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MONOPSONY IN SPATIAL EQUILIBRIUM

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ABSTRACT

An emerging labor economics literature studies the consequences of firms exercising market power in local labor markets. These monopsony models have implications for trends in earnings inequality. The extent of this market power is likely to vary across local labor markets. In choosing what local labor market to live and work in, workers tradeoff wages, rents and local amenities. Building on the Rosen/Roback spatial equilibrium model, we investigate how the existence of local monopsony power affects the cross-sectional spatial distribution of wages and rents across cities. We find an elasticity of land prices to employment concentration of –0.037—similar to Rinz (2018) reported elasticity of compensation. For renters, this offsets the monopsony wage effect and shifts part of the incidence of monopsony to homeowners.

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Introduction

Recent research in labor economics has questioned whether the perfect competition model offers an accurate representation for understanding how wages are set for many workers. Building on the research of Alan Manning (2003, 2006, 2009, 2011), a growing number of studies have documented that wages are lower in areas featuring greater concentration of employment among larger firms (see Benmelech, Bergman, and Kim 2018). At a time of great concern about income inequality, this research suggests that the labor market rents generated from productive worker/firm matches are increasingly going to firms with market power.

Commuting costs conscribe one's job search once a worker has selected a local labor market. In choosing a local labor market, workers have strong incentives to consider their expected well-being in such a location. This calculation is based on one's expected earnings, housing rents, taxes, government services and amenities resulting from locating in an area. The expansion of teleworking during the Covid-19 crisis may be eroding this physical connection between place of residence and place of work.

A mature urban economics literature has examined the compensating differentials arising from capitalization of amenities, government services and local taxes in wages and rents (Gyourko and Tracy 1991). Building on the insights of the classic Rosen/Roback spatial equilibrium model, this literature concludes that wages and real estate rents adjust so that the marginal worker is just indifferent between living and working in each local labor market.

This urban economics literature has direct implications for the new generation of monopsony models. A city's degree of local monopsony power is another place-based attribute and thus becomes part of the bundle one must "consume" by locating in a city. Using the spatial equilibrium model, we argue that cities with monopsonistic firms, and thus lower wages, will in equilibrium feature lower rents as a compensating differential. This assumes that the monopsony power is extensive enough to impact the marginal household considering staying or leaving the city. If, on the other hand, monopsony power is localized within a small sector of the city affecting only inframarginal households, then capitalization into house prices would not occur.

Labor economists have focused on estimating the implications of this market power on earnings inequality assuming that the economic incidence is on the impacted workers. Our results suggest that the economic incidence of such market power is at least partially borne more broadly by local land owners. Using panel data from the County Business Patterns and county Zillow housing data, we document that home prices are lower in counties where the Herfindahl index of establishment size concentration (HHI) is growing. This indicates that local housing markets partially capture local labor market concentration dynamics.

In an extension of the model, we introduce a local government with the power to tax and provide public goods. If this government chooses to tax and redistribute the monopsony rents, then this will attenuate the land rent effect. This result builds on the work of Brueckner and Neumark (2014) who find that in high amenity areas local governments tax the local rich and use the proceeds to provide more generous compensation for local public employees.

The typical urban spatial model assumes zero migration costs. In an extension of our core model, we introduce migration costs and study how this affects the spatial equilibrium. Migration costs create a "zone of inaction" such that incumbents will not move away if firms cut their wages. This resulting reduced mobility tends to mitigate the incidence of monopsony on local rents.

Throughout the first part of the paper, we assume that workers are homogeneous. We then relax this assumption and adopt a Roy Model approach in which each worker is a bundle of sector-specific skills. A city where firms are exercising monopsony power feature a different ratio of skill factor prices than a perfect competition city. We use the Roy Model to highlight the subset of workers who choose to remain in the monopsony city and the change in the allocation of workers across sectors within the city. We document that when worker skills are positively correlated across sectors the "exploited sector" in a monopsony city will suffer a "brain drain." Thus, in addition to the downward pressure on wages due to monopsony power, lower wages in this sector partially reflect a composition shift as the skill of the marginal worker in these sectors declines.

Our study highlights the importance of explicitly integrating insights from urban economics into the new generation of labor economics models. Our empirical findings offer support for introducing integrated local real estate and labor markets when studying the consequences of local labor market power.

Introducing Monopsony Power into the Rosen-Roback Model

We use the model of Gyourko and Tracy (1989) that introduced produced government services into the spatial equilibrium model of Rosen-Roback. This model seeks to explain the pattern of compensating differentials (as reflected by spatial variation in wages and rents). Workers in a community consume non-produced local amenities as well as produced local government services. A representative worker-resident is assumed to consume a composite traded good Y at a constant price (normalized to 1) and land services N. By living in the j^{th} community, the household also consumes the amenity bundle A_j and government services G_j. The household utility is given by

$$U(Y, N; A_j, G_j) \tag{1}$$

The gross-of-tax of the composite good is $(1+s)$ where s is the combined state and local sales tax. The gross-of-tax land rental price is $r=(1+t)n$ where t is the property tax rate and n the local land rental. Assume that households inelastically supply one unit of labor that is compensated at an after-tax rate of $(1-z)W^g$ where z is the combined income tax rate. Finally, let I denote any non-wage income available to the household.

The household's budget constraint requires that expenditures on the composite good and land consumption do not exceed the household's after-tax wage and non-wage income.

$$(1+s_j)Y_j + (1+t_j)n_j N_j \leq (1-z_j)(W_j^g + I) \tag{2}$$

The associated indirect utility function is given by

$$\bar{V} = V\left\{W^g(1-z), t, (1+s); A, G, I\right\} \tag{3}$$

Firms are profit maximizing where they use labor (*L*), land (*N*) and intermediate inputs to produce the composite commodity.

$$Y_j = F\left(L_j, N_j, R_j; A_j, G_j\right) \tag{4}$$

Conditional on the firm's current location, the firm's optimization problem is given by

$$\max_{R,N,L}\ \pi = (1-\tau)\left[Y_j - (1+t_j)n_j N_j - W_j^g L_j - (1+s_j)R_j\right], \tag{5}$$

where τ is the corporate profits tax and all other terms are as previously defined.

Substituting the firm's factor demand functions into (5) yields the firm's indirect profit function, Π. Assuming that capital is mobile, equilibrium requires that profits are equalized across localities. This gives us

$$\Pi\left\{W^g, r, \tau, (1+s); A, G\right\} = \bar{\Pi} \tag{6}$$

Equilibrium in the local market consists of a gross of property tax land rental rate and gross of income tax wage rate that clears the market. This is shown by point A in Figure 1 where the local gross wage is W_o^g and gross of property tax housing rents $(1+t)n_0$. An implication is that holding government services constant changes in the effective property tax rate (t_j) are fully capitalized into land prices.

Now assume that a large employer enters the market displacing the existing small employers. A recent literature has examined how Walmart makes its entry decisions and how it affects the spatial distribution of employment in its local vicinity, see Neumark et al (2008), Holmes (2011) and

Basker and Pope (2015).[1] The large employer uses its market power to act in a monopsonistic manner to reduce employment and cut wages. As a result, it increases its profit level from $\bar{\pi}_0$ to $\bar{\pi}_1$. Absent any change in the land rental rate, we would move in Figure 1 from point A to B with gross wages falling to W_B^g . However, point B would involve a lower level of indirect utility. With zero cost of mobility for workers, this would induce workers to migrate from the city. As a consequence, to restore household utility back to $\bar{V}$ the land rental rate falls to $(1+t)n_1$ given by point C. As a result, the observed decline in wages due to the monopsonist is mitigated to $W_1^g > W_B^g$. The new equilibrium has the feature that there is no incentive for households to move out of the city.

This application of the Rosen (1979)-Roback (1982) urban model illustrates that with costless mobility, the impact of a monopsonist in a local market leads to offsetting compensating differentials in housing prices. In this case, households are induced to remain in the local market despite the lower wages by a reduction the cost of housing. If we introduce heterogeneity across types of households, then the incidence will vary across types of households and the equilibrium will be determined by the marginal household type.

All resident homeowners in the local market face the negative house price capitalization of the monopsonist wage effect, even if they are retired.[2] That is, retired households do not directly experience the lower wages due to the entry of the monopsonist, but do face the negative capitalization of these lower wages into house values. Households that own their homes effectively own an equity stake in the community and the value of that equity declines with the entry of the monopsonist. In contrast, renters do not face the capitalization effect and benefit from the lower housing rent. Finally, non-resident retired households would now find this locality more desirable as a place to live in retirement. Again, if they move to the locality after the monopsonist enters, they would not be affected by the lower wages and would benefit from the lower house prices.

