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# The elasticity of labor supply to the firm over the business cycle[☆]

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ABSTRACT

Recent empirical work has found evidence that the elasticity of labor supply to individual firms is finite, implying that firms may have wage setting power. However, these studies capture only single snapshots of the elasticity. We are the first to study how the elasticity of labor supply to the firm changes between economic contractions and economic expansions. We study two manufacturing firms operating in geographically distinct labor markets during the volatile inter-war period. Our analysis suggests that the elasticity of labor supply to the firm is lower during recessions than during expansions, providing evidence of differential wage setting power over the business cycle. This differential wage setting ability provides an explanation of the pro-cyclicality of real wages.

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## 1. Introduction

One of the most important, yet understudied, issues within the field of labor economics is the degree of wage setting power that firms possess. In a standard wage setting model, a firm's wage setting power is negatively related to the size of the elasticity of labor supply to the firm. Understanding the value of this parameter can help explain puzzling empirical findings such as the gender wage gap, the fact that low wage workers are more likely than high wage workers to search for new jobs and separate from existing employment, and the lack of evidence of large negative effects of the minimum wage on employment, among other things (Manning, 2003: p. 361).[1] In this paper, we make a novel contribution by estimating the elasticity of labor supply to the firm during both expansions and contractions. Consistent with a theoretical wage posting search model, our empirical estimates find that the elasticity of labor supply to the firm is counter-cyclical. Thus, cyclicality in monopsony power provides an additional pro-cyclical component to real wages.

Standard macroeconomic models account for the existence of search frictions which, even in a thick labor market with many competing firms, imply that individual firms may face an upward sloping labor supply curve. In wage setting models, a firm facing an upward sloping labor supply curve has the ability to mark down wages below the marginal revenue product, just as a firm facing a downward sloping product demand curve has the ability to mark up prices over marginal cost. The degree of this wage setting power depends on the value of the elasticity of the labor supply to the firm. The assumption that labor markets are frictionless, and thus that the elasticity of labor supply to a firm is infinite, suggests that workers face no mobility constraints and receive no rents from jobs. In the words of Manning (2003), the fact that "people go to the pub to celebrate when they get a job rather than greeting the news with the shrug of the shoulders" and likewise that "people go to the pub to drown their sorrows when they lose their job rather than picking up another one straight away" belie the simple notion of frictionless labor markets.

The value of the elasticity of supply to an individual firm is ultimately an empirical question. Recent work has found evidence that this elasticity is in the range of 1 to 10, suggesting a broad range of firm wage setting power.[2] However, the heterogeneity of these estimates is not surprising: it follows from the fact that the individual firms studied compete for different types of workers in different geographic labor markets and may face different macroeconomic conditions.

The primary contribution of our paper is to move beyond previous snapshot estimates of the elasticity and to understand how the elasticity

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[1] Card and Krueger (1995) argue that monopsonistic labor markets could explain the lack of empirical evidence of large employment effects of the minimum wage. Danziger (2010) argues that imperfectly enforced minimum wages may actually create monopsony power.

[2] See Boal (1995), Ransom and Oaxaca (2005), Ransom and Oaxaca (2010), Hirsch et al. (2006), Hirsch (2007), Hotchkiss and Quispe-Agnoli (2013), Ransom and Sims (2010), Hirsch et al. (2010), Falch (2010), Ransom and Lambson (2011), Falch (2011), Dube et al. (2010), Falch (2012) and Webber (2013).

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of labor supply to an individual firm varies over the business cycle. We find strong evidence that this parameter is finite and pro-cyclical, and thus wage setting power is counter-cyclical. Our result is consistent with the comparative statics in a simple wage-posting search model, where job offers to workers arrive at a lower rate during a recession; the slower arrival rate decreases the threat of workers separating from a firm that pays low wages. This is consistent with empirical evidence of the pro-cyclicality of real wages, but provides a different theoretical basis than has been offered in the past: differential wage setting ability over the business cycle.

To test the robustness of the cyclicality of firm wage setting power, we analyze employee behavior at two manufacturing firms in two distinct labor markets. Hall and Krueger (2010) survey a representative sample of U.S. workers and provide evidence that a wage posting model best describes the labor market for blue collar workers, as only 5% of these workers bargain over their wages. The wage posting characteristics of the manufacturing industry provide an ideal environment in which to test the implications of a monopsonistic labor market as the underlying theoretical model is derived from a simple wage-posting search model (Burdett and Mortensen, 1998). The firms we study were located in different geographic labor markets during the inter-war years of 1919 through 1940, covering five NBER-defined contractions and six such expansions. No other twenty-two year period since contains the same frequency and degree of business cycle volatility, thus providing us with the variation needed to identify the cyclicality of the elasticity of labor supply to an individual firm.

