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What Happens to Wages after Displacement?

Economic shocks and policy reforms can induce large changes in establishment-level employment. Since wage losses from displacement can be large and long-lasting, policymakers often express a desire to support displaced workers. When resources are limited, policymakers need to target support to the workers who need it most.

But the academic literature offers little guidance on how to do this. There is little agreement on how wages change after displacement. The influential works of Jacobson, LaLonde, and Sullivan document large adverse effects of displacement on workers in the United States.[1] Subsequent studies also find that displacement has significant long-term adverse effects.[2] More recent international comparisons, however, find zero or positive wage changes following displacement. Abbring and others find no change in wages in the United States, and Bender and others find positive wage changes following displacement in France and Germany.[3]

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1. Jacobson, LaLonde, and Sullivan (1993a, 1993b).

2. Most studies focus on the United States, including Caballero, Engle, and Haltiwanger (1997), Davis and Haltiwanger (1999), Stevens (1995, 1997), Revenga, Riboud, and Tan (1994), and Marcal (2001). Others focus on other developing countries, such as Menezes-Filho (2004), Burda and Mertens (2001), Couch (2001), Fallick (1996), Kletzer (1998), and Ruhm (1991a, 1991b).

3. Abbring and others (2002); Bender and others (2002).

The literature also offers conflicting explanations of why these estimates vary. Kuhn suggests that differences in inequality and institutions in France, Germany, and the United States can explain the different estimates for these countries.[4] Alternatively, Howland and Peterson, Carrington, Jacobson, LaLonde, and Sullivan, and Farber suggest that labor market conditions can affect postdisplacement wages.[5] Since a wide variation in displacement costs makes targeting aid difficult, the efficiency gains from identifying determinants of postdisplacement wages are potentially significant.

This paper studies the Mexican labor market to contrast various explanations for differences in postdisplacement wage changes. We hope to identify patterns that may help policymakers target aid to displaced workers. An environment with varying temporal and regional economic conditions and with economic conditions and institutions substantially different from those in the countries previously studied is ideally suited to identify such patterns. If institutions vary little across regions, then the institutional hypothesis would be an unlikely explanation of differences across regions in postdisplacement wages.

Mexico meets these conditions. Differences between Mexico and other countries, as well as differences within Mexico over time and space, can help us identify these patterns in postdisplacement wage changes. First, wage dispersion is higher in Mexico than in France, Germany, or the United States.[6] If inequality drives differences in postdisplacement wages, then Mexican workers should have much more negative postdisplacement experiences than observed in these countries.

Second, institutions such as workers' separation costs, the legislated costs of displacement (to the firm), and unions are very different in Mexico than in other countries. Mexican workers are much less likely to leave firms voluntarily than workers in other countries, which suggests that they have

4. Kuhn (2002).

5. Howland and Peterson (1988); Carrington (1993); Jacobson, LaLonde, and Sullivan (1993b, chap. 6); Farber (2003). When examining local labor market conditions, Jacobson, LaLonde, and Sullivan (1993b) compare two Pennsylvania regions over the same time period. Carrington (1993) and Howland and Peterson (1988) provide much wider geographic coverage, but these studies are not directly comparable to Jacobson, LaLonde, and Sullivan because they use cross-section data that are subject to recall error rather than tracking the actual wages of workers over time.

6. The Deininger and Squire data set (available at www.worldbank.org/research/growth/dddeisqu.htm) shows that Mexico's historically averaged Gini coefficient (52.92) is higher than that of the United States (35.79), France (37.71), and Germany (32.91).

higher separation costs. Mexico's mandatory severance pay is higher than what is legislated in France, Germany, and the United States (the latter two have no legislated severance pay). Unions also have much less wage-setting power in Mexico than in the comparison countries, which can lead to negative union-wage differentials.[7] If unions explain the difference in results across countries, then Mexican workers should have much more negative postdisplacement experiences than is the case elsewhere.

Third, Mexico's geographic regions exhibit little variation in unionization and inequality, but large differences in economic conditions.[8] Mexican labor laws regarding severance payments, strikes, prohibitions against nominal wage reductions, the legal recourses of workers in case of unfair treatment, and guarantees of profit sharing are determined at the federal level and therefore do not vary across regions. Moreover, no important labor market reforms occurred in the period we study.

In short, we use this variation in economic conditions (but not institutions) to compare local labor market conditions and postdisplacement wages over time and space. Since inequality and institutions vary less within Mexico than across the countries previously studied in the literature, heterogeneity in postdisplacement wages within Mexico probably cannot be explained by inequality and institutions. This points instead toward an important role for labor market conditions. At the same time, our results help explain the variation found in the literature. It thus seems very likely that they can be applied beyond Mexico to target aid to displaced workers when and where it is most needed.

Our approach differs from previous studies in two key ways. First, we use a very simple, but formal, theoretical framework that illustrates how differences in institutions, such as separation costs for both the firm and the worker, play a key role in the postdisplacement experience. The model also shows how a displaced worker might earn higher wages after being displaced and yet not have wanted to leave the original job in search of higher wages prior to displacement. More important, the model shows how unemployment rates (through time) and differences in economic activity (through space) can lead to negative, zero, or positive postseparation wage changes.[9] Second, we employ a near-census-sized administrative data set that allows us to directly compare displacement experiences across time

7. Panagides and Patrinos (1994).

8. On unionization, see Fairris and Levine (2004).

9. The model also shows how the comparison group plays a key role, as Kuhn (2002) suggests.

and regions. Since we want our results to be as directly comparable with previous studies as possible, we use the methodological "gold standard" established by Jacobson, LaLonde, and Sullivan.[10] We use the same standards as in previous studies to identify displaced workers, match workers to firms, and track workers as they move between firms. We are therefore able to avoid the so-called recall bias from displaced-worker surveys and directly compare our results with earlier studies.

In line with the model, we find that different external conditions can cause wages to go up, go down, or stay constant after displacement. Workers who are displaced during good times experience higher wages than nondisplaced workers (including both nondisplaced workers who remained employed in firms that underwent large employment contractions and nondisplaced workers who never worked in these firms), while workers displaced in bad times can experience very large losses.[11] Furthermore, the effects of separating in bad times linger: workers who separate when unemployment is high never seem to catch up to workers who separate when unemployment is low. This effect is most pronounced in relatively less economically dynamic geographic regions.

Our basic results are robust to the effects of age, attrition, tenure, and switching sectors. Like previous studies, we find that displaced workers with longer tenure experience larger losses than workers with shorter tenure in some periods but not others. Variation in economic conditions through time may therefore explain why Kreichel and Pfann argue that tenure does not account for observed wage differences, while other studies, such as Carrington, support the tenure explanation.[12] We also find effects of changing sectors that are similar to previous studies. Our main conclusion is that changing local labor market conditions produce a wide range of displacement effects and therefore might be the key to understanding when displacement hurts workers.

10. For example, Jacobson, LaLonde, and Sullivan (1993a) analyze the effects of displacement on workers using matched firm-worker data from the United States. Their results suggest that workers begin to experience falling wages before they are displaced and that earnings recovery may take more than five years. Hamermesh (1989) and Davis and Haltiwanger (1992) show that adjustment costs at the firm level are generally nonlinear and significantly affect employment decisions. Other studies examine earnings losses before displacement (de la Rica, 1995) and how changing labor market conditions affect displacement (Stevens, 2001; Clark, Herzog, and Schlottmann, 1998; Helwig, 2001).

11. We find loss levels that are very similar to those documented by Jacobson, LaLonde, and Sullivan (1993a, 1993b).

12. Kreichel and Pfann (2003); Carrington (1993).

We present our analysis in five sections. We start by presenting our simple theoretical framework. The subsequent section describes the source, collection, and limitations of our data, discusses the Mexican economic environment, defines the term displaced worker, and finally describes the various comparison groups. We then explain our empirical approach and present our results. A final section concludes.

Theory

This section illustrates how differences in economic conditions can result in either an increase or a decrease in wages following displacement. The model modifies McLaughlin's theory of quits and layoffs by incorporating a separation cost that the worker bears in the case of a quit but that the firm pays to the worker in the case of a layoff.[13] We present the model in its simplest form to illustrate the concepts that guide our empirical work.

Workers receive a wage, w, and produce value to the firm, W. We assume that the value to the firm is a function denoted $W(X, G)$ in which X represents worker-specific characteristics and G represents firm-specific characteristics, including the firm's output price and productivity shocks. Workers have the ability to search on the job. Denote as $E(r)$ the expected value of an outside wage offer from a firm that values the worker at R. We assume the outside offer is costlessly verifiable once it is made, and that the expected value of the offer is a function of external characteristics, including the number of firms that value the worker's skills (following Stevens), the unemployment rate (which reduces the expected value), and the economic activity in the region (which increases the expected value).[14]

We employ McLaughlin's important distinction between layoffs and quits. McLaughlin defines a quit as the result of a firm-refused, worker-initiated attempt to increase wages and a layoff as the result of a firm-initiated, worker-refused attempt to lower wages. Firms (workers) have the option to accept proposals for changes in the wage, and they will do so as long as the value of the wage is not larger (smaller) than the value of the output to the firm, or the reservation wage. We modify McLaughlin's model by adding a separation cost. The separation cost may stem from the loss of shared surplus from firm-specific training, an institutional arrangement that

13. McLaughlin (1991).
14. Stevens (1994).

encourages long-term employment, or other reasons.[15] The relevant characteristic is that this cost is paid to the worker in the event of a layoff. This is particularly relevant for the Mexican case, because Mexico, like some European and many Latin American countries, follows a more preventative stance.[16] Article 50 of the Mexican Federal Labor Law mandates that workers hired for an indefinite period who are laid off (without cause) are entitled to twenty days pay for each year of service.[17] This mandate may significantly increase the cost of separation in Mexico.[18]

The effect of this type of legislation on employment flows is still under debate.[19] One particularly relevant study argues that this kind of legislation in Brazil creates the incentive for workers to negotiate with firms to make quits look like layoffs, in order to receive this payment.[20] This behavior creates a procyclical turnover pattern, because workers may be particularly interested in getting their separation payment in good times to start new businesses or invest in areas with higher returns. Kaplan, Martínez González, and Robertson examine job creation and job destruction in Mexico.[21] They find that the pattern of job destruction—especially the component that is due to contraction (layoffs)—is weakly counter cyclical. Over the 1986–2001 period, the component of job destruction stemming from firm contraction moved negatively with the net growth rate of employment. We are therefore confident that the kind of adverse incentives and false layoffs documented in Brazil do not affect our results.[22]

15. Hashimoto (1979, 1981).

16. Kuhn (2002).

17. This provision applies to contracts of indefinite length. The United States and Germany have no legislated severance pay, although in the United States the industry standard is one to two weeks per year of service and in Germany severance pay is generally included in the social plan. In France, workers with more than two years of service receive 0.1 months of salary per year of service (Kuhn, 2002).

