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**Real Origins of the Great Depression: Monopoly Power,  
Unions and the American Business Cycle in the 1920s**

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## **Abstract**

We attempt to explain the severe 1920-21 recession, the roaring 1920s boom, and the slide into the Great Depression after 1929 in a unified framework. The model combines monopolistic product market competition with search frictions in the labor market, allowing for both individual and collective wage bargaining. We attribute the extraordinary macroeconomic and financial volatility of this period to two factors: Shifts in the wage bargaining regime and in the degree of monopoly power in the economy. A shift from individual to collective bargaining presents as a recession, involving declines in output and asset values, and increases in unemployment and real wages. The pro-union provisions of the Clayton Act of 1914 facilitated the rise of collective bargaining after World War I, leading to the asset price crash and recession of 1920-21. A series of tough anti-union Supreme Court decisions in late 1921 induced a shift back to individual bargaining, leading the economy out of the recession. This, coupled with the lax anti-trust enforcement of the Coolidge and Hoover administrations enabled a major rise in corporate profits and stock market valuations throughout the 1920s. Landmark pro-union court decisions in the late 1920s, as well as political pressure on firms to adopt the welfare capitalism model of high wages, led to collapsing profit expectations, contributing substantially to the stock market crash. We model the onset of the Great Depression as an equilibrium switch from individual wage bargaining to (actual or mimicked) collective wage bargaining. The general equilibrium effects of this regime change are consistent with large decreases in output, employment, and stock prices and moderate increases in real wages.

Keywords: Trade unions, collective bargaining, Great Depression  
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## 1. Introduction

The period between World War I and the New Deal was a time of extraordinary macroeconomic volatility. This short time span was punctuated by two sharp recessions, separated by a long and sustained expansion. At the same time, asset markets first fell sharply until 1921, then rose to hitherto unheard of heights during the 1920s stock market boom, before crashing precipitously in 1929 and beyond.

Most treatments of this era have focused on the Great Depression and its aftermath. In contrast, we take a unified view of the interwar period. We look at the slide into and the emergence from the 1920 recession and the roaring 1920s expansion as well as the slide into the Great Depression after 1929, and attempt to explain the macroeconomic and asset market phenomena in a unified framework.

We propose a new paradigm for the explanation of large shifts in asset prices and macro aggregates. This paradigm is based not upon transitory shocks but rather upon low-frequency shifts between steady states. Each steady state is characterized by one of two labor bargaining regimes, individual or collective, and is easily understood from first principles. A shift from individual to collective bargaining presents as a recession, and involves declines in output and asset prices, accompanied by increases in unemployment and real wages. Conversely, a shift from collective to individual bargaining presents as an expansion, with increases in output and asset prices, accompanied by a decrease in unemployment.

How are labor bargaining institutions and macroeconomic performance linked? When price-setting firms and unions bargain, they find it optimal to reduce employment and raise wages relative to the individual bargaining levels. The intuition is that under collective bargaining, unions are able to share in monopoly rents. This aligns firms' and workers' incentives to maximize monopoly rents. By first principles, firms and workers maximize monopoly rents by restricting output below the socially efficient level, and indeed below the level obtained under individual bargaining. Hence, a switch from individual to collective bargaining is associated with decreases in output and employment, and with increases in real wages.

This replicates nicely the behavior of macroeconomic aggregates during both the 1920-21 and the 1929-33 downturns, in particular the otherwise somewhat puzzling behavior of wages. Quantitatively, our model does surprisingly well at matching the magnitudes of the drops in output and employment, as well as the relatively mod-

erate real wage increases in both recessions. Conversely, a shift from collective to individual bargaining, leads to an increase in output and a decrease in unemployment, such as those observed during the roaring 20s expansion beginning in the 4<sup>th</sup> Quarter of 1921.

At the same time, firm values decline due to a switch to collective bargaining. The reason is that under individual bargaining, firms do not share their monopoly rents with workers. Under collective bargaining, however, workers are able to obtain a share of rents, decreasing the firms' steady-state profits and hence the firms' stock market value. Conversely, a switch to individual bargaining would increase firms' steady-state profits and stock market values. Quantitatively, we demonstrate that these swings in asset valuations can be large enough to replicate the behavior of asset markets during the boom of the 1920s and the crash of 1929.