We can relax the assumption of costless mobility for households. Assume instead that there is a utility cost of moving of $\Delta\bar{V} = \bar{V}_0 - \bar{V}_1$.[3] In this case, following the entry of a monopsonist into

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[1] An important issue is whether the monopsonist creates any consumption amenities for example by providing a greater variety of goods and discount prices relative to the firms that it displaces.

[2] Similarly, Mayer and Hilber (2009) argue that retired households support the provision of high quality local public schools because the quality is capitalized into house prices.

[3] For example, long-time residents may build up location specific social capital and this acts as a migration cost (Glaeser, Laibson and Sacerdote 2002).

the local market, land prices and wages will adjust to provide households with the utility level $\bar{V}_1 < \bar{V}_0$. The introduction of costly mobility limits the degree to which land prices adjust in response to the entry of the monopsonist. The new equilibrium would be at point D in Figure 2 instead of point C with the gross wage being between W_B^g and W_1^g . In the extreme, if mobility is prohibitively costly, then the equilibrium shifts up to point B which is the standard analysis.[4]

Local Government

The analysis so far assumes no reaction by the local government to the actions taken by the monopsonist. That is, government services and local tax rates are unchanged. Note that, absent any changes in the property tax or income tax rate, aggregate property taxes and wage income taxes will decline with the entry of the monopsonist.[5] At the same time, labor costs to the local government will decline due to lower wages. Any resulting decline in net tax revenue must be offset by higher tax business taxes (perhaps on the profits of the monopsonist) for the level of government services (and taxes on households) to be unaffected.

The profits by the monopsonist are a locational rent, so they may be subject to expropriation by the local government if it has the ability to tax the monopsonist. If this is not possible, then the impact of the resulting reduction in government services depends on whether these services are valued by households, firm, or both. Similarly, if taxes are raised in lieu of service reductions, then the impact depends on which taxes are changed.

The interaction between the local government and the monopsonist may also depend on whether the local government is unionized. For localities that have desirable locational amenities, local public sector unions through collective bargaining may be able to bid up their wages as a way of expropriating some of the value of the amenities (Brueckner and Neumark 2014). In this scenario, if a monopsonist enters the local market, then services may be maintained by pressure being put on the public sector unions to agree to wage concessions. In this case, rents will be

[4] Mendez-Chacon and Van Patten (2019) argue that outside opportunities restrained the monopsony effects of the United Fruit Company (UFC) operating in Costa Rica. In their case, UFC offset lower wages with improved amenities provided to its workers.
[5] If a local sales tax exists, then in the case of costless mobility the decline in rents offsets the lower wage income so that sales taxes may not be adversely impacted. With mobility costs, the decline in rents do not fully offset the lower wage income so sales tax revenues would likely decline.

transferred from the unionized public sector workers to the monopsonist. This will mitigate the need to raise taxes and/or cut services as discussed earlier.

Will New Firms Enter a Monopsonized Local Labor Market?

As the large employer enters the market and uses its market power to pay lower wages, this will induce lower equilibrium land rents. A potential entrant may now be attracted to moving to the monopsony area because rents and wagers are lower. Forces that limit firm entry to the monopsony local labor market matter because if the profit opportunity could be easily arbitraged away by entering firms or taxed away by the local government, then the land rent capitalization would not be observed or it would only be a transitory effect.

There are at least three considerations that could preclude new firm entry. One is the standard entry deterrence game where the large incumbent credibly commits to lower future prices in a price war that discourages firm entry in the same industry as the incumbent. A second explanation builds on Bresnahan and Reiss (1990, 1991) and argues that in small markets there may not be sufficient scale of aggregate demand to support the incumbent monopsonist and the entrant. Both of these explanations hinge on the assumption that the monopsonist sells its output on the local (not the national market).

A third consideration for why firms may choose not to enter a monopsonized local labor market focuses on firm-specific tenure and the division of labor market rents. An older empirical labor literature estimated the returns to firm-specific tenure, see Altonji and Shakotko (1987) and Topel (1991). For large firms that suddenly choose to "exploit" their incumbent workers, they will alter this tenure/earnings profile and keep more of the match surplus. While a worker can quit such a firm, the worker will start out at zero tenure at the next firm. The monopsonist can calculate how much surplus can be extracted such that older workers remains at the firm. Entering firms do not gain a wage discount on such workers. In this case, rents will be lower in such monopsony areas to compensate new hires as they anticipate their future "holdup" problem once they lock-in with such a firm.

The Economic Incidence of Monopsony in a Roy Model Featuring Heterogeneous Skills and Sectoral Choice

We now relax the assumption of homogenous workers. When workers differ with respect to their skills, the rise of monopsony power will induce behavioral change at the extensive margin and workers will re-sort across sectors. The early Rosen/Roback literature compensating differentials literature abstracted from explicitly considering the assignment of heterogeneous workers to sectors (based on skill) to local markets.[6]

Assume that workers in a local labor market are heterogeneous in their ability. The labor market consists of two sectors. Each worker's ability is given by a pair of sector-specific abilities (a_{i1}, a_{i2}). These abilities have a joint distribution in the local labor market. Each sector consists of many employers who pay a common sector specific ability wage, w_k. A worker is paid a wage equal to the ability wage in that sector times that worker's sector specific ability, $w_{ik} = w_k a_{ik}$.

Assume that mobility between sectors within a local market is costless for workers, but that movement between local labor markets is prohibitively expensive. In this case, each worker will select the sector of employment that provides the higher wage. That is, worker *i* will select sector 1 if $w_1 a_{i1} > w_2 a_{i2}$ or $w_1 / w_2 > a_{i2} / a_{i1}$. Self-selection implies that the ray with slope w_1 / w_2 divides the joint distribution of skills such that workers with skill pairs below the ray will select to work in sector 1 and workers with skill pairs above the ray will select to work in sector 2.

Positive correlation in skill attributes across sectors

We will label sector 1 as "Retail" and sector 2 as "Mfg". Assume for now that the two skill abilities are positively correlated and that the variance of abilities in manufacturing is higher than in retail. Let the ability wages w_1^c and w_2^c represent a competitive equilibrium where, given the selection of workers across the two sectors induced by these ability wages, firms make zero profits selling their output. With this joint distribution of abilities, self-selection leads the manufacturing

[6] The value of a statistical life literature (started by Rosen and Thaler 1974) is a first cousin of the Rosen/Roback model. In that literature, researchers seek to estimate the compensating differential for working in a riskier job (Viscusi 1993). Hwang, Reed and Hubbard's (1992) work investigates the assignment of heterogeneous workers to risky and safe jobs.

sector to attract, on average, higher quality workers than the retail sector. While high ability workers in manufacturing are also high ability in retail, the larger variance of ability in manufacturing allows many of these high skilled workers to earn more in manufacturing. This is illustrated in Figure 3.

Consider now the entry into the local labor market of a large retail employer that displaces the small retailers. Once the small retail employers have exited, the large retail employer acts as a monopsonist. The assignment of workers to sectors implies that the large retail employer faces an upward sloping supply curve of workers that is indexed to the ability wage paid in manufacturing. Acting as a monopsonist, the retail employer reduces the ability wage paid in retail, $w_1^m < w_1^c$, so that the marginal revenue product of labor equals the marginal factor cost.

Holding constant the ability wage in manufacturing, the lower ability wage in retail rotates the relative ability ray downward as shown in Figure 3. This induces workers with ability pairs between the two rays to reallocate from retail to manufacturing. Total employment in retail is reduced as a consequence.[7] Wages fall for those workers who remain in the retail sector. For a worker with retail skill a_{i1} who remains in the retail sector, the wage decline is proportional to the vertical distance between the two skill price rays at a_{i1}. In addition, the average ability of workers in retail is lower under the monopsony retailer than under the earlier competitive retail sector. So, the decline in average retail earnings reflects both the lower ability wage and the lower average ability of workers remaining in the retail sector.

The prediction that the decline in average earnings in the monopsony sector reflects both a wage and a skill composition effect has been examined in the literature. Qiu and Sojourner (2019) find that increasing concentration reduces the share of college-educated workers in the affected sector. They find that controlling for the human capital characteristics of workers substantially reduces the conditional impact of concentration on wages. Azar et al (2019) find that controlling for job titles (a proxy for worker quality) lowers the impact of concentration on wages. This is also consistent with an increase in concentration in a sector leading to a reduction in workers quality in that sector.