18. McLaughlin's (1991) analysis of data from the Panel Study of Income Dynamics (PSID) suggests that separations in the United States are evenly divided between quits and layoffs. Mexicans, in contrast, are much less likely to leave voluntarily, which may imply a larger separation cost. See figure 3.

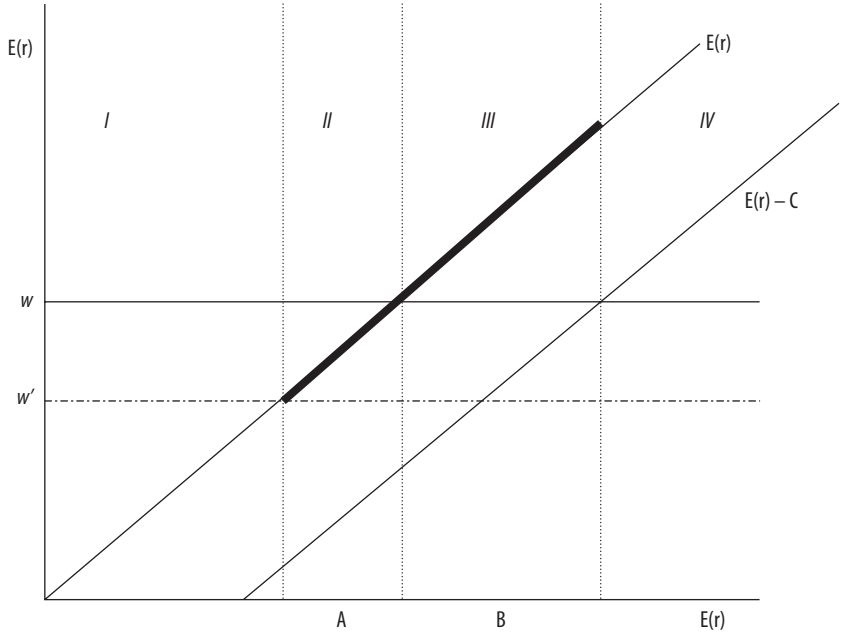
19. See Heckman and Pagés (2000) and Robertson and Dutkowsky (2002) for examples of estimates of labor market adjustment costs in Latin America and a discussion of their link to labor market legislation.

20. Gonzaga (2003).

21. Kaplan, Martínez González, and Robertson (2004).

22. We do not claim that this behavior does not occur in Mexico or that these concerns are not relevant for Mexico. The aggregate statistics, however, seem to suggest that such behavior does not have a significant effect on our results.

FIGURE 1. Worker's Decision Rule



The worker's decision rule is most clearly illustrated graphically, as seen in figure 1. Given an initial wage of w, the worker will voluntarily leave the firm as long as the expected wage, $E(r)$, minus the separation cost, C, is greater than the current wage. In figure 1, all workers with wages in region IV will quit and seek employment elsewhere. Workers with wages in regions I, II, and III will remain in the firm. The separation cost will lead some workers to remain in the firm even if they have higher expected wages elsewhere (as shown in region III).

Now consider the effect of an adverse shock that lowers the worker's value to the firm from w to w'. Such an adverse shock could stem from an adverse productivity or price shock or from some other factor. In this case, the firm will offer the worker a wage reduction, which the worker can either accept or reject. If the worker accepts the lower wage, the worker remains with the firm; if the worker refuses the wage cut, the worker is laid off. According to Mexican law, the worker must receive a separation payment, which is presumably intended to compensate the worker for the

separation. The effect of this payment means that workers with expected wages above the new wage, w', will be laid off. Some of those workers will receive lower wages than in their prior employment (workers with expected wages in region II), but other workers will now take jobs with higher wages (workers with expected wages in region III). Workers with wages in regions II and III will both have higher postdisplacement wages than workers in the same firm (region I).

The effect of displacement on wages is therefore ambiguous: wages may either rise or fall after displacement. Wages may go up because the separation cost keeps workers from voluntarily moving to take advantage of higher potential wages in other firms. This result illustrates why a worker who involuntarily separates from a firm may have higher wages after separating, while lacking the incentive to take a higher-paying job (before incurring the separation cost) prior to being displaced.

For a given level of separation costs, the value of wages in other jobs (that is, the expected value of the outside offers) depends on several factors. If labor markets are not perfect and worker experience is valued outside a single firm, then increasing the number of firms that value the worker's experience or that would compete for workers will drive up the outside wage offers into region III.[23] Alternatively, a higher unemployment rate reduces the expected value of wage offers into region II, which implies that displaced workers would tend to enter firms with lower wages. The model thus illustrates that the heterogeneity of results found in the literature (negative, zero, and positive) is consistent with a simple theory and that this heterogeneity can be linked to institutions and labor market conditions in ways that can be empirically compared.

When assessing a theoretical framework such as this one, it is useful to consider alternative explanations that may generate similar results. Most theory in this literature focuses on explanations for lower postdisplacement wages. Suggestions include loss of firm-specific capital and seniority. These concepts can be easily incorporated into the model above, but they offer little guidance for the case of higher postdisplacement wages. Higher postdisplacement wages are somewhat more difficult to reconcile if workers can move to higher paying jobs. This argument, however, assumes that moving is basically costless. As explained above, a positive moving cost directly addresses this concern. Furthermore, the model described above differs from previous approaches that focus on either positive or negative

23. See Stevens (1994).

wage changes because it shows how differing labor market conditions could generate either positive or negative postdisplacement wages.

The Data

Mexican labor laws require all private sector firms to report wage and employment information on all employees to the Mexican Social Security Institute (*Instituto Mexicano del Seguro Social,* or IMSS). In practice, however, firms report information on roughly half the private sector employees. Firms may choose not to formally register in order to evade taxes and social security contributions. Academic studies of Mexico's informal sector use the act of reporting to the IMSS as a criterion for formal sector participation. The IMSS records thus represent a census of private firms in the formal sector of the Mexican economy.[24] Our data come directly from these records.

The IMSS data are collected at the firm level rather than at the establishment level. Each formal sector firm in Mexico has a firm identifier called its *registro patronal.* The *registro patronal* is similar to the employer identification number (EIN) that is commonly used as a firm identifier in U.S. data sets. Just as several subsidiary EINs in the United States might be owned by one parent firm, several *registros patronales* might be owned by the same parent company in Mexican data. The *registro patronal* may incorporate more than one establishment in a single firm (again like EIN in U.S. data), but in almost all cases, we identify individual establishments (or plants in the case of manufacturing industries). We use the *registro patronal* to link observations over time, to follow workers as they move among firms, and to track workers' wages within their given firm over time.[25]

As an initial check of data quality, we compare our sample with official IMSS employment statistics. The motivation behind this comparison is that the IMSS reports formal employment statistics based on their data, which are used as an indicator of Mexican employment, but their method for calculating these statistics is not known to us. A favorable comparison

24. Public sector workers and members of the military have social security accounts with other agencies.

25. Firms could potentially change their *registros patronales* from time to time for administrative reasons, and this would generate false births and deaths stemming from changes in the *registro patronal* for continuing firms. In practice, however, very few firms (fewer than four) closed entirely and opened again in the next quarter with the same employees. These firms were dropped from the sample.

with official statistics would indicate that we have a reliable data set, and in fact the figures match up quite well in a comparison with data from official IMSS statistics.[26]

Our data represent all sectors of the Mexican economy.[27] To verify coverage, we compared the 1993 average employment in manufacturing in our data (2,958,715.5) with the 1993 average total employment in the 1993 Mexican Industrial Census (3,246,039.0). Our data thus cover about 91.1 percent of total manufacturing employment. This leads us to conclude that the distinction between formal and informal labor markets, which is so important in developing economies, is mainly an issue outside the manufacturing sector.

Since our data are effectively a census of formal sector employment, we are particularly concerned about the rate of attrition in our sample. Workers may leave our sample for three reasons: they may leave the labor force, become unemployed, or enter the informal sector. To get a sense of the rate of attrition in our sample, we focus on workers who worked at least one quarter in 1993. Of these workers, 78 percent worked at least once in 1994, and 57 percent worked at least once in 2000. About 87 percent of the workers who appear in our sample for at least one quarter in 1993 appear in our sample for at least one quarter between 1994 and 2000.

Analytically, treating workers who leave the labor force or become unemployed is straightforward. The complication in our data arises because a potentially significant number of workers who leave our sample may enter the informal sector. The informal sector has traditionally been thought of as an employer of last resort, in which workers earn lower wages and experience inferior working conditions. Maloney challenges this view for Latin America generally and for Mexico in particular.[28] He shows that workers who become self-employed in the informal sector often earn 25 percent higher wages, on average, than they did as salaried workers in the formal sector. Salaried workers in the informal sector, however, always earn less than their formal sector counterparts. This result suggests that there is no clear presumption of bias, or, more specifically, the direction of a bias from not being able to account for informal sector employment is unclear. In the empirical section below, we address this potential bias by comparing results across samples that include and exclude workers who drop out of our sample.

26. The official data are from www.imss.gob.mx/ventunica/memoria_2001/2/024000.htm. A table showing this comparison is available on request.

27. Our data cover all economic sectors and are classified using a four-digit industry code that is similar, but not identical, to the U.S. 1987 SIC code.

28. Maloney (2004).

We analyze employee-level records for the period 1993 to 2000, measuring wages on 31 March, 30 June, 30 September, and 31 December of each year. This yields thirty-two quarters of data. While the period is determined by data availability, it is a particularly interesting time in which to study displacement because it encompasses several reforms and macroeconomic events, including the implementation of the North American Free Trade Agreement (NAFTA) in 1994 and the December 1994 collapse of the peso, which induced a serious recession that lasted until 1996.