We identify three major shifts in the ability of unions to bargain collectively, occurring in 1914, 1921 and beginning in 1929. First, in October of 1914, the Clayton Act was enacted. Section 6 of the Clayton Act states that antitrust laws are not applicable to labor organizations<sup>1</sup>, which greatly expanded the ability of labor unions to organize and bargain collectively. This favorable environment for collective bargaining led to a marked increase in union activity, as measured by trade union membership and strike activity.

This renaissance of organized labor was brought to an abrupt end, however, by a series of Supreme Court rulings in late 1921 and 1922 that declared the pro-union provisions of the Clayton Act unconstitutional. This marked the second major shift in the legal environment for organized labor, and was accompanied by a drop in strike activity and union membership rates.

We identify a third shift in labor policy beginning in 1929. We discuss the role of two intertwined events in that year, which paved the way for the New Deal's pro-union labor legislation. One was a landmark court case on the right of railway unions

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<sup>1</sup> The text of Section 6 of the Clayton Act famously states: "The labor of a human being is not a commodity or article of commerce. Nothing contained in the antitrust laws shall be construed to forbid the existence and operation of labor, agricultural, or horticultural organizations, instituted for the purposes of mutual help, and not having capital stock or conducted for profit, or to forbid or restrain individual members of such organizations from lawfully carrying out the legitimate objects thereof; nor shall such organizations, or the members thereof, be held or construed to be illegal combinations or conspiracies in restraint of trade, under the antitrust laws."

to organize, which the union won in the 2<sup>nd</sup> Court of Appeals in the summer of 1929. The union had won previously in the District Court in 1927, upholding the unions' rights to choose their own representation when bargaining under the Railway Labor Act of 1926. Given that the Supreme Court would almost never overturn a consensual ruling of the two previous courts, this meant that a reversal of the anti-union stance of the Supreme Court was imminent. Indeed, in May 1930 the Supreme Court ruled in favor of the union, thus laying the constitutional basis for the New Deal.

Intertwined with this was a second development. Lawmakers in Congress sought to impose new limits on the use of injunctions against unions. In light of the Supreme Court's 1921 rulings, the constitutional basis for this seemed slim at first. The proposal gained momentum in the summer of 1929, after it was discernible that the Supreme Court's stance would change. Lawmakers obtained the support of the American Federation of Labor (AFL) for their proposal in a meeting held in August 1929 in Atlantic City, and importantly, during a large AFL congress held in Toronto in October. This marked a sea change, as the AFL now accepted legal regulation and limitation of court injunctions in industrial disputes instead of a total ban. Thus, a basic consensus on the principles of trade union activity established itself between lawmakers in both parties and the AFL.

As expected, in May 1930 the Supreme Court ruling in the *Texas and New Orleans Railways* case<sup>2</sup> provided green light, which paved the way for the Norris-LaGuardia Act of 1932 limiting the use of injunctions against unions, and ultimately for the New Deal legislation. Thus, a reversal in the Supreme Court's stance toward unions and a growing consensus among politicians and trade unions on the eve of the Great Depression indicated that the tide had begun to turn in the favor of unions. We document these developments carefully in the body of the paper.

The shifts in labor market regimes coincide neatly with turning points in the asset markets. During the pro-union Clayton Act era, between the 2<sup>nd</sup> quarter of 1914 and the 3<sup>rd</sup> quarter of 1921, the Standard&Poor's 500 lost nearly half of its value. The first of the major anti-union Supreme Court cases, the *Tri-City Trades* case<sup>3</sup> and

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<sup>2</sup> *Texas and New Orleans Railway Co. v. Brotherhood of Railway and Steamship Clerks*, 281 U.S. 548.

<sup>3</sup> *American Steel Foundries v. Tri-City Central Trades Council et al.*, No. 2, 257 U.S. 184, reargued October 4-5, 1921 and decided December 5, 1921.

*Truax v. Corrigan*<sup>4</sup>, were argued during the first week in October of 1921. This coincides neatly with the end of the long 1914-1921 slide in asset prices<sup>5</sup>, and indeed marks the advent of the long, sustained asset price boom which would peak in 1929. Finally, we argue that pro-union court decisions and legislative efforts in 1929 affected expectations on the likelihood of a switch back to collective bargaining, so that investors would have rationally expected firm profits to decline sharply, depressing stock prices.