[7] Our analysis ignores minimum wage restrictions that may be bindings in some markets. See Azar et al 2019 for an analysis of the interaction of minimum wages and employment concentration in determining employment effects associated with the minimum wage.

The Roy model also provides insights for the relative wage effects of a monopsonist between workers who switch sectors and workers who remain in retail. For a worker with retail skill a_{i1} who switches to manufacturing, the wage decline is proportional to the height of the original skill price ray at a_{i1} less the worker's skill level in manufacturing, a_{i2}. Workers with retail skill a_{i1} who remain in retail suffer a wage loss proportional to the vertical distance between the two skill price rays at a_{i1}. For a given skill level in retail, then, the wage loss for workers who remain in retail is greater than the wage loss for workers who switch to manufacturing.[8]

Whether this is the new equilibrium depends on if the manufacturing sector for this labor market is a price taker in a broader manufacturing market. If this is the case, then the ability wage in manufacturing is not affected by the influx of additional workers to the local manufacturing sector. For workers who were already working in manufacturing, the entry of the monopsonist in the retail sector does not affect their wages. However, the average earnings in manufacturing increase due to the high average ability of the new entrants from the retail sector. In contrast, if the local manufacturing sector is not a price taker, then the expanded output due to the influx of workers from the retail sector will result in a lower skill wage in manufacturing. This shifts the supply curve facing the monopsonist and will reduce the overall movement of workers into manufacturing.

The entry of the monopsonist retailer reduces the skill wage in retail and possibly also in manufacturing. This reduces the utility of workers in retail and also in manufacturing if there is a negative wage externality.[9] With migration to other labor markets not possible, the profits for the monopsonist are created at the expense of local workers and consumers. Retired households would not bear any of the wage cost. The standard analysis ignores the housing market and assumes that rents and house prices remain unaffected. Capitalization of the monopsony effect into lower house prices affects all homeowners regardless of whether they experience a lower wage from the monopsonist.

We can consider other extensions of the basic Roy model. The standard application considers households with a single worker. Assume now that there are two-earner households where

[8] In contrast, Neal (1995) finds that industry switchers tend to suffer greater wage losses than industry stayers following a job displacement.

[9] If the manufacturing sector sells to a local market so the reallocation of workers to that sector would increase supply to the local market, causing the price to decline. This price decline would lead to a reduction in the skill wage for manufacturing. This is the negative pecuniary wage externality.

their skill attributes are positively correlated, see Becker (1973, 1974). For the subset of these households that are working in the sector that the monopsonist enters, the wage effects will be compounded. The house price effect, however, does not directly vary with the number of earners. In this case, the two worker families working in retail bear more of the costs of the local "exploitation". A second extension would be to add a third sector consisting of home production. If the value of home production is unaffected by the entry of the monopsonist (similar to the manufacturing sector that sells into a national market), then the reduction in the skill wage in retail will induce reallocation both to the manufacturing and the home production sectors. Including a third sector likely will increase the labor supply elasticity facing the monopsonist and therefore reduce the degree of the reduction in the retail skill wage.

Recent Empirical Research on Local Monopsony Power

Recent research on measuring monopsony power has sought to describe the time series patterns and the cross-sectional variation in labor market power. If monopsony power rises uniformly across local labor markets, then the spatial equilibrium model is not the right model for evaluating the economic incidence of this trend. The recent empirical evidence, however, suggests that monopsony is concentrated in specific types of local labor markets.

The most comprehensive empirical analysis on changes in local labor market concentration and worker compensation are based on the Census Longitudinal Business Database (LRB).[10] This covers the universe of establishments providing for each establishment the location, industry (NAICS) classification, employment count and payroll. In addition, identifiers allow researchers to link establishments for the same firm. For each establishment, average earnings is calculated as establishment payroll divided by employment. Rinz (2018) also merges in employee W-2 information to provide employee-specific earnings information. In addition, he merges in Census information to provide the age, gender and race/ethnicity of individual workers.

Using the LRB data, Rinz finds that employment weighted local labor market concentration measured at a 4-digit industry/commuting zone level declined nationally between 1976 and 2008, and then increased immediately following the financial crisis with declines returning after 2010 (Rinz

[10] This data must be accessed through a Census Research Data Center and requires special approval.

2018, Figure 2). Using a more detailed 5-digit/commuting zone definition of a local market, Lipsius 2018 finds little change in employment weighted average concentration across time. Focusing just on manufacturing, Benmelech et al 2018 find a slight increase in concentration from the late 1970s to the early 2000s.[11] Disaggregating by geography, Rinz shows that the more concentrated areas tend to be smaller markets.

How does labor market concentration affect local wages? Lipsius 2018 regresses the log of establishment average earnings per worker on a quadratic in HHI, industry times city fixed effects, and different specifications of time effects. He finds that a one standard deviation increase in HHI is associated with around an 8 percent decline in average earnings per workers. Using a worker-specific earnings slightly lowers the impact of concentration on earnings. Using establishment average earnings per worker, Rinz 2018 finds the coefficient on the log of HHI is around -0.05. When he switches to W-2 earnings, the coefficient on the log of HHI declines to around -0.03.[12]

The estimated negative partial correlation between employment concentration and wages is consistent with local monopsony, but does not confirm that this is the underlying mechanism at work. Berry et al (2019) reviews the potential problems in applying the *structure-conduct-performance* paradigm from the traditional industrial organization literature. The authors state that "… there are multiple causal paths that can explain a given correlation between concentration and other market outcomes" (page 46). This is distinct from an endogeneity problem.

For example, assume that employment concentration increased in some localities due to de-industrialization as manufacturing plants closed reflecting increased global competition and movement of production to non-union plants in the South.[13] Wages would fall as high pay jobs (many unionized) leave the local market. Given the inelastic supply of existing housing (Glaeser and Gyourko (2005)), the loss of income would be reflected in lower house prices. In addition, as the tax base erodes there would be upward pressure on tax rates to maintain services. This would put further downward pressure on house prices. This would suggest that we test for differences in capitalization effects from employment concentration in the Rust Belt states vs outside this region.

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[11] Rossi-Hansberg et al (2019) document a similar increasing trend in national product market concentration and decreasing trend in local concentration.

[12] Hershbein et al (2019) examine the relationship between concentration and plant-level markdown in manufacturing—the ratio of a plant's marginal revenue product and its wage. They find that markdowns on average declined from the 1970s to the early 2000s and then sharply increased.

[13] Employment concentration could rise due to a "last plant" surviving effect.

Testing for Real Estate Market Capitalization Effects

Using a U.S county panel data set, we present reduced form regressions to test whether real estate prices are lower in counties featuring greater concentrations of employment. We include a rich set of fixed effects and introduce an instrumental variables strategy. Our main goal here is to highlight results from a feasible empirical specification and to suggest fruitful paths for further empirical research.

Deriving County Level Employment Concentration

We use County Business Patterns (CBP) data from 1986 to 2016. This provides the total county employment and the number of establishments in each size category. The list of employee size categories provided are: 1-4, 5-9, 10-19, 20-49, 50-99, 100-249, 250-499, 500-999, 1,000-1,499, 1,500-2,499, 2,500-4,999, 5,000+. Table 1 provides the share of establishments in each size category when we pool across all of the counties and years. The distribution of establishments and employment by size is extremely skewed. More than half of all establishments are less than 5 persons in size and two-thirds are less than 10 persons. The task is to use this information to allocate to establishments the county employment across these categories. We can then calculate the standard measures of employment concentration.

We start with the case of a county that has no establishments in the upper open size category. We assume that that all establishments have a size that places them at a given relative distance within their size category. We select this distance so that the sum the estimated establishment sizes equals the total employment for the county. An implication is that this distance can vary across counties.

For counties that have one or more establishments in the upper open size category, we start by assuming the distance is the median of the earlier distance estimates (0.338 of the width). We allocate as before employees for establishments in the closed size categories. We then aggregate the total allocated employees and subtract this from the county total employment. We check that this employment difference exceeds 5,000 times the number of establishments in the upper open size category. If this is the case, then the establishment size for these remaining firms is simply the employment difference divided by the number of large establishments. If the check is not satisfied, then we recalculate using the 25th percentile (0.309 of the width) in place of the median. We continue in this manner shrinking the distance measure until the condition is satisfied.

Returning to Table 1, as noted above establishments with less than 10 employees account for approximately 75 percent of total establishments, yet they represent for less than 9 percent of total employment. Similarly, establishments of 1,000 or more employees account for less than a tenth of a percent of total establishments and 13 percent of total employment.