The Mexican Economic Environment

In addition to the firm-worker identifier, the data also include details such as geographic region, sector, and the gender and birth date (month and year) of each worker. Regional heterogeneity in Mexico emerges as a result of historical differences in production (centered on Mexico City), concentration of foreign investment in the U.S.-Mexican border region, and the persistent poverty and lack of growth in southern Mexico. In particular, Mexican regions have had very different experiences with adjustment.[29] We therefore focus on four Mexican regions: the border, the north, central Mexico, and the south.[30]

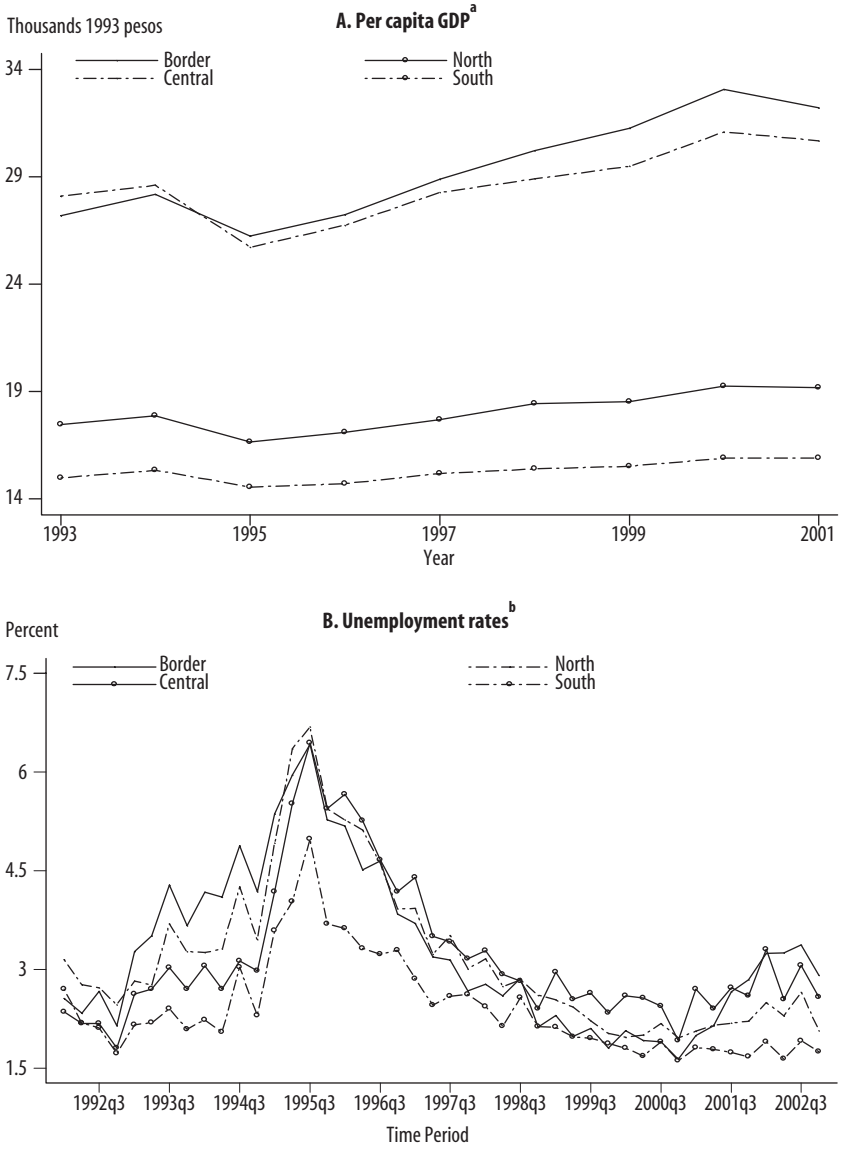
The simple model presented earlier suggests that differences in the concentration of economic activity can affect postdisplacement wages. Mexico exhibits significant regional heterogeneity. Manufacturing is predominantly located in the border, north, and central regions. The highest rates of employment growth and investment have been concentrated in the border region, possibly as a result of *maquiladora* investment.[31] The south, in contrast, concentrates on tourism (most notably in the state of Quintana Roo, home of Cancún) and oil. While aggregate statistics suggest that manufacturing is similar in the border, north, and center regions, the regions are actually quite different. Figure 2 (panel A) shows the evolution of per capita gross domestic product (GDP) for each region over time. The central

29. Conroy and West (2000).

30. We define the four regions as encompassing the following Mexican states: the border region: Baja California, Coahuila de Zaragoza, Chihuahua, Nuevo León, Sonora, and Tamaulipas; the north: Aguascalientes, Baja California Sur, Durango, Guanajuato, Hidalgo, Jalisco, Nayarit, Querétaro de Arteaga, San Luis Potosí, Sinaloa, Veracruz-llave, and Zacatecas; the central region: Distrito Federal, México, Morelos, Puebla, and Tlaxcala; and the south: Campeche, Colima, Chiapas, Guerrero, Michoacán de Ocampo, Oaxaca, Quintana Roo, Tabasco, and Yucatán.

31. Feenstra and Hanson (1997); Robertson (2000).

FIGURE 2. Regional Differences in per Capita GDP and Unemployment Rates



a. The four lines represent GDP per capita for the different regions. The GDP of each region is calculated as the sum of the real state GDP of all states in each region. The population of each region in each year was calculated using a linear growth trend from data between the 1990 and 2000 population censuses. The real state GDP is in thousands of 1993 pesos. The distribution of states into regions is identified in the text.

b. Regional unemployment rates are the simple averages of city-level unemployment rates in each region, as identified in the text. Tic marks are at third quarter of given year.

and border regions are much more economically dynamic than the north. The central region has the largest amount of measured economic activity, although it has the fewest states. The border and the north regions have similar levels of total GDP, but GDP per capita is much higher in the border region, suggesting that economic activity is more concentrated in the border region than in the north. The border region also had a higher GDP growth rate than the north for most of the sample period. All regions experienced a sharp recession in 1995; the years following 1995 are recovery years. We expect that, to be consistent with the model, postdisplacement wages would generally be lower in the north than in the central and border regions.

The model also suggests that unemployment rates can affect postdisplacement wages. Panel B of the figure presents regional unemployment rates calculated as a simple average of the official urban unemployment for the main cities in each state. The recession is especially evident here. Unemployment rates are highest in the third quarter of 1995, and they fall steadily in the third quarters of subsequent years in our sample. Unemployment rates track each other quite closely across regions, but the south tends to have lower unemployment rates than the rest of the country. The north has the highest peak unemployment rate. Prior to the collapse, the border region had higher unemployment rates than other regions, but rates in the border region fell faster than the rest of the country during the recovery period. We expect that, to be consistent with the model, postdisplacement wages would generally be lower for workers who separated during the height of the recession.

In contrast, institutions (such as unions) and inequality differ very little across regions in Mexico. Fairris and Levine find unionization rates for 1998 of 0.21 both in states that share a border with the United States and in states that do not.[32] In general, they find little heterogeneity in unionization rates across regions in Mexico. Inequality varies little across regions, as well. As a measure of income inequality, we calculated the Gini coefficient of the natural logarithm of the real daily wage (the wage measure used in the empirical work below) for each region in our data. In the first quarter of 1993, the Gini coefficients for the border, north, central, and south regions were 0.424, 0.422, 0.422, and 0.439, respectively.[33]

32. Fairris and Levine (2004).

33. For the first quarter of 1991, the Gini coefficients were, in the same order, 0.406, 0.409, 0.419, and 0.405. The regional Gini coefficients generally track each other closely over time, rising after Mexico's entrance into GATT and then leveling off when NAFTA went into effect. See Robertson (2004) for further discussion of Mexican wage inequality.

These rates are much more similar to each other than they are to the Gini coefficients of France, Germany, and the United States.

Description of Comparison Groups and Definition of Displaced Workers

We divide our sample of approximately 80 million observations in several ways. Given the overwhelming size of the data set, we focus on workers displaced between the third and fourth quarters of 1995, 1996, and 1997. These periods match three possibly distinct conditions: high unemployment (1995), sharply falling unemployment (1996), and relatively low and stabilizing unemployment (1997). These three displacement periods also maximize the time necessary to identify wage movements before and after displacement.

The issues related to defining displaced workers are widely discussed in the literature. Administrative data, such as those used by Jacobson, LaLonde, and Sullivan, generally do not include direct information on the cause of separation. The cause of separation is important because workers who leave voluntarily are more likely to have more positive economic prospects beyond their current firm. Including voluntary separations would therefore bias the estimated effects of displacement upwards.

To get a sense of the magnitude of voluntary and involuntary displacement, we draw from the National Urban Employment Survey (*Encuesta Nacional de Empleo Urbano,* or ENEU). This household survey is like the U.S. Current Population Survey in that it is used to calculate measures of unemployment. The survey contains a question that can be used to determine whether a worker separated voluntarily or involuntarily from the firm. The average responses over time are shown in figure 3. Two facts are immediately apparent. First, workers in Mexico are more likely to leave their firm involuntarily than voluntarily, which might suggest a high voluntary separation cost for workers. Second, the rate of involuntary (voluntary) separation is highest (lowest) during the three years on which we focus (1995, 1996, and 1997). These rates follow the business cycle (they are consistent with figure 2, panel B) and suggest that our focus years are the least susceptible to selection bias.[34]

34. Gonzaga (2003) suggests that workers may negotiate with firms to create the impression that they were fired when they actually quit, in order to receive severance payments mandated by Brazilian labor law. Our Mexican data do not seem to exhibit the same kinds of patterns (for example, the cyclicality of separations) that this phenomenon apparently causes in Brazil.

FIGURE 3. Separation Rates by Motive[a]

a. Separation rates are calculated based on the Mexican quarterly *Encuesta Nacional de Empleo Urbano*. The two rates do not add up to 100 because we excluded separation resulting from injury and other exogeneous factors.

We follow previous studies in our attempt to minimize this bias by focusing on workers who left firms with significant contractions. We created two samples to identify displaced workers. We first identified firms that contracted more than 60 percent between the third and fourth quarters of the reference year, from an initial employment of 50 or more workers. Our second sample uses a 30 percent contraction threshold. We labeled these displacing firms.[35] The logic behind this decision, which is well established in the literature, is that workers leaving these distressed firms are most likely to be immune from the selection bias that arises from voluntary separation.

We broke down each of the two samples into four subsamples of displaced workers to examine the possible effects of tenure, sample attrition,

35. Jacobson, LaLonde, and Sullivan (1993a) label all firms that contract more than 30 percent from an early sample average as contracting firms.

age, and sector changes. To focus on the effects of tenure, we restricted our sample to workers who were in the displacing firm for the entire period up until the displacement event, left the firm at the time of displacement, found work in another firm either immediately or after spending some time out of our sample, and then worked in one firm until the end of the sample period. We refer to this group as C1. Workers who are out of the sample may be either unemployed or working in the informal sector.[36] Since we cannot distinguish between these two conditions, we created another subsample of displaced workers who found jobs immediately after the displacement event and then remained employed for the rest of the sample. We label this group C2. Our third group comprises workers who worked at the same (displacing) firm for less than two years prior to displacement and then worked at one firm following displacement (C3); these workers may not be in the sample for the entire period. This short-tenure criterion contrasts directly with the long-tenure criterion for workers in the first group. The final group consists of workers who worked at one firm prior to displacement, are in the sample in all periods, but may have worked at several firms following displacement (C4).

We contrast the wage patterns of these workers against two comparison groups. Employees in the first group (A) worked in every quarter at firms that did not experience large contractions in any quarter during our period of study. Given the large size of the data set, we selected these workers from a 1 percent sample of all workers in nondisplacing firms. For 1995, our sample of this group begins with 3.87 million observations, or about 121,000 per quarter. The second group (B) consists of workers who worked at a displacing firm in every period of the sample (that is, workers in displacing firms who remain with the firm after the displacement event).[37]

About 18 percent of the observations represent multiple firms per worker in each quarter. This could be due to the fact that workers could hold several formal sector jobs, change jobs frequently within the quarter, or are not coded correctly. The problem of multiple jobs becomes slightly more serious when considering displacement because being displaced from your second job may not have the same implications as being displaced from

36. See appendix A for a discussion of the age differences of those who are displaced and those who leave the sample.

37. Since we want to compare the wages of workers who remain in displacing plants, we omit plants that shut down completely.

your primary job. Since we do not have data on hours, it is difficult to determine which is the primary job, which entries are errors, and which entries represent changing jobs. We therefore drop all workers with multiple observations per quarter from the sample.

