Estimating the Elasticity of Labor Supply to a Firm: Results from a Field Experiment

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Abstract

“New Monopsony” models imply that firms can possess wage-setting power even in competitive markets so long as they face an upward-sloping labor supply curve due to labor market frictions. However, previous research has yielded wildly different estimates of the elasticity of labor supply to a firm. Using a field experiment where identical job offers were posted with varying wages in statistically matched or the same area, I estimate that the elasticity of labor supply to a restaurant to be quite high, between 11.6 and 20.9, implying that workers are hired at wages between 92% and 95% of their marginal products. These results provide evidence for a model where firms only possess wage-setting power over incumbent employees, while new employees are hired at wages close to their marginal products. The policy implications of such a model are discussed.

Keywords: monopsony, labor market, wage-setting
Introduction

The possibility of persistent, widespread wage-setting power of employers has the potential to overturn volumes of conventional wisdom on labor economics and beyond. If employers do pay wages significantly below workers’ marginal products, then a slew of policies, from pro-union legislation to minimum wages, have the potential to increase not only wages, but also employment. However, attempts to identify the degree to which employers set wages using the elasticity of labor supply faced by firms yields wildly differing results depending on the strategy used. Using the elasticity of the rate of incumbent employee separations to the wage rate yields elasticities which imply that workers are paid only 73% of their marginal products, while other methods examining wage-setting for new workers indicate much less wage setting power. One overlooked identification strategy, however, it to perform a field experiment where one poses as a firm hiring workers and examines the response of application volume to posted wage rates. After a review of the literature on monopsony to date, I discuss the experimental design, my results, and possible policy implications.

Literature Review: Old and New Monopsony

Since Robinson (1933), economists have long been aware of the possibility of a “monopsonistic” labor market where, contrary to the predictions of the perfect competition model, a single firm is able to set wages below workers’ marginal products. However, monopsony was considered to be, at best, applicable to specific cases such as isolated mining towns (Ehrenberg and Smith, 1994, Kaufman, 1993), and, and worst, a textbook curiosity, with “the general impression given by most textbooks is that employers have negligible market power over their workers or that this is, at best, a trivial side issue” (Manning, 2004).

Recently though, economists have recognized that the presence of only a single firm or a small number of firms is a sufficient, but not a necessary condition for workers to be paid a wage below their marginal product. As Ashenfelter et al. (2010) note:

Although not monopsony in the strictest sense, monopsony power can be exercised by any employer that faces an upward sloping supply curve for labor. A single employer in a nominally competitive labor market can have monopsony power over his current workforce if workers bear a cost of job change, pecuniary or non-pecuniary.

The relationship between the elasticity of labor supply and monopsony power can be demonstrated by the following maximization problem. A profit maximizing firm which faces an upward sloping labor supply curve \( w(L) \) seeks to maximize:

\[
\Pi = p * f(L) - w(L) * L
\]

Maximizing yields the firm’s chosen wage:

\[
w = \left( \frac{p \partial f}{\partial L} \right) \left( \frac{\partial f}{\partial w} + 1 \right)
\]
Since \((\frac{\partial f}{\partial L})\) is the marginal revenue product of labor \((MRP)\), and \((\frac{\partial L}{\partial w})\) is the elasticity of labor supply with respect to the firm’s wage \((\epsilon)\), this can be rewritten as:

\[
w = MRP \frac{\epsilon}{1 + \epsilon}
\]

Because \(\epsilon > 0\), \(\frac{\epsilon}{1 + \epsilon}\) represents the “markdown”, or the degree to which monopsonistic firms pay workers below their marginal product. It is also evident that workers are paid their marginal product in the perfectly competitive case where \(\epsilon = \infty\).

In their meta-analysis of research on labor supply elasticity to the firm, Sokolova and Sorensen (2018) summarize that the literature has a mean estimate of 3.75, but a standard deviation of 36.9. They attribute the wide range of estimates mostly to variations in methods, within which two families of identification strategies for the elasticity of labor supply to the firm can be categorized.