We construct two measures of concentration using the county-level data on imputed establishment sizes. These are the share of total county employment accounted for by the top 10 establishments, and the Herfindahl index (where the maximum value is 10,000). Descriptive statistics on these two measures are provided in Table 2. As found by Rinz (2018), the distribution of both measures of employment concentration shift to the left as we move from small to large counties. Figure 4 provides the employment weighted aggregate time-series on our measures of concentration. Similar to Rinz's Figure 2, the data indicate a declining level of concentration up to 2006, and a subsequent rise to levels that prevailed around 2001. We disaggregate by county size in Figures 5 and 6. These show that the pattern across localities observed by Rinz (2108) is most closely followed by our small-sized counties for both concentration measures.

How important is growing employment concentration given the aggregate patterns in the data? We compute the percent change in the Herfindahl index for each county over the 10-year period beginning in 2006 when the mean concentration across counties began to rise. Over this period, the median (unweighted) county experienced no change in concentration. However, ten percent of counties (317) experienced an increase in employment concentration of 64 percent or more, while 5 percent of counties (158) experienced an increase of 104 percent or more. So, over the more recent period, rising employment concentration is not an issue for most counties. However, monopsony power could be considered an issue for a subset of counties. The Rosen/Roback model would be less relevant if there were a general increase in employment concentration. In this case, the outside indirect utility would be changing where we have assumed that it is constant.

Our measure of house prices is the county median home price per square foot from Zillow.[14] We use data from July for the years 2000 to 2016. Zillow provides these data for roughly 1,500

[14] Zillow uses both public record and Multiple Listing Service data to estimate individual home values using a hybrid hedonic and repeat-sale methodology.

counties. The smallest counties are much less likely to have such data provided. Combining this with our employment concentration measures from CBP, we estimate the following regression specifications for county *j* in state *i* at time *t*.

$$\log(\mathit{house\ price} / \mathit{sq\ foot}_{jit}) = \beta_0 + \beta_1 \log(\mathit{employment}_{jit}) + \beta_2 \mathit{concentration}_{jit} + \alpha_j + \mu_{it} + \varepsilon_{jit} \qquad (7)$$

where "concentration" is either $\log(HHI_{jit})$ or $\mathit{Share\ Top}\ 10_{jit}$. We control for county (α_j) and state/year (μ_{it}) fixed effects.

There are two concerns with estimating (7) with OLS. The first is that within county variation in employment concentration can reflect left-out local economic factors that are correlated with house prices and the size distribution of employment. If left uncorrected, these left-out factors would impart a bias to our estimate of β_2. The second is that our county-specific employment concentration measures display a degree of mean reverting measurement error. For example, the correlation between within county adjacent year-to-year changes in the Herfindahl measure is −0.25. This measurement error if left uncorrected will attenuate the estimated relationship between local housing costs and employment concentration.

To address both concerns, we instrument for our two employment concentration measures in a county. We follow a variant of the strategy used by Azar et al (2017) and Rinz (2018) where we use the mean value of that concentration measure in a set of similar counties. We assign counties to one of twenty size categories based on their total employment in 1998. For each county and year, we calculate the mean employment concentration in that year for the counties in the same size class less the concentration for that county and any contiguous counties that are in the same class.

There is a strong positive correlation between the two measures of employment concentration in a county and the county-specific adjusted mean concentration in that class. This instrument will help isolate changes in a county's employment concentration that are driven by non-local factors and less likely to reflect influences of unobserved local conditions. Also, by averaging across a set of counties, variation in the instrument will help remove measurement error from the change in a county's employment concentration.

The results using the Herfindahl employment concentration measure are provided in Table 3 and for the top 10 share in Table 4. The upper panel in each table reports results from OLS regressions and the bottom panel from IV regressions. The first specification is for the pooled sample of counties. Specifications (2) and (3) split the sample into counties from the rust belt and those outside the rust belt.[15] Finally, in specifications (4) to (6) we disaggregate the estimation sample of counties into terciles based on total county employment. In all cases, we estimate the employment concentration coefficient using within county variation deviated from state-specific year effects.

Start with the OLS results for the Herfindahl measure of employment concentration reported in the top half of Table 3. In all of the specifications, we find a statistically significant positive relationship between County employment and house prices. The elasticity for the pooled sample is 11 percent. The relationship between employment and house prices is strongest in the upper third of counties based on total employment where the elasticity is roughly double in size from the smallest counties.[16]

Turning to employment concentration, the OLS estimates indicate a statistically significant negative relationship between the Herfindahl measure of employment concentration and house prices across the specifications. For the pooled sample, the data indicate an elasticity of –0.02. When we divide counties into those in Rust Belt states and those outside these states, the elasticity is negative in both cases but twice the magnitude for counties outside of the Rust Belt states. Finally, when we disaggregate by county size, the estimated elasticity is negative for all three-size categories and largest for the middle size counties.

Turning to the relationship between employment concentration and house prices, , a few points are worth noting. For the pooled sample of counties, the IV estimate of the elasticity between employment concentration and house prices increases in absolute value from 0.021 to 0.037. In contrast to the OLS findings, the IV estimates indicate a larger elasticity for counties in Rust Belt states. Looking across size categories, the OLS and the IV estimates both indicate that the relationship between employment concentration and house prices is strongest for middle size

[15] We define the Rust Belt to include the following states; IL, IN, MI, OH, PA and WI.

[16] Pope and Pope (2015) estimate that the presence of a Wal-Mart store is associated with higher prices of between 1-2 percent for properties between a half-mile and a mile from the store location. Using Wal-Mart location data published by Holmes (2011) for the period pre-2007, we find a Wal-Mart effect on overall house prices of 1.8 percent (though not statistically significant).

counties.[17] However, the IV results indicate for the largest counties a positive but statistically insignificant elasticity in contrast to the negative and significant OLS elasticity. This suggests a differentiation in the dynamic of employment concentration across large and smaller counties that has different implications for local housing markets.[18]

We check for robustness of our findings in Table 4 where we use the Top-10 employment share as our measure of employment concentration. As was the case for the Herfindahl measure, the OLS estimated effects of rising employment concentration on house prices are all negative and statistically significant. A one standard deviation change in the share top 10 (i.e. 0.17), for the pooled sample is associated with an OLS estimated decline in house prices of 4 percent. The associated pooled IV estimate is a decline of 6 percent. The IV estimates suggest that the effect of employment concentration is similar between Rust Belt and non-Rust Belt states. Finally, the IV estimate for the largest size counties using the Top-10 share indicates a positive and significant relationship between employment concentration and house prices.

We can compare these house price effects to the estimated wage effects to get a sense of the economic significance of the offset in house prices. Recall that Rinz (2018) finds that the employment weighted elasticity of employment concentration (as measured by the Herfindahl index) and W-2 payroll compensation is –0.032. For a renter considering the transition to homeownership, how would higher employment concentration affect the affordability of owning a home? The IV estimates using the Herfindahl measure indicate that house price reductions would on average fully offset the increase in the debt service cost, property taxes and homeowners insurance relative to income induced by the higher employment concentration.[19]

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17 Henderson (1997) demonstrates that "middle cities" tend to be the most specialized in their production of traded goods.

18 For example, increased employment concentration in large counties may reflect the growth of technology and internet firms that hire skilled workers and pay high wages.

19 The "front-end" ratio or PITI is the sum of the annual principal and interest on the mortgage, property taxes and homeowner insurance divided by annual income. The PITI, therefore, can be expressed as a percentage of the house price to annual income. The change in the PITI from employment concentration depends on the impact on the ratio of the house price to annual income.

Understanding Local Labor Market Concentration Dynamics

In estimating equation (7), we rely on within county variation in industry employment concentration. In this section, we explore three different mechanisms that could be generating this variation. One focuses on urban economic decline and the other two on economic growth. Before exploring these mechanisms, it is worth noting that monopsony does not require concentration in the local labor market. Collusion between firms over hiring practices can also give rise collectively to monopsony power (see CEA 2016, page 4-5).

In cities such as Detroit and smaller manufacturing cities such as Akron over the 1970s through the recent decades there has been a significant reduction in manufacturing activity as factories have either closed or relocated. While urban and labor economics research has focused on the total loss of employment, our interest here is in any resulting changes in industrial concentration. Recall, as shown in equation (7), in our specifications we always control for overall county employment. As factories close, the county HHI could rise as the few remaining factories in the declining city become the dominant employers. These remaining firms could seek to exercise market power in order to face lower wages to help offset declining profits.