We impose additional sample restrictions. We restrict the sample to workers between fifteen (in the first year) and seventy-one years of age (in the last year), those with positive earnings, and those who are not missing sectoral information. We also restrict the sample to those who are not missing any geographic data.

Summary Statistics

Tables 1 and 2 contain summary statistics for the 1995 ABC1 and ABC2 samples (that is, samples covering groups A, B, and either C1 or C2) by sector and region. The "1995 sample" refers to the sample for the 1995 displacement event and contains observations for every quarter between 1993 and 2000. The summary statistics in tables 1 and 2 summarize data for 1996 from these samples. Our measure of wages is the natural log of the real daily wage.[38] Several interesting results emerge. Workers are generally youngest in the central and border regions, and wages are lowest in the border. The border and the north have higher employment shares in manufacturing than in services.

Table 3 disaggregates the A, B, and C components of the sample and compares the sample summary statistics before and after the 1995 displacement event by summarizing the data for 1994 and 1996. The table shows that the wages of all workers fell between 1994 and 1996. Interestingly, the average wages of workers who remained in displacing firms fell by more than workers who were displaced.

One potential concern is that the ages of displaced workers and workers who left the sample affect our results. Appendix A formally compares the ages of workers in each subsample and those who leave our data. This comparison reveals two main results. First, for workers who remained in the sample, there is no statistical difference between workers who were displaced and workers who remained in displacing firms in the 1995 and 1996 sample (workers who remained in displacing firms were, on average,

38. We converted nominal wages to real wages using the national-level consumer price index available at www.banxico.org, based on the index values corresponding to the month of observation.

TABLE 1. Summary Statistics for the ABC1 Displacement Sample, 1995:3 to 1995:4[a]

Sector and summary statistic	*Geographic region*				*Total*
	Border	*North*	*Central*	*South*	
Agriculture					
Wage	2.94	2.87	2.80	2.46	2.84
Age	37.51	37.52	39.51	44.2	38.46
Percent female	8.79	13.11	10.59	18.78	12.1
No. observations	2,674	3,096	236	905	6,911
Mining					
Wage	3.34	3.36	3.04	3.63	3.40
Age	33.62	35.06	36.92	35.79	34.66
Percent female	1.94	1.8	11.11	2.96	2.4
No. observations	1,029	778	72	540	2,419
Manufacturing					
Wage	3.25	3.52	3.39	3.47	3.42
Age	30.4	33.18	33.63	32.69	32.74
Percent female	33.04	29.89	29.61	17.67	29.36
No. observations	22,455	45,223	36,741	9,909	114,328
Transport equipment					
Wage	3.50	3.61	3.86	. . .	3.65
Age	29.4	32.72	33.64	. . .	31.65
Percent female	28.03	14.91	10.2	. . .	18.77
No. observations	2,472	1,254	2,107	0	5,834
Construction					
Wage	3.21	3.23	3.20	3.46	3.26
Age	35.81	33.89	33.82	35.05	34.79
Percent female	3.05	2.78	11.62	9.01	5.33
No. observations	15,042	12,888	5,997	8,033	41,960
Utilities					
Wage	4.03	4.32	4.15	3.96	4.18
Age	38	39.51	39.01	38.36	39.02
Percent female	14.44	16	12.6	12.59	14.25
No. observations	561	2,025	1,619	588	4,793
Services					
Wage	3.20	3.35	3.49	3.32	3.37
Age	35.38	36.09	34.81	36.04	35.49
Percent female	35.75	42.42	39.76	42.19	40.28
No. observations	19,492	35,706	42,777	17,636	115,611
Total					
Wage	3.23	3.42	3.45	3.38	3.38
Age	33.58	34.57	34.33	35.17	34.36
Percent female	24.91	29.66	32.43	27.06	29.14
No. observations	63,725	100,970	89,549	37,612	291,856

. . . No observations in this category.
a. Data are for 1996.

TABLE 2. Summary Statistics for the ABC2 Displacement Sample, 1995:3 to 1995:4[a]

Sector and summary statistic	*Geographic region*				
	Border	*North*	*Central*	*South*	*Total*
Agriculture					
Wage	2.89	2.71	2.79	2.39	2.66
Age	40.21	41.33	44	45.72	42.53
Percent female	14.49	13.31	7.32	18.33	14.63
No. observations	552	1,052	164	720	2,488
Mining					
Wage	3.70	3.49	3.28	3.92	3.67
Age	37.59	36.75	38.71	34.81	36.58
Percent female	3.41	1.01	14.29	1.47	2.29
No. observations	352	396	28	272	1,048
Manufacturing					
Wage	3.63	3.79	3.70	3.70	3.71
Age	33.94	35.76	37.73	36.28	36.11
Percent female	32.79	25.82	24.8	17.31	26.36
No. observations	8,344	12,020	13,500	2,888	36,752
Transport equipment					
Wage	3.77	3.84	4.18	. . .	3.94
Age	30.93	33.5	35.94	. . .	33.27
Percent female	35.73	14.68	7.21	. . .	21.54
No. observations	1,500	436	1,276	0	3,212
Construction					
Wage	3.45	3.38	3.74	4.02	3.62
Age	39.22	35.32	34.19	36.54	36.09
Percent female	14.56	7.78	7.69	47.77	17.34
No. observations	632	1,028	780	628	3,068
Utilities					
Wage	4.16	4.04	4.27	4.01	4.16
Age	39.79	39.83	40.37	40.4	40.13
Percent female	17.27	20.97	6.95	14.12	13.32
No. observations	440	744	1,208	340	2,732
Services					
Wage	3.55	3.38	3.81	3.48	3.58
Age	38.33	38	38.15	37.84	38.09
Percent female	44.8	45.72	39.7	48.66	43.79
No. observations	7,884	13,936	15,112	5,540	42,472
Total					
Wage	3.59	3.55	3.79	3.53	3.64
Age	36.01	37.08	37.91	37.88	37.23
Percent female	35.85	33.5	29.94	35.43	32.98
No. observations	19,704	29,612	32,068	10,388	91,772

. . . No observations in this category.
a. Data are for 1996.

TABLE 3. Descriptive Statistics by Displacement Status before and after Displacement Event[a]

	Year before displacement (1994)				*Year after displacement (1996)*			
Statistic	*A*	*B*	*C1*	*C2*	*A*	*B*	*C1*	*C2*
Wage	3.820	4.189	3.541	3.907	3.569	3.854	3.278	3.607
	(0.829)	(0.806)	(0.785)	(0.774)	(0.854)	(0.848)	(0.737)	(0.804)
Age	35.962	33.519	33.042	34.301	37.962	35.519	33.134	36.301
	(9.902)	(9.311)	(10.641)	(9.455)	(9.902)	(9.311)	(10.474)	(9.455)
Percent female	0.349	0.299	0.342	0.248	0.349	0.299	0.273	0.248
	(0.477)	(0.458)	(0.474)	(0.432)	(0.477)	(0.458)	(0.446)	(0.432)
Agriculture	0.035	0.002	0.018	0.019	0.035	0.002	0.023	0.042
	(0.184)	(0.047)	(0.133)	(0.135)	(0.184)	(0.047)	(0.149)	(0.202)
Mining	0.012	0.014	0.008	0.000	0.012	0.014	0.007	0.000
	(0.107)	(0.117)	(0.088)	(0.000)	(0.107)	(0.117)	(0.081)	(0.000)
Manufacturing	0.330	0.640	0.319	0.207	0.330	0.640	0.382	0.192
	(0.470)	(0.480)	(0.466)	(0.405)	(0.470)	(0.480)	(0.486)	(0.394)
Transport equipment	0.049	0.007	0.010	0.000	0.049	0.007	0.013	0.000
	(0.216)	(0.081)	(0.101)	(0.000)	(0.216)	(0.081)	(0.112)	(0.000)
Construction	0.012	0.049	0.179	0.074	0.012	0.049	0.194	0.193
	(0.109)	(0.216)	(0.383)	(0.261)	(0.109)	(0.216)	(0.396)	(0.395)
Utilities	0.038	0.014	0.008	0.001	0.038	0.014	0.010	0.002
	(0.192)	(0.119)	(0.087)	(0.036)	(0.192)	(0.119)	(0.100)	(0.045)
Services	0.524	0.274	0.459	0.699	0.524	0.274	0.372	0.570
	(0.499)	(0.446)	(0.498)	(0.459)	(0.499)	(0.446)	(0.483)	(0.495)
Border	0.263	0.103	0.181	0.145	0.263	0.103	0.218	0.145
	(0.441)	(0.304)	(0.385)	(0.352)	(0.441)	(0.304)	(0.413)	(0.352)
North	0.271	0.468	0.374	0.284	0.271	0.468	0.355	0.288
	(0.445)	(0.499)	(0.484)	(0.451)	(0.445)	(0.499)	(0.478)	(0.453)
Central	0.369	0.255	0.305	0.523	0.369	0.255	0.294	0.519
	(0.482)	(0.436)	(0.460)	(0.500)	(0.482)	(0.436)	(0.456)	(0.500)
South	0.097	0.174	0.140	0.048	0.097	0.174	0.133	0.048
	(0.295)	(0.379)	(0.347)	(0.213)	(0.295)	(0.379)	(0.340)	(0.213)
No. observations	62,260	23,480	251,313	6,032	62,260	23,480	206,116	6,032

a. Displacement occurred between 1995:3 and 1995:4. The groups are defined as follows: group A: workers who are not in displacing firms and remain in the same firm; group B: workers who are in displacing firms but do not separate from displacing firms; group C1: workers who are in displacing firms, separate from those firms, and are not necessarily employed in every period in the sample; and group C2: workers who are in displacing firms, separate from those firms, and are employed in every period in the sample. Standard errors are in parentheses.

1.32 years older than displaced workers in 1997). The point estimates suggest that workers displaced in 1995 and 1996 were slightly older than workers who remained in displacing firms. Second, workers who left the sample were younger than those who remained in the sample. Other studies suggest that workers in Mexico often leave the formal sector to become entrepreneurs in the informal sector.[39] Since risk is often associated with

39. Maloney (1998, 2004); Maloney and Krebs (1999).

youth, our results seem to be consistent with the idea that when displaced, young workers may find the informal sector attractive and therefore remain out of our sample.

Table 3 also shows that sample ABC2 is balanced, but ABC1 is not, since workers in C1 are allowed to exit and return to the sample after the displacement event. When we consider only a balanced panel of workers, the average age of all workers is two years higher in the later period. The table also shows that displaced workers who found a job right away were most likely to be male, while the difference in the percent of females in C1 and C2 suggests that workers who were displaced and exited the sample were more likely to be female.

