

# LABOR MARKET OLIGOPSONISTIC COMPETITION: THE EFFECT OF WORKER IMMOBILITY ON WAGES

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## Abstract

We describe a wage renegotiation model which predicts that workers who face positive mobility costs receive wage offers that are lower than the competitive wage from their employers. However, the firm's ability to exploit worker immobility in its wage setting behavior declines in the competitiveness of the local labor market. We test the model using measures of individual mobility costs and of labor market competition, at the metropolitan area level, by occupation. Individual mobility costs have a significant negative effect on wages, especially for workers in small markets, and in occupations where individual wage bargaining is more likely to occur.

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## **1. Introduction**

Workers face important monetary and psychic costs of moving across locations. Since migration is costly, worker moving decisions depend on whether the observed wage disparity between the destination and the origin suffices to cover the costs of moving. So, the presence of mobility costs may explain why workers choose to stay in low-wage local markets, instead of migrating to markets that offer higher wages. Although researchers in many disciplines - economics, sociology, psychology - concur that worker migration decisions are multidimensional and are greatly affected by individual mobility costs, rarely have they asked whether such costs influence the wage setting behavior of employers.

In this paper, we examine if employers in a local labour market exploit worker mobility costs in their wage setting behavior. Specifically, we suggest that firms in a metropolitan area have an incentive to offer workers with positive mobility costs wages that are lower than their marginal product. Such exploitation is possible since workers with positive mobility costs may be willing to accept lower wages to stay in their current market rather than move to another location and pay the associated mobility costs.

If employers have wage bargaining power on account of worker mobility costs, that power would decline in the intensity of the local labour market competition. For example, in a monopsonistic market, the firm faces no local competition, so the local monopsonist is in position to exploit immobile workers and offer them lower wages. On the other hand, in a market with a large number of employers, labour market competition would drive wages for immobile workers to their marginal product, so no exploitation of worker immobility would be possible. In addition, wage discrimination based on worker immobility would be less feasible against workers in unionized occupations, where wages are collectively bargained. In general, we expect

workers with positive mobility costs to have lower wages, especially in less competitive metropolitan areas, and in occupations with weak union presence.

A number of empirical exercises are produced to test this idea. We construct a measure of worker mobility costs using worker characteristics that capture individual immobility and measures of local labour market competition at the metropolitan area level based on occupation. These measures are used to estimate the effect of worker immobility and local labour market competition on wages. Empirical results show that wage discrimination based on worker immobility causes substantial wage variation across equally productive workers in small, weakly competitive metropolitan areas. Our results also show that immobile workers earn substantially lower wages in less competitive markets than what they would earn in large, competitive markets, where firms have limited wage setting power. Finally, the negative effect of worker immobility on wages is lower for workers in highly unionized occupations, where wages are collectively bargained.

## **2.1. Background**

Under perfect competition, wage disparities across workers are explained by differences in their accumulated human capital and innate ability (Schultz, 1961; Mincer, 1974; Becker, 1993). Empirically, researchers have used variation in worker productive characteristics, such as education and labour market experience, to explain wage differences, most notably across gender and racial groups. Altonji and Blank (1999) provide an extensive review of this literature.

Wage disparities are also explained in a hedonic environment, through compensating differences. According to the hedonic wages theory, if jobs provide different levels of attributes, high-amenity jobs will offer lower wages (Rosen, 1986). There is substantial empirical work suggesting that wages differ across employers due to heterogeneity in working conditions

(Dorsey and Walzer, 1983; McNabb 1989; Dorman and Hagstrom, 1998), and location amenities (Roback, 1982; Blomquist et al, 1988).

Both lines of work assume that the labour market is perfectly competitive, and they have been successful in explaining portions of the observed wage disparities across workers, within and across locations. However, there is evidence that labour supply to one employer is not always infinitely elastic, as the competitive model requires, and employers may have an active role in wage setting. Card and Krueger (1994) conclude that an increase in the minimum wage does not reduce employment, a finding that is inconsistent with the competitive model. Krueger and Summers (1987, pp. 18-47) note the persistence in wage differences across observably identical workers between industries and conclude that market failures may be a reason for that persistence.<sup>1</sup> Furthermore, a positive relationship between wages and firm size is found in numerous papers in the literature. Brown and Medoff (1989) show that this relationship persists even after accounting for differences in worker quality and working conditions.

Models of classic monopsony (Bronfenbrenner, 1956) could explain some of this curious empirical evidence. For example, in a monopsonistic market, a carefully selected minimum wage leads to an increase in employment levels. A monopsony model can also explain wage variation that is not accounted for by differences in worker productivity. If a monopsonist observed non-productive worker characteristics, which could be used to sort workers into different labour supply elasticity groups, the monopsonist would offer lower wages to workers who are less responsive to marginal wage changes (classic monopsonistic wage discrimination).

Pure monopsonies rarely exist in the real economy, so the above explanations are of little relevance. However, researchers have explored whether monopsonistic or oligopsonistic

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<sup>1</sup> The authors note (p. 42): “Our conclusion that the inter-industry wage structure cannot plausibly be interpreted as a competitive outcome, has significance for both micro and macroeconomic issues”.

behavior is possible even in markets with a large number of employers.<sup>2</sup> For example, if firms differ along dimensions that affect worker utility, then firms with higher levels of the desirable characteristic enjoy an upward sloping labour supply (Boal and Ransom, 1997). Also, Bhaskar and To (1999) show that, in a perfectly competitive market, firm differentiation could explain how an increase in the minimum wage may raise employment levels.

Black and Loewenstein (1991) introduced the possibility that a lone firm in a local market is in position to exploit worker mobility costs. The authors note that a worker facing mobility costs in a monopsonistic market may accept the wage offer she receives from the monopsonist, or reject the offer, move to another market, and pay the associated mobility costs. As a result, the monopsonist chooses to offer such workers wages that are lower than their marginal product, while it offers zero-mobility cost workers wages that equal their marginal product. This prediction contradicts the perfect market outcome and provides intuition on how wage discrimination based on worker mobility costs may occur.

Ransom (1993) uses a similar intuition to attribute the negative returns to tenure for college professors to low geographic mobility. He suggests that since colleges are geographically isolated they can exploit professors with positive mobility costs by offering them lower wages late in their careers.

## **2.2. Exploitation of Worker Immobility in Setting Wages**

The Black and Loewenstein (1991) and Ransom (1993) models describe the market for college professors, in which some employers are geographically isolated. In this section, we extend the intuition of this work to understand more generally under which conditions employers in a local labour market may exploit worker mobility costs in their wage setting behavior.

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<sup>2</sup> See Bhaskar, Manning, and To (2002), and Boal and Ransom (1997) for literature reviews.

Suppose that firms in a local labour market (i.e. a metropolitan area) observe worker characteristics signaling whether the worker faces positive costs of moving to another location. Using observed mobility cost signals, firms would be able to sort workers in different mobility cost groups based on perceived immobility. For example, workers may value working in their birthplace and married workers may appreciate living in their spouse's place of birth. So, firms will expect local workers to be less willing to move to another market than non-locals. In addition, firms will expect married local workers whose spouses were born in the same location to be less mobile than unmarried local workers. In contrast, unmarried non-local workers are expected to be highly mobile.

