If these workers are not typical of the usual workers who exit the establishment in normal times (for example, they might be more productive workers), this can result in the remaining workers being different than if the mass layoff was unanticipated. We generate a sample of “Early Leavers” who exited the mass layoff establishment in the year prior to the mass layoff event and a sample of “Very Early Leavers” who exited in the year before that. We compare the early leavers to both the very early leavers and to the displaced workers and provide evidence in Appendix Table 1 that these workers are quite similar, thus increasing our confidence that this Early Leaver bias does not arise in our sample.

3.3 Generating Comparison/Control Groups

As our work seeks to examine how features of place shape labor market outcomes for workers displaced during the Great Recession, we construct two sets of comparison groups to provide a counterfactual, each with its own advantages and drawbacks.

We compare the set of workers who experienced job losses as part of a mass layoff to the outcomes of both (1) non-displaced workers at the mass layoff establishment (referred to as *Control Group A)* and (2) non-displaced workers at other establishments in the same labor market (referred to as *Control Group B*). To construct Control Group B, we include a random sample of the full set of workers in each MSA who do not experience a mass layoff, as the full sample would be prohibitively large. We match the size of this sample to that of the first control group. We require all workers in both of our comparison groups to meet the same baseline conditions as our sample of mass-layoff workers.

A key advantage of Control Group A is that it controls for selection into the establishment. The disadvantage is that these remaining workers may be different, for example more productive, from the laid-off workers. Their earnings are also likely to be affected as they are employed at the establishment during the mass layoff event. For this reason, the comparison of the earnings of the displaced and non-separated workers may not capture the full impact of the mass layoff. One advantage of Control Group B is that these workers do not suffer from the selection bias of the first control group, nor do they experience a mass layoff event. On the other hand, the types of workers who are employed at the non-mass-layoff establishments might be different in observable and unobservable ways from those who work at mass-layoff establishments. Another advantage is that we can compare the earnings of Control Group A to those of Control Group B to estimate the impact of remaining at a mass layoff establishment.

3.4 Descriptive Statistics

We begin by presenting descriptive statistics for our sample of 162,000 workers displaced by mass layoffs, as well as our two control groups. In Table 1 we summarize who these workers are in terms of basic demographics, prior earnings, worker history, and industry at baseline. In Table 2, we present an overview of jobless duration spells of the displaced workers preceding re-employment in a stable job from the baseline through five years out. In Table 3, we then provide worker characteristics by destination of new employment.

Table 1 provides an overview of all the 389,000 workers (both displaced workers and non-displaced Control Group A in the same establishment) at mass layoff establishments (column 1) and Control Group B, the 238,000 workers at non-mass layoff establishments (column 4). We see that the workers at the mass layoff establishments are somewhat younger, have slightly lower prior earnings, have shorter tenure, are more likely to be male, and are significantly more likely than workers in non-mass layoff establishments (Control Group B) to be in smaller establishments and in the construction and manufacturing sectors.

Characteristics are also presented for the two sub-groups of all workers at mass layoff establishments: the 162,000 displaced workers (column 2) and the 227,000 non-separated workers, Control Group A (column 3). What is quite interesting is that Control Group B (column 4) is very similar to Control Group A (column 3). The only substantive differences are in gender, industry, as we might expect, and establishment size. Both comparison groups are slightly different from the displaced workers. This is consistent with our prior discussion of the displaced workers not being randomly chosen from the mass layoff establishments. They are younger, have lower prior earnings, and less tenure than the workers in both control groups.

As mentioned above, there is a concern that a mass layoff event could be anticipated and hence early leavers would not be typical of exiting workers in normal times, thus making the remaining set of workers experiencing mass layoff less representative of those we may expect to see in more stable times. To address this concern, we compared workers who left in the four quarters leading up to the onset of the mass layoff, who we call *early leavers*, with those who left in the four quarters prior to this period, who we label *very early leavers*. The summary statistics for these two groups are provided in Appendix Table 1, columns 3 and 4. Columns 1 and 2 present the same statistics that are included in Table 1 for all workers at mass layoff establishments and the displaced workers, respectively. In columns 3 and 4 of the appendix table, we see that the means for these variables are nearly identical for the early leavers and the very early leavers. This provides evidence against the assertion that workers anticipate the mass layoff and leave early.

Table 2 presents information on when and where displaced workers find new employment. They find re-employment in a stable job in their origin MSA two-thirds of the time. There is a substantial right tail to this distribution, with 9.2 percent remaining jobless five years after displacement. Finally, though most displaced workers find re-employment in their origin MSA, a significant share, 24 percent, find re-employment in a different MSA.

Table 3 presents descriptions of displaced workers in terms of their first stable employment state post-mass layoff. The first column, carried forward from Table 1 (column 2), provides benchmark numbers for the distribution of displaced workers by characteristics. The characteristics of these workers are then presented for three sub-groups in columns 2-4: displaced workers who find stable re-employment in their origin MSA, in a different MSA, and those who remain jobless after five years.

Workers taking a job in a different MSA tend to be younger and have relatively higher prior earnings, while those who remain jobless are relatively older and have lower prior earnings. Dislocated workers who find a job in the same MSA have the longest tenure prior to mass layoff. Men are over-represented among those finding re-employment 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 of origin, workers in Wholesale/Retail Trade are over-represented in terms of re-employment in other MSAs, the Finance and Related as well as Education and Health sectors are over-represented in terms of re-employment in same MSA, and Manufacturing workers are relatively more likely to remain jobless.

4. Empirical Approach

Our analysis examines outcomes for workers who lose their jobs in a mass layoff and how they are affected by local and competing labor market characteristics including employment opportunities, housing costs, and unemployment compensation. We focus on labor market outcomes that relate to jobless duration, mobility, and future earnings paths.

4.1 A Competing Risks Model of Jobless Duration and Mobility

Since consideration of location is a key element of our analysis, we specify a hazard model of jobless duration with two potential re-employment outcomes: employment in the origin MSA, and employment in a competing MSA.

To measure jobless duration and mobility, we use the LEHD to observe the future employment of displaced workers on a quarterly basis. The existing literature is not always clear on how to characterize new employment. One frequently used option is to look for the first instance of positive earnings (Andersson, et al. 2018). Our approach is to specify that a worker exits joblessness if we observe four consecutive quarters of positive earnings. We take this approach given that identifying workers who find stable jobs could be the focus of policies to support re-employment. This approach allows us to include workers who find jobs in the 28 states for which we have full labor market information and workers who find stable jobs in the 22 states plus the District of Columbia for whom we do not have complete earnings information.

We set the quarter that the worker is displaced due to the mass layoff to be period 1.[10] Let $Y_{imsdt} = 1$ if jobless, = 2 if employed in the same MSA, = 3 if employed in a different MSA, for individual *i* in MSA *m* at the time of the mass layoff, industrial sector *s*, duration *d*, and time *t*. Then the competing risk (multinomial logit) model is specified as follows:

[10] Note that this could be in any of the 4 quarters that make up the mass layoff event.

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

and

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

where $X_{i,0}$ is a vector of individual characteristics in period 0 (prior to the mass layoff) that includes age, prior tenure and earnings, race, gender, and industry, $\text{MSA}^0_{m,t}$ is a vector of MSA characteristics in MSA *m* in period 0 and observed in period t, $\text{MSAN}^0_{m,t}$ is a weighted average of characteristics in competing MSAs, ν_{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 measure the probability of exiting to outcome 2 or 3 relative to outcome 1 (joblessness) conditional on worker and metropolitan area characteristics.

$\text{MSAN}^0_{m,t}$ represents three factors, the Job Opportunity Index (JOI), an index of housing costs (HCI), and the average monthly unemployment insurance payment (UI). These measures correspond to the MSA where the worker was employed at the time of mass layoff. $\text{MSAN}^0_{m,t}$ includes JOI and HCI corresponding to the other competing risk: competing MSAs. As discussed above, for these measures we take weighted averages of five MSAs based on the frequency of job-to-job flows (J2J) that we obtain from the aggregated J2J LEHD data in 2001.

We expect that as the JOI in the origin MSA increases, the likelihood of exiting joblessness in the same (competing) MSA will increase (decrease). In contrast, we expect that an increase in the JOI in a competing MSA will cause the likelihood of exiting joblessness in the same (competing) MSA to possibly decrease (increase).[11] We expect the opposite results when considering an increase in the housing cost index as this represents an increase in costs (HCI) versus benefits (JOI).

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

We next examine the changes in earnings for workers after the mass layoff. We include the subset of displaced workers we analyzed using the above hazard model for whom we observe future earnings. And we include the two control groups discussed above: the non-separated workers in mass layoff establishments (Control Group A) and the workers at non-mass layoff establishments (Control Group B). For Control Group B, of course, there is no specific mass layoff event. For each quarter, we choose workers in non-mass layoff establishments in the same MSAs 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 (same as Control Group A).

