Wal-Mart's Monopsony Power in Local Labor Markets

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Selected Paper prepared for presentation at the American Agricultural Economics Association Annual Meeting, Orlando, FL, July 27-29, 2008.

JEL: J42, L13, L81

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Abstract

This paper measures the degree of monopsony power exerted by Wal-Mart over retail workers using a dominant-firm model and data on contiguous U.S. counties where the company operates, presenting for the first time a measure of the anti-competitive behavior of the company. Empirical results show that Wal-Mart's monopsony power over workers varies significantly across the country, being higher in rural counties, particularly in the south. For instance, Wal-Mart's buying power index in labor markets in rural southern central states is estimated to be 5% or higher while the impact on northeastern states' retail wages is negligible.

** The authors would like to thank Ronald W. Cotterill, Xenia Matschke, Delia Furtado, Elena Lopez and Emek Basker for valuable comments and suggestions during the development of this paper. All remaining errors are, of course, the responsibility of the authors.

Introduction

Wal-Mart, the largest retailer in the world, employs nearly 1.4 million people in the United States (Wal-Mart Inc. United States Operational Datasheet, May 2007), making it the largest private employer. The growth of Wal-Mart in the last two decades, fueled by low consumer prices and costs,[1] has significantly altered the retailing and employment landscape throughout the country. Moreover, Wal-Mart has been the target of local and state regulation proposals of numerous lawsuits regarding its workforce. Critics contend that the company undercuts wages. However, only mixed empirical evidence exists to support this claim.

From an economic standpoint, lower wages can be due to companies' buying power, productivity of non-labor inputs, and strategic location in lower-wage markets. The available literature has focused on controlling for the latter without relying on a structural model that explicitly accounts for the sources of the company's lower wages, leaving interpretation hostage to empirical results. The benchmark for comparison has so far been wages in counties where Wal-Mart does not operate, which does not necessarily reflect the competitive benchmark once a Wal-Mart has located there.

The empirical evidence is also scant and rather mixed: Ketchum and Hughes (1997) find no evidence of Wal-Mart's impact on wage growth and employment across Maine counties. Neumark, Zhang and Ciccarella (2006) find a negative impact of Wal-Mart on per capita earnings, estimated at an approximately 2.7% drop per store opening. Dube, Lester and Eidlin (2007) find a negative impact on retail earnings estimated to be between 0.5 and 0.9%.[2] Basker (2005a) finds instead Wal-Mart having small positive effect on county-level retail employment, even if reducing wholesale employment.

Table 1 illustrates the importance of Wal-Mart in U.S. retail labor markets.[3] Overall, Wal-Mart has a higher share of retail employment in the south and mid-west, where it typically employs one in four or five retail workers in the counties where it operates, than in the northeast or the Pacific west. Wal-Mart has not only faced myriad labor lawsuits but also policy maker's threats in Illinois and Maryland. A Chicago City Council ordinance, successively vetoed by the Mayor, required stores with more than 90,000 square feet and companies grossing more than $1 billion annually to pay a hourly minimum wage of $10 and benefits worth at least $3. The Maryland State Assembly passed the Maryland Fair Share Health Act which would have imposed tax burdens on companies paying low healthcare benefits, which, by design, was to affect only Wal-Mart, violating federal trade laws (Wagner, 2006). Being notoriously a "union-free" company, Wal-Mart also faces stiff criticism by public officials and labor unions: in February 2004, democratic Congressman George Miller presented a report to the House of Representative highlighting the low-wage and union-free policies of the company and the many labor malpractice which Wal-Mart stores' managers are allegedly responsible for (Miller, 2004). In other words, the company has faced nationwide criticism regarding labor wages and conditions, regardless of its importance in local labor markets and without well-grounded economic evidence.

Figure 1 illustrates the correlation between Wal-Mart retail labor shares and average retail labor earnings in counties where the company operated in 2004. It is interesting to note that higher Wal-Mart labor shares in those counties are associated with lower workers' earnings, suggesting a wage-decreasing effect. However, this is not evidence of exploitation as these figures do not correct for local market conditions or productivity differentials and do not consider the presence of monopsony power markdown. Given the public concern over the

impact of the company on retail workers and the existence of competing explanations for its alleged wage-decreasing effects, there is a need for formal structural analysis that quantifies the effect, rigorously testing for the hypothesis of monopsony power over workers based on *local* rather than nationwide conditions.

This paper estimates a structural framework to measure Wal-Mart's monopsony power in local labor markets. A dominant firm model is estimated with data from contiguous U.S. counties where Wal-Mart operated in 2004. Empirical results show that although Wal-Mart's monopsony power is on average limited (less than 3%), the company exerts a significant amount of power over workers in rural areas located in south central states where it consistently exceeds 5%, generating concerns in terms of workers' losses. On the other hand, Wal-Mart effect on retail earnings in the northeast is practically negligible. While we find evidence to support the criticisms in some states, the findings do not support the notion that this is a nationwide problem.