The magnitude of both the macroeconomic and asset market movements induced by a shift in bargaining regime turns out to be increasing in the degree of monopoly power. In economies in which monopoly power plays little role, shifts in the bargaining environment lead to only small movements of endogenous variables. In economies with substantial monopoly power, however, large magnitude movements on the order of magnitude of those observed during the Great Depression occur. In the body of the paper, we will present evidence that monopoly power increased during the Coolidge administration (1921-28), which was renowned for its lax stance on anti-trust. Within our model framework, an increase in monopoly power during the 1920s would account for both the greater severity of the Great Depression than its precursor earlier in the decade and part of the increase in asset prices during the 1920s.

In independent work, Ohanian (2006) has also come to the conclusion that institutional changes in the labor market were instrumental in causing the Great Depression. His model differs substantially from ours, however, as it does not involve search or explicit bargaining in the labor market. Rather, Ohanian (2006) emphasizes that firms would have found it optimal to reduce firm size (and hence employment) in order to avoid being targeted by unions, who by assumption concentrated their organization efforts on larger firms.

Our work is also related to that of Cole and Ohanian (1999, 2004). For the New Deal and the 1930s, they have argued forcefully that collective bargaining in the labor market, in conjunction with a lax anti-trust stance, as well as the institutional protection both received under the Wagner Act of 1935, were key in contributing to

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<sup>4</sup> *Truax v. Corrigan*, 257 U.S. 312 No. 13, reargued October 5-6, 1921, decided December 19, 1921.

<sup>5</sup> Although World War I and related disturbances certainly had some impact on stock prices, it is not clear why that impact should have been so profoundly negative. By comparison, both indices gained substantial ground during World War II.

the persistence of unemployment in the U.S. throughout the 1930s. This interpretation has been applied successfully to other countries, see Cole and Ohanian (2002) for the UK, Beaudry and Portier (2002) for France, and Fisher and Hornstein (2002) for Germany. Our work is similar in spirit to that of Cole and Ohanian, in the sense that our analysis also builds upon the interaction of collective bargaining and monopoly power. Once again, however, the modeling differs substantially. Cole and Ohanian's model of bargaining in the labor market is specifically tailored to New Deal era legislation, while our model of the labor market is more general and more explicit. We embed a Mortensen-Pissarides labor search framework, which leads to fully micro-founded involuntary unemployment and wage bargaining, in a model of monopolistic competition in the goods market.

Beginning with the seminal work of Friedman and Schwartz (1963), a large literature focuses on the pernicious effects of monetary tightening as a cause of the Great Depression. One important strand of this literature argues that *given* nominal wage stickiness, contractionary monetary shocks led to real wage increases, which in turn were detrimental for output and employment.<sup>6</sup> The crucial assumption in this literature is that nominal wages are highly unresponsive to labor demand changes. This leaves open the fundamental question as to why wages did not adjust in the face of a massive and protracted drop in labor demand. This is a very puzzling question, especially in light of the dramatic decline in corporate profits due to the combination of high wages and lower output. *Prima facie*, it is not obvious how this could have been optimal for firms, especially in light of the masses of unemployed workers who would presumably have been happy to work at lower wages.

Our contribution in this context is that we identify the common source of collapsing output and labor demand and rising wages after 1929. We provide a mechanism by which profit-maximizing monopolistically competitive firms and surplus-maximizing unions optimally choose to raise real wages while lowering employment. The crucial element is a shift in the legal environment in favor of unions, expressed as a shift in workers' ability to credibly threaten to form labor unions and bargain collectively. Importantly, our analysis does not depend on the existence of formal collective bargaining, which does not play a role in the US economy on a large scale until the

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<sup>6</sup> See for example Bernanke and Carey (1996), Bordo, Erceg and Evans (2000) or Christiano, Motto and Rostagno (2003).

enactment of New Deal labor policies. Rather, we show that in the face of a credible threat to unionize, firms might prefer to *implicitly* implement the efficient bargaining solution, perhaps in order to avoid the disruptions and unrest linked to union activity.

Hence, although our analysis is presented exclusively in real terms, it does not contradict a role for monetary forces. It is plausible that extending the model to include monetary factors would find that the monetary contraction exacerbated the output and employment declines during the early part of the Great Depression.

A more neoclassical explanation for 1929 and the ensuing slump has argued for adverse productivity shocks, as in Cole, Ohanian and Leung (2005), while rejecting the stock market overvaluation hypothesis, see McGrattan and Prescott (2004). The business cycle accounting approach of Chari, Kehoe and McGrattan (2006) points to a prominent role for the labor wedge, in accordance with our findings.