We specify the following model:

$$\mathrm{Y}_{\mathrm{imst}} = \beta_0 + \sum_{\mathrm{k}=-4}^{23} \mathrm{D}_{\mathrm{kit}} \delta_{\mathrm{k}}^{\mathrm{j}} + \alpha_{\mathrm{i}} + \gamma_{\mathrm{st}} + \varepsilon_{\mathrm{imst}} \qquad (3)$$

where Y_{ismt} represents the (real) earnings of worker *i,* in metropolitan area *m*, state *s*, at time *t*; k indexes a set of indicator variables, D_{kit}, which identify the number of quarters before and after displacement; and α_{i} and γ_{st} represent individual and state by quarter fixed effects. We include the four quarters prior to the beginning of the mass layoff event, and then follow them for at least 20 quarters in the post-mass layoff period.

Again, the definition of a mass layoff establishment is one that loses 30 percent of its workforce over four quarters, with the mass layoff event consisting of these 4 quarters and where mass layoff is designated to take place in the fourth of these quarters.

We need to establish the quarter relative to the mass layoff to match up the timing for the three groups. For displaced workers, this is based on when they exit employment. Consider a worker

[11] We discuss the reasons for this in the results section.

displaced in quarter 3 of the four-quarter period that defines the mass layoff event. While it is the case that this worker's earnings could be affected in quarters 1 and 2, the major impact on earnings will be in period 3 when the layoff occurs. Thus, relative time is set to 0 in quarter 2. Likewise, for a worker who was laid off in quarter 2, relative time is set to 0 in quarter 1. We find that the results of earnings impacts that we display in the figures in Section 5 below 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.[12]

For workers in the two control groups, there is no specific quarter when the workers are laid off that defines the mass layoff event, thus we need to specify a time 0 that represents an appropriate comparison point in time. For Control Group A relative time is set to 0 in the quarter before the first of the 4 quarters that determine this mass layoff event. As these workers are also impacted by the mass layoff event, though they do not lose their job in this period, it makes sense to specify the period before the mass layoff event begins as the baseline for this group.[13] For Control Group B we select a random quarter during our study period as indicating relative time 0 as these workers are not tied to any specific mass layoff event.

We consider four factors that might affect these earnings paths. We interact the relative time indicators in equation (3) with JOI and HCI at the time of mass layoff to see how these MSA-level characteristics affect earnings. We also interact these indicator variables with the location of earnings, either the same MSA or a competing MSA. This measures the potential benefits to workers who move to find a job. Finally, we interact the relative time indicators with industry sector indicators to see how the earnings paths differ by the workers' sector at time of mass layoff. Since the Great Recession had the largest impact on employment in the manufacturing sector, we expect

[12] And note, then, that the displaced workers will have been employed at the mass layoff establishment for 4 to 7 quarters when getting laid off in quarters 1 to 4 of the mass layoff period. This is why we start the index k at -4 in equation (3) since all workers will have been at their establishment for a minimum of 4 quarters before the mass layoff period begins.

[13] Note that all workers in our sample were employed at the establishment for the 4 quarters prior to the 4 quarters that determine the mass layoff (time -3 to 0). Since non-separated workers remain employed at the establishment during the four quarters that determine the mass layoff, they are employed at the establishment for at least 8 quarters (time -3 to 4) prior to the end of the post-mass layoff period.

that the impact on earnings will be larger and the recovery slower for displaced workers in this sector.

5. Results

5.1 Joblessness Hazard Duration Model Estimation

We present results for the joblessness hazard duration model in Tables 4 and Figures 2 and 3. We also estimate a version of this model that allows for heterogeneous impacts based on worker skill levels (earnings) and present in Table 5 and Figures 4 and 5. Our results include separate sets of parameter estimates for the two re-employment outcomes: employed in same MSA and employed in a competing MSA. This allows us to examine the differential impacts of factors that affect re-employment on the location of re-employment. The key variables of interest are our measure of job opportunities (JOI) and housing costs (HCI). We include measures of these two variables for the origin MSA and for competing MSAs. This allows us to see how changes in these variables in different locations affect the likelihood of exiting joblessness in each competing risk outcome.

Our results are generally in line with our intuition. Figure 2 (drawn from rows 1 and 2 of Table 4) summarizes results for the effects of JOI on locational re-employment outcomes. Starting at the left side of Figure 2, we see that a one standard deviation increase in the JOI in the worker's origin MSA leads to a substantive increase in the likelihood of finding re-employment in the same MSA (a standardized coefficient (sc) of 0.21). Given the average duration of unemployment in the US is 24 weeks, with a standard deviation of approximately 13 weeks (BLS, 2024), our estimates predict that a one standard deviation increase in the job opportunities of a labor market can reduce time non-employed by 0.2 standard deviations, or about 2.7 weeks.

This figure also shows a symmetric (but opposite in sign) impact of a one standard deviation increase in the JOI in the competing MSAs on the likelihood of exiting joblessness in the competing MSAs (sc =0.17 or a reduction in the time non-employed by 2.2 weeks, on average.

Intuitively what we learn from this exercise is that job opportunities have a strong 'pull' effect in terms of increasing the likelihood of employment in one's home MSA as well as increasing the likelihood of a move into a neighboring MSA. These magnitudes are also quite large. Looking at other coefficients in Table 4 we see that a one standard deviation increase in the JOI increases the probability of finding new employment as much as being in the 50-55 age bracket (the oldest) relative to the 25-29 age bracket (the youngest).

It is surprising, however, that an increase in the JOI in a competing market has a negative, though much smaller, impact on re-employment in the same market (sc = -0.06). It is possible that workers might be taking extra time in expanding their job search to this other market and they might then be less willing to take a job locally as they search for better jobs in the competing MSAs. It is also possible that this result is picking up some omitted variables, perhaps some negative characteristics of these markets. Similarly, an increase in the JOI in one's own market has a negative, though very small, impact on re-employment in a competing market.

Figure 3 (drawn from rows 3 and 4 of Table 4) summarizes the impacts of an increase in housing costs. These results are, as expected, generally opposite in sign to the JOI impacts, as this is an increase in costs (housing) versus benefits (job opportunity). Yet, the magnitudes are different. Again, starting from the left, we see that a one standard deviation increase in HCI in the worker's origin MSA leads to a small decrease in the likelihood of finding re-employment there (sc = -0.05) and in a competing MSA (sc = -0.02). The fact that the impact is small may well be because homeowners are not influenced much by increases in HCI.

On the other hand, a one standard deviation increase in HCI in a competing MSA has large positive effect on the likelihood of re-employment in the origin MSA (sc = 0.21) and a large decrease in the likelihood of re-employment in a competing MSA (sc = -0.24). This is an indication that the cost of housing in a competing MSA, and not the origin MSA, is an important driver of mobility such that a one standard deviation increase in HCI in a competing MSA results in a 2.7 week increase in non-employment in the origin MSA and a 3.1 week decrease in non-employment in the competing MSA.

We also present results for unemployment insurance (UI) benefits in row 5 of Table 4.[14] Since these benefits are measured at the state level, we only include UI in the state of the origin MSA since many of the competing MSAs can be within the same state as the origin MSA. We see that an increase in weekly UI benefits results in a decrease in the likelihood of re-employment in the same MSA

[14] Obtained for the Department of Labor.

(sc = -0.12). This is our hypothesized result: higher benefits decrease the cost of remaining jobless. Considering other MSAs, the impact of an increase in weekly UI benefits in the origin MSA results in a small increase in the likelihood of re-employment in another MSA (sc = 0.05). It could be that the more generous in-state UI benefits will allow you more time to find a better match in a competing MSA and possibly even support your move to achieve a better match.

The results presented in Table 4 also control for worker and industry characteristics. The results for displaced worker age are presented with respect to the youngest group aged 25-29. Here we see that the probability of finding a job in any location decreases with age. We also see that these decreases are greater for the competing MSA choice, with the largest effect occurring for the oldest group aged 50-55 (semi-elasticity of -0.52). This result is consistent with a decreased willingness to migrate with increasing age.

The results for prior earnings are presented with respect to the lowest earning group ($15,000 - $29,999). In Table 4 we see that as prior earnings increase, the probability of finding a job increases markedly. The results also reflect the substantive degree to which higher earning workers are more mobile. For each level of prior earnings, the relative impact on the likelihood of moving to a competing MSA is more than double that of remaining in the origin MSA. The semi-elasticities, ranging from 0.32 to 0.77, reflect this finding. The results for prior job tenure are measured with respect to the lowest job tenure that we consider: one year. Increased prior job tenure raises the likelihood of re-employment in the origin MSA, with this effect increasing by length of prior tenure. For competing MSAs, higher prior job tenure leads to a decreased likelihood of employment, again with the effect increasing in strength with years of prior tenure. We thus find that displaced workers with the longest prior tenure at the mass layoff establishment are the most likely to find new jobs in their origin MSA but the least likely to move for a new job in another MSA. This can reflect a greater attachment to the local labor market.