There have been “two distinct empirical approaches for recovering the labor supply elasticity face by firms; a direct approach of looking at wage setting behavioral by firms, and an indirect approach of looking at workers’ job separation behavior” (Tucker, 2017, p. 3). The indirect approach measuring the elasticity of the separation rate to the wage has generally yielded small elasticities indicating significant wage-setting power for employers, including Hirsh et al. (2010) finding estimates between 2 and 4 using data from Germany, Ransom and Sims finding an elasticity of 3.7 for public school teachers in Missouri, and Oaxaca (2010) reports estimates for a single employer between 1.5 and 3. Overall, Sokolova and Sorensen report that the mean elasticity resulting from separations-based estimates is 2.75, with a much tighter confidence interval of 1.21 to 4.29. Other approaches thus seek to estimate firms’ labor supply elasticity using responses to natural experiments. For example, Matsudaira (2014) uses the implementation of minimum nurse staffing regulations as one such natural experiment, concluding that “facilities initially out of compliance with the new law did not have to raise their wage offers relative to their competitors in order to hire more nurses”, which is consistent with more competitive labor markets.

**Experimental Design**

However, one overlooked strategy for estimating the elasticity of labor supply to the firm is to become the firm! I chose to post an ad pretending to be restaurant owner for two reasons. First, due to the large number of restaurants in any given area, job-seekers are used to seeing job postings for establishments that they are not familiar with, which allowed Pareto’s Pizza’s posting to blend in with a crowd of job offers. Second, speculation about monopsony power in the restaurant industry has existed since Card and Krueger’s (1994) seminal paper on the minimum wage in New Jersey.

First, I obtained the number of restaurant establishments, restaurant employment, average weekly wages for restaurant workers, and the legal minimum wage for 2589 counties in June, 2018 in the United States from the Bureau of
Labor Statistics. The next step was to identify counties with similar patterns of employment and wages in the restaurant industry using nearest-neighbor matching. Once matches were generated for each county, a pair was selected for 1) close “distance” in terms of establishments, employment, and wages and 2) a lack of geographic proximity to avoid “spillover” effects wherein people living in one county might conceivably look for jobs in neighboring counties.

<table>
<thead>
<tr>
<th>County</th>
<th>Establishments</th>
<th>Employment</th>
<th>Wages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morgan County, GA</td>
<td>41</td>
<td>1,011</td>
<td>274</td>
</tr>
<tr>
<td>Kleberg County, TX</td>
<td>61</td>
<td>1,302</td>
<td>274</td>
</tr>
<tr>
<td>Wythe County, VA</td>
<td>46</td>
<td>1,041</td>
<td>297</td>
</tr>
<tr>
<td>Chambers County, TX</td>
<td>63</td>
<td>1,050</td>
<td>304</td>
</tr>
<tr>
<td>Johnson County, IN</td>
<td>293</td>
<td>6,939</td>
<td>313</td>
</tr>
<tr>
<td>Catawba County, NC</td>
<td>322</td>
<td>6,948</td>
<td>299</td>
</tr>
</tbody>
</table>

An alternative matching procedure was performed on BLS metropolitan statistical areas instead of counties, matching on total employment, mean hourly wage, and the location quotient, all for the restaurant industry.

<table>
<thead>
<tr>
<th>MSA</th>
<th>Location Quotient</th>
<th>Employment</th>
<th>Wages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Altoona, PA</td>
<td>1</td>
<td>5,300</td>
<td>10.58</td>
</tr>
<tr>
<td>Dubuque, IA</td>
<td>1.01</td>
<td>5,360</td>
<td>10.58</td>
</tr>
<tr>
<td>Idaho Falls, ID</td>
<td>0.86</td>
<td>5,130</td>
<td>10.07</td>
</tr>
<tr>
<td>Jackson, TN</td>
<td>0.88</td>
<td>5,270</td>
<td>10.02</td>
</tr>
<tr>
<td>Pittsburgh, PA</td>
<td>1</td>
<td>104,590</td>
<td>10.99</td>
</tr>
<tr>
<td>Charlotte-Concord-Gastonia NC-SC</td>
<td>0.99</td>
<td>108,400</td>
<td>10.53</td>
</tr>
<tr>
<td>Daphne-Fairhope-Foley, AL</td>
<td>1.75</td>
<td>11,530</td>
<td>11.19</td>
</tr>
<tr>
<td>Hilton Head Island-Bluffton-Beaufort, SC</td>
<td>1.7</td>
<td>11,460</td>
<td>10.82</td>
</tr>
</tbody>
</table>

The following identical job offer was posted in each pair of counties on the jobs website Glassdoor.com, with one county having a posted wage of $7.50/hr and the other having a posted wage of $10.50/hr:

Pareto’s Pizza is seeking crew members for our new [City] location. This position offers the opportunity for career growth and experience in a fast-paced dynamic restaurant environment. We offer flexible hours to work with your schedule and competitive pay with benefits, including free meals while on shift! While prior restaurant experience is preferred, we encourage anyone who works well with a team and is willing to learn to apply.