If firms observe such worker characteristics, they will know which workers may be willing to accept lower wages to avoid moving to another market. So, firms will have an incentive to offer workers with positive mobility costs wages that are lower than their marginal product. Wage offers will be even lower for workers in high mobility cost groups. In the above example, wages offered to local workers will be lower than their marginal product and wages for married local workers whose spouses were born in the same location will be lower still.

Since workers with positive mobility costs may accept lower wages to avoid moving, firms would obtain greater profits from hiring them. This means that if there were multiple firms in the local market, they would all compete to hire such workers. So, the higher the number of firms in a local market, the more intense the competition to hire immobile workers will be, leading to higher wages. In other words, the wage setting power firms enjoy due to worker immobility would decline in the intensity of the local labour market competition.

Let us consider a local labour market with only one employer. A worker in such market will accept the offer he receives from the monopsonistic firm or move to another market and pay

the associated mobility costs. As a result, in the absence of local competition, the monopsonist is in position to offer immobile workers lower wages. In an oligopsonistic market, where there is more than one employer, all firms would compete for workers who are perceived as having positive mobility costs. Competition would push wages for immobile workers up and would limit, but not eliminate, the ability of local employers to exploit worker immobility in setting wages. As a result, immobile workers in an oligopsonistic market would receive wage offers that are lower than their marginal product but higher than the monopsonistic wage rate.

On the other hand, in a perfectly competitive local labour market (i.e. a market with a large number of firms) firms will not be able to exploit worker mobility costs. The intensity of the local competition to hire immobile workers would push wages for such workers to their marginal product, eliminating wage discrimination based on worker immobility.

In summary, in the presence of worker mobility costs, firms in a local market may exploit workers with positive mobility costs by offering them lower wages. However, the wage setting power employers enjoy would diminish in the competitiveness of the local market; only firms in weakly competitive markets will be able to exploit worker immobility. This scenario has two important implications. First, unexplained wage differences across workers may be accounted for by characteristics reflecting worker immobility, especially in less competitive markets. Second, a portion of the wage premium in large metropolitan areas may be partially due to the lower wage setting power firms in large markets enjoy compared to firms in smaller metropolitan areas.

This intuition implies that the wage equation for a worker in mobility group  $i$  in location  $k$  is:

$$W_k^i = W(C^i, F_k) \tag{1}$$

$C^i$  is the expected mobility cost for workers in mobility group  $i$ ; groups are defined based on observed worker immobility characteristics (e.g. worker is local, married worker whose spouse is local).  $F_k$  is the number of employers in market  $k$ . Wages are a decreasing function of  $C^i$  ( $\frac{dW_k^i}{dC^i} < 0$ ), meaning that workers who are perceived as being less mobile receive lower wages. Also, the number of firms in the market positively affects wages directly ( $\frac{dW_k^i}{dF_k} > 0$ ) and through its interaction with  $C^i$  ( $\frac{d^2W_k^i}{dC^i dF_k} > 0$ ). The direct effect of the number of firms on wages reflects the well-documented market size wage premium (size effect), while the interaction effect reflects how local competition reduces the ability of firms to exploit worker immobility in setting wages (competition effect).

Since workers perceived as being immobile receive lower wage offers, only those with high actual mobility costs would accept a lower wage to avoid moving. Let the actual mobility costs for worker  $j$  be  $c_j$  and the worker's marginal product be  $p$ . If the worker is in mobility group  $i$ , location  $k$ , he will receive a wage offer equal to  $W_k^i$  from firms in location  $k$ . So, the worker will choose to stay in location  $k$  only if  $W_k^i \geq p - c_j$ . This means that, within mobility cost group  $i$  (i.e. among workers who are offered  $W_k^i$ ), only workers with high actual mobility costs ( $c_j$ ) will accept the lower wage and stay. This result is amplified in smaller, less competitive labour markets, where wage offers for immobile workers are lower.

Finally, we expect wage discrimination based on worker immobility to be less likely to apply for workers in highly unionized occupations, where wages are collectively bargained. In the presence of a union, it would be hard for employers to engage in wage discrimination based

on worker non-productive characteristics, so the negative effect of worker immobility on wages should be lower for workers in occupations with a strong union presence.

### **3. Empirical Evidence**

Testing whether worker immobility and local labour market competition affect wages entails a number of challenges. First, we need appropriate measures of worker mobility costs. Second, we need measures of local labour market competition that capture the variation in local competition based on occupation across metropolitan areas. In the next sections, we describe the data used to construct such measures and present the empirical results.

#### **3.1. Data**

We use the 5 percent Public Use Micro Sample (PUMS) of the 2000 Decennial Census, which reports worker demographic, geographic, and employment characteristics. The sample is constrained to full-time employed males, ages 35 to 64, who live in a metropolitan statistical area (MSA). Table 1 provides a description of the sample. This data fits well with the empirical purpose of this paper for two reasons. First, it contains a large number of observations by occupation, for 283 U.S. metropolitan areas. Second, it contains worker characteristics that can be used to construct an appropriate measure of worker mobility costs.

Two data sources are used to construct measures of metropolitan area competition, by occupation. We use the 2000 County Business Patterns (CBP), which reports the number of firms in each MSA, overall and by industry. In addition, the unpublished long form of the 2000 Decennial Census data is used to construct a measure of market concentration, by occupation.<sup>3</sup>

#### **3.2. Constructing a Measure of Worker Mobility Costs**

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<sup>3</sup> This measure is then attached to the publicly available 5% PUMS for the regression analyses. We have the consent of the U.S. Census Bureau to publish analysis that involves the aforementioned measure.

We identify observable worker characteristics that are positively correlated to worker immobility and uncorrelated with unobserved ability, based on which employers can sort workers into mobility cost groups.<sup>4</sup> Previous research suggested people suffer important psychic costs of moving away from their birthplace. Sjaastad (1962) suggests that one would be reluctant to migrate out of his birthplace, since he would lose the social network he enjoys there. Speare et al (1982) comment, “*Households with strong bonds to an area are more likely to seek a solution which enables them to stay in the area*”.<sup>5</sup> So, we expect that an individual that works in his (or his spouse’s) state of birth, is less likely to move to another location, relative to others.

Other researchers find that individuals consider their spouse’s labour force status and earnings when facing relocation decisions (Sandell, 1977; Mincer, 1978). Sandell (1977) finds that a family is less mobile when the spouse is also employed, while Bartel (1979) shows that individual migration propensities are higher when the spouse is not in the labour force. Bielby and Bielby (1992) find that family migration probabilities are lower when both spouses are working. So, we expect a married worker with a working spouse to be less mobile relative to a single worker or to a married worker whose spouse is not in the labour force. It is also reasonable to expect workers with a disabled child to be less mobile than others.

These characteristics are reported in the 2000 PUMS and can be used to construct a measure of worker mobility costs that captures individual immobility. Table 2 shows that, in 2000, 48.7 percent of workers in the sample were living in their state of birth (*State of Birth, 2000*) and 37.9 percent were living in their spouse’s state of birth (*Spouse State of Birth, 2000*).

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<sup>4</sup> There are two types of relocation costs: monetary and non-monetary (or psychic). Monetary costs only occur once, at the time of the relocation, whereas psychic costs persist even after relocation. In our analysis, we primarily consider characteristics that capture psychic relocation costs.