The table also includes information about the sectoral distribution of each group in each period (the sum over the sectors in each column equals one hundred percent). Since workers who did not change firms did not change sectors, the sectoral distribution of the first two groups remains constant. One might expect that the sectoral distribution of the two groups of workers who were in displacing firms would be identical, but we restrict the sample to workers who were employed in every period. Therefore, differences in the sectoral distribution between the second two groups reflect the differences in future employment patterns. In our sample, no workers who were displaced from transportation equipment or mining remained in those sectors when they were displaced. They could be excluded from the sample as a result of extended search times or they could have moved to other sectors, such as construction or agriculture. The percent of displaced workers in construction and agriculture more than doubles following displacement (for workers who immediately found employment).

Regional differences in displacement patterns are also evident in table 3. The majority of employment is in the central region, but so are most of the displaced workers who immediately found jobs. The north has the highest share of workers who either were in displacing firms and did not leave or were displaced and exited the sample at some point. This may be consistent with the shift in production from the central region to the north, as described by Hanson.[40] On the other hand, the overall regional pattern of employment in table 3 displays a large degree of stability, suggesting that few workers who were displaced in a particular region moved to other regions in the very short run to begin other jobs.

40. Hanson (1998).

Empirical Approach

To maximize comparability with studies in developed countries, we employ the methodological gold standard established by Jacobson, LaLonde, and Sullivan.[41] We first define displacement indicators as D_{jit}, which equals one if the worker separated from a displacing firm (and zero otherwise) to compare the wages of displaced workers with all other workers. After presenting these initial results below, we redefine the displacement indicator to identify workers in each of three groups ($j = 1, 2, 3$). The first variable takes on the value of one for workers who were not in displacing firms, and zero otherwise (group A). The second takes on a value of one for workers in displacing firms who remained with the same firm, and zero otherwise (group B). The third variable takes on a value of one if the workers left firms that contracted more than 60 percent in the quarter in which they separated (that is, they are in one of the C samples). We estimate each aggregated sample separately (ABC1, ABC2, and so forth). We begin with the following specification.

$$(1)\quad w_{it} = a_i + \gamma_t + \mathbf{x}_{it}\beta + \sum_j \vartheta_j D_{ji} + \sum_j \sum_t D_{ji}\gamma_{it}\delta_{jt} + \varepsilon_{it}.$$

The dependent variable is the natural log of the real wage, which is calculated by adjusting the nominal wages variable by the Mexican national consumer price index using 1994 as the base year. The a_i term captures individual-specific fixed effects that take on a value of one for each individual in the sample. The parameter γ_t represents time-specific effects. Each estimated equation includes a dummy variable for each quarter-year (for thirty-one of thirty-two periods, omitting the first quarter in the sample). The vector $\mathbf{x_{it}}$ represents other time-varying characteristics of workers, including age. We also include the indicator for the individual's displacement group status, excluding the workers not in displacing firms as a control group. We then interact the time effects with the displacement group indicators to compare wages in each group before and after the displacement event. We estimate this equation separately for each of the four geographic regions in our sample.[42]

By fully interacting displacement status with the time effects (dummy variables for each quarter), we allow the time trend for displaced workers

41. Jacobson, LaLonde, and Sullivan (1993a, 1993b).

42. We estimate separate equations for each region because the sample sizes are so large.

to differ from the time trend for nondisplaced workers. These differential time trends are identified off differences over time in wage changes between displaced workers and nondisplaced workers. We would expect, for example, that wage changes over time would be fairly similar for displaced workers and nondisplaced workers before the displacement event, but that wage changes would begin to differ sharply after the displacement event. This is, in fact, what we normally observe.[43]

Results

We begin by estimating equation 1 by ordinary least squares (OLS) for each region. All but thirteen of the 124 estimated marginal effects of the displacement **x** time variables (thirty-one coefficients for each of four regions) for sample ABC1 are statistically significant at the 5 percent level. The R^2 are all 0.90 or higher. A nearly identical pattern of significance emerges for sample ABC2.[44] The standard errors are generally very small. Since we are particularly concerned about the pattern of the relative wages of displaced workers' wages over time, however, a graphical presentation may more effectively facilitate comparisons across years and sectors.[45] Figures 4 and 5 graph the estimated coefficients for the 1995, 1996, and 1997 displacement samples. The patterns of standard errors and diagnostic statistics are similar for the other years.[46]

As in Jacobson, LaLonde, and Sullivan, wages in all periods and all regions fell prior to displacement; in contrast with Jacobson, LaLonde, and Sullivan, no region exhibits a sharp drop in wages at the time of displacement.[47] Figures 4 and 5 do show significant effects of displacement, but these effects vary by region and time of displacement. Figure 4, for example, reveals that workers who were displaced in 1995, the trough of the recession, did worse than other workers. Workers displaced in later years, however, recovered. The heterogeneity across time is especially evident in the central and border regions. Workers in the relatively poor

43. We are required to use some normalization for both time trends. For both displaced workers and nondisplaced workers, we set the coefficient equal to zero for the dummy variable corresponding to nine quarters before the (potential) displacement event.

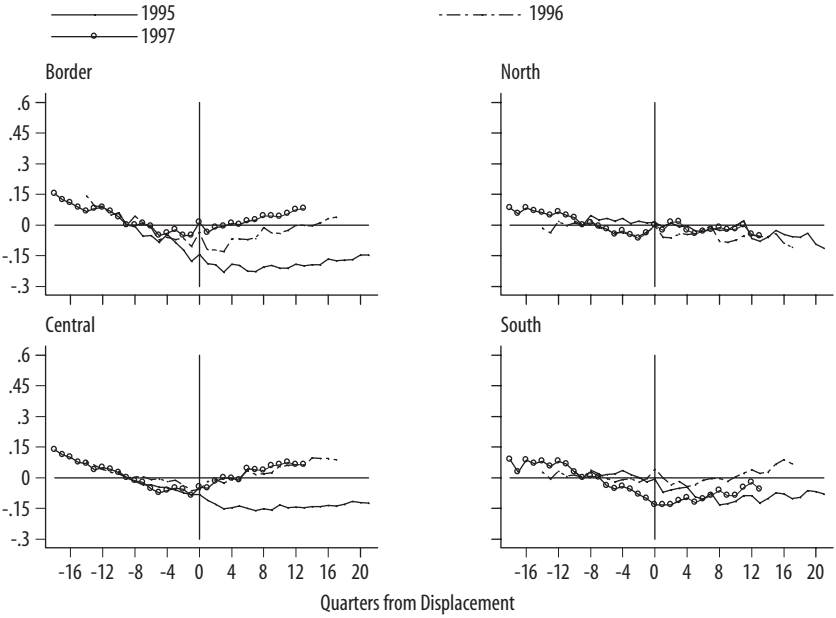
44. The tables are available on request.

45. Appendix B provides a more extensive evaluation of statistical significance and standard errors.

46. These results are also available on request.

47. Jacobson, LaLonde, and Sullivan (1993a, 1993b).

FIGURE 4. Effects of Displacement by Region: Sample ABC1[a]



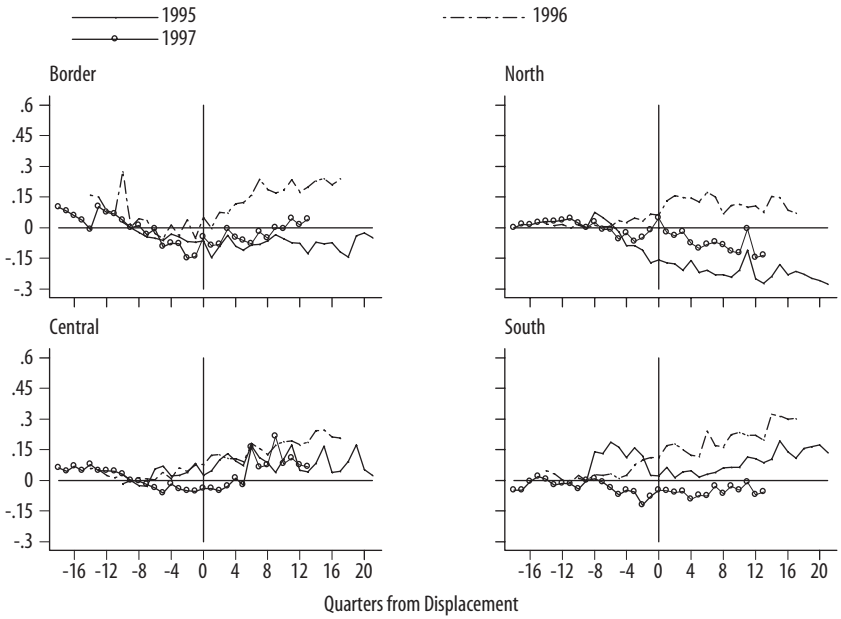
a. The sample is defined as workers who were in the displacing firm for the entire period up until the displacement event, left the firm at the time of displacement, found work in another firm either immediately or after spending some time out of our sample, and then worked in one firm until the end of the sample period (sample ABC1 in the text). Estimated coefficients of the time **x** displacement status effects for displaced workers are from equation 1. Groups A and B were both omitted, so these coefficient estimates represent the difference between the wages of displaced workers and all other workers in the sample. The reference time period is nine quarters prior to the displacement event for each sample.

north show few effects of displacement and fewer of recovery. While the wage trends in the border and central regions become positive at the time of displacement, wage trends remain flat in the north and (to a lesser degree) the south.

The second important message emerging from figures 4 and 5 is that the effects of being displaced in 1995 seem to be permanent, or at least long-lasting. That is, there is little evidence of recovery over the sample period. This is especially true in the border and central regions. The results of being displaced at times of peak unemployment are therefore similar to the findings of Jacobson, LaLonde, and Sullivan.[48] Being displaced at different times generates different results that include positive post-displacement wages.