The Model

Consider a simple dominant firm model with labor as the only variable input, where Wal-Mart exerts monopsony power in the labor market. Wal-Mart sets wages at the level where the marginal revenue product of labor ($MRPL_{WM}$) equals marginal labor cost (*mlc*), which lies above the company's residual supply of labor (x_{WM}^{s} **,** obtained by subtracting the fringe demand for labor from the total supply of labor). This results in both a wage rate x^{*} and an employment level x_{WM}^{*} that are below the perfectly competitive ones (w^{pc} and x_{WM}^{pc} , respectively).[4]

To formalize, let $X_T\left(w, Z^T\right)$ and $x_{FR}^{d}\left(w, Z_{FR}^{d}\right)$ represent the total supply of labor and fringe demand for labor, where Z^T and Z_{FR}^{d} are respectively vectors of total supply of labor and

fringe demand for labor shifters. Assuming no worker mobility across markets, the residual supply of labor facing Wal-Mart (x_{WM}) can be expressed as:

$$x_{WM} = X_T\left(w, Z^T\right) - x_{FR}^d\left(w, Z_{FR}^d\right) = x_{WM}\left(w, Z^T, Z_{FR}^d\right) \ . \qquad (1)$$

For simplicity, assume that labor is homogenous and that it is the only variable input used by Wal-Mart to sell a bundle of goods at competitive prices. The first-order condition for profit maximization w.r.t. wages yields:

$$w^* = MRPL_{WM}\ \eta_{WM}/(1+\eta_{WM}), \qquad (2)$$

where $MRPL_{WM}$ is the company's marginal revenue product of labor and η_{WM} is the wage elasticity of the residual labor supply $\left(\eta_{WM} = \partial \ln x_{WM}/\partial \ln w\right)$. From (2), one can derive the classical measure of monopsony power in labor markets, what Pigou (1924, p.754) defined as the "rate of exploitation" and Blair and Harrison (1993) refer to as the Buying Power Index (*BPI*), given by the inverse of the elasticity of the residual supply of labor facing Wal-Mart:

$$BPI = \left(MRPL_{WM} - w^*\right)\Big/ w^* = 1/\eta_{WM} \ . \qquad (3)$$

Given the assumption of homogeneous labor the residual supply of labor for Wal-Mart can be obtained via the fringe demand for labor and total supply of labor.[5] Using (1) and (3), the *BPI*, representing Wal-Mart's percent markdown below the marginal revenue product of labor is given by:

$$BPI = S_{WM}\Big/\left[\eta_T - \eta_{FR}^d(1-S_{WM})\right], \qquad (4)$$

where $S_{WM} = x_{WM}/X_T$ is Wal-Mart's market share of the retailing labor market, $\eta_{FR}^d = \partial \ln x_{FR}^d/\partial \ln w$ is the elasticity of the fringe demand for labor, and $\eta_T = \partial \ln X_T/\partial \ln w$ is the

elasticity of the total supply of labor for the retailing industry. In order to estimate *BPI*, one needs values for both η_{FR}^{d} and η_{T}.

The total supply of retail labor is assumed to take a log-linear form given by

$$\ln X_T = \alpha_0 + \eta_T \ln w + \sum_l \alpha_l Z_{Tl} + e_{TS}, \tag{5}$$

where $\eta_T = \partial \ln X_T / \partial \ln w$ is the elasticity of the total supply of retailing labor, the Z_Ts are labor supply shifters; the αs are parameters to be estimated; and e_{TS} is an error term. The fringe revenue function is assumed to be:

$$R_{FR} = Z_{FR} x_{FR}^{1+\varepsilon_{FR}} k_{FR}^{\gamma} / \left(1+\varepsilon_{FR}\right), \tag{6}$$

where R_{FR} represents revenues accruing to fringe retailers; $1+\varepsilon_{FR}$ the revenue elasticity with respect to labor; and γ the revenue elasticity with respect to capital. For (6) to be well-behaved, $1+\varepsilon_{FR} > 0$ or $\varepsilon_{FR} > -1$, $\gamma > 0$ and $1+\varepsilon_{FR}+\gamma > 0$. Under the assumption of a competitive fringe (in the labor market), the wages offered will be equal to the marginal revenue product of labor:

$$w = MRPL_{FR} = Z_{FR} x_{FR}^{\varepsilon_{FR}} k_{FR}^{\gamma} \tag{7}$$

Taking natural logs for both sides of the equations, rearranging and adding a random error term, an estimable expression for the fringe retailers' demand for labor is:

$$\ln x_{FR} = \eta_{FR}^{d} \ln w - \eta_{FR}^{d} \left(\gamma \ln k_{FR} + \beta_0 + \sum_k \beta_k z_{FRk}^{d} \right) + e_{FD}, \tag{8}$$

where ln is the natural log operator; $\eta_{FR}^{d} = \partial \ln x_{FR} / \partial \ln w$ is the elasticity of fringe demand, which for consistency with (8) is expected to be less than < -1 (*i.e.*, their demand for labor is

wage elastic);[6] the β_ks are parameters to be estimated; the z_{FR}^ds are labor demand shifters; and e_{FD} is an error term.

To complete the empirical model, one needs to address the issue that output, which is usually introduced as a labor demand shifter, is potentially endogenous as addressed in Quandt and Rosen (1989) and Gorter, Hassink, Nijkamp and Pels (1997). To deal with this problem, output is modeled explicitly with an additional equation following Quandt and Rosen's (1989) approach. Using (8) and normalizing output prices to 1, an instrument for the log of output is expressed as[7]

$$\ln y_{FR} = \ln R_{FR}\big|_{p_{FR}=1} = \delta_0 + \left[\left(1+\eta_{FR}^d\right)\Big/\eta_{FR}^d\right]\ln x_{FR} + \gamma \ln k_{FR} + \sum_l \delta_l z_{FRl} + e_{FR}^y, \quad (9)$$

where $\delta_0 = -\ln\left(1+\eta_{FR}^d\right)\Big/\eta_{FR}^d$ and $\sum_l \delta_l z_{FRl} = \ln Z_{FR}$; the z_{FR}s are output shifters; the δs parameters to be estimated and e_{FR}^y is an error term.