<sup>5</sup> The authors find using panel data for workers in Rhode Island that migration probabilities decline significantly in the proportion of relatives and friends that the person has in the area.

Also, 45.3 percent of workers in 2000 had a working spouse (*Spouse Works FT, 2000*) and 2.4 percent had a disabled child (*Child Disabled, 2000*).

In order to construct an appropriate mobility cost measure using these characteristics, we have to account for the fact that they probably do not equally affect the probability of moving across MSAs. Using the 2000 PUMS we can produce reasonable estimates of the effects of these characteristics on the probability of moving. Specifically, the data reports the respondents' MSA of residence at the time of the survey, while for a number of respondents it reports their MSA of residence in 1995. So, we can estimate the relationship of the mobility cost indicators outlined above with the probability of moving across MSAs between 1995 and 2000. The estimated probability effects will then be applied to the worker's characteristics in 2000 in order to construct a measure of worker immobility.

To estimate the relationship between the mobility cost indicators and the migration decision, we need to know which of these characteristics applied to the workers in the sample in 1995. The data reports whether the worker was living in his state of birth in 1995 (*State of Birth, 1995*) and the age of his children, so we know if the worker had a disabled child in 1995 (*Child Disabled, 1995*). However, there are two issues that complicate the measurement of *Spouse State of Birth, 1995* and *Spouse Works FT, 1995*. First, although the data reports whether the worker and his spouse were living in the spouse's state of birth in 1995, it does not report whether the worker was married to his 2000 spouse in 1995. Second, the data does not report the work status of the spouse in 1995.

Regarding the first issue, we expect that most married men between the ages of 35 and 65 in 2000 were also married in 1995.<sup>6</sup> If the worker was married in 2000 and was living in his

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<sup>6</sup> Using information from a report published by the Census Bureau ("Number, Timing, and Duration of Marriages and Divorces: 2001", Household Economic Studies, February 2005), we estimate that only 8.3 percent of married

spouse's state of birth in 1995 is a reasonable indication that a married worker in 2000 was living in his spouse's state of birth in 1995. But to further reduce the measurement error, we set *Spouse State of Birth, 1995* equal to 1 only if all of the following three conditions apply; worker was married in 2000, the spouse was living in her state of birth in 1995, and the worker and his spouse were living in the same MSA in 1995. Otherwise, *Spouse State of Birth, 1995* is equal to 0. By applying the restriction that the worker had to be living in the same MSA in 1995 as his spouse, further reduces the error in measuring *Spouse State of Birth, 1995*, making it a reliable measure for the purpose of this paper.

Since the data does not report if the spouse was working in 1995, constructing *Spouse Works FT, 1995* is not straightforward either. Using a similar approach as above, we set *Spouse Works FT, 1995* equal to 1 only if all of the following conditions apply; worker was married in 2000, the worker and spouse were living in the same MSA in 1995, the spouse worked full time in 2000, the spouse was not attending school in 2000, and the spouse's age in 2000 exceeded her years of schooling by at least 5 years. The first two conditions maximize the possibility that the worker was married to his 2000 spouse in 1995, while the latter three conditions maximize the possibility that a working spouse in 2000 was also working in 1995. These restrictions reduce the error in constructing *Spouse Works FT, 1995* and make it a reliable measure for our analysis.

Table 3 reports the marginal probability effects of the 1995 mobility cost indicators on the likelihood of being a mover, as estimated by probit models, and controlling for other available demographic characteristics. Those who worked in their state of birth in 1995 (*State of Birth, 1995*) were about 11 percentage points less likely to move across MSAs relative to their counterparts. The estimated marginal probability effect for *Spouse State of Birth, 1995* is 6.5

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men between the ages of 35 and 65 in 2001 were not married in 1996. These estimates were produced using the marriage and divorce rates by age group and gender in Tables 1 and 3 of the aforementioned report.

percent while for *Spouse Works FT, 1995* is 7.4 percentage points.<sup>7</sup> Finally, workers with a disabled child were 1.5 percentage points less likely to move than others. All estimates are statistically significant at the 1 percent level.

These estimates show that these characteristics are reasonable indicators of individual mobility costs, so it is appropriate to use them to construct a measure of worker immobility. Specifically, we construct a mobility cost index (MCI) that is simply the weighted sum of all mobility cost characteristics in 2000 (each weighted by the probability effect in specification 3 of Table 3) divided by the sum of the probability effects. So, the MCI for worker  $j$ , is:

$$MCI_j = \{ .112*(State\ of\ Birth,\ 2000) + .065*(Spouse\ State\ of\ Birth,\ 2000) + .074*(Spouse\ Works\ FT,\ 2000) + .015*(Child\ Disabled,\ 2000) \} / (.266) \quad (2)$$

By construction, MCI is bounded between 0 and 1, and is higher for workers who share characteristics that are strongly connected to worker immobility.<sup>8</sup> Table 4 presents select mobility cost groups, where each group includes workers who lie on different percentiles of the MCI distribution, showing the variation in the values of MCI. For example, workers in group 1 (no immobility characteristics) have a zero MCI, while workers in group 4 (*State of Birth, 2000=1, Spouse State of Birth, 2000=1*), have an MCI equal to .665. The sample variation in the values of MCI allows its use as a measure of worker immobility in our regression analysis.

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<sup>7</sup> The adjustments made in measuring *Spouse State of Birth, 1995* and *Spouse Works FT, 1995* limit but do not eliminate the measurement error. The remaining error may lead to the underestimation of the negative probability effects of *Spouse State of Birth, 1995* and *Spouse Works FT, 1995* on the probability of moving across MSAs between 1995 and 2000.

<sup>8</sup> Since *Spouse State of Birth, 1995* and *Spouse Works FT, 1995* are measured with some error, the estimated effects of these characteristics on the probability of moving are underestimated. The goal of obtaining these estimates is simply to produce a weighting scheme when constructing the MCI so that we account for the different effect that immobility characteristics may have on the probability of moving. So, the only consequence of the measurement issues is the underrepresentation of *Spouse State of Birth, 2000* and *Spouse Works FT, 2000* in MCI, relative to *State of Birth, 2000* and *Child Disabled, 2000*. This does not affect in any significant way the interpretation of the empirical analysis that follows.

There is a concern that the most important component of MCI, *State of Birth*, may be correlated with unobserved ability. For example, it may be true that workers who work in their state of birth lack the skills or entrepreneurship to seek job opportunities in other locations that have higher wages. If so, living in one's state of birth is a signal of low mobility but it may also be a signal of low skills. Using our empirical results, we will explain why MCI predominantly captures worker immobility rather than unobserved ability.

### **3.3. Measures of Local Labour Market Competition**

In order to capture the variation in labour market competition across MSAs and within a MSA, by occupation, we construct measures of local labour market competition at the MSA level, by occupation. Using the 2000 CBP, we have two straightforward measures of local competition: the total number of firms in the MSA, and the total number of firms in the MSA, by 2-digit NAICS industry. Table 5 summarizes the CBP data for the MSAs in our sample.