Relative to white individuals, the results for race and ethnicity indicate that Black, non-Black Hispanic, and other displaced workers have lower probabilities of finding a job in their origin MSA. For competing MSAs, this is also true for Black workers, while the results for the other two groups are not significant. Displaced female workers are more likely than male workers to be re-employed in their home MSAs (semi-elasticity of 0.07) whereas they are less likely to be re-employed than males in competing MSAs (semi-elasticity of -0.04). Both are relatively small impacts.

The results by industry reflect the strong blue-collar focus of the difficulty finding new jobs during the Great Recession. Workers subject to mass layoffs in the base industry of construction, along with workers in manufacturing, had the lowest likelihood of finding a job in either their home MSA or in a competing MSA. On the other hand, displaced workers in two major industry groups had substantially higher probabilities of finding a job in their origin MSA: (1) education and health, and (2) arts, entertainment, accommodation, and food. Looking at finding a job in other MSAs, we see that displaced workers in wholesale and retail trades, along with transportation, had quite higher probabilities of finding work relative to those in the construction industry.

Given the relatively large impact of the Great Recession on middle- and low-income workers, we consider heterogeneous effects on re-employment by pre-mass layoff earnings. We define lower-income as earning less than $45,000 over the 4 quarters prior to the mass layoff event, and higher-income as earning at least $45,000 over the same reference period. Since earnings prior to mass layoff are shown in Table 4 to affect displaced workers' time in non-employment and in the location of their re-employment, we focus on how the impacts of our two key labor market measures (JOI and HCI) on jobless duration and location of re-employment vary for lower- and higher-income workers.

The results stratified by worker baseline earnings are presented in Table 5 and are generally similar in direction to those in Table 4. We provide a visual representation of these results in Figures 4 and 5. As shown in Figure 5, the housing cost results are quite similar across the higher- and lower-income groups. On the other hand, Figure 4 shows that the JOI impacts are different across these groups. Starting on the left-hand-side of Figure 4, we find that increasing job opportunities in the origin MSA leads to a substantial and significant increase in the likelihood of finding a job in the origin MSA for both earnings groups. This effect, however, is much larger for the higher income group than for the lower income group (sc = 0.74 and 0.40, respectively).

The effects of an increase in the JOI in competing labor markets are shown on the right-hand side of Figure 4. For impacts on re-employment in the competing labor market, the estimates for high and lower-income displaced workers are both large (sc=0.32 and 0.36). Whereas the impacts on re-employment in the origin labor market are small and not significant for lower-income displaced workers but large and negative for higher-income displaced workers (sc = -0.33). We find that differentiating by income level is important as it shows significant differences in the impact of JOI on re-employment for lower- and higher-income displaced workers.

5.2 Earnings Model Estimation

In this section we provide the earnings model results, examining how the earnings trajectories of the workers in our sample progress over the 20 quarters post-displacement. We display the results for our three key groups: those displaced after a mass layoff, those in mass layoff establishments who were not separated during the mass layoff (Control Group A), and those in non-mass layoff establishments (Control Group B). Figure 6A shows the change in real quarterly earnings for these three groups. Figure 6B provides the treatment effect (percent difference in earnings) for dislocated workers relative to Control Groups A and B and for treatment effect for the non-separated workers at mass layoff establishments (Control Group A) relative to Control Group B. The relative real earnings of Control Group B were very stable over the time period covered in this analysis (Figure 6A). This is consistent with how earnings behaved for the bulk of workers during this period. And the pre-treatment earnings paths are quite similar for all three groups. This provides support for using workers at non-mass layoff establishments as valid controls.

Both Figures 6A and 6B highlight the significant decline in earnings experienced by displaced workers in the first quarter of job loss - a nearly 30 percent decline, on average. This average, however, obscures the heterogeneity of displaced worker experiences. Some found a new full-time job in this first quarter (see Table 2), some had earnings from continuing secondary jobs, while others remained jobless for the full time period. We observe that there was a gradual increase in average earnings after this initial shock, but average quarterly earnings were still 7.5/14.6 percent lower than those for Control Group A/B after five years.

One might presume that the non-separated workers in the mass layoff establishments would serve as a good control for the dislocated workers since they are all from the same establishment (and hence control for sorting across establishments). However, these non-separated workers also suffered earnings losses relative to Control Group B. They were 7.4% lower after one year and remained lower by six to nine percent over the next four years. This comparison group is nonetheless useful since the outcome path for treated workers could be based in part on the types of establishments likely to have a mass layoff event. Still, comparing the dislocated workers to those workers who remain in the mass layoff establishments can significantly underrepresent the overall losses in earnings for the former group.

One concern regarding these estimates is that they could suffer from selection bias if the characteristics of the treatment group are substantially different from the characteristics of the control group. For example, we showed in Section 3 that the displaced workers were younger, had lower prior earnings, and had shorter job tenure than the workers in Control Group B. And while we include worker fixed effects that control for time-invariant (observable and unobservable) worker characteristics, we also employ propensity score matching to better align our control group to our treatment group in terms of observables. We first use the samples of dislocated and Control Group B workers to estimate a selection model where we regress the indicator of being in the treatment group (dislocated workers) on the characteristics given in Table 1. Second, we estimate the earnings equation based on the samples of dislocated and Control Group B workers using the inverse estimated propensity scores as weights. In Appendix Figure 1, we provide the percent difference in earnings between the dislocated and Control Group B workers based on the results from the unweighted and weighted earning regressions. These results are almost identical. We also get similar results when we carry out the same exercise for Control Groups A and B. Thus, we feel comfortable going forward using the full sample of Control group B workers as our control sample.

Figure 7 displays the earnings paths for displaced workers for separate sectors: Manufacturing, Finance, Accommodations and Food Service, and Other. As expected, earnings losses are greatest for workers in manufacturing where the dislocated workers suffer huge earnings losses in the first quarter after mass layoff (43 percent) and remain 18 percent below baseline after five years. Accommodation and Food Service workers experienced the smallest impact.

Figure 8 displays the percent change in relative real earnings for displaced workers based on re-employment location. We might expect that workers who moved to another MSA did so to take advantage of higher earnings and hence they would experience the lowest decline in earnings. What we see is that there is a slightly larger initial decline in earnings for the movers, although they eventually catch up with displaced workers who found re-employment in the origin MSA. This could reflect the fact that workers who experienced the largest initial loss in earnings were the ones who then saw the largest relative gains by moving.

Figures 9 and 10 display the earnings paths for displaced workers by different levels of the JOI and HCI in the origin MSA at the time of mass layoff. These paths are evaluated at the 10th, 25th, 50th, 75th, and 90th percentiles of the JOI and HCI indices. Significantly, we find that the workers in MSAs with higher JOIs fared better after displacement than those with lower JOIs. Initially these differences are quite large, approximately 22 percentage points, but these relative differences across MSAs dissipate after six quarters and remain similarly distributed after that. Even after 20 quarters post displacement, workers who were initially laid off in MSAs with JOIs at the 90th percentile experienced earnings losses 12 percent smaller than individuals in MSAs with JOIs at the 10th percentile. Note that although some of these differences existed before the mass layoff, the magnitude of this gap almost doubles post-mass layoff.

In the case of housing costs, we also find that workers in higher cost MSAs fare better after displacement. In fact, the loss in earnings in the first period after displacement is 18 percent for workers in the MSA at the 90th percentiles of the HCI and 36 percent for workers in the MSA at the 10th percentile of the HCI. This relative difference is maintained after five years. At this five-year point, the earnings for the workers in the MSA at the 90th percentile had returned to their baseline levels. While one might have expected that workers in the 10th percentile MSAs of the HCI would have fared better as they face lower housing costs, this is not the case. These MSAs could simply be inferior along the dimensions of job opportunities for which we are not controlling, transportation, safety, public schools, and other urban amenities that then make it more difficult to find relatively higher paying jobs.

6. Conclusion/Implications

To date, research on displaced workers has been limited by lack of attention to how features of both local and competing labor markets shape earnings and employment outcomes. We use a location-specific longitudinal data set, combining near-universal quarterly matched employee-employer microdata from the Longitudinal Employer Household Dynamics (LEHD) with local labor market measures to study medium- and long-run employment outcomes for workers displaced in five Great Lakes states during the Great Recession. Our unique approach underscores the importance of considering labor market characteristics in both the origin MSA and competing locations. We provide a detailed examination of how local labor markets shape displaced workers' re-employment experiences. Our empirical approach, which includes both a competing risks model of jobless duration and a long-term earnings model, allows us to examine how our key measures of local labor markets shape the probability that a worker will find employment in either their own metropolitan area or a competing one, as well as how the local the labor market shapes their longer-term earnings trajectory.