Summarizing, the model to be estimated consists of three simultaneous equations: total supply of labor (equation 5), demand for labor by fringe retailers (equation 8), and an output instrument (equation 9). From the estimated parameters, the monopsony power of Wal-Mart over workers can be then obtained using equation (4).

Data and Estimation

Using the political boundaries of counties as the geographical definition of local markets, the data used to estimate equations (5), (8) and (9) consisted of 1,607 contiguous U.S. counties in which Wal-Mart operated in 2004. A total of 119 counties were excluded due to data disclosure issues and missing observations. For the purposes of analysis, this sample (which will be referred

to as the "full sample") was further sub-divided into 746 urban and 861 rural counties, using the U. S. Bureau of Census classification system.[8] Wal-Mart employment at the country level came from aggregating individual store employment data from Dun & Bradstreet's Million Dollar Database (D&B).[9] Total county retail employment (NAICS 44) and earnings came from the County Business Patterns (CBP) database of the U.S. Bureau of Census, excluding Motor Vehicles and Parts Dealers (NAICS 441). The values for NAICS 441 (Motor Vehicle and Parts Dealers) were subtracted from the total, given that Wal-Mart does not compete directly with those types of businesses and that workers in this sub-industry have skills that cannot be easily transferred to other businesses. NAICS 441 is also one of the excluded sub-industries in Basker (2005a). Then Wal-Mart's shares of retail employment and average retail earnings (used in lieu of wages) were computed. State averages are shown in Table 1 along with the number of Wal-Mart stores in each state.

For equation (5), the dependent variable is total county retail employment discussed above. The supply shifters are: total size of the labor force, unemployment rate,[10] state-level personal income tax rate, following the disequilibrium model of Hall, Henry and Pemberton (1992), earnings for other low-skilled jobs (measured by the per capita earnings for the NAICS 722 industry: Food Services and Drinking Places), and composition of the labor force, as in Dube *et al.*, (2007). The last includes the percentages of the eligible population that are female, white Caucasian, and belonging to the three age groups 15-24, 25-64 and over 65 years of age. County labor force data including total labor force and unemployment rate are retrieved from the U.S. Bureau of Census County Population Survey, while county-level population characteristics are retrieved from the Population Estimates Program. The same source is used to obtain the percentage of population above 25 years of age having at least a high school degree, which is

used as proxy for education level. Per capita earnings for the NAICS 722 (Food Services and Drinking Places) are obtained from the CBP and used as proxy for earnings of other low-skill jobs.

For equation (8), the dependent variable is total retail employment minus Wal-Mart's. The fringe demand shifters are: capital investment (measured by the number of fringe stores per square mile), the number of years Wal-Mart operated in a county (to capture strategic and any technological changes due to the company's presence; see Khanna and Tice, 2000) from Emek Basker's Wal-Mart store openings database, the state-level percentage of unionized workers (from the Bureau of Labor Statistics multiplied by county-level retail employment), and output.

Equation (9) is estimated to instrumentalize fringe output. The dependent variable is sales data for retail establishments (excluding NAICS 441) from the Economic Census for 2002, projected to 2004 values, using the percentage growth of the retail trade contribution to the Gross State Product (U.S. Bureau of Economic Analysis) from 2002 to 2004, minus Wal-Mart sales obtained from D&B. Partial productivity of retail labor is measured by dividing retail gross product[11] by the total number of retail workers in each county.

In order to account for the fact that the markdown is determined by the monopsonist's market share, as in equation (3), the natural log of earnings is w is regressed on a set of exogenous variables that are correlated with Wal-Mart's presence across different geographic areas, such as county population density, distance from Benton County[12] (measured in hundreds of miles and is obtained applying the Haversine formula to county coordinates obtained from the Census Gazetteer of Counties for the year 2000), its squared value and Census division[13] dummies. The predicted log of earnings is then used in place of the actual ones in the system.[14]

All variables used as shifters are expressed in natural log values unless otherwise specified. Also, in order to control for unobservables, the shifters of all equations include fixed regional effects (*i.e*., dummies for eight out of the nine Census divisions).

Once all the variables were operational, equations (5), (8) and (9) were estimated simultaneously via heteroscedastic robust non-linear three stage least squares. Three versions of the model were estimated: the full sample (with 1,607 observations), rural counties, and urban counties. The results are presented below.

Empirical Results

The parameter estimates and the associated statistics using the full sample are presented in Table 2. Nearly all the parameters are statistically significant at the 1% level and show the expected signs. Furthermore, the Wald test for joint significance of the model shows significance at the 0.1%.

The elasticity of retail labor supply with respect to wages is approximately 0.80, indicating a moderate responsiveness of workers to wages. In terms of shifters, the results are consistent with the composition of the population willing to work in the retailing industry (see Dube *et al.* 2007): higher education makes individuals less likely to supply labor to this industry as is being white Caucasian, while females and those in age groups including high school/college students (15-24) and retirees (over 65) are more likely to actively seek jobs in retailing, being also more willing to accept part time jobs and the flexibility required by retailing jobs. Also, restaurant workers' earnings are positively related to the supply of labor in retailing; however, the small estimated coefficient suggests a limited complementarity between the two types of

low-skill jobs.[15] The retailing supply of labor is not significantly affected by state income tax or unemployment rates.