The total number of firms in a MSA is an appropriate measure of MSA-level competition for some occupations (e.g. administrative support, transportation, and cleaning and maintenance occupations). However, using the total number of firms to measure competition implies that labour market competition in a given MSA is the same across all occupations. The number of firms, by industry, is appropriate to measure competition for occupations like college professors and health care professionals. But use of this measure implies that industry-level competition reflects occupation-level competition at the MSA level. So, even though the numbers of firms, overall and by industry, are good measures of local competition, neither fully captures the variation in local competition for all occupations, within and across MSAs.

To construct a measure that accounts for the number of employers in each MSA and for within-MSA variation in labour market competition across occupations, we use the unpublished

2000 Decennial Census data. This data reports the actual city block that each worker is employed in, allowing us to calculate the number of workers, by occupation, employed in each block of the MSAs in the data. So, for each MSA, we are able to calculate the employment share of each of its blocks, by occupation. Since we do not know the number of firms that employ workers in a given occupation for each MSA, we use city blocks as proxies for firms. Using the employment shares of all blocks in each MSA, we construct a Herfindahl Index (HI) that captures the labour market concentration in a MSA, by occupation.<sup>9</sup>

Researchers have found HI to be an attractive measure of market concentration since it possesses two important properties.<sup>10</sup> First, it captures the size of the market since it decreases in the number of employers in the market. Second, it increases in the market share dispersion across firms, capturing employment concentration in the market. HI is bounded between 0 and 1; 0 implies perfect dispersion (perfect competition), and 1 implies perfect concentration (monopsony). Formally, the HI for occupation  $g$  in MSA  $k$  is simply the sum of the squared employment shares of all blocks in MSA  $k$  for occupation  $g$ :

$$HI_{kg} = \sum_b \left( \frac{E_{bkg}}{\sum_b E_{bkg}} \right)^2 = \sum_b \left( \frac{E_{bkg}}{E_{kg}} \right)^2 \quad (3)$$

$E_{bkg}$  is the number of workers in block  $b$ , MSA  $k$ , occupation  $g$ , and  $E_{kg}$  is the number of workers in MSA  $k$ , occupation  $g$ . Based on the US Antitrust Department's classifications of industry concentration, a MSA is a *concentrated* market if HI is at least equal to .1, *moderately concentrated* if HI is between .1 and .18, and *highly concentrated* if HI exceeds .18. Table 6

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<sup>9</sup> We have gained access to the unpublished 2000 Census data under the condition that we would only produce the HI for 23 broad occupation categories, as defined by the Standard Occupational Classification (SOC). We were then allowed to attach the HI to the 5 percent PUMS data (given each worker's MSA and occupation) for our analyses. All analyses that include the HI are cleared for use in this paper, and for publication, by the U.S. Census Bureau.

<sup>10</sup> Examples of research using the HI as a measure of market concentration in various settings, include Santerre and Neun (1986), Link and Landon (1975), and Luizer and Thornton (1986).

presents the variation in the values of HI across occupations and across MSAs, by occupation. Table 6 shows that a large number of MSAs are concentrated markets for occupations like *College Professors* (196) and *Physicians* (108). Also, there are at least 10 concentrated markets in 12 occupation groups, while there is at least one concentrated MSA for all but three occupation groups in the data. Finally, column 4 of table 6 shows that there is substantial variation in market concentration across MSAs, by occupation.

### 3.4. Estimation Results

Based on equation (1), we estimate a classic human capital wage equation:

$$\log w_{jk} = X \cdot \beta + \gamma \cdot MCI_j + \delta \cdot MCI_j \cdot LC_k + \zeta \cdot LC_k + u_{jk} \quad (4)$$

In words,  $\log w_{jk}$  is the logarithm of wages for worker  $j$ , in MSA  $k$ , while  $X$  includes all available worker characteristics.  $MCI_j$  is the mobility cost index for worker  $j$  and  $LC_k$  measures MSA-level competition. The first parameter of interest is  $\gamma$  (effect of worker immobility on wages), which we expect to be negative. The other parameter of interest is  $\delta$ , which captures the effect of local competition on the relationship between worker immobility and wages;  $\delta$  should be positive when we use the number of firms in the MSA to measure local competition, and negative when we use HI.

Equation 4 is estimated using all three measures of MSA-level competition: total number of firms in the MSA, in 10,000s ( $F_M$ ), total number of firms, by industry, in 1,000s ( $F_{M,I}$ ), and the Herfindahl Index of market concentration, by occupation (HI).  $F_M$  and  $F_{M,I}$  are attached to our 5 percent PUMS regression sample using the worker's MSA of residence, while HI is attached to our sample using the worker's MSA and occupation. Also, since workers with a disabled child may spend less time than average working than others, they may have lower

earnings. So, to ensure regression results are not driven by differences in the amount of time worked between immobile and mobile workers, we also control for the number of weeks and the number of hours per week worked.

### **3.4.1. The Effect of Worker Immobility on Wages**

The first three columns of table 7 present the regression results for equation 4 when we use  $F_M$  as a measure of local labour market competition. The MCI coefficient is -.115 when we do not control for MSA competition and is significant at the 1 percent level. When we control for  $F_M$  and its interaction with MCI, the MCI coefficient is even higher (-.154), while the MCI- $F_M$  interaction coefficient is significantly positive (.004), as is the coefficient of  $F_M$  (.003).<sup>11</sup>

Columns 4 and 5 present the results when we use HI in the specification, instead of  $F_M$ . HI is a function of the number of city blocks in an MSA, so besides market concentration, it may also capture MSA size; to account for that, we include MSA population in the specification. The MCI coefficient in specification 4 is -.122 and is statistically significant, as is the coefficient of HI (-.601). In specification 5, where we control for HI and its interaction with MCI, the MCI coefficient drops to -.012, whereas the MCI, HI interaction effect is -.607. Both are statistically significant at the 1 percent level and reinforce the idea that individual immobility has a negative effect on wages, an effect that increases in the concentration of the local labour market. *Population* has a significant positive coefficient, capturing in part the MSA size wage premium.

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<sup>11</sup> We also estimate equation 4 using  $F_{M,I}$  as a measure of labour market competition. Regression results using  $F_{M,I}$  are very similar to those using  $F_M$ , and are available upon request. Also note that the regression results are not sensitive to the weights used to construct MCI or the variables used to construct MCI. For example, we obtain similar results when we estimate the wage equation using an MCI that only includes *State of Birth, 2000* and *Child Disabled, 2000* (i.e. an MCI that excludes *Spouse State of Birth, 2000* and *Spouse Works FT, 2000*). These results are available upon request.

These results show that MCI has a negative effect on wages, an effect that declines in the competitiveness of the MSA. Two interesting implications arise from these estimates. First, individual mobility costs produce wage variation across equally productive workers within the same MSA. Second, since firms in smaller markets are in better position to exploit worker immobility in their wage setting than firms in large MSAs, worker immobility may account for a portion of the well-documented wage differences across MSAs of different size.

Assessing the degree to which wage discrimination based on worker immobility causes wage variation within and across MSAs is not straightforward. Using the estimation results presented in Table 7, we delineate the effect of individual immobility on wages of workers in MSAs of different size, to produce a more intuitive interpretation of the results. Specifically, using the regression results in Table 7, we calculate the mean predicted income for the five worker groups presented in Table 4, for each MSA in the data. By comparing the mean predicted income across worker groups within a MSA, we get the effect of worker immobility on the within-MSA wage variation. Also, by comparing the mean predicted income across MSAs, we get the across-MSA wage variation due to differences in MSA competition, by worker group.