We find that about 60 percent of displaced workers attain stable employment within one quarter after mass layoff and about nine percent do not find such employment within five years. We find that of re-employed workers, 67 percent find stable employment in their origin MSA labor market and a full 24 percent find re-employment in another MSA.

To simultaneously explore duration of non-employment and the associated mobility with re-employment, we develop and estimate a hazard model of jobless duration where non-employed workers exit to a stable job in the origin MSA or a competing MSA. We include measures of the local and competing labor markets in our duration model – a job opportunity index (JOI) which we construct and a housing cost index (HCI). We find that these play a substantive role in determining whether displaced workers are re-employed in their origin MSA or in a competing MSA.

The results indicate that the probability of finding a stable job increases in the origin MSA by around 0.2 standard deviations when the JOI increases by one standard deviation or about a about 2.7 week decline in joblessness, on average. A comparable effect occurs when the JOI increases in the competing MSA (2.2 weeks). We find that an increase in HCI in the origin MSA has little impact on re-employment whereas a one standard deviation increase in HCI is a competing MSA results in a 2.7 week decrease in the origin MSA and a 3.2 week increase in the competing MSA in the duration on non-employment, on average.

We also develop an earnings model to estimate the long-term earnings impacts for these displaced workers. Our primary control group consists of workers at non-mass layoff establishments in the same MSA. Relative to this control group, we find large and persistent long-term declines in earnings for displaced workers after mass layoff, even among movers, of about 15 percent, in line with the existing literature. The largest earnings losses are for individuals working in manufacturing. We also find persistent long-term declines in earnings for non-separated workers at mass layoff establishments of about 5 percent, which has not been previously identified in the literature. Significantly, we find that job opportunities and housing costs at time of mass layoff appear to play a substantial role in earnings impacts. When looking at MSAs with the strongest labor markets (in terms of job opportunities) workers displaced in these areas experience half the long-term earnings losses experienced by workers employed in MSAs in the bottom decile of the JOI distribution.

Our results provide some policy relevant context when considering the role of the federal government in supporting displaced workers. While our results were obtained for the Great Recession period, we believe that some of our results are sufficiently strong to be applied in a range of economic periods. First, given how significant local labor markets are in terms of affecting the time to finding re-employment for displaced workers and affecting earnings losses post-mass layoff it indicates the potential importance of adjusting the timing and amount of federal aid provided to mass laid off workers based on local labor market conditions. Currently the Workforce Innovation and Opportunities Act (WIOA) authorizes National Dislocated Worker Grants, which is competitive funding to support workers in states and local areas experiencing disasters, emergencies or “major economic dislocations” (Bradley, 2015). Our results suggest that these allocations could be administered in a parallel fashion to how HUD provides rental assistance of different levels depending on the cost of housing in a neighborhood (Collinson, 2019).

Second, our findings provide additional support for the growing body of work on local industrial policies and place-based investments (Austin, Glaeser and Summers, 2018; Aiginger and Rodrik, 2020). As our paper focuses on variation in labor markets within the Midwest during the Great Recession, our work demonstrates that even the variation in job opportunities across these metropolitan areas has a significant impact on both the time it takes a worker to find re-employment as well as the ultimate earnings of the job they secure. An example of such a policy is the Regional Technology and Innovation Hubs (Tech Hubs) program created by the Biden administration[15]. As

[15] https://www.eda.gov/funding/programs/regional-technology-and-innovation-hubs

these programs are implemented, we hope to examine the extent to which they support the ability of displaced workers to re-enter the labor market.

Third, the enduring nature of the earnings losses we observe for displaced workers is also highly relevant to informing optimal design of the US wage insurance program. Between 2002 and 2022, the US Trade Adjustment Assistance (TAA) program provided wage insurance to workers aged 50 and over who were laid off in a trade-related displacement.[16] These workers received both funding to cover job training costs for up to three years and extended UI payments during training. Recent research on this program finds that it increased short-run employment probabilities and though it leads to slightly higher earnings in the short term due to increased employment, long-term earnings normalized among workers (Hyman et al, 2021). These results combined with ours suggest that if and when Congress begins designing a new program to assist displaced workers, wage insurance programs should be adjusted based on local labor market characteristics in addition to industry and worker characteristics. Overall our work provides new insights into the role local job opportunities and housing costs played in the ability of midwestern workers displaced during the Great Recession to re-enter the labor market. In future work we plan to expand our analysis to include growth periods as well as recessions and look at a broader set of geographies.

[16] https://www.nytimes.com/2024/12/20/opinion/trade-adjustment-assistance.html?smid=em-share

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Table 1. Characteristics of Workers, Mass Layoff and Non-Mass Layoff

	Mass Layoff Establishments			Non-Mass Establishments
	All Workers (1)	Displaced Workers (2)	Non-Displaced Workers (3)	Non-Displaced Workers (4)
Age				
25-29	0.112	0.130	0.099	0.103
30-34	0.139	0.150	0.132	0.135
35-39	0.162	0.163	0.161	0.159
40-44	0.178	0.173	0.181	0.174
45-49	0.196	0.185	0.203	0.200
50-55	0.214	0.199	0.225	0.228
Earnings				
$15,000-$29,999	0.252	0.312	0.209	0.230
$30,000-$44,999	0.305	0.297	0.311	0.288
$45,000-$59,999	0.192	0.163	0.213	0.213
$60,000-$74,999	0.111	0.092	0.124	0.123
$75,000-$89,999	0.059	0.054	0.062	0.061
$90,000+	0.082	0.081	0.082	0.085
Tenure				
4 Quarters	0.242	0.292	0.206	0.176
5-8 Quarters	0.305	0.336	0.283	0.262
9-16 Quarters	0.162	0.143	0.175	0.192
16+ Quarters	0.292	0.230	0.337	0.371
Race/Ethnicity				
Non-Hispanic White	0.844	0.811	0.867	0.876
Black	0.088	0.111	0.071	0.075
Non-Black Hispanic	0.041	0.046	0.037	0.025
Other	0.028	0.032	0.025	0.023
Gender				
Male	0.641	0.597	0.673	0.483
Female	0.359	0.403	0.327	0.518
Industry				
Extraction/Utilities/Construction	0.092	0.062	0.114	0.030
Manufacturing	0.422	0.349	0.474	0.180
Wholesale Trade/Retail Trade/Transportation	0.139	0.186	0.105	0.137
Information/Finance/Real Estate/Professional	0.209	0.233	0.193	0.196
Education/Health	0.092	0.127	0.067	0.335
Arts/Entertainment/Accommodation/Food	0.022	0.030	0.016	0.024
Other Industry	0.024	0.013	0.031	0.098
Establishment Size				
50-500 Employees	0.704	0.698	0.709	0.579
501-2000 Employees	0.204	0.192	0.213	0.255
2000+ Employees	0.092	0.110	0.079	0.167
Number of Observations	389,000	162,000	227,000	238,000

Notes: Calculations from LEHD data. Earnings are in 2000 dollars. Sample includes displaced workers, non-displaced workers at mass layoff establishments and non-displaced workers at non mass layoff establishments for whom we can identify whether or not they experience stable employment.

Table 2. Transitions to a Permanent Job after Displacement

Employment Status	Percent Share
Still Without Stable Job	0.092
Re-employed Same MSA	0.672
Re-employed Different MSA	0.236
Joblessness Spell	
<1 Quarter	0.361
1 Quarter	0.258
2-3 Quarters	0.089
4-7 Quarters	0.111
8+ Quarters	0.180
Number of Observations	162,000

Notes: Calculations from LEHD data. Sample includes displaced workers for whom we can identify whether or not they experience stable employment post mass layoff.