As shown in Figures 4 and 5, the concentration index declines sharply starting in 2001. This is exactly the time when Autor et al (2013) report that the acceleration of Chinese exports to the U.S that injured domestic producers who were in direct competition with Chinese producers. This timing suggests that the shrinkage of U.S manufacturing in the Rust Belt is likely not driving our concentration dynamics.

A second explanation for rising local industrial concentration focuses on large new firms opening typically in Southern Right to Work States (Holmes 1998). As major plants such as Mercedes opening in Tuscaloosa, Alabama in 1993 and fully opening in 1997, the county level employment concentration could rise as such a major new plant accounts for a significant amount of the local employment. In the presence of agglomeration effects, synergistic firms will locate nearby to trade with this major plant. In the case of a growing county, rents could actually be rising in such places as HHI rises reflecting the relative high wages associated with the new jobs.

To explore the HHI dynamics in counties that attract major plants, we use data on "million dollar plant" openings and "control" counties from Patrick (2016).[20] The data contain the counties attracting a large plant that is used by Greenstone et. al. (2010). There are three different sets of control counties. The first set consists of the "losing" county (or counties) identified by the firm after the competition and used in Greenstone et al (2010). Patrick (2016) argues that these identified losing counties may not have been the next best locations for the plant. If firms plan on future plant locations, they may want to encourage large incentives by reporting losing counties that offered high incentives. In addition, a firm may not want to identify its next best location in order to preserve the option of locating a plant there in the future. Patrick uses propensity score matching to identify the "top match" county and the "top 5 match" counties.

Our interest is what impact, if any, is there on the county employment concentration from the location of a new large plant. Table 5 reports regression results where we use the log of the county Herfindahl index as our measure of county employment concentration. Specifications (1), (3), and (5) assume that the control counties are essentially identical to the counties winning the location contests in the pre-award period. Controlling for any differences in overall county employment, the results would indicate that winning counties experience a significant increase in employment concentration following the location of the new plant. In specifications (2), (4) and (6) we relax the assumption on the similarity of the control counties in the pre-award period and include a pre-award indicator for the winning county. The data indicate that controlling for overall county employment, counties that win large plant location contests are more concentrated than the control counties in the pre-award period.[21] Using the "loser" county controls, there is no significant impact on county concentration following the opening of the new plant. However, when we use Patrick's control counties we find that the employment concentration increases 6 to 11 percent following the opening of the new plant.

Importantly, the pre-award estimated effect on employment concentration is much stronger than the post-award effect. An implication is that the association between the opening of new plants and county-level employment concentration reflects predominately the association between existing

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[20] We would like to thank Carlianne Patrick for providing us with the data.

[21] The propensity score methodology Patrick uses to identify the control counties controls for many factors that a firm would likely consider important in making a location decision. Consequently, the higher pre-award employment concentration should not reflect these left-out variables.

employment concentration and the likelihood that a county attracts a new plant. This suggests that the location of new large manufacturing plants is also not a likely driver of our results.

The third explanation for within county employer concentration dynamics focuses on the "Walmart Effect"(Basker 2007). As corporate giants such as Amazon, CVS, Home Depot and Walmart take on greater market share in retail markets, there is a consolidation of smaller stores. The reduction in the count of establishments could reduce the competitiveness in local labor markets. These larger entities are also more capital intensive. While we do not have direct new evidence to report on this dynamic, previous research has quantified this effect. Given that the manufacturing dynamics discussed above is unlikely to be the key drivers of the variation, future work should explore whether retail and services consolidation is the main culprit.

Conclusion

The spatial equilibrium model from urban economics imposes important cross-restrictions on the cross-sectional spatial patterns of wages and rents that will emerge. In the spatial equilibrium, no worker or firm can raise its utility or profits by moving. Wages **and** rents adjust until this condition holds. This equilibrium concept helps to evaluate the economic incidence consequences of the rise of local labor market monopsony. Recent work in labor economics has been very valuable in highlighting emerging patterns. Existing models from urban economics play a central role in evaluating who pays for this market power.

The urban perspective suggests that how employment in a city becomes more concentrated is likely to be important in addition to the increase in concentration. If a national retailer enters the market displacing local firms, this increases local monopsony power which we have shown would generate negative capitalization into house prices. However, the national retailer might also provide consumption amenities in the form of increased product variety and lower prices. This would lead to an offsetting positive capitalization into house prices. In contrast, if increased international trade with low cost foreign manufactures results in many manufacturing plants in a city to close, any remaining plants will gain monopsony power. However, the lower prices associated with global trade are not location specific, so there would not be any offsetting positive capitalization.

Our new empirical work provides evidence that labor market power is capitalized into rent prices. Our estimated results are consistent with renters being the marginal worker in these local markets in that the rent effect offsets the wage effect. An ideal test of the role of spatial equilibrium in determining the economic incidence of rising monopsony power would feature a baseline perfectly competitive labor market in many different cities. The researcher would then randomly assign a subset of major firms in the city to having labor market power. The researcher could then observe the flows of workers into the city and out of the city and the real estate market dynamics introduced by this shock.

The human capital approach to studying worker earnings emphasizes that people are bundles of skills such as brains and brawn. A silver lining of the ongoing COVID-19 Pandemic is the rise of teleworking using cloud-based computing and online collaboration tools. These capabilities will only expand with time. If workers in a local labor market face increased monopsony power being exercised by local employers, they increasingly have the option to telecommute to use their "brain" skills (brawn cannot be used in telecommuting) to sell in a different local labor market. Future research could explore whether such arbitrage activity limits the local wage losses associated with monopsony.

References

Abouy, David. "Are Big Cities Really Bad Places to Live? Improving Quality-of-Life Estimates across Cities." Working Paper #14427. National Bureau of Economic Research, 2008. https://www.nber.org/papers/w14472.

Altonji, Joseph G., and Robert A. Shakotko. "Do Wages Rise with Job Seniority?" *Review of Economic Studies* 54 (July 1987): 437-459.

Ashenfelter, Orley C., Henry Farber, Michael R. Ransom, and . "Labor Market Monopsony." *Journal of Labor Economics* 28 (April 2010): 203-210.

Autor, David H., David Dorn, and Gordon H. Hanson. "The China Syndrome: Local Labor Market Effects of Import Competition in the United States." *American Economic Review* 103 (October 2013): 2121-2168.

Azar, Jose A., Ioana Marinescu, and Marshall I. Steinbaum. "Labor Market Concentration Does Not Explain the Falling Labor Share." Working Paper #24147. National Bureau of Economic Research, 2019. https://www.nber.org/papers/w24147.

------, Ioana Marinescu, Marshall I. Steinbaum, and Bledi Taska. "Concentration in US Labor Markets: Evidence From Online Vacancy Data." Working Paper #24395. National Bureau of Economic Research, 2018. https://www.nber.org/papers/w24395.

Azar, Jose, Emiliano Huet-Vaughn, Ioanna Marinescu, Bledi Taska, and Till von Wachter. "Minimum Wage Employment Effects and Labor Market Concentration." Working Paper #26101. National Bureau of Economic Research, July, 2019. https://www.nber.org/papers/w26101.pdf.

Basker, Emek. "The Causes and Consequences of Wal-Mart's Growth." *Journal of Economic Perspectives* 21 (Summer 2007): 177-198.

Becker, Gary S. "A Theory of Marriage: Part II." *Journal of Political Economy* 81 (July/August 1973): 813-846.

------. "A Theory of Marriage: Part II." *Journal of Political Economy* 82 (March-April 1974): S11-S26.

Benmelech, Efraim, Nittai Bergman, and Hyunseob Kim. "Strong Employers and Weak Employees: How Does Employer Concentration Affect Wages?" Working Paper #24307. National Bureau of Economic Research, February, 2018. https://www.nber.org/papers/w24307.

Berry, Steven, Martin Gaynor, and Fiona Scott Morton. "Do Increasing Markups Matter? Lessons from Empirical Industrial Organization." *Journal of Economic Perspectives* 33 (Summer 2019): 44-68.

Bhaskar, V., Alan Manning, Ted To, and . "Oligopsony and Monopsonistic Competition in Labor Markets." *Journal of Economic Perspectives* 16 (Spring 2002): 155-174.

Bresnahan, Timothy F., and Peter C. Reiss. "Entry in Monopoly Markets." *The Review of Economics and Statistics* 57 (October 1990): 531-553.

------, and Peter C. Reiss. "Entry and Competition in Concentrated Markets." *Journal of Political Economy* 99 (October 1991): 977-1009.

Brueckner, Jan K., and David Neumark. "Beaches, Sunshine, and Public Sector Pay: Theory and Evidence on Amenities and Rent Extraction by Government Workers." *American Economic Journal: Economic Policy* 6 (May 2014): 198-230.