First, we calculate the mean predicted income for each worker group in the MSAs in the data, using specification 3 in table 7, holding other worker characteristics equal. Table 8 presents the mean predicted income of each worker group in three select MSAs: Boston, MA, Charlotte, NC, and Utica, NY.<sup>12</sup> Table 8 also reports in parenthesis the percentage deviation of the predicted income of each worker group from that of the average worker (MCI=.427), within the

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<sup>12</sup> Note that, in our sample, workers in Boston are on the 90<sup>th</sup> percentile of the  $F_M$  distribution, thus Boston represents a perfectly competitive MSA. Workers in Charlotte and in Utica are on the 50<sup>th</sup> and 10<sup>th</sup> percentile of the  $F_M$  distribution, respectively; Charlotte represents a moderately competitive MSA and Utica a MSA with weak labour market competition.

same MSA. It also reports in brackets the percentage deviation of the mean predicted income in each MSA from that of Boston, by worker group.

Table 8 shows that in Utica, the predicted income of the average worker (MCI=.427) is \$41,688. A Utica worker with no mobility costs (MCI=0) earns \$44,439, 6.6 percent more than the wages of the average worker. On the other hand, an immobile worker (MCI=.942) earns \$38,601 in Utica, 7.4 percent less than the average worker and 14 percent less than the zero-mobility cost worker. These numbers show that worker immobility causes significant wage variation across workers within a weakly competitive MSA, like Utica.

Individual mobility costs also produce substantial wage variation across workers in Charlotte, a moderately competitive market. A mobile worker (MCI=0) in Charlotte earns \$45,663, 5.4 percent higher than the income of the average worker, which is \$43,337. On the other hand, an immobile worker (MCI=.942) in Charlotte earns \$40,692, 6.1 percent less than the average worker and 11.5 percent less than the zero-mobility cost worker. Note that the wage variation produced by worker immobility is lower in Charlotte, a moderately competitive market, compared to the weakly competitive market of Utica.

Finally, worker immobility has a smaller effect on worker wages in Boston, a MSA with a very large number of employers. A worker with zero mobility costs earns \$49,021 on average, which is 2.2 percent more than the average worker, whereas an immobile worker earns \$46,706, just 2.6 percent less than the average worker and 4.8 percent less than workers in group 1. Therefore, consistent with our intuition, worker immobility is not as important in explaining wage differences across workers in large, highly competitive MSAs.

Table 8 also shows that wage discrimination due to worker immobility produces important wage variation across MSAs, beyond the well-documented MSA size wage premium.

To assess the quantitative effect of worker immobility on wage differences across MSAs, we have to account for the MSA size effect on worker wages. The average zero-mobility cost worker earns \$49,021 in Boston. The same worker earns \$45,663 in Charlotte and \$44,439 in Utica, 6.9 and 9.3 percent less than what he would earn in Boston respectively. In other words, solely because of the smaller size of the two markets, Charlotte and Utica workers earn 6.9 and 9.3 percent less than Boston workers respectively.

The first row of Table 8 shows that the average worker earns \$43,337 in Charlotte, 9.6 percent lower than what he would earn in Boston. Since the MSA size wage effect is -6.9 percent for Charlotte, the average worker earns 2.7 percent less in Charlotte relative to Boston because of the ability of Charlotte employers to exploit the worker's immobility. By the same token, the average worker in Utica earns \$41,688, 13.1 percent less compared to Boston; the Utica size effect is -9.3 percent, thus the average worker earns 3.8 percent less in Utica than he would in Boston because of his immobility.

Wage differences across MSAs of different size are even more substantial among high-mobility cost workers. The average worker in group 5 earns \$40,692 in Charlotte and \$38,601 in Utica, 12.9 and 17.4 percent lower compared to Boston. So, after discounting the MSA size premium, high-mobility cost workers in Charlotte and Utica have wages that are 6 and 8.1 percent lower than what high-mobility cost workers would earn in Boston, respectively.

We replicate the exercise above using specification 5 of Table 7, in which HI is used to capture occupation-specific market concentration. Specifically, we calculate the predicted income of each worker group in a perfectly competitive market ( $HI=0$ ), a moderately competitive

market (HI=.10), an “oligopsony” (HI=.18), and a “monopsony” (HI=.84).<sup>13</sup> Table 9 reports the outcome of this exercise using the same format as Table 8.

Table 9 verifies that wage exploitation of worker immobility produces important wage variation within MSAs with a less than competitive labour market. In a perfectly competitive market (HI=0), an immobile worker (group 5) earns just 0.6 percent less than the average worker and 1.1 percent less than zero-mobility cost worker. In contrast, in a moderately competitive market (HI=.10), a worker in group 5 earns 3.6 percent less than the average worker and 6.7 percent less than the income of the zero-mobility cost worker in the same market.

Worker immobility produces even higher wage variation across workers in an oligopsonistic market (HI=.18) and in a monopsonistic market (HI=.84). In an oligopsony, a group 5 worker earns 6 percent less than the average worker and 11.3 percent less than the zero-mobility cost worker. In a monopsony, a group 5 worker earns 23.6 percent less than the average worker and about 48.7 percent of what a zero-mobility cost worker earns in the same market.

In addition, Table 9 confirms that worker immobility explains wage differences across MSAs, even after we account for the MSA size wage effect. For example, the average worker in a moderately competitive market earns 6.1 percent less than in a perfectly competitive market; the size effect is -3.2 percent and the competition effect is -2.9 percent. Similarly, the competition effect for the average worker is -4.7 percent in an oligopsony and -14.8 percent in a monopsony. So, the average worker earns 4.7 percent less in an oligopsony and 14.8 percent less in a monopsony because weak competition allows firms in such markets to exploit worker immobility.

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<sup>13</sup> Note that we characterize each market based on the US Antitrust Department’s classifications of industry concentration. A monopsonistic market should have HI=1, however, the maximum HI value in our data is .84.

In conclusion, wage discrimination due to worker immobility produces important wage variation across equally productive workers within MSAs that are not perfectly competitive. Immobile workers in smaller, less competitive MSAs, have wages that are at least 10 percent lower than the wages of zero-mobility cost workers. Worker immobility has a modest effect on wages in perfectly competitive markets and does very little in explaining wage variation in such markets. Furthermore, worker immobility allows employers in less competitive markets to offer lower wages to highly immobile workers. As a result, differences in employer wage setting power in this context produce substantial variation in worker wages across MSAs of different size, beyond the well-documented effect of MSA size on wages. We find that immobile workers in less competitive MSAs have wages that are at least 6 percent lower than the wages they would earn in a perfectly competitive market.