Table 3. Sample Characteristics for Displaced Workers by Stable Employment State

	All Workers	Employed		Non-employed
		Same MSA	Different MSA	
	(1)	(2)	(3)	(4)
Age				
25-29	0.130	0.127	0.150	0.100
30-34	0.150	0.149	0.165	0.118
35-39	0.163	0.165	0.170	0.130
40-44	0.173	0.176	0.174	0.147
45-49	0.185	0.188	0.174	0.193
50-55	0.199	0.194	0.168	0.313
Earnings				
$15,000-$29,999	0.312	0.309	0.265	0.451
$30,000-$44,999	0.297	0.298	0.301	0.281
$45,000-$59,999	0.163	0.164	0.178	0.124
$60,000-$74,999	0.092	0.092	0.103	0.066
$75,000-$89,999	0.054	0.055	0.061	0.034
$90,000+	0.081	0.082	0.093	0.044
Tenure				
4 Quarters	0.292	0.270	0.339	0.327
5-8 Quarters	0.336	0.322	0.379	0.327
9-16 Quarters	0.143	0.151	0.119	0.146
16+ Quarters	0.230	0.257	0.163	0.200
Race/Ethnicity				
Non-Hispanic White	0.811	0.821	0.799	0.769
Black	0.111	0.109	0.107	0.135
Non-Black Hispanic	0.046	0.041	0.055	0.061
Other	0.032	0.030	0.038	0.035
Gender				
Male	0.597	0.570	0.662	0.627
Female	0.403	0.430	0.338	0.373
Industry				
Extraction/Utilities/Construction	0.062	0.053	0.077	0.084
Manufacturing	0.349	0.341	0.330	0.450
Wholesale Trade/Retail Trade/Transportation	0.186	0.157	0.283	0.152
Information/Finance/Real Estate/Professional	0.233	0.246	0.207	0.203
Education/Health	0.127	0.153	0.076	0.071
Arts/Entertainment/Accommodation/Food	0.030	0.035	0.020	0.021
Other Industry	0.013	0.014	0.008	0.020
Establishment Size				
50-500 Employees	0.698	0.706	0.650	0.764
501-2000 Employees	0.192	0.211	0.153	0.159
2000+ Employees	0.110	0.083	0.197	0.078
Number of Observations	162,000	109,000	38,500	15,000

Notes: Calculations from LEHD data. Earnings are in 2000 dollars. Sample includes displaced workers for whom we can identify whether or not they experience stable employment.

Table 4. Duration/Mobility Model Results:
Probability of Finding New Employment by Geographic Location

	Estimates		Standardized Coefficients	
VARIABLES	Same MSA (1)	Different MSA (2)	Same MSA (3)	Different MSA (3)
Job Opportunity Index: Origin MSA	0.00148***	-0.000559***	0.2075	-0.07037
	(4.03e-05)	(6.38e-05)		
Job Opportunity Index: Weighted Avg. of Competing MSAs	-0.000371***	0.000934***	-0.06502	0.1706
	(3.46e-05)	(4.71e-05)		
Housing Cost: Origin MSA	-0.00170***	-0.000616**	-0.05235	-0.01667
	(0.000193)	(0.000311)		
Housing Cost: Weighted Avg. of Competing MSAs	0.00469***	-0.00593***	0.2112	-0.2447
	(0.000257)	(0.000387)		
Weekly Unemployment Benefits	-0.00422***	0.00222***	-0.1181	0.05379
	(0.000375)	(0.000506)		
			Semi-elasticities	
Age				
Base case: 25-29	-	-	-	-
30-34	-0.0585***	-0.0830***	-0.03876	-0.07203
	(0.0137)	(0.0194)		
35-39	-0.0666***	-0.173***	-0.04412	-0.1505
	(0.0135)	(0.0195)		
40-44	-0.0891***	-0.232***	-0.05903	-0.2017
	(0.0134)	(0.0195)		
45-49	-0.159***	-0.336***	-0.105	-0.2915
	(0.0133)	(0.0196)		
50-55	-0.328***	-0.594***	-0.2176	-0.5158
	(0.0133)	(0.0198)		
Earnings				
Base case: $15,000-$29,999	-	-	-	-
$30,000-$44,999	0.178***	0.374***	0.1182	0.3244
	(0.00920)	(0.0145)		
$45,000-$59,999	0.292***	0.618***	0.1936	0.5367
	(0.0113)	(0.0171)		
$60,000-$74,999	0.364***	0.771***	0.2414	0.6693
	(0.0140)	(0.0206)		
$75,000-$89,999	0.407***	0.830***	0.2695	0.7204
	(0.0174)	(0.0253)		
$90,000+	0.430***	0.885***	0.2849	0.7684
	(0.0153)	(0.0222)		
Prior Job Tenure				
Base case: 4 Quarters	-	-	-	-
2-4 Years	0.0586***	-0.0716***	0.03881	-0.06221
	(0.00920)	(0.0129)		
4-6 Years	0.201***	-0.219***	0.1329	-0.1898
	(0.0115)	(0.0181)		
6 Or More Years	0.371***	-0.225***	0.2456	-0.1954
	(0.0103)	(0.0167)		
Race/Ethnicity				

Base case: White Non-Hispanic	-	-	-	-
Black	-0.163***	-0.134***	-0.1081	-0.1164
	(0.0116)	(0.0177)		
Non-Black Hispanic	-0.231***	0.0248	-0.1533	0.02156
	(0.0176)	(0.0240)		
Other	-0.227***	-0.0259	-0.1505	-0.02252
	(0.0207)	(0.0286)		
Gender				
Base case: Male	-	-	-	-
Female	0.110***	-0.0432***	0.07304	-0.03753
	(0.00790)	(0.0122)		
Industry				
Base case: Extraction/Utilities/Construction	-	-	-	-
Manufacturing	0.160***	-0.203***	0.1057	-0.1762
	(0.0161)	(0.0219)		
Wholesale and Retail Trade, Transportation	0.268***	0.559***	0.1773	0.485
	(0.0174)	(0.0225)		
Information, Finance, Real Estate, Professional, Management, Administrative Services	0.468***	0.109***	0.3097	0.09439
	(0.0168)	(0.0233)		
Education and Health	0.980***	0.276***	0.649	0.2395
	(0.0188)	(0.0289)		
Arts, Entertainment, Accommodation and Food	0.748***	0.103**	0.4955	0.08972
	(0.0252)	(0.0430)		
Other industry	0.320***	-0.424***	0.2117	-0.368
	(0.0328)	(0.0624)		
Mass Layoff Spell	-0.448***	-0.0176***		
	(0.00410)	(0.00569)		
Mass Layoff Spell 2	0.00978***	-0.00716***		
	(0.000260)	(0.000376)		
Constant	-0.512***	-2.615***		
	(0.125)	(0.173)		
Observations	813,000	813,000		
Individuals	162,000	162,000		

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

Notes: Calculations from LEHD data. Includes all individuals experiencing mass layoffs for whom we can identify stable employment. Estimates presented in columns (1) and (2) and standardized coefficients presented in columns (3) and (4).

Table 5. Duration/Mobility Model Results: Higher- and Lower-Income Workers

	Estimates		Std Coefficients	
VARIABLES	Same MSA (1)	Different MSA (2)	Same MSA (3)	Different MSA (4)
Job Opportunity Index: Origin MSA (lower income)	0.00109***	-0.000309***	0.4023	-0.09974
	(5.33e-05)	(8.78e-05)		
Job Opportunity Index: Weighted Avg. of Comp MSAs (low)	-0.0000606	0.000963***	-0.02497	0.3578
	(4.57e-05)	(6.69e-05)		
Housing Cost: Origin MSA (low)	-0.00171***	-0.00164***	-0.1176	-0.09879
	(0.000237)	(0.000398)		
Housing Cost: Weighted Avg. of Comp MSAs (low)	0.00427***	-0.00687***	0.3821	-0.5426
	(0.000274)	(0.000419)		
Job Opportunity Index: Origin MSA (higher income)	0.00192***	-0.000726***	0.7402	-0.2385
	(5.71e-05)	(8.64e-05)		
Job Opportunity Index: Weighted Avg. of Comp MSAs (high)	-0.000760***	0.000779***	-0.3278	0.3155
	(5.07e-05)	(6.44e-05)		
Housing Cost: Origin MSA (high)	-0.00127***	0.000274	-0.08617	0.01639
	(0.000267)	(0.000408)		
Housing Cost: Weighted Avg. of Comp MSAs (high)	0.00514***	-0.00501***	0.45	-0.4077
	(0.000314)	(0.000456)		
Weekly Unemployment Benefits (low)	-0.00553***	0.000423	-1	0.06952
	(0.000405)	(0.000569)		
Weekly Unemployment Benefits (high)	-0.00250***	0.00445***	-0.4534	0.7353
	(0.000425)	(0.000575)		
Mass Layoff Spell	-0.448***	-0.0159***		
	(0.00411)	(0.00571)		
Mass Layoff Spell 2	0.00981***	-0.00731***		
	(0.000260)	(0.000377)		
Constant	-0.0344	-1.986***		
	(0.135)	(0.192)		
Observations	813,000	813,000		
Individuals	162,000	162,000		

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

Notes: Calculations from LEHD data. Includes all individuals experiencing mass layoffs for whom we can identify stable employment. Estimates presented in columns (1) and (2) and standardized coefficients presented in columns (3) and (4).