Council of Economic Advisors. "Issue Brief." Washington, DC, October, 2016. https://obamawhitehouse.archives.gov/sites/default/files/page/files/20161025_monopsony_labor_mrkt_cea.pdf.

Glaeser, Edward L., David Laibson, and Bruce Sacerdote. "An Economic Approach to Social Capital." *Economic Journal* 112 (November 2009): F437-F458.

Glaeser, Edward, and Joseph Gyourko. "Urban Decline and Durable Housing." *Journal of Political Economy* 113, no. 2 (2005): 345-375.

Greenstone, Michael, Richard Hornbeck, and Enrico Moretti. "Identifying Agglomeration Spillovers: Evidence from Winners and Losers of Large Plant Openings." *Journal of Political Economy* 118 (June 2010): 536-598.

Gyourko, Joseph, and Joseph Tracy. "The Importance of Local Fiscal Conditions in Analyzing Local Labor Markets." *Journal of Political Economy* 97 (1989): 1208-1231.

------, and Joseph Tracy. "The Structure of Local Public Finance and the Quality of Life." *Journal of Political Economy* 99 (August 1991): 774-806.

Henderson, J. Vernon. "Medium Size Cities." *Regional Science and Urban Economics* 27 (November 1997): 583-612.

Hershbein, Brad, and Claudia Macaluso. "Labor Market Concentration and the Demand for Skills." Working Paper. W.E. Upjohn Institute, July, 2018. http://conference.iza.org/conference_files/DATA_2018/macaluso_c26795.pdf.

------, Claudia Macaluso, and Chen Yeh. "Monopsony in the U.S. Labor Market." Working Paper, December 6, 2019.

Hilber, Christian A.L., and Christopher Mayer. "Why Do Households Without Children Support Local Public Schools? Linking House Price Capitalization to School Spending." *Journal of Urban Economics* 65 (January 2009): 74-90.

Holmes, Thomas J. "The Effect of State Policies on the Location of Manufacturing: Evidence From State Borders." *Journal of Political Economy* 106 (August 1998): 667-705.

------. "The Diffusion of Wal-Mart and Economics of Density." *Econometrica* 79 (January 2011): 253-302.

Hwang, Hae-shin, W. Robert Reed, and Carlton Hubbard. "Compensating Wage Differentials and Unobserved Productivity." *Journal of Political Economy* 100 (August 1992): 835-858.

Lipsius, Ben. "Labor Market Concentration Does Not Explain the Falling Labor Share." Working Paper. University of Michigan, November, 2018.

Manning, Alan. *Monopsony in motion: Imperfect competition in labor markets*. Princeton and Oxford, Princeton University Press, 2003.

------. "A Generalised Model of Monopsony." *Economic Journal* 116 (January 2006): 84-100.

------. "The Plant Size-Place Effect: Agglomeration and Monopsony in Labour Markets." *Journal of Economic Geography* 10 (September 2009): 717-744.

------. "Imperfect Competition in the Labor Market." In *Handbook of Labor Economics*, 973-1041. Elsevier, 2011.

Matsudaira, Jordan D. "Monopsony in the Low-Wage Labor Market? Evidence from Minimum Nurse Staffing Regulations." *Review of Economics and Statistics* 96 (March 2014): 92-102.

Mendez-Chacon, Esteban, and Diana Van Patten. "Multinationals, Monopsony and Local Development: Evidence from the United Fruit Company." Working Paper. University of California, Los Angeles, November, 2019. https://1ac50a88-25ab-4011-94bc-c9af1856189b.filesusr.com/ugd/27755d_6d30e743947a41ba9ced37d3b0fdba56.pdf.

Neal, Derek. "Industry-Specific Human Capital: Evidence from Displaced Workers." *Journal of Labor Economics* 13 (October 1995): 653-677.

Neumark, David, Junfu Zhang, and Stephen Ciccarella. "The Effects of Wal-Mart on Local Labor Markets." *Journal of Urban Economics* 63 (March 2008): 405-430.

Patrick, Carlianne. "Identifying the Local Development Effects of Million Dollar Facilities." *Economic Inquiry* 54 (October 2016): 1737-1762.

------, and Mark Partridge. "Identifying Agglomeration Spillovers: New Evidence From Large Plant Openings." Working Paper. Georgia State University, December, 2019.

Poletaev, Maxim, and Chris Robinson. "Human Capital Specificity: Evidence from the Dictionary of Occupation Titles and Displaced Worker Surveys, 1984-2000." *Journal of Labor Economics* 26 (July 2008): 387-420.
Pope, Devin G., and Jaren C. Pope. "When Walmart Comes to Town: Always Low Housing Prices? Always?" *Journal of Urban Economics* 87 (May 2015): 1-13.
Qiu, Yue, and Aaron Sojourner. "Labor-Market Concentration and Labor Compensation." Working Paper. Temple University, Fox School of Business, October, 2019.
Rinz, Kevin. "Labor Market Concentration, Earnings Inequality, and Earnings Mobility." Working Paper 2018-10. U.S. Census Bureau, September, 2018.
Roback, Jennifer. "Wages, Rents, and the Quality of Life." *Journal of Political Economy* 90 (1982): 1257-1278.
Rosen, Sherwin. "Wage-based Indexes of Urban Quality of Life." In *Current Issues in Urban Economics*, edited by Peter Mieszkowski and Mahlon Straszheim. Baltimore, Johns Hopkins University Press, 1979.
Rossi-Hansberg, Esteban, Pierre-Daniel Sarte, and Nicholas Trachter. "Diverging Trends in National and Local Concentration." Working Paper. Princeton University, April, 2019. https://www.princeton.edu/~erossi/DTNLC.pdf.
Thaler, Richard, and Sherwin Rosen. "The Value of Saving a Life: Evidence from the Labor Market." In *Markets and Diversity*, 91-127. Cambridge and London, Harvard University Press, 2004.
Topel, Robert H. "Specific Capital, Mobility and Wages: Wages Rise with Job Seniority." *Journal of Political Economy* 99 (February 1991): 145-176.
Viscusi, W. Kip. "The Value of Risks to Life and Health." *Journal of Economic Literature* 31 (December 1993): 1912-1946.

Table 1. Establishment Size Distribution

Employment Size Category	Share of Total Establishments	Share of Total Employment
1 – 4	0.5611	0.0787
5 – 9	0.1953	0.0864
10 – 19	0.1187	0.1079
20 – 49	0.0773	0.1607
50 – 99	0.0269	0.1250
100 – 249	0.0146	0.1534
250 – 499	0.0038	0.0891
500 – 999	0.0015	0.0681
1,000 – 1,499	0.00039	0.0323
1,500 – 2,499	0.00026	0.0332
2,500 – 4,999	0.00013	0.0294
5,000+	0.00005	0.0358

Notes: County Business Pattern data, 1986 – 2016.

Table 2 Summary Statistics on County-Level Employment Concentration

	10th	25th	50th	75th	90th
Pooled:					
Top 10 employment share	14.4	22.8	33.6	45.4	58.0
Herfindahl index	42.1	95.4	195.8	381.6	744.3
Small:					
Top 10 employment share	31.3	37.6	46.1	57.1	70.1
Herfindahl index	174.3	244.4	373.5	647.2	1,191.2
Medium:					
Top 10 employment share	23.2	28.0	34.6	43.1	52.3
Herfindahl index	97.3	135.3	202.2	341.7	621.5
Large:					
Top 10 employment share	9.5	13.3	18.9	26.0	34.5e
Herfindahl index	19.6	36.3	68.0	123.0	228.5

Notes: County Business Pattern data, 1986 to 2016

Table 3. House Price Impacts of Employment Concentration -- Herfindahl

	(1) All	(2) Rust Belt	(3) Non Rust-Belt	(4) Small	(5) Medium	(6) Large
			OLS			
Log(employment)	0.112***	0.093***	0.114***	0.102***	0.123***	0.237***
	(0.005)	(0.017)	(0.005)	(0.008)	(0.010)	(0.013)
Log(HHI)	–0.021***	–0.010*	–0.022***	–0.018***	–0.024**	–0.016***
	(0.002)	(0.005)	(0.002)	(0.003)	(0.003)	(0.003)
Constant	3.096***	3.063***	3.085***	3.294***	2.924***	1.374***
	(0.051)	(0.136)	(0.053)	(0.102)	(0.093)	(0.161)
R-square	0.98	0.93	0.98	0.98	0.98	0.98
			IV			
Log(employment)	0.096***	0.085***	0.097***	0.086***	0.102***	0.234***
	(0.005)	(0.017)	(0.005)	(0.007)	(0.010)	(0.013)
Log(HHI)	–0.037***	–0.058***	–0.033***	–0.025***	–0.030***	0.013
	(0.006)	(0.017)	(0.007)	(0.012)	(0.011)	(0.022)
Constant	3.334***	3.394	3.302***	3.484***	3.150***	1.300
	(0.063)	(0.167))	(0.066)	(0.140)	(0.109)	(0.180)
R-square	0.98	0.93	0.98	0.98	0.98	0.98
Observations	29,962	4,748	25,195	9,992	9,992	9,993