I also conducted the experiment with a single location, posting the above ad twice: one with the title of “Crew Member” paying $10.50/hr and another with the title of “Dishwasher” paying $7.50/hr. This has the advantage of avoiding any possibility of imprecise matches, but posting two ads on the same board could make the low wage offer seem marginally less appealing with a direct comparison posting directly above it.

In order to avoid collecting unnecessary identifying information, the “apply” button on each of the postings linked to a web page describing the research project, one for each posting. I used the traffic from the area that the ad was
posting in to the “informed consent” pages as measurements of quantity of labor supplied at each wage rate. Each posting was receiving applicants for 72 hours, as preliminary tests of the experimental design resulted in a sharp drop-off in “applicants” after 72 hours.

Results:

Matched Areas Estimates

| $7.50/hr Applications | $10.50/hr Applications | Point Elasticity | Arc Elasticity$
|-----------------------|------------------------|------------------|----------------
| 4 (Morgan, GA)        | 22 (Kleberg, TX)       | 11.3             | 4.2
| 0 (Chambers, TX)      | 8 (Wythe, VA)          | $\infty$         | 6.0
| 1 (Johnson, IN)       | 10 (Catawba, NC)       | 22.5             | 5.0
| 1 (Altoona, PN)       | 4 (Dubuque, IA)        | 7.5              | 3.6
| 1 (Idaho Falls, ID)   | 6 (Jackson, TN)        | 12.5             | 4.3
| 1 (Pittsburgh, PN)    | 7 (Charlotte, NC)      | 15               | 5.25
| 0 (Daphne, AL)        | 1 (Hilton Head, SC)    | $\infty$         | 6.0

In-Place Estimates

| Area                   | $7.50/hr | $10.50/hr | Point Elasticity | Arc Elasticity
|------------------------|----------|----------|------------------|----------------
| Fairfax, VA            | 1        | 7        | 15               | 5.25
| Portsmouth, NH         | 1        | 4        | 7.5              | 3.6
| Tulsa, OK              | 0        | 4        | $\infty$         | 6.0
| Savannah, GA           | 0        | 6        | $\infty$         | 6.0

95% confidence intervals bound the elasticity of labor supply for an individual restaurant between 7.87 and 18.39, indicating that workers facing monopsony are typically hired at wages between 88% and 95% of their marginal products. An alternative confidence interval, obtained by replacing the infinite elasticities with 22.5 (the highest non-infinite elasticity), is 11.61 and 20.9, reducing the estimated markdown to between 92% and 95%. The arc elasticities using the midpoint method have mean of 5.02, with a 95% confidence interval of 4.37 to 5.66. While much smaller than the point estimates, mostly due to the limitation that the elasticity cannot exceed 6, it is still important to note that the lower bound of this confidence interval (4.37) exceeds the upper bound of Sokolova and Sorensen’s separations-based confidence interval (4.29).

Policy Implications

These results suggest that restaurants have very little wage-setting power over their new hires, especially if they are interpreted as short-run elasticities. This discrepancy between the elasticity of labor supply of new and incumbent workers

\footnote{Note that, in this case, Arc Elasticity cannot exceed 6.0. It is for this reason that I treat the point elasticity as my preferred estimate.}
is present already in existing literature on monopsony. For example, Kline et al. (2017), using firms’ responses to patent grants, concluded that:

“...because the wages of new hires are unresponsive to patent allowances, we cannot reject that the entry market is perfectly competitive. By contrast...among firm stayers, the wage elasticity of labor supply falls to approximately 1, or to 1.5...” (p. 26-27).

Similarly, Issen (2013), using a novel approach utilizing changes in firm output following unexpected worker deaths, concluded that:

“....the results suggest that workers are on average paid no more than 85 percent of their marginal product...and find that more-tenured workers are underpaid relative to less-tenured workers” (p. 23-24).

Finally, Tucker (2017) concluded using Brazilian Administrative data that:

“Although my results provide clear evidence that labor markets are imperfect even at hiring, they also strongly suggest that firms hold comparatively little monopsony power of their new hires compared to their existing workers” (p. 1).