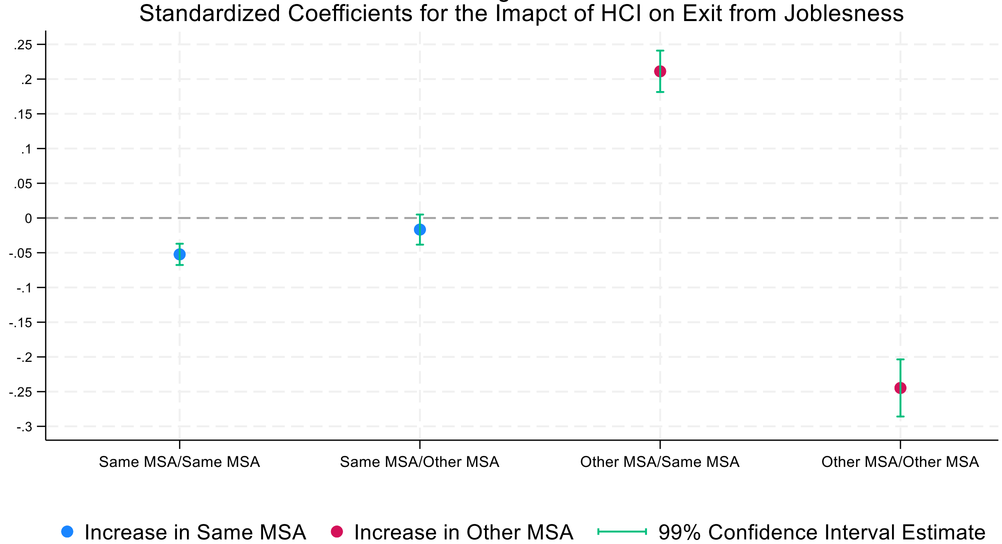
Figure 1: New Mass layoffs: Quarterly, Selected Insustries
Percent difference from 2007q4

Notes: Calculations from LEHD data, for all establishments in our five sample states, in all industries as well as within three key sectors. Estimates of establishment level mass layoff events between 2002 and 2015. Estimates are seasonally adjusted. Vertical lines represent the beginning/end of the Great Recession +2, which is our key study period.

Figure 2
Standardized Coefficients for the Imapct of JOI on Exit from Joblesness

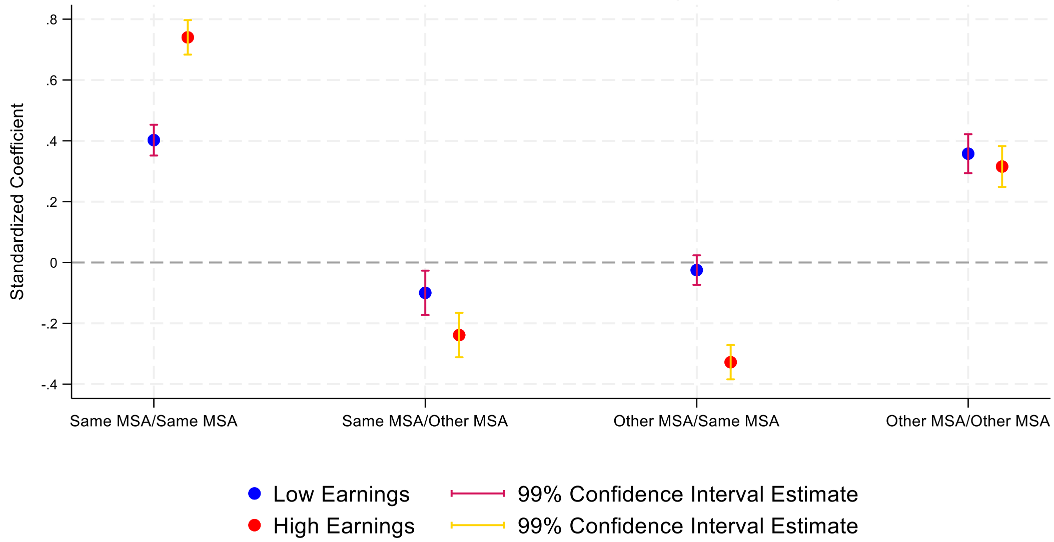
Notes: Values in this table are resutls from estimating the competing risks model of jobless duration and mobility (equations 1 and 2) using the LEHD data (see Table 4). Indicators on the X axis refer to – (the source of the change)/(the location of the impact). The capped lines around the point estimates are the 99% confidence interval estimates.

Figure 3
Standardized Coefficients for the Imapct of HCI on Exit from Joblesness



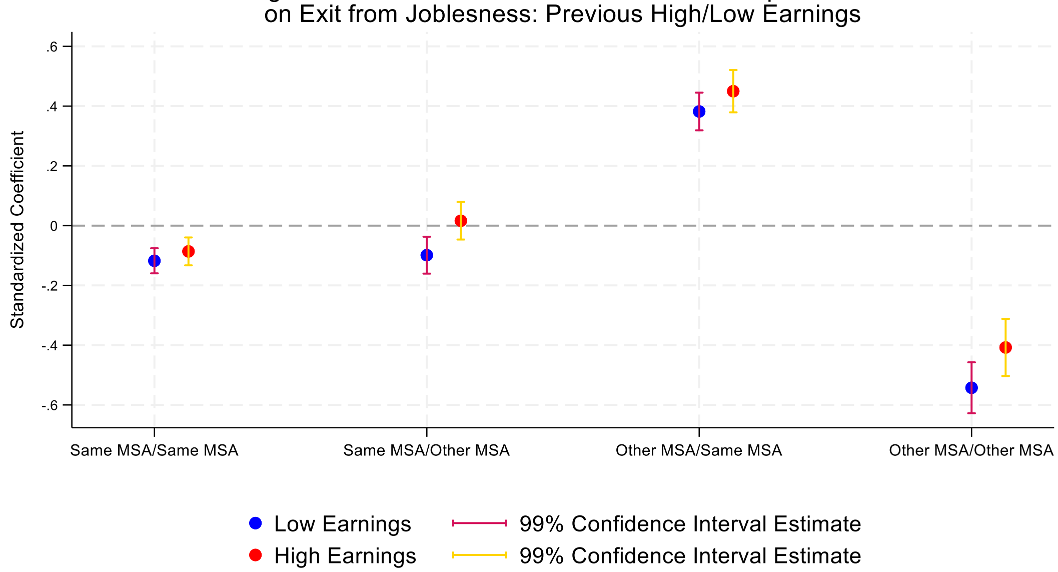
Notes: Values in this table are resutls from estimating the competing risks model of jobless duration and mobility (equations 1 and 2) using the LEHD data (see Table 4). Indicators on the X axis refer to – (the source of the change)/(the location of the impact). The capped lines around the point estimates are the 99% confidence interval estimates.

Figure 4: Standardized Coefficients for the Imapct of JOI on Exit from Joblesness: Previous High/Low Earnings

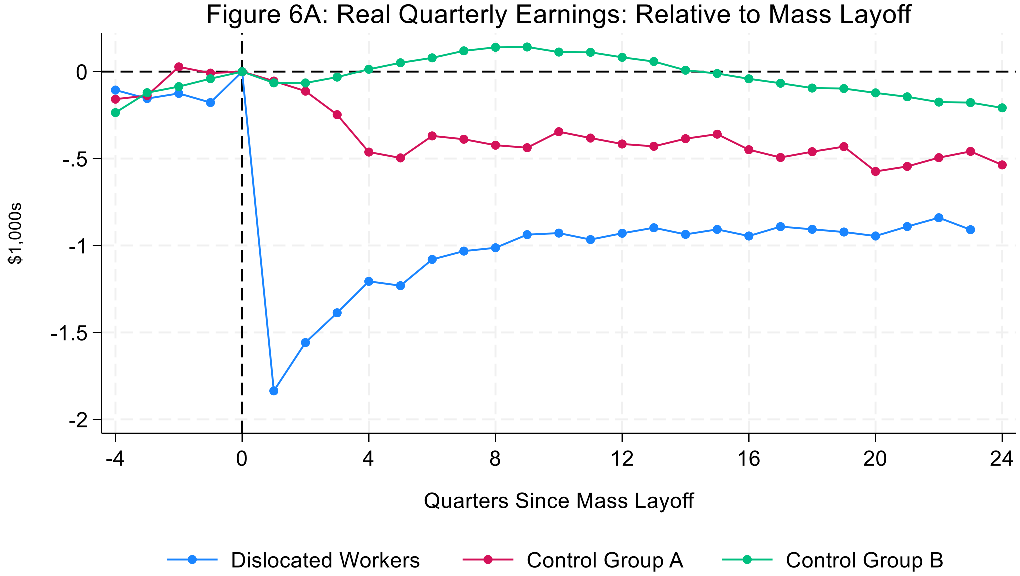


Notes: Values in this table are results from estimating the competing risks model of jobless duration and mobility (equations 1 and 2) using the LEHD data (see Table 4). Indicators on the X axis refer to (the source of the change)/(the location of the impact). The capped lines around the point estimates are the 99% confidence interval estimates.