The wage elasticity of the fringe demand for labor is estimated at approximately -6.23, indicating that under monopsonistic wages, fringe retailers will tend to hire significantly more retail workers countervailing in part employment losses from Wal-Mart's anti-competitive behavior. In terms of shifters, it can be pointed out that fringe retailers that have been exposed longer to Wal-Mart tend to hire fewer workers. Considering that output is controlled for, this suggests that the presence of Wal-Mart pushes its competitors toward labor-saving technologies. Another possibility is that Wal-Mart expedites fringe retailers' exit from or delays their entry into the market, an effect that is absorbed in the coefficient of the output variable. In fact, output, as reflected by fringe retail sales, significantly increases the fringe demand for labor, while on the other hand, the degrees of capital utilization and unionization expand it. While the first is a basic result from production theory, the second may be a result of surplus labor generated by negotiation through unions. The estimated parameters for the fringe output equation are significant and satisfy the restrictions of the theoretical model. Both the estimated output elasticity of labor (0.8492) and capital (0.0556) are significant at the 1% level. As expected, the partial productivity of labor increases output.

To gain further insight into Wal-Mart's behavior in local labor markets, the model is estimated separately for the two sub-samples, rural and urban areas. A Chow Test for structural break in the parameters validates the hypothesis that the structure of the retailing labor market in rural and urban counties is different.[16] The parameter estimates and associated statistics are presented in Tables 3 and 4.

The retailing supply of labor in urban areas is less elastic than in rural ones (0.4691 and 1.6127 respectively). This result indicates that workers in rural communities are more responsive to changes in retail wages than urban workers, meaning that they are more willing to supply labor to the retail industry as wages increase but also more easily discouraged by wage decreases, making Wal-Mart's wage decisions more crucial for rural areas. The other insight from the two sets of estimates is that the age composition of the labor force matters. For instance, in urban areas the retail labor supply is more strongly driven by the older (over 65) and younger (15-24) population than in rural areas, where the main source of retail workers is those in the 25-64 age range. This difference along with the fact that retail workers are less sensitive to wage changes in urban than in rural areas indicates that retail jobs may be more appealing to the workforce in those areas where there may be lack of employment alternatives.

The estimated fringe retailers' demand for labor is more wage elastic in urban than in rural counties, the estimated elasticities being approximately -6.09 and -4.41 respectively. This implies that labor is a more important input for fringe retailers operating in rural areas than for those operating in urban ones, which is also supported by the larger estimated parameters for labor in the output equations.

In sum, what the split-sample regressions indicate is that the total supply of retail labor is more sensitive to wages in rural counties than in urban ones while for the fringe demand the wage-sensitivity is the reverse. These findings have direct implications for Wal-Mart's residual labor supply elasticity and therefore for the company's monopsony power. From the estimated parameters obtained for urban and rural counties, the market power of the company is expected to be larger in the latter, regardless of the size of the market shares. As it can be seen from equation (6) the larger the elasticity of the fringe demand, the smaller the magnitude of *BPI*;

being the demand for labor more elastic in urban areas than in rural areas, one would expect Wal-Mart to have greater monopsony power in the latter. Although the magnitude of *BPI* decreases with higher elasticities of supply (and the estimated elasticity of supply is lower in urban than rural counties), the monopsony power of the company in rural areas will be larger than in urban ones for all the values of labor shares included in the sample. This difference is also expected to be exacerbated in many of the states because of the company's large presence in rural areas.

The buying power indexes are estimated in equation (6), using the econometric estimates of the total labor supply elasticity and fringe demand elasticity with respect to wages and Wal-Mart labor shares. As shown at the bottom of Tables 2-4, these estimates were highly significant. For the full sample, the average residual supply elasticity facing Wal-Mart was estimated at 38.492, leading to a *BPI* of 2.61 %, indicating that *nationally* Wal-Mart pays wages that are nearly 2.6% below their marginal revenue product of labor. Considering that the *BPI* provides an upper bound to the percentage of wage decrease (the BPI would represent the effective percentage decrease in earnings only if the monopsonist's demand for the input was infinitely elastic) this average result appears to be consistent with both Neumark *et al.*'s (2006) and Dube *et al.*'s (2007) findings.

Considering that the Department of Justice does not have well-developed explicit monopsony guidelines, applying a 5% rule (considered by the antitrust authorities in the evaluation of market power in merger analysis as a "small but significant" level of market power) as a threshold of imperfect competition, a 2.6% markdown on wages nationally does not appear to be a compelling case for action against Wal-Mart by antitrust authorities or anti-Wal-Mart organizations. However, for urban counties, Wal-Mart's average residual supply of retail

labor is estimated at 54.48, resulting in a *BPI* of approximately 1.8%, while for the rural sample Wal-Mart average residual supply elasticity is estimated at 25.656, leading to a *BPI* of approximately 3.89%, larger than that of the total sample, and closer to the 5% threshold. Thus, overall, the issue of monopsony power is less relevant in urban America, where Wal-Mart often faces criticism for its labor practices.

Further insight is obtained when monopsony power is calculated by states, as shown in Table 5. Given that the magnitude of *BPI* increases with the monopsonist's market shares (Blair and Harrison, 1993), Wal-Mart is expected to have significantly greater market power in counties where it is the predominant employer in retailing. In fact, two consistent results are that Wal-Mart shows larger market power in 1) rural counties than in urban ones, and 2) that in some rural south-central states, the average *BPI*s exceed 5%. Thus rural counties in south-central states, as well as in other selected states where the company's presence is strong, are where Wal-Mart monopsony power is the highest, exceeding 6% in Kansas, West Virginia and Arkansas, and above 5% in five states (Colorado, Kentucky, Idaho, Illinois, Oklahoma and Utah). On the other hand, counties in the Northeast, show minimal degrees of Wal-Mart's monopsony power over workers, with Vermont showing the lowest *BPI* among all states.