48. Jacobson, LaLonde, and Sullivan (1993a, 1993b).

FIGURE 5. Effects of Displacement by Region: Sample ABC2[a]

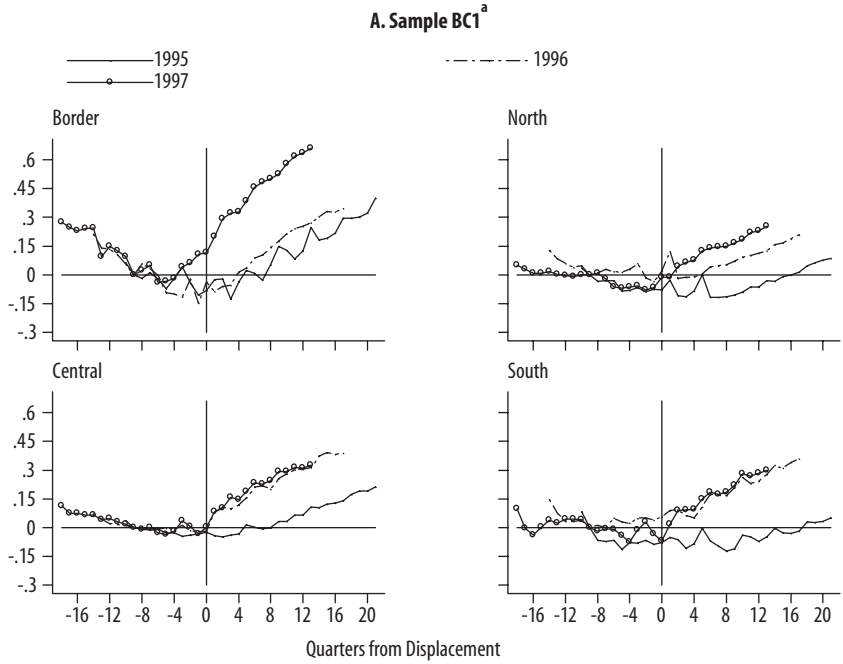


a. The sample is defined as workers who were in the displacing firm for the entire period up until the displacement event, left the firm at the time of displacement, found work in another firm immediately (that is, they spent no time out of our sample), and then worked in one firm until the end of the sample period (sample ABC2 in the text). Estimated coefficients of the time **x** displacement status effects for displaced workers are from equation 1. Groups A and B were both omitted, so these coefficient estimates represent the difference between the wages of displaced workers and all other workers in the sample. The reference time period is nine quarters prior to the displacement event for each sample. The omitted category is workers who were not in displacing firms and remained in the same firm for the entire sample.

The differences between figures 4 and 5 suggest that workers who may not be in the sample in all periods may suffer more serious repercussions from displacement than other workers. In general, workers who were employed immediately did better than workers who were out of the sample for any length of time. The difference between 1995 and 1996 becomes more pronounced in the north and somewhat less pronounced in other regions when we focus on those in the sample in all periods. Even workers who were employed immediately in the north continued to experience falling wages, whereas workers in the dynamic central and border regions did much better when employed immediately.

Figures 4 and 5 compare the wages of displaced workers with all other workers, which allows us to compare our results with other studies in the

FIGURE 6. Effects of Displacement by Region Relative to Workers Who Remained in the Firm



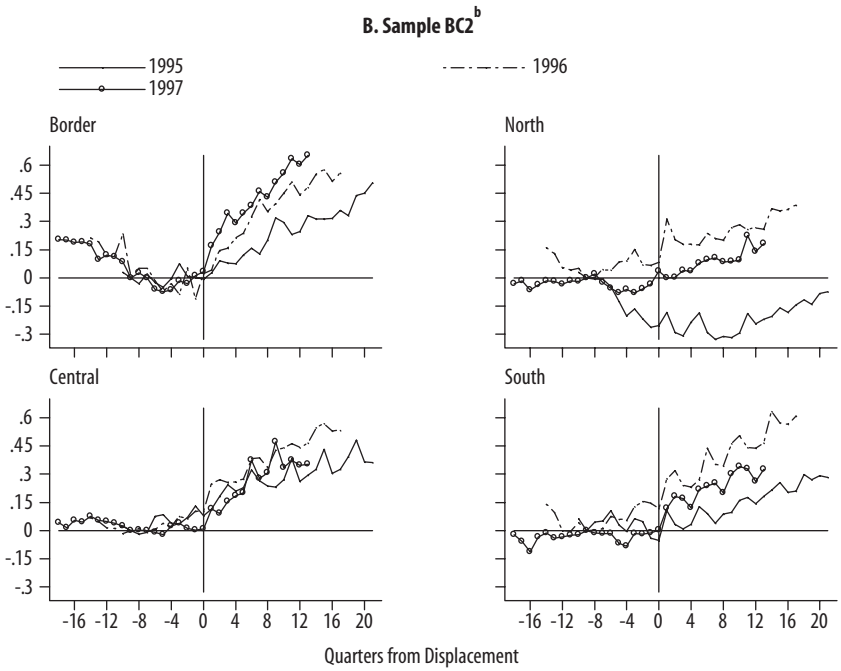
a. The sample is defined as workers who were in the displacing firm for the entire period up until the displacement event, left the firm at the time of displacement, found work in another firm either immediately or after spending some time out of our sample, and then worked in one firm until the end of the sample period (sample ABC1 in the text). Estimated coefficients of the time **x** displacement status effects for displaced workers are from equation 1. Group B was omitted, so these coefficient estimates represent the difference between the wages of displaced workers who remained in the displacing firm. The reference time period is nine quarters prior to the displacement event for each sample.

(*continued*)

literature. We can also divide the comparison groups into nonseparating workers who are in distressed firms and those who are not in distressed firms. Figure 6 contains the results from the comparison of displaced workers with workers who remain in contracting firms for the entire sample.[49] The main result of this comparison is that workers who were displaced experienced large wage gains relative to workers who remained in distressed firms. In nearly every region and every time period, workers who separated from distressed firms experienced higher wages relative to

49. The results from comparisons with workers in nondisplacing firms only are very similar to those described above, so we do not discuss them in detail.

FIGURE 6. Effects of Displacement by Region Relative to Workers Who Remained in the Firm (*Continued*)

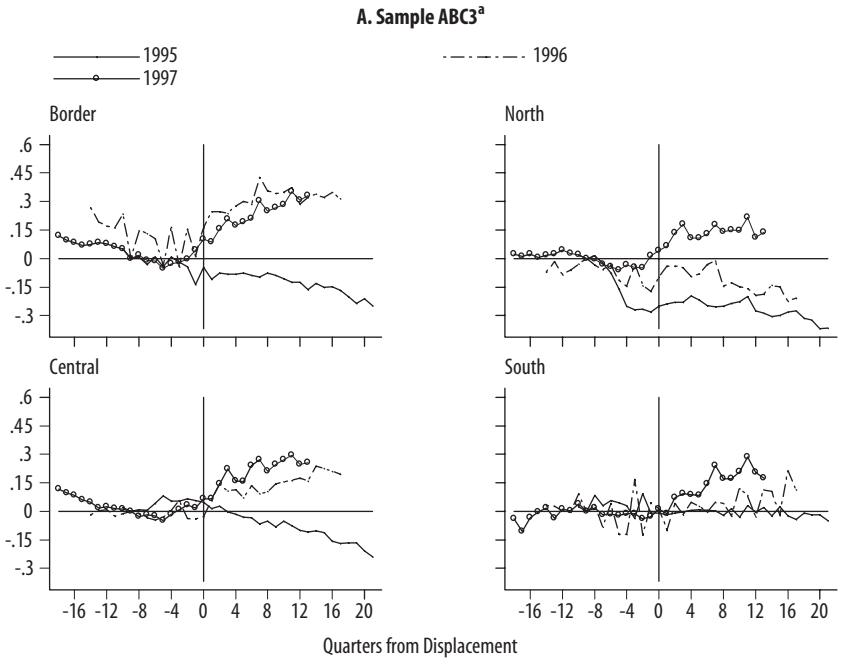


b. The sample is defined as workers who were in the displacing firm for the entire period up until the displacement event, left the firm at the time of displacement, found work in another firm immediately (that is, they spent no time out of our sample), and then worked in one firm until the end of the sample period (sample BC2 in the text). Estimated coefficients of the time **x** displacement status effects for displaced workers are from equation 1. Group B was omitted, so these coefficient estimates represent the difference between the wages of displaced workers who remained in the displacing firm. The reference time period is nine quarters prior to the displacement event for each sample.

workers who stayed behind. This result is consistent with the model presented earlier (specifically, regions II and III of figure 1).

The second result that emerges from figure 6 is that many of the patterns described in the analysis of figures 4 and 5 remain: wages fall prior to displacement and the long-run effects of being displaced in 1995 are less positive than the effects of being displaced in recovery years. Displacement in the border and central regions is followed by higher wages than in the north and south. Workers displaced in 1995 in the north and south took much longer to recover than their counterparts in the border and central regions. As the economy recovered, so did the prospects of displaced workers.

FIGURE 7. Effects of Displacement by Region: Short-Tenure Workers

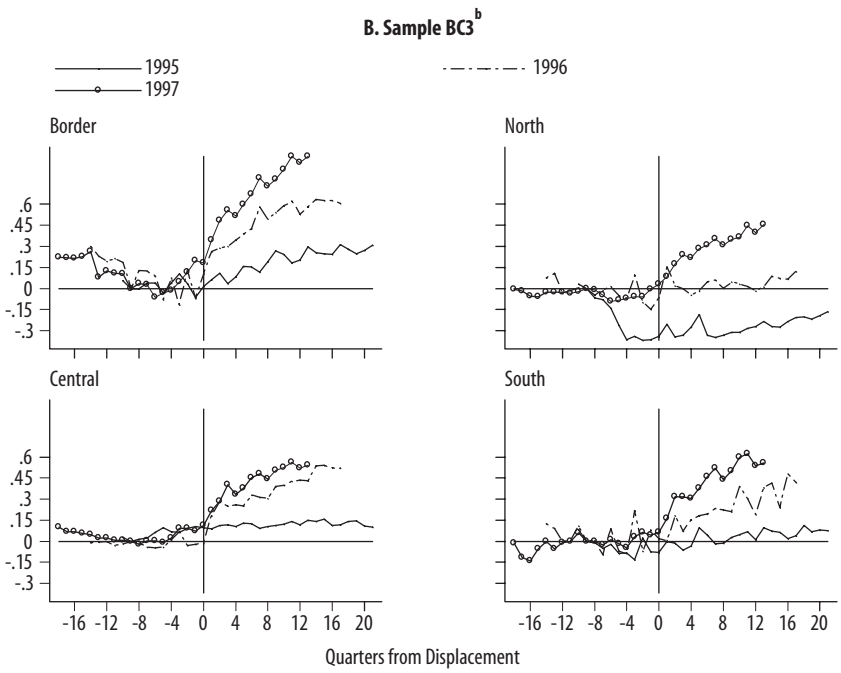


a. The sample is defined as workers who may not have been in the sample for the entire period, who worked at the same (displacing) firm for less than two years prior to displacement, and then worked at one firm following displacement (sample ABC3 in the text). This short tenure contrasts directly with the long tenure of workers in the first group. Estimated coefficients of the time **x** displacement status effects for displaced workers are from equation 1. Groups A and B were both omitted, so these coefficient estimates represent the difference between the wages of displaced workers and all other workers in the sample. The reference time period is nine quarters prior to the displacement event for each sample. The omitted category is workers who were not in displacing firms and remained in the same firm for the entire sample.