### ***3.4.2. The Effect of Unionization on the Magnitude of Exploitation***

When wages are collectively bargained, it is less likely that firms will discriminate against immobile workers and offer them lower wages. So, it is unlikely that heterogeneity in terms of worker immobility would produce substantial wage variation for workers in highly unionized occupations. Union status is not reported in the 2000 PUMS. To test if wages of workers in unionized occupations are affected by individual immobility, we construct a measure of unionization, by occupation, using the March Supplement of the 2000 Current Population Survey (CPS).<sup>14</sup> Specifically, we use the March 2000 CPS to calculate the percentage of workers

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<sup>14</sup> Ideally, we would like to have a measure of unionization at the MSA-occupation-industry level; such measure would be more accurate in capturing the probability of union membership for workers in our sample. However, MSA of residence is not reported in the CPS so we cannot measure unionization at the MSA level. Also, the relatively low number of observations in the CPS does not allow us to construct a reliable unionization rate at the occupation-industry level for many occupation-industry pairs. For this reason, we use unionization by occupation to estimate the effect of unions on wage exploitation. Note also that since HI is only measured at the occupation level, the results using HI and occupation-specific unionization rates make for a straightforward interpretation of the results at the occupation level.

who are union members in each of the 23 SOC occupation groups. Table 10 presents the unionization rate, by occupation.

We re-estimate equation 4, after we include in the specification the unionization rate (Union) and the interaction between Union and MCI. The unionization rate captures the likelihood of a worker being a union member, given his occupation, and the interaction term captures the effect of unionization on the relationship between MCI and wages. We expect the Union-MCI interaction effect to be positive, that is, the negative effect of worker immobility on wages to be weaker for workers in unionized occupations. Table 11 reports the results.

When we use  $F_M$  (column 2) the estimated effect of MCI on wages is negative and significant, and the MCI- $F_M$  interaction effect is significantly positive. At the same time, the MCI-Union interaction effect is positive (.007) and significant, suggesting that workers in highly unionized occupations face lower wage penalties because of their observed immobility. Using HI as a measure of local market competition produces the same positive interaction effect. These results show that exploitation of worker immobility is more relevant in explaining wage variation across workers in occupations where wages are individually bargained (e.g. legal occupations, college professors, and physicians), than for workers in occupations where wages are collectively bargained (e.g. teachers, protective services).<sup>15</sup>

### **3.4.3. Sensitivity Analysis**

Overall, regression results support the idea that worker immobility has a significant negative effect on wages, an effect that is lower for workers in more competitive MSAs, and for workers in highly unionized occupations. As discussed earlier, one could argue that *State of Birth, 2000*, the most important component of MCI, is negatively correlated with unobserved

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<sup>15</sup> Similar results are produced when we use the unionization rate, by industry instead of unionization, by occupation. These results are available upon request.

ability since low-skill workers may be those least likely to move out of their state of birth. This implies that the negative effect of MCI on wages may reflect the low skills of workers in the sample rather than worker immobility.

This argument is refuted by the fact that the negative effect of MCI on wages substantially declines in the competitiveness of the MSA and is modest for workers in perfectly competitive markets. If MCI was negatively correlated with unobserved ability, there is no reason its negative effect on wages would decline in the competitiveness of the market, and be non-existent in large MSAs.

In addition, we can show that the empirical findings presented earlier are not sensitive to the use of *State of Birth, 2000* in constructing the MCI. Specifically, we run the regressions in Table 7 restricting the sample to workers who worked outside their state of birth (*State of Birth, 2000*=0). If the argument that the negative effect of MCI on wages (an effect that declines in the competitiveness of the MSA) is mainly driven by the negative correlation between *State of Birth, 2000* and unobserved worker skills is valid, then MCI should have a weak effect on wages for workers who live outside their state of birth. However, we find that MCI has a significantly negative effect on wages of workers who live outside their state of birth, an effect that declines in the competitiveness of the local labour market.<sup>16</sup>

Overall, we conclude that MCI is an appropriate measure of worker immobility. First, all components of MCI are negatively correlated with worker mobility. Second, empirical results show that the negative effect of MCI on wages declines in the competitiveness of the MSA; if MCI was negatively correlated with unobserved worker skills, there is no reason its negative effect on wages would decline in the MSA competitiveness. Finally, we show that our empirical analysis holds even if we constrain the sample to workers who live outside their state of birth.

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<sup>16</sup> See table A in the Appendix for a summary of the results.

#### **4. Conclusions - Discussion**

In this paper, we discuss the possibility that firms in a local labour market exploit individual mobility costs to offer immobile workers wages that are lower than their marginal product. The wage setting power firms enjoy due to worker immobility should diminish in the intensity of the local labour market competition; wages for workers in small, less competitive local markets would be more affected by worker mobility costs. This intuition has two important implications. First, exploitation of worker immobility causes wage variation across equally productive workers within the same market, especially in less competitive MSAs. Second, holding worker immobility constant, wage disparities across MSAs of different size may be partly explained by differences in the local labour market competition.

Our empirical analysis provides substantial support for the idea that worker immobility affects the wage setting behavior of firms. Less mobile workers have significantly lower wages compared to their counterparts while the magnitude of exploitation is significantly higher for workers in less competitive MSAs. Moreover, workers in highly unionized occupations are less subject to wage discrimination, since wages in such occupations are collectively bargained.

The findings in this paper contribute to the understanding of the important wage differences across local labour markets. High wages in large MSAs are generally associated with high productivity, high cost of living, and undesirable local amenities. This paper introduces an additional explanation, that is, the lack of market competition in smaller MSAs allows firms to offer immobile workers lower wages. In conclusion, our work indicates that differences in the intensity of the local labour market competition should have an important role in the discussion of the determinants of wage disparities across metropolitan areas.

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Table 1: Sample Description, Decennial Census 5% PUMS

	Sample Proportion		Sample Proportion / Mean (St. Dev.)
White	82.2	Married	77.3
Black	7.9	With Children	58.0
American Indian	0.5	Disabled	10.4
Asian	4.0	No English	3.1
Other Race	5.4	Foreigner	14.5
Hispanic	8.6		
High School Dropout	10.9	Age	46.5 (7.7)
High School Diploma	47.3	Wages	57,384 (54,097)
Associate Degree	7.4	Log Wages	10.7 (0.7)
College Degree	20.3	Weeks Worked	50.9 (3.4)
Post-Graduate Degree	14.1	Hours per Week	45.6 (8.6)

Note: Sample includes male, full-time (worked 30+ weeks, 30+ hours per week) workers, ages 35-65, living in a MSA and reported positive earnings. Observations: 788,728.

Table 2: Mobility Cost Indicators

	Sample Proportions in 2000		Sample Proportions in 1995
State of Birth, 2000	48.7 %	State of Birth, 1995	44.0 %
Spouse State of Birth, 2000	37.9 %	Spouse State of Birth, 1995	28.5 %
Spouse Works FT, 2000	45.3 %	Spouse Works FT, 1995	35.9 %
Child Disabled, 2000	2.4 %	Child Disabled, 1995	1.8 %
Observations	788,728	Observations	262,623

Note: Worker characteristics in 1995 are only calculated for workers for which the metropolitan area of residence is reported for both 1995 and 2000.