When examining individual states, it emerges that those areas where the company's anti-competitive behavior toward workers may raise concern, *i.e.* rural counties in south central and north central states, do not necessarily coincide with areas where Wal-Mart's labor practices are strongly questioned. Of all the states where Wal-Mart has faced workers' class actions,[17] only one present a *BPI* exceeding the 5% threshold in rural areas (Kentucky). Also, the estimated *BPI*s do not support the necessity for policy intervention in Maryland (such as the Maryland Fair Share Health Act) and urban Illinois (Chicago's "living wage" ordinance).

Overall, the results presented in this paper do not support policy intervention aimed at mitigating the company's anti-competitive behavior for three reasons. First, given the small magnitude of the wage-elasticity for the total supply of retailing labor and the large wage-elasticity of fringe retailers' demand for labor, the losses in workers' surplus are likely to be internalized in large part by firms operating in the market with relatively small deadweight losses. Second, the measures presented here are valid for a post-entry scenario and do not consider the overall impact of Wal-Mart's entry on retail labor; there is no *a priori* reason to believe that in counties without Wal-Mart, the perfectly competitive equilibrium wages paid by other retailers would be higher than the monopsony wages set by the company. The same holds for the level of retail employment, where the empirical evidence on the subject is mixed. Third, considering Wal-Mart's depressive impact on retail prices (Basker, 2005b; Basker and Noel, 2007; Hausman and Liebtag, 2005) and incumbent retailers' oligopoly power (Cleary and Lopez, 2008), there are doubts as to whether deadweight losses from the company's anti-competitive behavior toward workers could overpower consumers' welfare gains.

Concluding remarks

The vivid debate about the impact of Wal-Mart on retail workers' conditions has triggered an increasing number of studies, which have failed, however, to reach conclusive and unanimous findings on the issue. This article estimates and tests for the degree of monopsony power exerted by the company on local retail labor markets, using a dominant firm model and data on contiguous U.S. counties.

Empirical results indicate that Wal-Mart does exert a statistically significant degree of monopsony power over workers but that this varies significantly across the nation. Overall, the

average buying power index with respect to labor is approximately 2.6%, in line with some previous findings. However, in selected rural areas of the south and the midwest, the degree of Wal-Mart's monopsony power reaches up to 6.4%, large enough to raise concerns.

Although this paper provides evidence of monopsonistic behavior by the company vis-à-vis its workers in some areas, it fails to show evidence to warrant deeming this a nationwide problem. In particular, the empirical evidence fails to show Wal-Mart having a consistently large monopsonistic behavior in all the states where facing former workers' class actions. Also, those attempts to regulate the wage and benefit policies of the company by local governments in Maryland and Illinois appear not to be justified from an economic standpoint. This leaves open the question of why Wal-Mart workers' issues are on local and state policy agendas throughout the nation, especially in areas where there is no evidence of its monopsony power. The high visibility of Wal-Mart makes it an easy target for policymakers and opinion leaders, who may see attacking the company's practices as a way to both increase public consensus and relieve political pressure from interested parties (such as retail workers' unions and traditional retailers).

Footnotes

1. For evidence of Wal-Mart's beneficial impact on consumers through low prices, see for instance Basker (2005b); Basker and Noel (2007); Cleary and Lopez (2008) and Hausman and Liebtag (2005). Low costs have been attributed to an extremely efficient logistic system (Edgecliffe–Johnson, 1999).

2. Interestingly, they established that Wal-Mart's effect in decreasing earnings was not due to differences in retailing workforce characteristics but was primarily associated with increased rents for the company.

3. The relevant market consists in Retailing industry (NAICS 44) at the net of the Motor Vehicle and Parts Dealers (NAICS 441) sub-industry; the data used to obtain the measures reported in Table 1 and Figure 1 are described in the Data and Estimation section.

4. In this framework, the location of Wal-Mart is given. The resulting equilibrium wages and employment if Wal-Mart was not present would be indicated by $D_{FR} = X_T$, which would result in a lower wage than the monopsony one set by the company.

5. Under the assumption of heterogeneous labor, one could use the approach developed by Baker and Bresnahan (1988). Even if this scenario would be more likely to represent a world in which a firm, Wal-Mart, hires non-unionized workers and other firms are left to bargain wages with unions, the unavailability of information on wages offered by both groups inhibits this approach.

6. Note that $\eta^D_{FR} = 1/\varepsilon_{FR}$; therefore, in order to satisfy $1+\varepsilon_{FR} > 0$, the condition $\eta^D_{FR} < -1$ needs to hold.

7. This assumes that the bundles of goods sold are the same across counties. Although this is a strong assumption, the unavailability of both retail quantity and price indexes at the county level forces the use of a value measure in place of a quantity measure of output.

8. The U.S. bureau of Census classifies as "Metro" those areas including central counties with urbanized areas of 50,000 or more residents, regardless of total area population, together with outlying counties with commuting thresholds of 25 percent and as "rural" the remaining ones.