(*continued*)

One of the findings in the current literature is that tenure increases the adverse effects of displacement. To investigate the effects of tenure, we created a sample similar to the first except that we dropped all workers with more than two years tenure in the displacing firm. We performed the same empirical exercise using this sample and present the results in figure 7. The results in panels A and B can be directly compared with the results in figures 4 and 6 (panel A). Panel A of figure 7 suggests that short-tenure workers did better than workers with longer tenure. This is consistent with worker training and other hypotheses in the literature. Short-tenure workers displaced in 1995, however, did worse than workers displaced in 1996 and 1997 in the border and central regions, since the

FIGURE 7. Effects of Displacement by Region: Short-Tenure Workers (*Continued*)

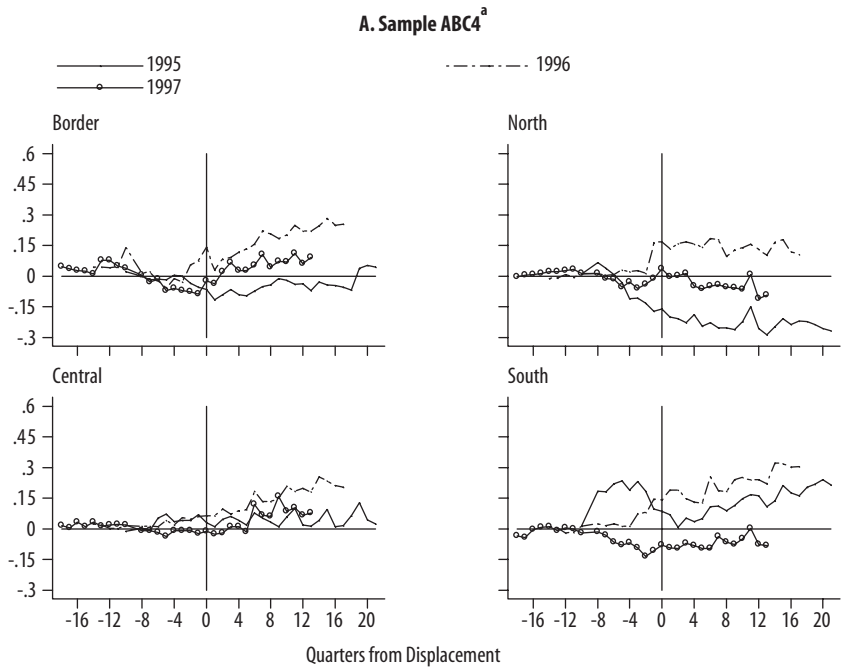


b. The sample is defined as workers who may not have been in the sample for the entire period, who worked at the same (displacing) firm for less than two years prior to displacement, and then worked at one firm following displacement (sample BC3 in the text). This short tenure contrasts directly with the long tenure of workers in the first group. Estimated coefficients of the time **x** displacement status effects for displaced workers are from equation 1. Group B was omitted, so these coefficient estimates represent the difference between the wages of displaced workers who remained in the displacing firm. The reference time period is nine quarters prior to the displacement event for each sample.

latter immediately earned higher wages and the former experienced a downward trend in wages. Time of displacement also induces more heterogeneity in the northern region: short-tenure workers in the north who separated in 1995 did much worse than long-tenure workers who displaced at the same time.

Tenure does not seem to matter when comparing displaced and nondisplaced workers from displacing firms, in the sense that the overall results in figures 6 (panel A) and 7 (panel B) are very similar. Workers in all periods and regions eventually did better than workers who stayed behind. Workers displaced during recovery periods did the best in all regions, and workers displaced in the border and central regions did better than workers in the north and south regardless of tenure. Therefore, differences in

FIGURE 8. Effects of Displacement by Region: Postdisplacement Movers



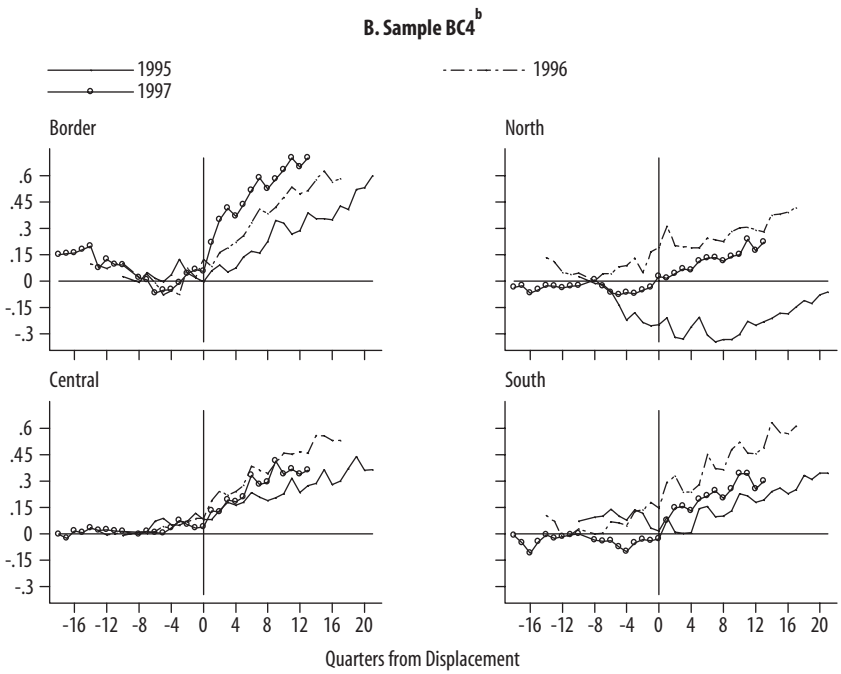
a. The sample is defined as workers who worked in one firm prior to displacement, were in the sample in all periods, and may have worked at several firms following displacement (sample ABC4 in the text). Estimated coefficients of the time **x** displacement status effects for displaced workers are from equation 1. Groups A and B were both omitted, so these coefficient estimates represent the difference between the wages of displaced workers and all other workers in the sample. The reference time period is nine quarters prior to the displacement event for each sample. The omitted category is workers who were not in displacing firms and remained in the same firm for the entire sample.

(*continued*)

the effects of displacement do not seem to be driven by tenure so much as by local labor market conditions.

Figure 8 presents our results for the sample in which workers are allowed to change firms several times following displacement but remain in the sample. We focus on this sample because workers who switch more often may have either lower search costs, which would suggest that their wages would be higher, or less potential to accumulate firm-specific capital, which would suggest that their wages would be lower. The results in panels A and B of the figure suggest that, generally, workers who switch more often may be no less susceptible to the effects of the time of displacement than workers who switch less often. In fact, the results are almost identical to figures 5 and 6 (panel B), respectively, which implies that the results are

FIGURE 8. Effects of Displacement by Region: Postdisplacement Movers (*Continued*)

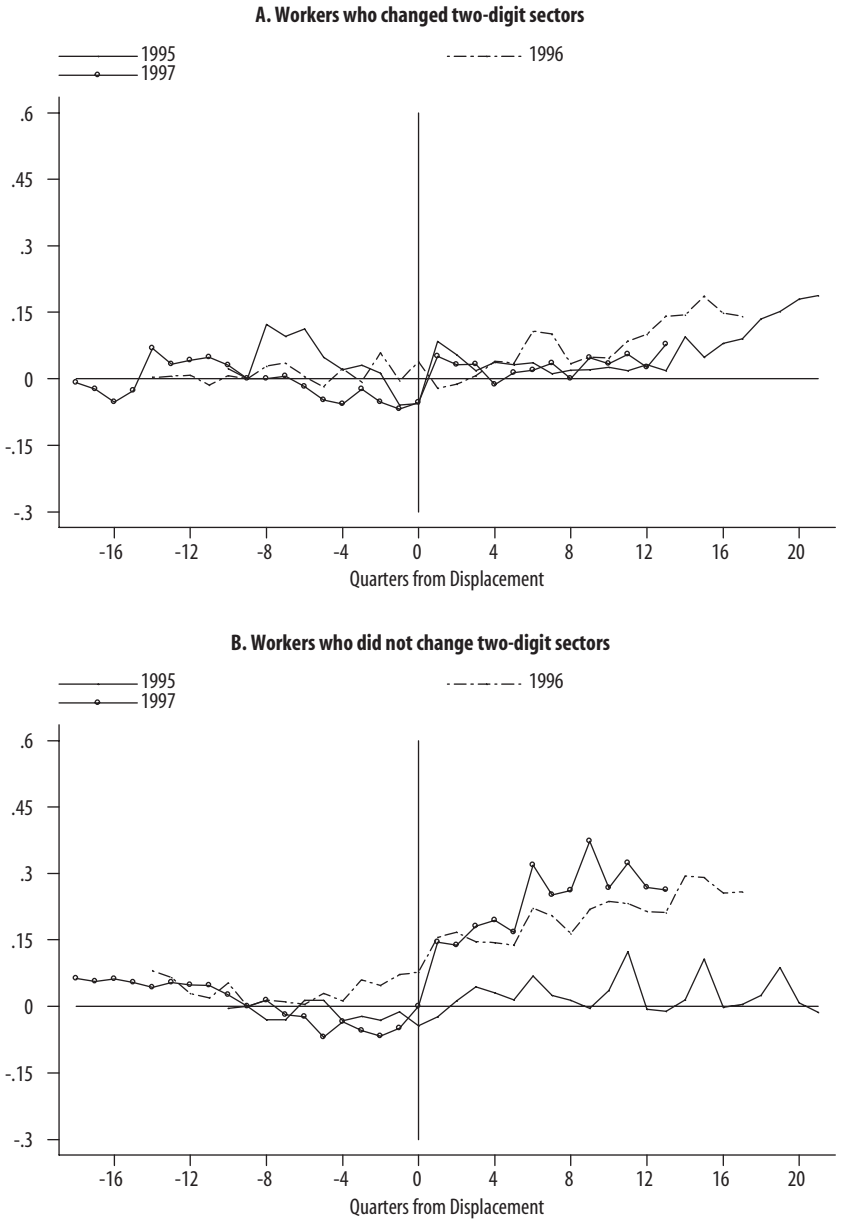


b. The sample is defined as workers who worked in one firm prior to displacement, were in the sample in all periods, and may have worked at several firms following displacement (sample BC4 in the text). Estimated coefficients of the time **x** displacement status effects for displaced workers are from equation 1. Group B was omitted, so these coefficient estimates represent the difference between the wages of displaced workers who remained in the displacing firm. The reference time period is nine quarters prior to the displacement event for each sample.

not driven by the restriction that workers stay in the same firm for the remainder of the sample. Overall, the regional and temporal heterogeneity seem to matter more than the worker's switching cost.

One of our concerns about displacement is that workers may lose specific human capital. This problem may increase with the degree of change a worker experiences from the original position. To consider some of the potential effects of the loss of such capital, we differentiated the effects of displacement for workers who remained in the same two-digit sector and those who changed sectors. To isolate the comparison, we focused on sample ABC4, which is the sample in which workers are observed for all periods but may change firms more than once following displacement. We then created an indicator variable based on whether the worker changed sectors at the time of displacement. The results are presented in figure 9.

FIGURE 9. Sectoral Effects of Displacement



Panel A compares workers who change sectors and all other workers, while panel B compares workers who remain in the same sector and all other workers. For these regressions, we pooled all of the regions and controlled for region-specific effects using regional dummy variables.

As in previous studies, our results suggest that Mexican workers experience some loss to capital from changing sectors or, perhaps more precisely, a gain from remaining in the same sector. Workers who changed sectors at the time of displacement do not seem that much different from other workers for the majority of the sample. Displaced workers who remained in the same sector, however, follow a pattern similar to those workers in previous samples. Wages fell prior to displacement, and rose following displacement if the workers were displaced after 1995.