Table 3: Marginal Probability Effects of Moving Cost Indicators on Migration Decisions

	(1)	(2)	(3)
State of Birth, 1995	-.130 (.002)**	-.111 (.002)**	-.112 (.002)**
Spouse State of Birth, 1995	--	-.074 (.002)**	-.065 (.002)**
Spouse Works FT, 1995	--	--	-.074 (.002)**
Child Disabled, 1995	--	--	-.015 (.004)**
Observations	262,623	262,623	262,623

Note: Dependent variable equals 1 if respondent is a mover, 0 otherwise. Probit estimates of the marginal probability effects are reported, with standard errors in parenthesis. Not reported are the probability effects of other worker characteristics, as listed in Table 1. \*\*=significant at the 1% level.

Table 4: Select Groups of Workers and the MCI Distribution

	Percentile	MCI
Group 1: No Mobility Cost Indicators	10 <sup>th</sup>	.000
Group 2: Child Disabled	25 <sup>th</sup>	.058
Group 3: State of Birth	50 <sup>th</sup>	.421
Group 4: State of Birth, Spouse State of Birth	75 <sup>th</sup>	.665
Group 5: State of Birth, Spouse State of Birth, Spouse Works FT	90 <sup>th</sup>	.942

Note: MCI Mean =.427, MCI Standard Deviation =.331, MCI Minimum=0, MCI Maximum=1.

Table 5: Number of Establishments, Metropolitan Areas in the 2000 PUMS

Summary Statistics (across MSAs)	Number of Establishments	Number of MSAs
Mean	38,171	Over 100,000
Standard Deviation	59,196	28
Minimum	1,170	Over 50,000
Maximum	491,578	60
		Over 10,000
		194
		Less than 10,000
		89

Source: Summary statistics are reported for the 283 metropolitan areas in the 2000 PUMS.

Table 6: Number of Concentrated Markets, by Occupation

Occupation Group	(1) Concentrated Markets $HI \geq 0.10$	(2) Moderately Concentrated Markets $.18 \geq HI > .10$	(3) Highly Concentrated Markets $HI > 0.18$	(4) HHI Range Min-Max (mean)
College Professors	196	90	106	.01-.84 (.18)
Physicians	108	89	19	.00-.43 (.08)
Farming, Forestry, Fishing	67	62	5	.00-.47 (.06)
Protective Services	52	49	3	.00-.20 (.05)
Scientists	45	36	9	.00-.42 (.05)
Computers and Mathematics	39	30	9	.00-.46 (.05)
Architects and Engineers	31	23	8	.00-.49 (.05)
Lawyers	22	22	0	.00-.15 (.05)
Health Care Support	19	17	2	.00-.23 (.04)
Arts, Media, and Entertainment	16	15	1	.00-.18 (.03)
Production	13	11	2	.00-.22 (.03)
Installers, Repairers, Mechanics	10	8	2	.00-.22 (.03)
Personal Care Services	3	3	0	.00-.11 (.02)
Business and Finance	3	3	0	.00-.16 (.02)
Construction	2	1	1	.00-.20 (.01)
CEOs and Managers	1	1	0	.00-.12 (.01)
Food Preparation & Serving	1	1	0	.00-.08 (.01)
Office and Admin. Support	1	1	0	.00-.11 (.01)
Teachers, Librarians, Archivists	1	1	0	.00-.12 (.02)
Transportation	1	1	0	.00-.09 (.01)
Community & Social Services	0	0	0	.00-.06 (.02)
Cleaning & Maintenance	0	0	0	.00-.08 (.01)
Sales	0	0	0	.00-.04 (.01)
Totals	631	464	167	.00-.84 (.04)

Note: HI is constructed for all MSAs in the sample, by each of the 23 occupation groups.

Table 7: The Effect of Worker Immobility on Wages

	(1)	(2)	(3)	(4)	(5)
MCI	-.115 (.014)**	-.113 (.011)**	-.154 (.014)**	-.122 (.011)**	-.012 (.001)**
MCI x $F_M$	--	--	.004 (.001)**	--	--
$F_M$	--	.005 (.001)**	.003 (.001)**	--	--
MCI x HHI	--	--	--	--	-.607 (.218)**
HHI	--	--	--	-.601 (.167)**	-.370 (.167)**
Population	--	--	--	.014 (.004)**	.014 (.004)**
Weeks Worked	.023 (.000)**	.023 (.000)**	.023 (.000)**	.023 (.000)**	.023 (.000)**
Hours per Week	.013 (.000)**	.013 (.000)**	.013 (.000)**	.013 (.000)**	.013 (.000)**
Age	.038 (.002)**	.039 (.002)**	.039 (.002)**	.039 (.002)**	.039 (.002)**
Age Squared	-.000 (.000)**	-.000 (.000)**	-.000 (.000)**	-.000 (.000)**	-.000 (.000)**
High School Dropout	-.159 (.004)**	-.158 (.004)**	-.157 (.004)**	-.158 (.004)**	-.158 (.004)**
Associate Degree	.042 (.003)**	.042 (.003)**	.042 (.003)**	.043 (.003)**	.043 (.003)**
College Degree	.249 (.005)**	.245 (.005)**	.245 (.005)**	.247 (.005)**	.247 (.005)**
Post-Graduate Degree	.411 (.008)**	.404 (.007)**	.403 (.007)**	.404 (.008)**	.404 (.008)**

(Table 7 is continued in the next page)

Table 7 (continued from the previous page)

Black	-0.117 (.008)**	-0.132 (.007)**	-0.131 (.007)**	-0.133 (.007)**	-0.133 (.007)**
American Indian	-0.129 (.012)**	-0.127 (.012)**	-0.126 (.012)**	-0.128 (.012)**	-0.128 (.012)**
Asian	-0.105 (.023)**	-0.116 (.023)**	-0.116 (.027)**	-0.113 (.025)**	-0.112 (.025)**
Other Race	-0.055 (.011)**	-0.065 (.013)**	-0.064 (.012)**	-0.066 (.011)**	-0.066 (.011)**
Hispanic	-0.080 (.015)**	-0.094 (.016)**	-0.095 (.015)**	-0.083 (.015)**	-0.083 (.015)**
Married	.155 (.006)**	.161 (.005)**	.160 (.005)**	.163 (.005)**	.163 (.005)**
With Children	.037 (.002)**	.035 (.002)**	.034 (.002)**	.034 (.002)**	.034 (.002)**
Disabled	-0.054 (.003)**	-0.056 (.002)**	-0.056 (.002)**	-0.057 (.003)**	-0.057 (.003)**
No English	-0.194 (.012)**	-0.204 (.012)**	-0.202 (.012)**	-0.203 (.012)**	-0.202 (.012)**
Foreigner	-0.046 (.010)**	-0.080 (.011)**	-0.072 (.009)**	-0.084 (.012)**	-0.083 (.011)**
Veteran	-0.038 (.002)**	-0.032 (.003)**	-0.033 (.003)**	-0.032 (.003)**	-0.032 (.003)**
R-Squared	.3822	.3889	.3894	.3894	.3895
Observations	788,728	788,728	788,728	788,728	788,728

Note: Dependent variable is the logarithm of yearly wages. MCI is the mobility cost index (mean: .427),  $F_M$  is the number of firms in the MSA, in 10,000s (mean: 12.34).  $MCI \times F_M$  is the interaction between MCI and  $F_M$  (mean: 4.70). HI is the MSA Herfindahl Index, by occupation (mean: .010), while  $MCI \times HI$  is the interaction between MCI and HI (mean: .004). Population is the MSA population, in millions; source, State and Metropolitan Area Data Book, 1997-98 (mean 3.02). Omitted categories are high school graduate for education and white for race. Least squares estimates, with standard errors clustered by MSA, and reported in parenthesis. \*\* = significant at the 1% level, \* = significant at the 5% level.