Notes: Dependent variable is log(median house price per square foot). Standard errors are given in parentheses and are clustered by County. All specifications include County and State/Year fixed effects
*** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level

Table 4. House Price Impacts of Employment Concentration – Top-10 Share

	(1) All	(2) Rust Belt	(3) Non Rust-Belt	(4) Small	(5) Medium	(6) Large
			OLS			
Log(employment)	0.125***	0.102***	0.127***	0.113***	0.133***	0.242***
	(0.005)	(0.018)	(0.005)	(0.008)	(0.010)	(0.013)
Top-10 Share	–0.234***	–0.134***	–0.245***	–0.179***	–0.257***	–0.242***
	(0.015)	(0.049)	(0.016)	(0.022)	(0.022)	(0.041)
Constant	2.942***	2.990***	2.924***	3.160***	2.778***	1.283***
	(0.053)	(0.140)	(0.054)	(0.105)	(0.095)	(0.161)
R-square	0.98	0.93	0.98	0.98	0.98	0.98
			IV			
Log(employment)	0.096***	0.085***	0.097***	0.085***	0.103***	0.237***
	(0.005)	(0.018)	(0.005)	(0.008)	(0.011)	(0.014)
Top-10 Share	–0.363***	–0.385***	–0.363***	–0.284***	–0.461***	0.329*
	(0.064)	(0.177)	(0.064)	(0.098)	(0.095)	(0.186)
Constant	3.261***	3.222***	3.250***	3.447***	3.140***	1.178***
	(0.058)	(0.159)	(0.060)	(0.113)	(0.110)	(0.194)
R-square	0.98	0.93	0.98	0.98	0.98	0.98
Observations	29,946	4,748	25,197	9,991	9,981	9,987

Notes: Dependent variable is log(median house price per square foot). Standard errors are given in parentheses and are clustered by County. All specifications include County and State/Year fixed effects
*** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level

Table 5. Impact of Winning a Million Dollar Plan on Employment Concentration

	Loser(s)		Top Match		Top 5 Match	
	(1)	(2)	(3)	(4)	(5)	(6)
Log employment	–0.547***	–0.542***	–0.482***	–0.507***	–0.604***	–0.611***
	(0.007)	(0.007)	(0.015)	(0.015)	(0.006)	(0.006)
Winner – pre award		0.155***		0.436***		0.311***
		(0.032)		(0.039)		(0.034)
Winner – post award	0.186***	0.041	0.405***	0.064*	0.373***	0.109***
	(0.014)	(0.033)	(0.020)	(0.036)	(0.016)	(0.033)
Constant	10.066***	9.965***	9.328***	9.348***	10.656***	10.659***
	(0.088)	(0.091)	(0.177)	(0.175)	(0.074)	(0.073)
Observations	8,567	8,567	4,606	4,606	10,437	10,437
R-square	0.772	0.773	0.810	0.816	0.744	0.746

Notes: Dependent variable is log of county Herfindahl index. Standard errors are given in parentheses. All specifications include year effects. Data on losing counties and top 1 and top 5 matched counties (propensity score) from Patrick (2016).

*** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level

Figure 1. Effect of Monopsonist on Local Equilibrium – No Mobility Costs

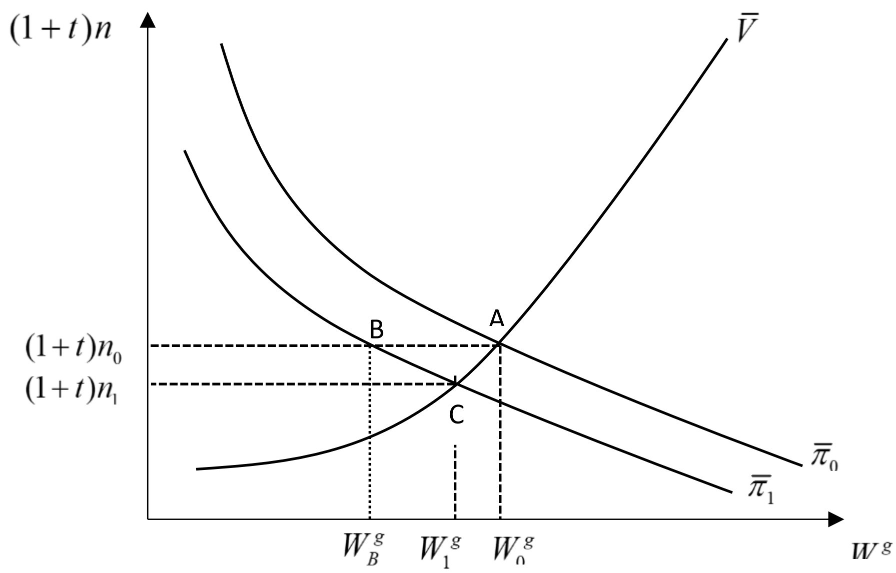

Figure 2. Effect of Monopsonist on Local Equilibrium – With Mobility Costs

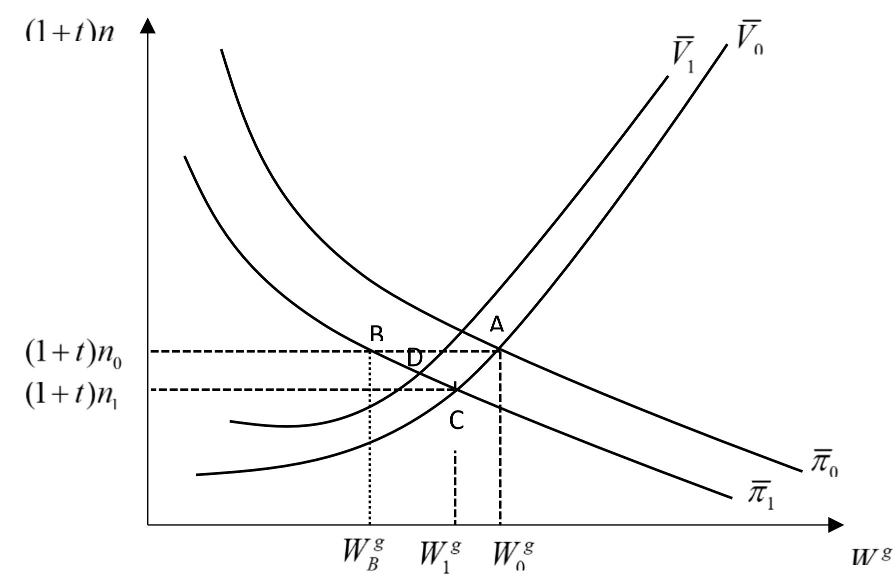

Figure 3. Impact of Monopsony on Worker Assignment – positive correlation in skills