As an additional robustness check, we considered all of the samples and results described above using a contraction of 30 percent, rather than 60 percent, as our criterion for identifying displacing firms. If selection bias severely affects our sample, then the bias would be larger with firms under the 30 percent contraction criterion, because workers leaving firms that contract by 30 percent would probably include a higher proportion of voluntary separations. These results are nearly identical numerically and qualitatively to the results presented above.[50] We find no evidence of a rising problem of selection bias when we expand the sample. This may be due to the fact that we include individual-specific fixed effects in all of the regressions, and these effects may effectively be capturing unobserved characteristics that are correlated with ability and other features that could drive selection bias. This result, along with the fact that we follow established approaches designed to minimize selection bias, leads us to believe that selection bias does not significantly drive our results.

Conclusions

Given limited resources and a desire to support displaced workers, policymakers could increase the efficiency of support programs if they targeted aid when and where it is needed most. Studies on the effects of displacement on wages have generated a wide range of results, but they do little theoretically or empirically to formally explain the underlying sources of this heterogeneity. Previous studies suggest that differences in institutions,

50. The results are available on request.

inequality, or labor market conditions might explain the results, but no study that we are aware of compares these possibilities using matched worker-firm data over time.

In this paper we examine the costs of displacement to workers using an administrative data set that allows us to follow workers over thirty-two quarters and four regions that vary significantly in labor market conditions. By following an established empirical methodology to estimate postdisplacement wages, we focus on the differences in institutions, inequality, and labor market conditions in a single study in an attempt to understand the difference in results.

Several findings emerge. First, our results exhibit the same heterogeneity found in the current literature. We find a range of postdisplacement experiences from negative (such as those documented by Jacobson, LaLonde, and Sullivan) to positive (such as those documented in Kuhn).[51] Since inequality and institutions (unions) are similar throughout Mexico but the empirical results vary through time and space, we therefore conclude that our analysis provides little support, if any, for the institutional explanation. This conclusion is further backed by international comparisons. If national institutions alone explained the differences in results between Germany and the United States, we would expect to see little heterogeneity within Mexico rather than the very wide range of results we find.[52] Furthermore, if France and Germany have positive postdisplacement because wages are more compressed than in the United States, then we would expect the displacement effects in Mexico to be mainly negative because Mexico's inequality is greater than that of the United States. Instead, we find much heterogeneity in the results, with many instances of positive postdisplacement wages.

We conclude that differences in local labor market conditions (over both space and time) are most consistent with our results. We do find large, negative, and lasting effects of displacement on wages for workers who are displaced during times of high unemployment and in less economically active regions.[53] Postdisplacement wage changes are typically zero or positive in good times and in the most economically active regions. This

51. Jacobson, LaLonde, and Sullivan (1993a, 1993b); Kuhn (2002).

52. The difference in the results of Jacobson, LaLonde, and Sullivan (1993b) and Abbring and others (2002), which both focus on the United States, also weighs against the institutional explanation.

53. Jacobson, LaLonde, and Sullivan (1993b) find similar results.

is similar to recently documented patterns in France, Germany, and the United States.

Our results are robust to changes in the definition of displaced worker. For example, we consider the implications of displacement for workers who may not be employed immediately following displacement, workers who are employed after possibly being outside the labor force, workers with different levels of tenure, and workers who change sectors. Our results are generally consistent with other studies that focus on tenure and sectoral changes. We also explore different reference groups and find strong and consistent evidence that displaced workers earn significantly higher wages than their coworkers that were left behind, which seems consistent with a very simple theoretical model and Kuhn's reminder that comparison group matters.[54]

We also find that of our four regions (the border, the north, central Mexico, and the south), the border region has the displacement wage pattern most like that of the United States. Other studies have shown that labor markets in this region are the most integrated with the United States, so this similarity may not be surprising. The main example of this is the decline in wages prior to displacement documented by Jacobson, LaLonde, and Sullivan.[55] This feature is not present in all regions or at all times of displacement in Mexico, but it emerges most frequently in Mexico's border region.

The main policy recommendation that emerges from our results is that targeting aid to displaced workers during recessions and in less economically active areas has potentially significant efficiency gains. These workers tend to suffer larger and more lasting adverse effects from displacement than other workers, which suggests that targeted aid may be especially valuable. This recommendation clearly assumes that behavior does not change with policy. But clearly, potential changes in behavior must be taken into account when considering changes to policy.

Appendix A: Age, Displacement, and Attrition

We formally compared the ages of displaced workers and workers who left our sample. We are concerned about any difference in age because it

54. Kuhn (2002).
55. Jacobson, LaLonde, and Sullivan (1993a, 1993b).

could affect our results through a sort of selectivity bias. If workers who left the sample are systematically younger than the workers who stayed, for example, then the remaining workers' wages may appear higher simply because these were older workers with more experience.

The results illustrate several points. First, workers in displacing firms are generally younger than workers in nondisplacing firms. The age of displaced workers is not statistically different from that of workers who remained in displacing firms for 1995 and 1996, although the point estimates suggest that displaced workers were slightly older. In 1997, displaced workers were younger than workers who remained in displacing firms, and the difference (about 1.32 years) is statistically significant.

Second, we find that workers who left the sample were significantly younger than workers who remained in the sample. As discussed in the text, this seems to be consistent with other papers that find relatively high rates of entrepreneurship in the informal sector. Our results may be biased downwards (upwards) if these workers earn higher (lower) wages, on average, than workers in the formal sector. These results are shown in table A1.

TABLE A1. Age Comparisons across Samples[a]

	Age		
Explanatory variable	*1995*	*1996*	*1997*
Age and attrition			
Always in sample	2.308	5.814	6.174
	(0.215)**	(0.129)**	(0.146)**
Constant	32.503	30.937	30.313
	(0.032)**	(0.031)**	(0.029)**
No. observations	112,032	116,437	136,321
R^2	0.00	0.02	0.01
Age relative to displaced workers			
All other workers	2.222	1.034	2.186
	(0.207)**	(0.140)**	(0.152)**
In displaced firms	–0.108	–0.171	1.324
	(0.230)	(0.183)	(0.193)**
Constant	34.811	36.751	36.487
	(0.191)**	(0.116)**	(0.130)**
No. observations	23,711	26,537	24,579
R^2	0.01	0.00	0.01

*Statistically significant at the 5 percent level; ** statistically significant at the 1 percent level.

a. Standard errors are in parentheses.

We used two main approaches to address this issue. First, we included age and individual-specific fixed effects in our wage regressions to control for differences in age. Second, we explored the robustness of our results to different samples. The basic patterns emerge in all samples, regardless of how we control for experience or attrition. Changing samples affects the absolute, but not the relative, magnitude of our results.

Appendix B: The Statistical Significance of the Differences

We undertook a simple analysis to determine whether the differences between regions and periods are statistically significant. Given our large sample sizes, the standard errors are generally quite small, suggesting that the differences between regions and periods are often statistically significant. For example, figure B1 graphs the 95 percent confidence intervals for the estimates of the three periods (1995, 1996, and 1997) for the border region graph in figure 4. The graph suggests that the differences across periods are probably not statistically significant prior to displacement, but clear

FIGURE B1. Ninety-Five Percent Confidence Intervals for the Border Region in Figure 4

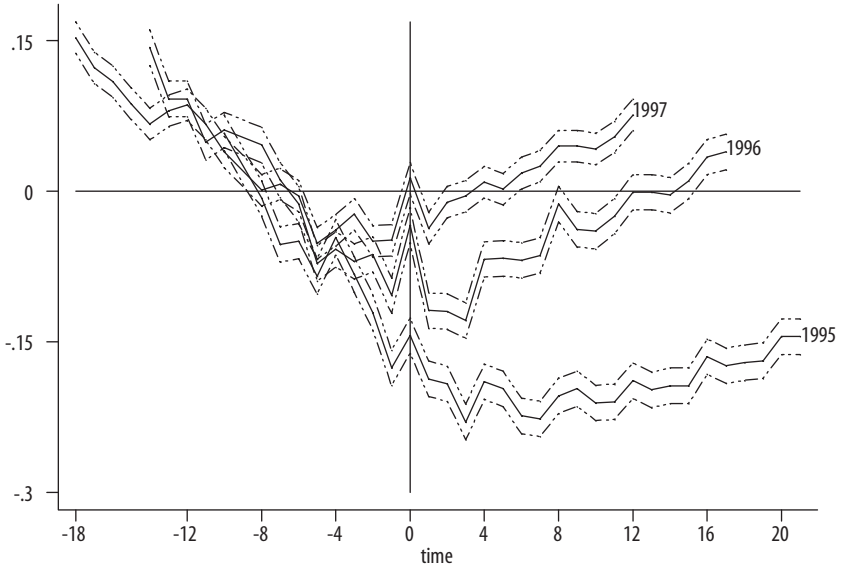
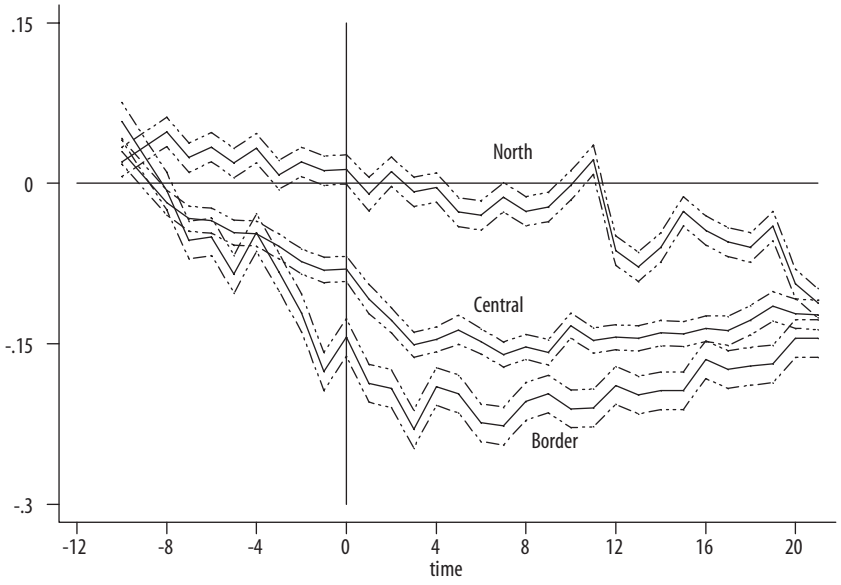


FIGURE B2. Ninety-Five Percent Confidence Intervals for Three Regions in the 1995 Sample in Figure 4



differences emerge after displacement. With regard to differences across regions, figure B2 graphs the effects of displacement in 1995 for the border, north, and central regions from figure 4 with the 95 percent confidence intervals. The differences between the lines again suggest that the differences between regions are statistically significant, especially in the post-displacement period.