9. D&B gives information on each store's type of business and location and estimates of its number of employees and values of sales. Those estimates are obtained from different sources, such as Government Registers and Legal Filing Offices and directly from the companies via telephone surveys. Another feature of the D&B database that made the data collection a harder process is that it is updated on a regular basis, so that historical data cannot be retrieved. To obtain data for the stores operating in 2004 (the D&B data were retrieved in 2006), the stores opened after December 2004 were excluded from the sample. Information on store opening was found using Wal-Mart Inc. Website News section (www.walmartfacts.com) and different years of Wal-Mart's shareholders' Annual Reports.

10. Regarding the use of unemployment rate, although this is determined at the equilibrium in the aggregate labor market, it is here considered exogenous in the determination of the market clearing condition for one particular industry.

11. Adapting Bauer and Lee's (2006) procedure to estimate the Gross State Product from national data, the contribution to the GSP of each county is assigned in terms of the personal income of the county population. Explicitly,

$$GCP_i = GSP*PI_i / PI,$$

where *GCPi* is the county-specific measure of value added; *GSP* is the Gross State Product for the year 2004 from retail trade, obtained from the U.S. Bureau of Economic Analysis; and PI_i and *PI* are Personal Income at the county and state level respectively, also from the U.S. Bureau of Economic Analysis.

12. Neumark *et al.* (2006) and Dube *et al*. (2007) use distance from Bentonville, Arkansas, and time, to predict the timing of Wal-Mart entry. The idea of distance from Benton County, Arkansas, being a good predictor of Wal-Mart's presence in a county comes from Sam Walton's autobiography (Walton and Huey, 1992), in which it is explained how Wal-Mart bases its growth strategy on expanding in areas closer to preexisting distribution centers, following the "hub and scope" logistic system. Basker (2006), argues that the distance from Bentonville may not be a good exogenous predictor of Wal-Mart expansion. However, given that this paper treats Wal-Mart's location as given, the distance from Benton County serves only the purpose of capturing exogenous variation in the distribution of the number of stores across the continental U.S..

13. The U.S. Bureau of Census divides the national territory in four regions, which are further divided in nine divisions. For a list of the regions, divisions and states they include, see Table 1.

14. The results of the OLS used to generate the instrument for the log of earnings are omitted for brevity. However, the regression has an R-squared of 0.5217, only 3 of the variables are not significant at the 10% level and an F-test for the joint significance of the parameters rejects the null of non-significance at the 0.1% level.

15. Dube *et al*. (2007) found that restaurant workers per-capita earnings to be positively related with retail workers' earnings, but not in a statistically significant way.

16. The calculated *F*-statistic for the test is 3.0562, above the critical value at the 5% level (with 44 and 1519 degrees of freedom) of 1.3829 rejecting the null hypothesis of the two sub-samples behaving in the same way.

17. The states that have been scenarios for Wal-Mart's workers class actions against the company are California, Georgia, Kentucky, Michigan, Missouri, New Jersey, New Mexico, Oregon, Pennsylvania and Tennessee.

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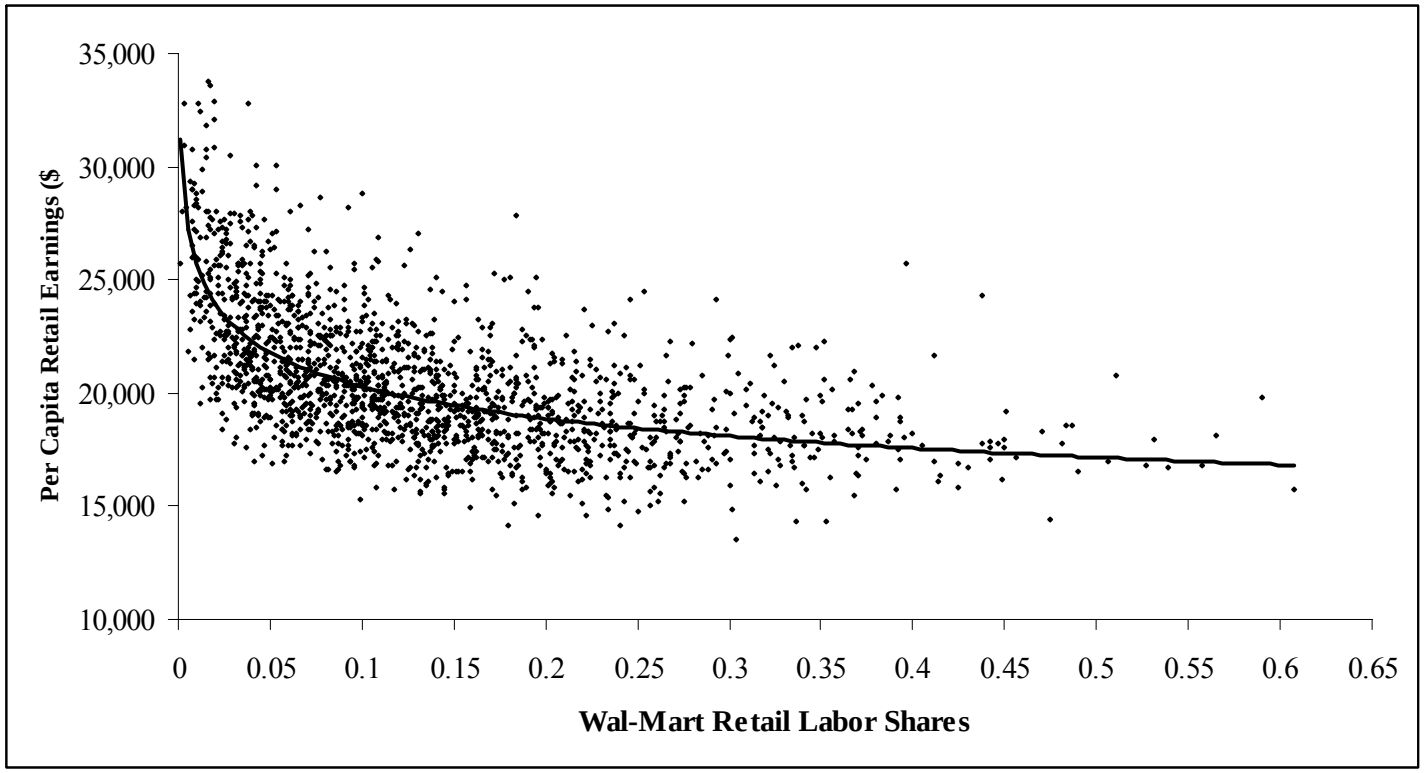
Figure 1. County-Level Wal-Mart Retail Labor Shares and Per Capita Earnings*