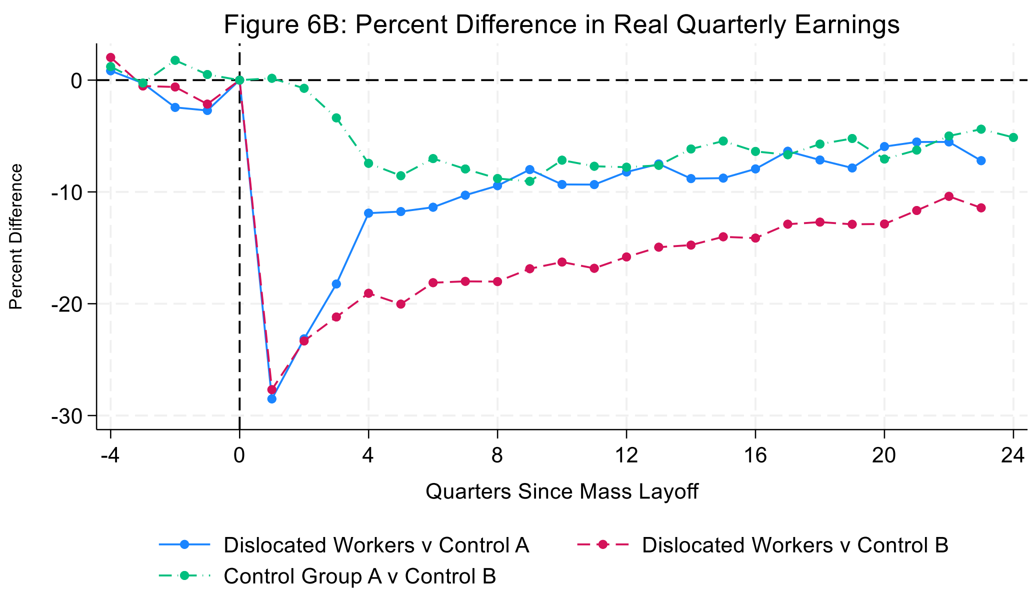
Figure 5: Standardized Coefficients for the Imapct of HCI on Exit from Joblesness: Previous High/Low Earnings



Notes: Values in this table are resutls from estimating the competing risks model of jobless duration and mobility (equations 1 and 2) using the LEHD data (see Table 4). Indicators on the X axis refer to (the source of the change)/(the location of the impact). The capped lines around the point estimates are the 99% confidence interval estimates.

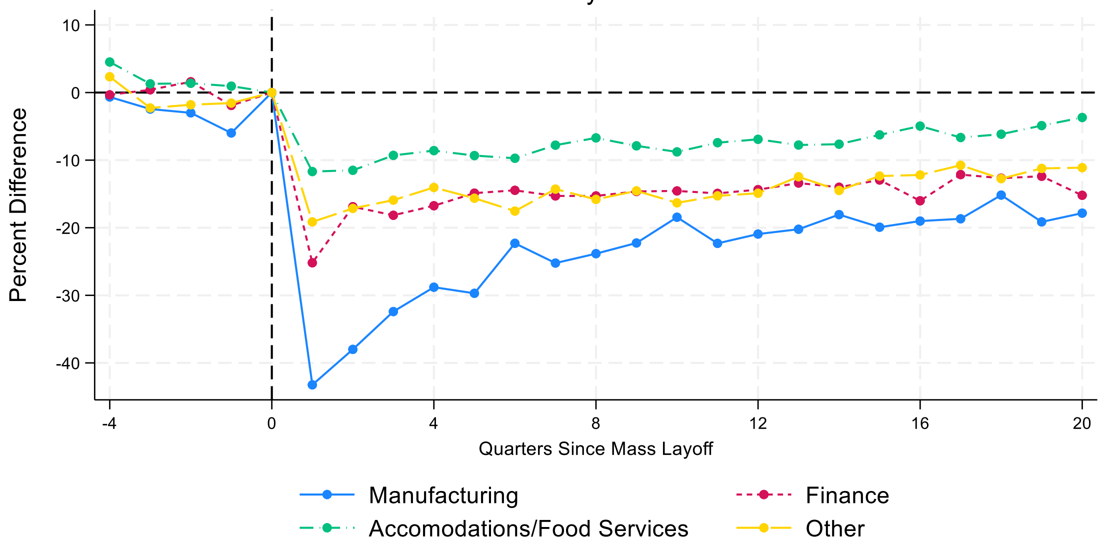


Notes: Calculations from LEHD data. Includes all individuals experiencing mass layoffs for whom we can identify earnings. Differences are relative to earnings in the quarter prior to Mass Layoff. Control Group A represents workers who were not separated from mass layoff establishments. Control Group B represents workers who were not employed in mass layoff establishments.



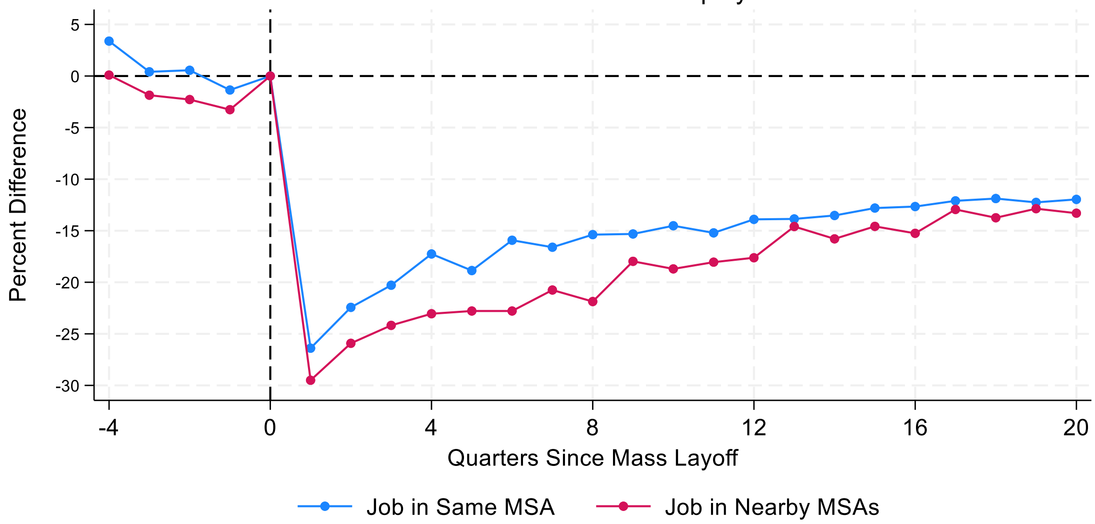
Notes: Calculations from LEHD data. Includes all individuals experiencing mass layoffs for whom we can identify earnings. Differences are relative to earnings in the quarter prior to Mass Layoff. Control Group A represents workers who were not separated from mass layoff establishments. Control Group B represents workers who were not employed in mass layoff establishments.

Figure 7: Percent Difference in Earnings: for Dislocated Workers
Relative to Mass Layoff: Select Industries



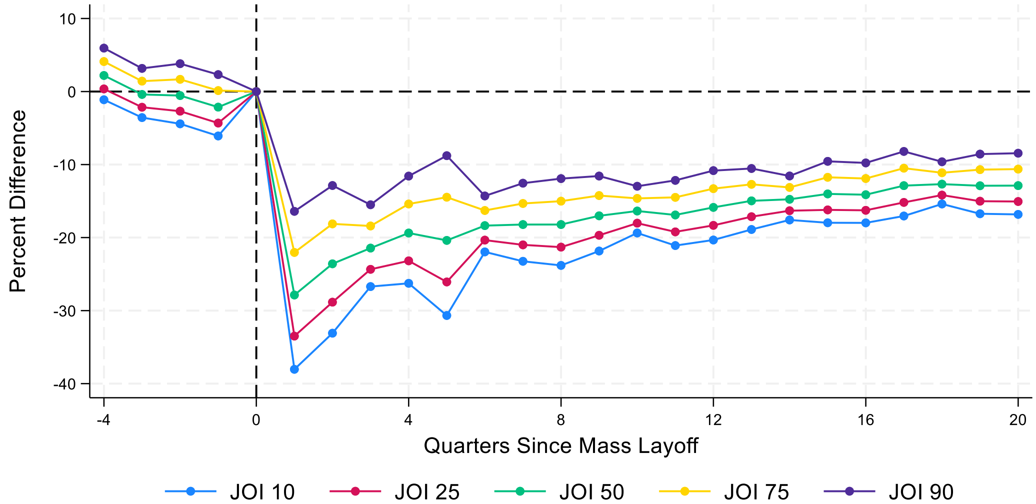
Notes: Calculations from LEHD data. Includes all individuals experiencing mass layoffs for whom we can identify earnings. Differences are relative to earnings in the quarter prior to Mass Layoff. Differences are relative to Control Group B in the same industry. Control Group B represents workers who were not employed in mass layoff establishments.