Our work is also similar in spirit to a recent literature discussing product market competition as a source of divergent labor market performance between Europe and the US in the 1980s and 1990s, cf. Blanchard and Giavazzi (2003), Fonseca, Lopez and Pissarides (2001) and Ebell and Haefke (2006a, 2006b). In fact, in Ebell and Haefke (2006b) a nearly identical model is successful at accounting for cross-sectional differences in European and US unemployment during the 90s.

Lax antitrust policies during the 1920s and possible increases in monopoly power have been noted in previous research, notably by Bittlingmayer (1992), who argues for a link with the booming stock market of the 1920s. While we concur with his explanation of the stock market upswing of the 1920s, our results offer an alternative interpretation of the stock market crash of 1929 and the ensuing depression. According to Bittlingmayer, threats of tighter antitrust enforcement in 1929 led to lower profit expectations and thus contributed to the fall in asset values. However, tighter antitrust enforcement should have led to an expansion, not a contraction, in output while asset prices fell. In our framework, asset prices may fall for two reasons: both expectations of declining monopoly power and of a switch from individual to collective wage bargaining will erode monopoly rents. While in the first case, an increase in output will accompany the stock market crash, in the second case, output and stock market values would decline in concert.

The remaining parts of the paper are structured as follows. The following section outlines the theoretical underpinnings of our reasoning. Section 3 reviews labor and antitrust policy during the 1920s and highlights the continuity hypothesis between

this period and the New Deal advanced in recent historical research. Section 4 presents the results of a quantitative general equilibrium analysis of the 1920s. Section 5 concludes.

## 2. Monopolistic Competition and Labor Market Frictions

In order to address the interplay between monopoly power and organized labor theoretically, two model elements are crucial. First, the goods market must allow for monopolistic competition. Second, there must be wage bargaining, allowing for two bargaining regimes: collective bargaining (organized labor) and individual bargaining. These model elements are integrated into as parsimonious a model setup as possible, in which agents are risk neutral, labor supply is inelastic and there is no capital. We assume that regime changes are unexpected.

### 2.1. Labor Search

The first crucial element of the model is the explicit assumption of a labor market which allows for two types of wage formation: collective and individual bargaining. Wage bargaining is underpinned by Mortensen-Pissarides search frictions in the labor market, which create rents. In particular, unemployed workers  $U$  and vacancies  $V$  are transformed into job matches by a constant returns to scale matching function

$$m(U, V) = sU^\eta V^{1-\eta}$$

where  $\eta$  is the elasticity of the matching function and  $s$  is a scaling factor. Job matches are separated at the exogenous rate  $\chi$ . Key variables are the aggregate labor market tightness, defined as  $\theta = \frac{V}{U}$ , the rate at which firms fill vacancies

$q(\theta) = \frac{m(U, V)}{V} = s\theta^{-\eta}$ , and the rate at which workers find jobs

$f(\theta) = \frac{m(U, V)}{U} = s\theta^{1-\eta}$ . The greater the number of vacancies relative to unemployed

workers (i.e. the higher is tightness), the easier it is for firms to fill vacancies, and the more difficult it is for workers to find jobs. In the steady-state, the flow of workers into and out of unemployment must be equal, leading to a Beveridge curve relating equilibrium unemployment to tightness:

$$U \cdot f(\theta) = (1-U)\chi \Rightarrow U = \frac{\chi}{\chi + f(\theta)}$$

There is a continuum of risk neutral workers on the unit interval.<sup>7</sup> Value functions for unemployed and employed workers are defined as follows<sup>8</sup>:

$$V_{E,k} = w_k + \frac{1}{1+r} [(1-\chi)V_{E,k} + \chi V_U] \quad (1)$$

$$V_U = b + \frac{1}{1+r} [(1-f(\theta_k))V_U + f(\theta_k)V_{E,k}] \quad (2)$$

The value of employment under bargaining regime  $k$  is the period real wage  $w_k$ , plus the expected continuation value of current employment. In calculating the expected continuation value, workers take into account that they will lose their jobs with probability  $\chi$ <sup>9</sup>. Similarly, the value of unemployment is the real flow value to unemployment  $b$  (which includes the value of home production and of any unemployment benefits or charitable assistance), plus the continuation value of unemployment, taking into account that the unemployed find jobs with probability  $f(\theta_k)$ .