Source: Computed from Dun & Bradstreet's Million Dollar Database and U.S. Bureau of Census - County Business Patterns.
Note: The data include only those counties in which Wal-Mart operated in 2004. Data details are in the data section.

Table 1. State Average Wal-Mart Retail Labor Shares (%), Retail Per-capita Earnings ($) and Number of Wal-Mart Stores, 2004.

Areas	Retail Labor Shares	Per-Capita Earnings	# Stores
South			
West South Central			
Arkansas	26.07	16,675	70
Louisiana	17.66	17,294	74
Oklahoma	25.47	16,534	78
Texas	18.42	19,096	266
East South Central			
Alabama	17.76	18,456	82
Kentucky	22.49	18,000	70
Mississippi	22.64	17,215	63
Tennessee	19.16	19,029	85
South Atlantic			
Delaware	7.82	21,624	8
Florida	12.85	20,261	155
Georgia	16.44	19,662	103
Maryland	8.44	21,750	39
North Carolina	12.95	19,148	98
South Carolina	13.23	19,020	58
Virginia	19.06	18,975	27
West Virginia	22.30	17,500	29
Northeast			
New England			
Connecticut	4.79	24,968	30
Maine	7.36	19,290	20
Massachusetts	4.14	23,332	42
New Hampshire	8.31	22,820	25
Rhode Island	4.26	21,846	8
Vermont	3.10	21,963	4
Middle Atlantic			
New Jersey	3.44	25,364	35
New York	8.93	19,812	77
Pennsylvania	8.89	18,881	94

Region *Division* State	Retail Labor Shares	Per-Capita Earnings	# Stores
West			
Mountain			
Arizona	12.92	20,807	50
Colorado	17.13	21,299	50
Idaho	17.65	19,844	15
New Mexico	16.87	18,729	50
Montana	9.87	19,245	10
Utah	16.08	18,177	26
Nevada	15.43	22,333	20
Wyoming	15.10	18,165	9
Pacific			
California	5.84	23,624	135
Oregon	9.65	20,037	28
Washington	10.53	20,765	31
Midwest			
East North Central			
Indiana	17.57	17,704	86
Illinois	18.79	18,347	112
Michigan	9.68	19,927	63
Ohio	11.08	18,809	98
Wisconsin	10.41	17,790	66
West North Central			
Iowa	15.47	17,945	52
Kansas	23.64	16,840	47
Minnesota	10.03	18,200	44
Missouri	20.65	17,361	101
Nebraska	19.45	16,569	17
North Dakota	10.73	17,654	7
South Dakota	13.34	17,516	7

Note: The state averages presented include only those counties where Wal-Mart operated in 2004.
Source: Elaboration from Dun & Bradstreet's Million Dollar Database; U.S. Bureau of Census - County Business Patterns; Wal-Mart Annual Report (2005).

Table 2. Econometrics Results for Full Sample

Variable	Coefficient	St. Error	Significance
Total Supply			
Constant	-8.2324	2.1924	***
Retail wages	0.8046	0.1592	***
Labor force	0.9837	0.0336	***
Unemployment	-0.0116	0.0336	
State Income Tax Rate	0.0038	0.0025	
Education	-0.1889	0.0296	***
Restaurant Wages	0.0172	0.0024	***
% Female	0.8408	0.2212	***
% White	-0.1541	0.0310	***
% 15-24	0.3489	0.0695	***
% 25-64	0.0892	0.1903	
% Over 65	0.4003	0.0441	***
Regional Dummies	Yes	Yes	
Fringe Demand			
Constant	10.0112	0.0143	***
Retailing wages	-6.2352	0.1599	***
Capital	0.0556	0.0012	***
Output	0.1795	0.0054	***
Wal-Mart years	-0.0096	0.0014	***
Unionization	0.0157	0.0017	***
Regional Dummies	Yes	Yes	
Fringe Output			
Constant	-0.7199	0.0659	***
Fringe labor	0.8392	0.0042	***
Capital	0.0556	0.0012	***
Productivity index	0.1691	0.0112	***
Regional Dummies	Yes	Yes	
Related Measures			
η_{WM}^{S}	38.429	1.4003	***
BPI	0.0261	0.0009	***
Wald-stat for overall significance: 940,091			
Critical 0.1% $\chi^2_{(44)}$	86.6773		