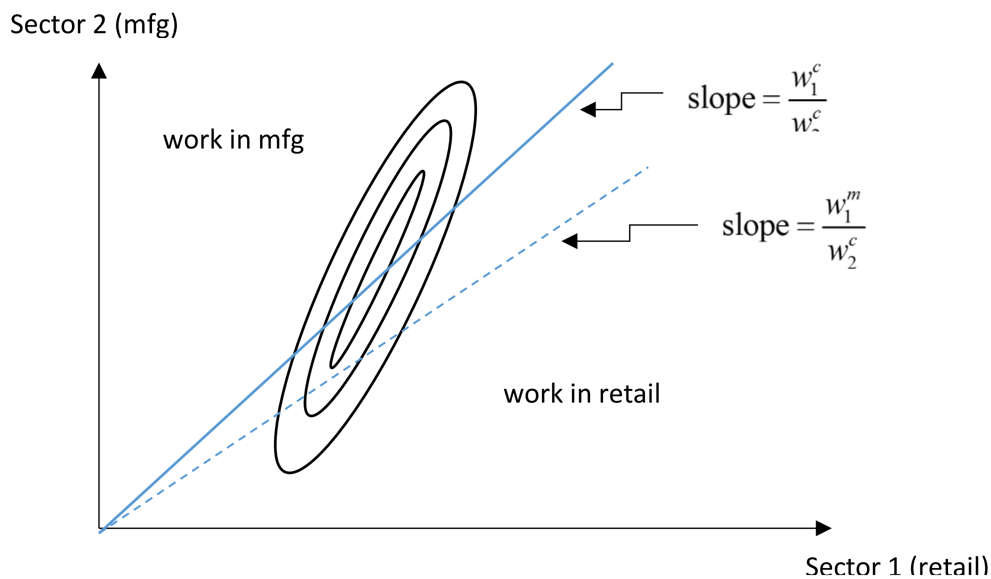

Figure 4. Time-Series of County-Level Employment Concentration

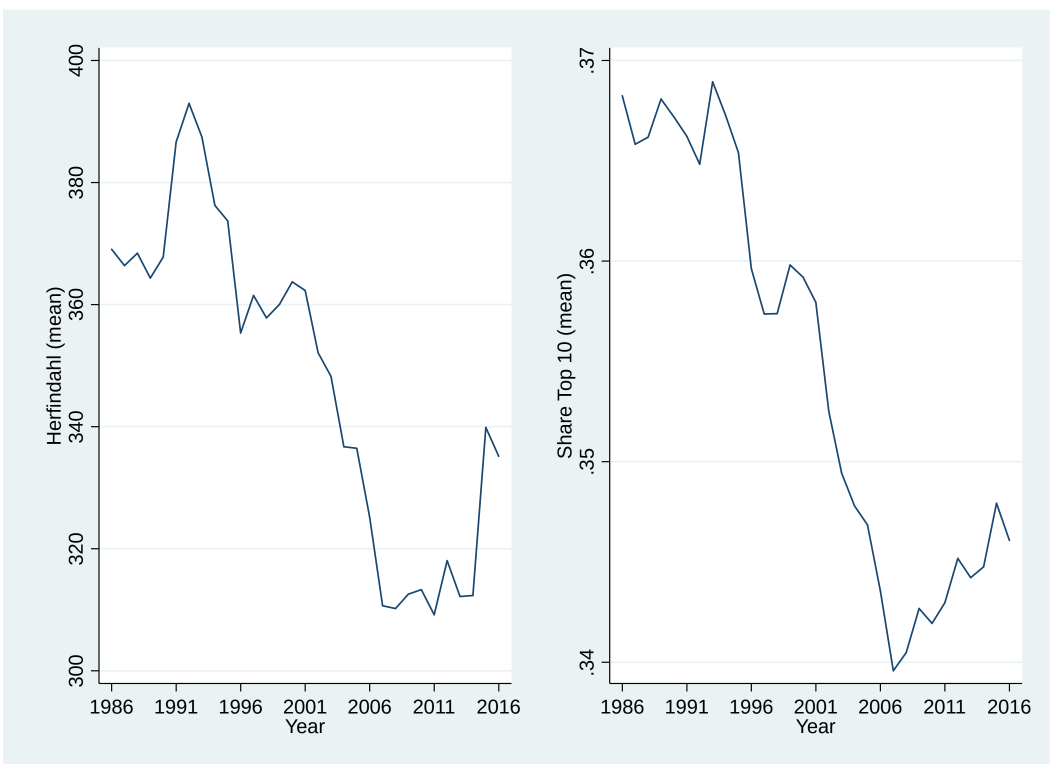

Figure 5. Time Series of Herfindahl – by Employment Tercile

Figure 6. Time Series of Share Top 10 – by Employment Tercile

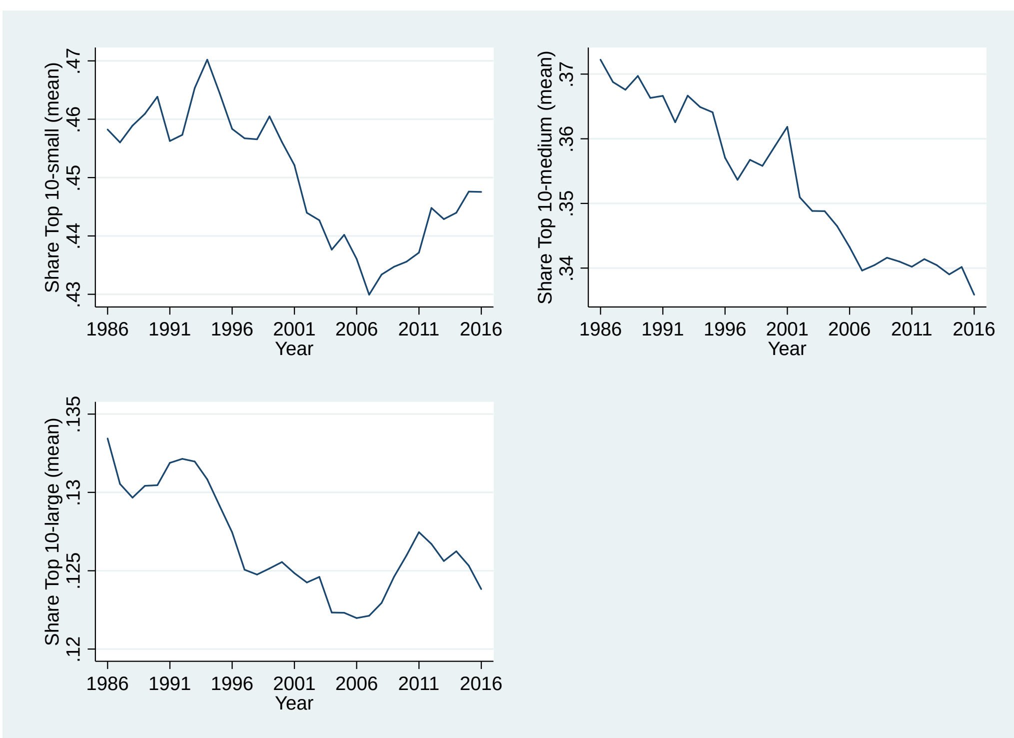

Figure 7. Time Series of Herfindahl – by Employment Tercile and Right-to-Work

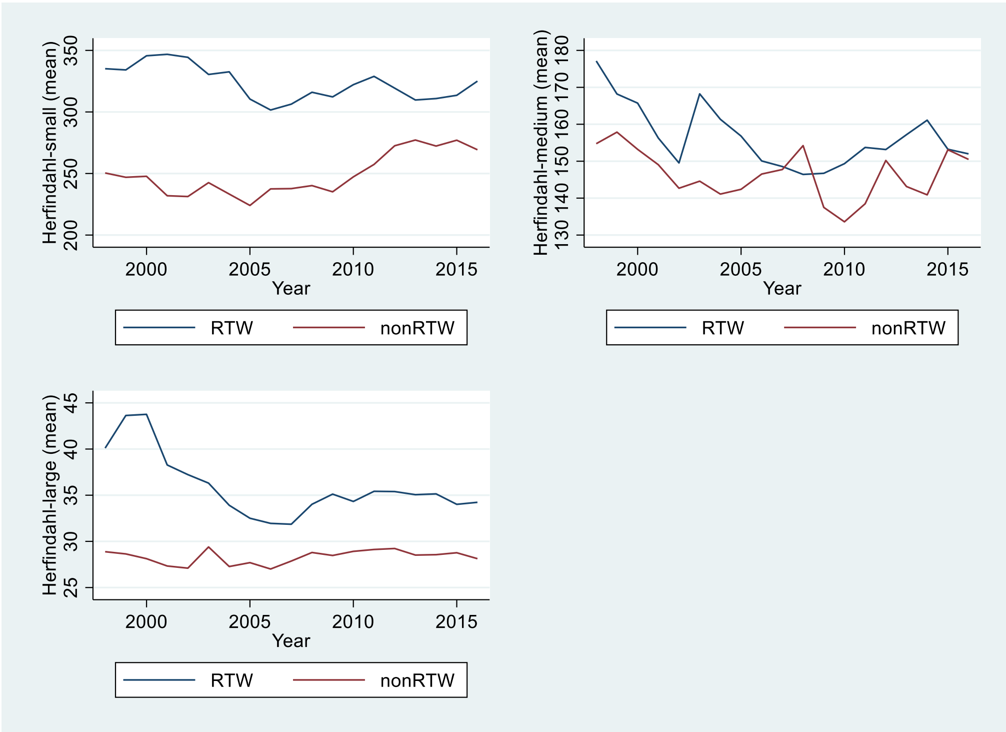

Figure 8. Time Series of Share Top 10 – by Employment Tercile and Right-to-Work