Figure 8: Percent Difference in Earnings: Relative to Mass Layoff
Dislocated Workers Based on Re-employment Location



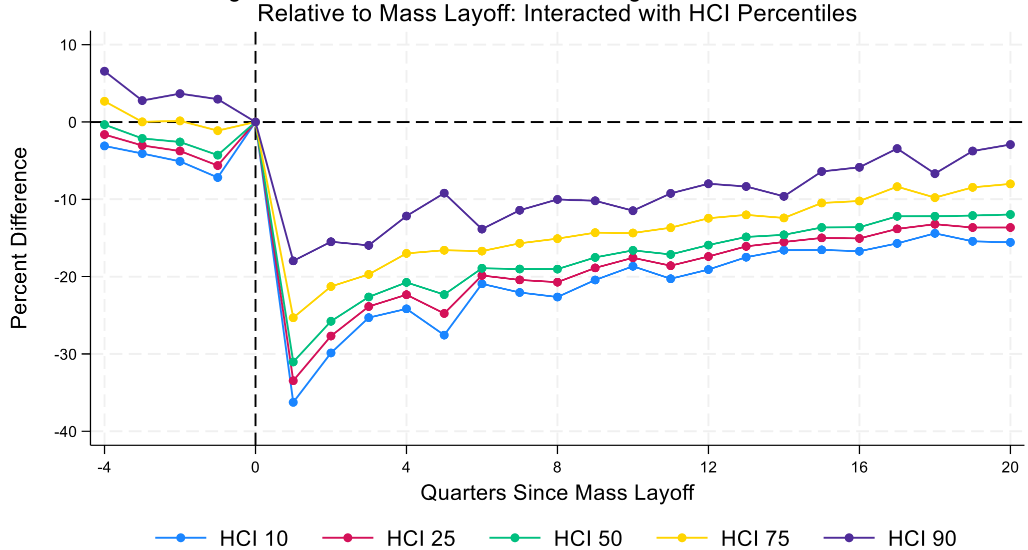
Notes: Calculations from LEHD data. Includes all individuals experiencing mass layoffs for whom we can identify earnings. Differences are relative to earnings in the quarter prior to Mass Layoff. Differences are calculated relative to Control Group B. Control Group B represents workers who were not employed in mass layoff establishments.

Figure 9: Percent Difference in Earnings for Dislocated Workers
Relative to Mass Layoff: Interacted with JOI Percentiles



Notes: Calculations from LEHD data. Includes all individuals experiencing mass layoffs for whom we can identify earnings. Differences are relative to earnings in the quarter prior to Mass Layoff and relative to Control Group B. Control Group B represents workers who were not employed in mass layoff establishments.

Figure 10: Percent Difference in Earnings for Dislocated Workers
Relative to Mass Layoff: Interacted with HCI Percentiles



Notes: Calculations from LEHD data. Includes all individuals experiencing mass layoffs for whom we can identify earnings. Differences are relative to earnings in the quarter prior to Mass Layoff and relative to Control Group B. Control Group B represents workers who were not employed in mass layoff establishments.

Appendix

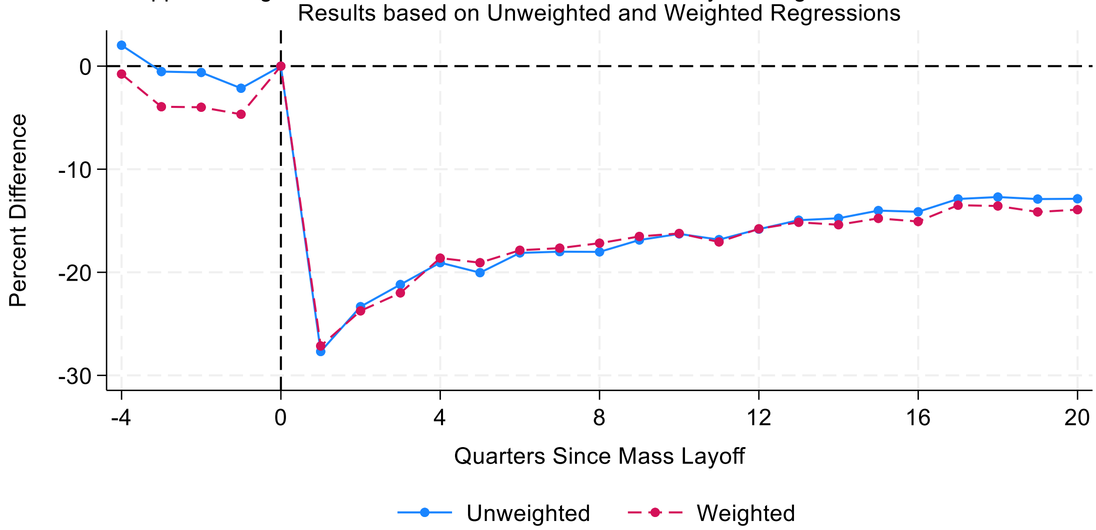
We provide details of the procedure we used to allocate workers to establishments when there are multiple establishments in a firm. This is needed to carry out our analysis at the establishment level since the LEHD only provides worker-level data at the firm level. For multi-establishment firms, we must determine the establishment in the firm where the workers are employed. We rely on the probabilistic method to allocate specific workers to establishments within the firm that was developed by the Census Bureau using results from Minnesota, where unemployment insurance data are reported at both the firm and establishment level (Abowd et al. 2009). The Census provides 10 "imputed establishments" for each worker. These imputations are based on a linear spline in the distance between the worker's residence and the physical location of each establishment in the firm. 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 nearby establishments a worker may have several "imputed" establishments. However, it is important to recall that we only consider establishments with at least 50 workers; thus, we do not have cases with many relatively small establishments. After exploration, we have chosen a cautious approach to minimize measurement error in identifying an appropriate establishment for a given displaced worker: we require seven or more imputes to a given establishment. Workers that have fewer than seven imputes to the same establishment are dropped from our analysis. We believe that this introduces minimal error and is considerably better than carrying out our analysis at the firm level.

Appendix Table 1. Characteristics of Workers Leaving before Mass Layoff Event

	All Workers (1)	Displaced Workers (2)	Early Leavers (1-4Q) (3)	Very Early Leavers (5-8Q) (4)
Age				
25-29	0.112	0.130	0.193	0.193
30-34	0.139	0.150	0.164	0.165
35-39	0.162	0.163	0.166	0.167
40-44	0.178	0.173	0.161	0.163
45-49	0.196	0.185	0.159	0.158
50-55	0.214	0.199	0.158	0.154
Earnings				
$15,000-$29,999	0.252	0.312	0.379	0.400
$30,000-$44,999	0.305	0.297	0.284	0.278
$45,000-$59,999	0.192	0.163	0.151	0.153
$60,000-$74,999	0.111	0.092	0.084	0.081
$75,000-$89,999	0.059	0.054	0.043	0.039
$90,000+	0.082	0.081	0.060	0.050
Tenure				
4 Quarters	0.242	0.292	0.480	0.507
5-8 Quarters	0.305	0.336	0.287	0.251
9-16 Quarters	0.162	0.143	0.095	0.118
16+ Quarters	0.292	0.230	0.139	0.124
Race/Ethnicity				
Non-Hispanic White	0.844	0.811	0.792	0.793
Black	0.088	0.111	0.127	0.127
Non-Black Hispanic	0.041	0.046	0.051	0.050
Other	0.028	0.032	0.030	0.030
Gender				
Male	0.641	0.597	0.604	0.599
Female	0.359	0.403	0.397	0.401
Industry				
Extraction/Utilities/Construction	0.092	0.062	0.091	0.093
Manufacturing	0.422	0.349	0.301	0.279
Wholesale Trade/Retail Trade/Transportation	0.139	0.186	0.134	0.144
Information/Finance/Real Estate/Professional	0.209	0.233	0.290	0.295
Education/Health	0.092	0.127	0.120	0.143
Arts/Entertainment/Accommodation/Food	0.022	0.030	0.046	0.032
Other Industry	0.024	0.013	0.017	0.015
Number of Observations	389,000	162,000	108,000	60,500

Notes: Calculations from LEHD data. Earnings are in 2000 dollars. Sample includes displaced workers, early leavers and very early leavers.

Appendix Figure 1: Percent Difference in Real Quarterly Earnings for Dislocated Workers
Results based on Unweighted and Weighted Regressions



Notes: Calculations from LEHD data. Includes all individuals experiencing mass layoffs for whom we can identify earnings. Differences are relative to earnings in the quarter prior to Mass Layoff and relative to Control Group B. Control Group B represents workers who were not employed in mass layoff establishments. Weighted results are based on inverse propensity score weights.