Table 8: Evaluating the Effect of Worker Immobility and Labour Market Competition on Wages

Mean Predicted Income (in \$)	Boston, MA ( $F_M = 27.3$ ) “Perfect Competition”	Charlotte, NC ( $F_M = 8.4$ ) “Moderate Competition”	Utica, NY ( $F_M = 1.2$ ) “Weak Competition”
Average Worker (MCI = .427)	47,957	43,337 [-9.6]	41,688 [-13.1]
Worker Group 1 (MCI = .000)	49,021 (2.2)	45,663 [-6.9] (5.4)	44,439 [-9.3] (6.6)
Worker Group 2 (MCI = .058)	48,876 (1.9)	45,341 [-7.2] (4.6)	44,056 [-9.9] (5.7)
Worker Group 3 (MCI = .421)	47,973 (0.0)	43,372 [-9.6] (0.1)	41,730 [-13.0] (0.1)
Worker Group 4 (MCI = .665)	47,375 (-1.2)	42,096 [-11.1] (-2.9)	40,234 [-15.1] (-3.5)
Worker Group 5 (MCI = .942)	46,706 (-2.6)	40,692 [-12.9] (-6.1)	38,601 [-17.4] (-7.4)

Note: Reported is the mean predicted income at different values of the MCI and  $F_M$  distributions, using the Table 7, column 3 results. All other worker characteristics are held at their sample means. In parenthesis is the percentage deviation of the predicted income of each worker group from the predicted income of the average worker within the same MSA. In brackets is the percentage deviation of the predicted income in each MSA from the predicted income of the perfectly competitive market, by worker group.

Table 9: Evaluating the Effect of Worker Immobility and Labour Market Concentration on Wages

Mean Predicted Income (in \$)	(1) Perfect Competition (HI = 0)	(2) Moderate Competition (HI = .10)	(3) Oligopsony (HI = .18)	(4) Monopsony (HI = .84)
Average Worker (MCI = .427)	45,594	42,812 [-6.1]	40,710 [-10.7]	26,818 [-41.2]
Worker Group 1 (MCI = .000)	45,820 (0.5)	44,155 [-3.2] (3.1)	42,866 [-6.0] (5.3)	33,536 [-26.4] (25.1)
Worker Group 2 (MCI = .058)	45,790 (0.4)	43,971 [-3.6] (2.7)	42,568 [-6.6] (4.6)	32,536 [-28.6] (21.3)
Worker Group 3 (MCI = .421)	45,598 (0.0)	42,833 [-6.1] (0.0)	40,743 [-10.6] (0.1)	26,913 [-41.0] (0.4)
Worker Group 4 (MCI = .665)	45,469 (-0.3)	42,084 [-7.7] (-1.7)	39,558 [-13.2] (-2.8)	23,685 [-48.1] (-11.7)
Worker Group 5 (MCI = .942)	45,324 (-0.6)	41,250 [-9.5] (-3.6)	38,256 [-16.1] (-6.0)	20,489 [-55.1] (-23.6)

Note: Reported is the mean predicted income at different values of the MCI and HI distributions, using the Table 7, column 5 results. All other worker characteristics are held at their sample means. Similar to Table 8, parentheses and brackets report the percentage deviation of each group’s predicted wages from the average worker’s wages and from the wages of the perfectly competitive market by worker group, respectively.

Table 10: Percent of Union Members, by Occupation Group

	Unionization		Unionization
Protective Services	43.8 %	Office & Admin. Support	8.0 %
Teachers, Librarians, Archivists	38.1 %	Personal Care Services	7.8 %
Construction	26.3 %	Physicians, Health Diagnostic	7.3 %
Transportation	26.0 %	Food Preparation and Serving	7.2 %
Installation, Repairers, Mechanics	24.6 %	Scientists	7.0 %
Cleaning and Maintenance	23.6 %	Farming, Forestry, Fishing	6.8 %
Production	18.4 %	CEOs & Managers	5.5 %
College Professors	14.3 %	Computers & Mathematics	5.1 %
Health Care Support	14.2 %	Legal Occupations	3.5 %
Community & Social Services	12.4 %	Sales	2.3 %
Business & Finance	8.7 %	Architects & Engineers	1.5 %
Arts, Media, Entertainment	8.4 %		

Source: Author tabulations of the Current Population Survey, March Supplement, 2000.

Table 11: The Effect of Unionization on the Magnitude of Exploitation

	(1)	(2)	(3)	(4)
MCI	-.154 (.014)**	-.247 (.015)**	-.012 (.001)**	-.020 (.002)**
MCI x $F_M$	.004 (.007)**	.004 (.001)**	--	--
MCI x HI	--	--	-.607 (.218)**	-.592 (.215)**
MCI x Union	--	.007 (.000)**	--	.006 (.000)**
$F_M$	.004 (.007)**	.003 (.001)**	--	--
HI	--	--	-.370 (.157)**	-.370 (.154)**
Union	-.012 (.000)**	-.015 (.001)**	-.013 (.001)**	-.016 (.001)**
R-Squared	.3894	.3904	.3895	.3905
Observations	788,728	788,728	788,728	788,728

Note: Dependent variable is the logarithm of wages. Union is the percentage of workers in the worker's occupation category (mean 13.98). MCI x Union is the interaction between MCI and Union (mean 6.27). Included in all specifications, but not reported, all worker characteristics listed in Table 1. Least squares estimates, with standard errors clustered by MSA, and reported in parenthesis. \*\* = significant at the 1% level.

## Appendix

Table A: Effect of MCI on Wages, Workers Living Outside their State of Birth

	(1)	(2)	(3)	(4)	(5)
MCI	-.279 (.018)**	-.273 (.0180)**	.315 (.018)**	-.279 (.018)**	-.027 (.002)**
MCI x $F_M$	--	--	.003 (.001)**	--	--
MCI x HI	--	--	--	--	-.706 (.240)**
$F_M$	--	.003 (.001)**	.003 (.001)**	--	--
HI	--	--	--	-.602 (.168)**	-.486 (.169)**
Population	--	--	--	.009 (.004)**	.009 (.004)**
R-Squared	.4167	.4198	.4199	.4203	.4203
Observations	404,719	404,719	404,719	404,719	404,719

Note: Regression sample includes only workers living outside their state of birth. Dependent variable is the logarithm of yearly wages. MCI is the mobility cost index (mean: .169),  $F_M$  is the number of firms in the MSA, in 10,000s (mean: 13.81). MCI x  $F_M$  is the interaction between MCI and  $F_M$  (mean: 2.15). HI is the MSA Herfindahl Index, by occupation (mean: .010), while MCI x HI is the interaction between MCI and HI (mean: .002). Population is the MSA population, in millions; source, State and Metropolitan Area Data Book, 1997-98 (mean 3.32). Included in the specification are the same characteristics used in the specifications in Table 7. Least squares estimates, with standard errors clustered by MSA, and reported in parenthesis. \*\* = significant at the 1% level, \* = significant at the 5% level.