Note: *, **, and *** represent 10, 5 and 1% significance levels

Table 3. Econometric Results for Urban Counties

Variable	Coefficient	St. Error	Significance
Total Supply			
Constant	-4.0789	2.7844	
Retail wages	0.4691	0.1874	**
Labor force	1.0403	0.0518	***
Unemployment	0.0553	0.0503	
State Income Tax Rate	0.0046	0.0034	
Education	-0.2499	0.0339	***
Restaurants' wages	0.0162	0.0048	**
% Female	1.0226	0.3881	**
% White	-0.0973	0.0487	**
% 15-24	0.3858	0.0896	***
% 25-64	-0.5082	0.2578	**
% Over 65	0.3868	0.0538	***
Regional Dummies	Yes	Yes	
Fringe Demand			
Constant	10.0830	0.0183	***
Retailing wages	-6.0949	0.2117	***
Capital	0.0667	0.0016	***
Output	0.1797	0.0075	***
Wal-Mart years	-0.0094	0.0019	***
Unionization	0.0134	0.0023	***
Regional Dummies	Yes	Yes	
Output			
Constant	-0.2359	0.1054	**
Fringe labor	0.8359	0.0051	***
Capital	0.0667	0.0016	***
Productivity index	0.0789	0.0169	***
Regional Dummies	Yes	Yes	
Related Measures			
η_{WM}^{S}	54.4830	2.7788	***
BPI	0.01835	0.0009	***
Wald-stat for overall significance: 496,241			
Critical 0.1% $\chi^2_{(44)}$	86.6773		

Note: *, **, and *** represent 10, 5 and 1% significance levels

Table 4. Econometric Results for Rural Counties

Variable	Coefficient	St. Error	Significance
Total Supply			
Constant	-18.1722	3.9524	***
Retail wages	1.6127	0.3134	***
Labor force	0.9849	0.04318	***
Unemployment	-0.0519	0.0395	
State Income Tax Rate	0.0010	0.0034	
Education	-0.1627	0.0408	***
Restaurant wages	0.0167	0.0026	***
% Female	1.2458	0.2567	***
% White	-0.1445	0.0387	***
% 15-24	0.1503	0.0984	
% 25-64	0.6198	0.2459	**
% Over 65	0.1552	0.0678	**
Regional Dummies	Yes	Yes	
Fringe Demand			
Constant	9.7968	0.0229	***
Retailing wages	-4.4164	0.1718	***
Capital	0.0229	0.0017	***
Output	0.2883	0.0134	***
Wal-Mart years	-0.0095	0.0015	***
Unionization	0.0128	0.0022	***
Regional Dummies	Yes	Yes	
Output			
Constant	0.0183	0.0884	
Fringe labor	0.7735	0.0088	***
Capital	0.0229	0.0017	***
Productivity index	0.0417	0.0117	**
Regional Dummies	Yes	Yes	
Related Measures			
η_{WM}^{S}	25.656	1.7099	***
BPI	0.0389	0.0026	***
Wald-stat for overall significance: 781,998			
Critical 0.1% $\chi^2_{(44)}$	86.6773		

Note: *, **, and *** represent 10, 5 and 1% significance levels

Table 5. Estimated Buying Power Indexes: State Averages†

Areas	All	Urban	Rural
South	**Average BPIs**		
West South Central			
Arkansas	5.21	4.70	6.05
Louisiana	3.18	2.61	4.38
Oklahoma	5.33	5.40	5.91
Texas	3.38	2.52	4.67
East South Central			
Alabama	3.30	2.70	4.50
Kentucky	4.48	2.99	5.56
Mississippi	4.40	5.51	4.60
Tennessee	3.50	3.02	4.38
South Atlantic			
Delaware	1.23	1.21	1.68
Florida	2.34	1.43	4.72
Georgia	3.12	2.98	4.00
Maryland	1.43	1.13	2.83
North Carolina	2.23	2.02	2.84
South Carolina	2.36	2.08	3.13
Virginia	3.52	2.39	4.97
West Virginia	4.76	2.61	6.32
Northeast			
New England			
Connecticut	0.72	0.71	0.98
Maine	1.14	0.98	1.43
Massachusetts	0.62	0.67	–
New Hampshire	1.30	1.02	1.66
Rhode Island	0.57	0.62	–
Vermont	0.45	0.28	0.60
Middle Atlantic			
New Jersey	0.52	0.56	–
New York	1.50	1.17	2.35
Pennsylvania	1.43	1.08	2.28

Region	All	Urban	Rural
West	**Average BPIs**		
Mountain			
Arizona	2.30	1.28	3.77
Colorado	3.30	1.07	5.43
Idaho	3.26	1.50	5.28
New Mexico	2.87	1.03	3.87
Montana	1.58	1.90	1.68
Utah	3.01	1.68	5.79
Nevada	2.70	0.76	4.14
Wyoming	2.55	1.44	3.27
Pacific			
California	0.92	0.68	2.75
Oregon	1.58	1.01	2.29
Washington	1.97	0.74	3.53
Midwest			
East North Central			
Indiana	3.20	2.80	4.37
Illinois	3.75	2.77	5.03
Michigan	1.62	0.91	2.77
Ohio	1.89	1.08	3.05
Wisconsin	1.73	1.02	2.62
West North Central			
Iowa	2.65	1.62	3.52
Kansas	4.67	2.69	6.39
Minnesota	1.66	0.71	2.55
Missouri	3.91	3.67	4.69
Nebraska	3.80	2.32	4.86
North Dakota	1.53	0.69	2.75
South Dakota	2.28	0.64	3.51
Average U.S.	2.61	1.85	3.89

† For Massachusetts, Rhode Island and New Jersey, the sample did not include counties having Wal-Mart which were classified as "rural".