From the worker's value functions, we can derive the worker's surplus  $V_{W,k}$  as the difference between the values of employment and unemployment.

$$V_{W,k} = \frac{(1+r)w_k - rV_U}{r + \chi} \quad (3)$$

## 2.2. Monopolistic Competition

We assume the standard Dixit-Stiglitz monopolistic competition setup. There is a continuum of firms on the unit interval, each producing a differentiated good indexed by  $i$ . Agents are risk neutral in the aggregate consumption good and have Dixit-Stiglitz preferences over the continuum of differentiated goods. Demand for goods in each period is derived from the household's optimization problem:

$$\max_{c_{i,n}} \left( \int c_{i,n}^{\frac{\sigma-1}{\sigma}} di \right)^{\frac{\sigma}{\sigma-1}}$$

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<sup>7</sup> For simplicity, there is neither capital nor savings in the model.

<sup>8</sup> These are steady-state values. Steady-state bargaining in a setting without shocks is standard in the labor search and matching literature, cf. Pissarides (2001).

<sup>9</sup> We follow Hall (2005) and Shimer (2005), who argue that the cyclical variation in separations is small enough so as to justify the assumption of a constant separation rate.

subject to the budget constraint  $I_n = \int c_{i,n} \frac{p_i}{P} di$ , where  $I_n$  denotes the real income of household  $n$  and  $c_{i,n}$  is household  $n$ 's consumption of good  $i$ . Thus we obtain aggregate demand for good  $i$  given as:

$$y_i = \int c_{i,n} dn = \left( \frac{P(y_i)}{P} \right)^{-\sigma} Y \quad (4)$$

where  $Y = \int I_n dn$  is aggregate real income and  $P = \left( \int P_i^{1-\sigma} \right)^{\frac{1}{1-\sigma}}$  is the inverse shadow price of wealth, typically interpreted as a price index. Equation (4) is the standard monopolistic-competition demand function where  $\sigma$  is the demand elasticity facing the firm. Monopoly power is measured by this demand elasticity. The lower is demand elasticity, the steeper is the demand curve facing the firm and the greater is the firm's monopoly power. Perfect competition is the special case in which demand elasticity approaches infinity, leading to a flat demand curve and hence price-taking behavior.

### 2.3. The Firm's Problem

In the presence of search frictions, firms cannot adjust employment instantaneously. Rather, in order to hire a worker at date  $t+1$ , firms must pay  $\kappa$  to post each of  $v_t$  vacancies at date  $t$  which are filled at rate  $q_t$ . At the same time, the firm's 'stock' of hired workers depreciates each period at constant rate  $\chi$ , representing an exogenous quit rate. Hence, the firm's stock of hired workers behaves like a capital stock with a linear adjustment cost.

The choice of bargaining regime has a profound impact on the firm's problem. Under individual bargaining, firms retain the right to choose employment optimally, and bargaining is over wages only. Under collective bargaining, both employment and wages are subject to negotiation. As a result, the firm makes no choices unilaterally, and only posts enough vacancies to implement the bargained employment level.

#### 2.3.1 Individual Bargaining Firms

Individual bargaining firms choose vacancies optimally in order to maximize the present discounted value of future profits

$$V_I(h_I) = \max_v \left\{ \frac{p(y_I)}{P} y_I - w_I \cdot h_I - \kappa v_I + \frac{1}{1+r} V_I(h_I') \right\}$$

subject to:

$$\begin{aligned} \frac{p(y_I)}{P} &= \left( \frac{y_I}{Y} \right)^{-\frac{1}{\sigma}} \\ h_I' &= (1 - \chi) h_I + q(\theta) v_I \\ w_I &= w(h_I) \end{aligned}$$

The last constraint anticipates that individually bargained wages may depend upon the firm's steady-state factor choice  $h_I$ .<sup>10</sup>

The firm's first order condition for vacancies equalizes the discounted value of a marginal worker to the cost of hiring that worker:

$$\frac{1}{1+r} \frac{\partial V_I(h_I')}{\partial h_I'} = \frac{\kappa}{q(\theta)} \quad (5)$$

The cost of hiring a worker is simply the product of vacancy cost  $\kappa$  and the number of vacancies which must be opened to hire one worker,  $\frac{1}{q(\theta)}$ . Combining (5) with the envelope condition yields the firm's Euler equation for employment:

$$\frac{\kappa}{q(\theta)} = \frac{1}{1+r} \left[ \frac{\sigma-1}{\sigma} A \frac{p(y_I')}{P} - w_I(h_I') - h_I' \frac{\partial w_I'}{\partial h_I'} + (1-\chi) \frac{\kappa}{q(\theta')} \right] \quad (6)$$

This Euler equation describes the firm's optimal employment decision. The left hand side represents the cost of hiring the marginal worker, while the right hand side represents the discounted future benefits to hiring the marginal worker: The first two terms in brackets are standard, representing the worker's marginal revenue product net of wages. The third term,  $h_I' \frac{\partial w_I'}{\partial h_I'}$ , reflects firms' correct anticipation that the result of wage bargaining will depend upon the number of workers hired. In section 2.4.2 we will connect this third term to the hiring externality. The fourth term in brackets represents the future savings in hiring costs from having hired the worker today.