We use individual payroll records from approximately 5000 workers to estimate the elasticity of labor supply to the firm. We do this by regressing an employee's decision to separate from the firm on a function of their wage. We find that the average elasticity of labor supply to the two firms in this study is typically between approximately 4 during expansions and 1.6 during recessions. This implies that under a simple wage setting model, where productivity is held constant and firms face no other constraints in setting wages, the firms in our sample could pay workers about 19% lower wages during a typical contraction in our period of study.

Our wage setting model relaxes the standard assumption that the elasticity of supply to the firm is infinite. However, it is still an abstraction from many of the characteristics of large industrial firms. For example, Boeringer and Piore (1971) discuss the role of on the job training and internal labor markets and their impact on the wages of workers. This implies that the wages that we observe workers are earning at the firm may only be a proxy for potential earnings at the firm. However, we believe that examining the sensitivity of workers' separation decisions as a function of their reported wage still informs us as to the degree of wage setting power that their current employer has.

## 2. Model

Manning (2003), using a simplified version of the Burdett and Mortensen (1998) search model, posits that labor market frictions imply that a model with upward sloping supply curves to each firm, as first described by Robinson (1933), best represents the labor market.[3] Previous work using Manning's (2003) methodology has estimated single snapshots of the elasticity in the range of 1 to 10.

Below, we examine how the elasticity of labor supply to the firm changes over the business cycle by deriving comparative statics of the elasticity with respect to the structural parameters of the labor market in the simplified Burdett and Mortensen (1998) search model. Specifically, we show how changes in the job offer arrival rate and job destruction rate affect the elasticity of labor supply to the firm. During an economic expansion, aggregate labor demand increases, causing a higher rate of job arrivals. This decreases frictions in the labor market and increases the probability that an individual separates to a higher wage firm. Similarly, the job destruction rate is likely to decrease during an economic expansion as firms are less likely to layoff or fire workers. In a recession, the job destruction rate increases as jobs become less secure.

We derive comparative statics of the elasticity of labor supply to the firm with respect to the ratio of the job offer arrival rate to the job destruction rate. This parameter, known as the labor market friction parameter, details the tightness in the labor market. In sum, we find that the model suggests that the elasticity of labor supply to the firm is pro-cyclical.

Following Card and Krueger (1995), let *s(w)* represent the *rate* at which workers separate from the firm and *R(w)* represent the *number* of new recruits (workers) that are employed at the firm in a given time period. Therefore, if a firm has $L_{t-1}$ workers last period and pays *w*, the firm's labor supply in this period is

$$L_t = [1-s(w)]L_{t-1} + R(w). \tag{1}$$

In a steady state where $L_t = L_{t-1}$, Eq. (1) results in

$$L(w) = \frac{R(w)}{s(w)}.$$

By taking the log of each side and differentiating with respect to *w*, the following equality holds (as shown by Card and Krueger (1995)):

$$\epsilon_{Lw} = \epsilon_{Rw} - \epsilon_{sw}, \tag{2}$$

where $\epsilon_{Rw}$ is the recruitment elasticity and $\epsilon_{sw}$ is the separation elasticity. Manning (2003) shows that through a simplified version of the Burdett and Mortensen (1998) search model and an assumption that the firm is in a steady state, $\epsilon_{sw} = -\epsilon_{Rw}$ and therefore, $\epsilon_{Lw} = -2\epsilon_{sw}$. This relationship results from separations and recruits having common job offer arrival rates and facing the same wage offer distribution in the labor market. As separations are much easier to observe in data than recruits, this result is extremely important in estimating the elasticity of labor supply to the firm.

To show how changes in the business cycle affect the elasticity of labor supply to the firm we follow the simplified wage posting search model of Burdett and Mortensen (1998), as presented by Manning (2003). As suggested earlier, the wage posting model of Burdett and Mortensen (1998) is likely appropriate for this setting because we are analyzing firms in industries that tend to post wages (Hall and Krueger, 2010). In this framework, the separation rate of employees from a firm, *s(w)*, is defined by

$$s(w) = \delta + \lambda[1-F(w)],$$

where $\delta$ is the exogenous job destruction rate, $\lambda$ is the job offer arrival rate and *F(w)* is the distribution of wage offers. The elasticity of the separation rate with respect to the wage is then

$$\epsilon_{sw} = \frac{-\lambda f(w)w}{\delta + \lambda[1-F(w)]}.$$

Therefore, using the insight from Manning (2003) the elasticity of labor supply to the firm is

$$\epsilon_{Lw} = \frac{2\lambda f(w)w}{\delta + \lambda[1-F(w)]}. \tag{3}$$

Substituting $\theta = \frac{\lambda}{\delta}$ in Eq. (3), the elasticity of labor supply to the firm is defined as

$$\epsilon_{Lw} = \frac{2\theta f(w)w}{1 + \theta[1-F(w)]}.$$

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[3] For additional detailed summary of monopsonistic labor markets see Ransom (1993) and Boal and Ransom (1997).

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