Such differential wage-setting power can be modeled by first recalling that:

\[ w = \frac{\epsilon(\mu)}{1+\epsilon} \]

Where \( \epsilon = \frac{\partial L}{\partial w} \) w, the elasticity of labor supply to the firm, and \( \mu = p \frac{\partial f}{\partial L} \), the marginal productivity of labor. The dynamics of \( w \) implied are:

\[ \ln(w) = \ln(\epsilon) + \ln(\mu) - \ln(1 + \epsilon) \]

\[ \frac{\dot{w}}{w} = \frac{\dot{\epsilon}}{\epsilon} + \frac{\dot{\mu}}{\mu} - \frac{\epsilon}{1+\epsilon} \]

Note that if \( \dot{\epsilon} = 0 \), wages grow at the rate of productivity growth (\( \dot{\mu} \)). However, if \( \epsilon = \infty \) at \( t = 0 \), but falls over the course of a worker’s tenure with the firm, making \( \dot{\epsilon} < 0 \), wage growth will slow to zero over time, implying a continuously widening gap between wage and marginal product. In other words, higher paid workers are actually more “exploited” in this model.

Policy prescriptions for a labor market where employers only have wage-setting power over incumbent workers have key differences than those derived from a “pure” monopsony model. Minimum Wages, for example, may increase the pay of experienced incumbent workers who are paid below their marginal product while simultaneously decreasing the hiring of new workers or decreasing the employment of lower paid, less experienced workers paid closer to their marginal products. This prediction has been borne out by both Jardem et al. (2018) who found that the “entirety of [the] gains [from Seattle’s minimum wage increase] accrued to workers with above-median experience at baseline [while] less-experienced workers saw no significant change in pay” (p. 2). Similarly, Meer and West (2013) found that negative employment effects of minimum wages are more visible as changes in job growth rather than immediate drops in employment levels. The effects of minimum wages under differential wage-setting power also apply to the effects of sectoral wage boards, proposed by
Dube (2019) as a potential remedy for monopsony power. Because wage boards set “minimum pay standards by sector and occupation”, they would mostly target the wages of workers at hiring, where wages are very close to marginal productivity, leading to a decrease in hiring rather than only an increase in starting wages.

Differences in the effects of noncompete agreements depending on the timing of the agreement found by Starr, Prescott, and Pishara (2019) also square quite nicely with a model of differential wage-setting power. The authors found that:

“...when workers are presented with noncompetes after accepting the job, they experience no wage or training benefits relative to an unconstrained individual, are less satisfied in their job, and have almost a year longer tenure. In contrast, workers presented with a noncompete before accepting the job appear to be better off: Relative to an unbound worker, they have 9.7% higher wages (which occur in the first few years of tenure), receive 11% more training, and are 6.6% more satisfied in their job than those who are not bound by noncompetes” (Starr, 2018, p. 5).

Conclusion

While the field experiment approach yielded consistent results between city matching, county matching, and in-place results, there are limitations to the approach. Most obviously, “application” volume may be an improper measure of quantity of labor supplied to the firm. If workers apply to many different restaurant jobs, but only accept the best offer given, then my estimates of quantity of labor supplied could be biased upwards at both wage rates. However, given the large number of low wage areas receiving one or no applications, it’s difficult to conclude that this upwardly biases my estimates of elasticity. Another limitation is that I only examined areas in which the federal minimum wage of $7.25/hr was binding for the purposes of uniformity. If an area’s choice of minimum wage is in any way endogenous to the degree of market power held by employers in that area, then it could be that the areas with higher minimum wages that I didn’t examine have uniformly different elasticities of labor supply to the firm. Future research using this approach will certainly investigate these areas.

Boettke et al. (2007) recalls the following parable attributed to Gordon Tullock:

“...according to this tale a Roman Emperor is asked to judge a singing contest between two contestants. Upon hearing the first contestant sing, the Emperor awards the prize to the second singer under the assumption that she clearly cannot be any worse than the first. But the Emperor’s assumption is quite possibly off the mark; the second singer could in fact be much worse.”
While usually applied to debates concerning the relative costs of market failure and government intervention, the parable of the employer applies quite aptly to the recent discussion of whether the labor market is best modeled using perfect competition or monopsony. Alan Manning opens his touchstone Monopsony in Motion by asking “What happens if an employer cuts the wage they pay their workers by one cent”, and goes on to say that unless all workers immediately quit, the labor market cannot be characterized as competitive. Manning is pointing out the “missed note” of the competitive model. However, the discussion of employer wage-setting power must begin to listen closely to the song sung by the monopsony model too if the profession is to craft policies that truly enhance welfare for both firms and their workers.

References


[14, 5, 8, 9, 10, 3, 1, 11, 4, 13, 12, 7, 2, 6]