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<sup>10</sup> Note that under individual bargaining, the firm's employment stock  $h_I$  is fixed in the previous period, and hence is fixed at the time of bargaining. Hence, the firm sets employment in advance, while taking into account the future strategic implications of this choice for the wage bargaining. Cf. Smith (1999).

### 2.3.2 Collective Bargaining Firms

The collective bargaining firm does not solve an optimization problem as such. Efficient collective bargaining involves bargaining over both wages and employment, determining both next period's employment and wage, and hence output. As a result, there is no choice which is made unilaterally by the firm, except to mechanically choose the number of vacancies which will implement the negotiated employment level  $h_c'$  according to the transition function:

$$h_c' = (1 - \chi)h_c + v_c q(\theta)$$

The steady-state value of the collective bargaining firm is simply the discounted present value of a constant stream of profits:

$$V_{J,C}(h_c) = \frac{1+r}{r} \left[ y_c \frac{p(y_c)}{P} - w_c h_c - \chi \frac{\kappa}{q(\theta_c)} h_c \right] \quad (7)$$

where  $v_c = \frac{\chi h_c}{q(\theta_c)}$  represents the firm's steady-state vacancy-posting rate.

### 2.4. Wage Bargaining

Search frictions imply that rents to employment arise, which firms and workers divide by Nash bargaining. We consider two bargaining frameworks. Collective bargaining occurs when all workers of a firm band together to bargain with their employer over both wages and employment. Under individual bargaining, each worker negotiates separately with his or her employer and wages can be renegotiated at any time.<sup>11</sup> The crucial distinction between the two bargaining regimes is that under this latter individual setup, each worker is treated as the marginal worker. The reason is that when negotiating with his employer, a worker's only threat point is to leave the firm's employment himself – not to take any other workers with him – making himself the marginal worker during wage negotiations. In contrast, under collective bargaining, workers can act jointly to shut down production in the event of a disagreement.

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<sup>11</sup> The individual bargaining framework examined here was introduced in partial equilibrium by Stole and Zwiebel (1996a, 1996b), and extended to general equilibrium by Smith (1999), Cahuc, Wasmer and Marque (2004) and Ebell and Haefke (2005).

### 2.4.1. Collective Bargaining

The surplus over which the employer and the union are bargaining is the difference between profits when negotiations are successful and when they fail. Under collective bargaining, the workers are able to prevent the firm from operating if negotiations fail, so that the firm's surplus is equal to total firm profits, or equivalently its total value given by (9)<sup>12</sup> The workers' surplus is the difference between the value of employment with the collective-bargaining firm and unemployment (3), multiplied by the number of workers  $h_C$ .<sup>13</sup>

$$V_{w,c}h_C = \frac{(1+r)w_C - rV_U}{r + \chi} h_C$$

Hence, the Nash bargaining problem becomes:

$$\max_{w_C, h_C} \phi \ln \left[ \left( \frac{(1+r)w_C - rV_U}{r + \chi} \right) h_C \right] + (1-\phi) \ln \left\{ \frac{1+r}{r} \left[ y_C \frac{p(y_C)}{P} - w_C h_C - \chi \frac{\kappa}{q(\theta)} h_C \right] \right\}$$

where worker's bargaining power is given by  $\phi$ .<sup>14</sup>

The first-order conditions with respect to the wage and to employment are:

$$w_C = (1-\phi) \frac{r}{1+r} V_U + \phi \left[ A \frac{p(y_C)}{P} - \chi \frac{\kappa}{q(\theta)} \right]$$

$$w_C = \left[ (1-\phi) \frac{\sigma-1}{\sigma} + \phi \right] A \frac{p(y_C)}{P} - \chi \frac{\kappa}{q(\theta)}$$

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<sup>12</sup> This is the standard efficient bargaining framework, which guarantees that total surplus (worker's surplus of employment over unemployment plus firm's profits) is maximized. See Layard (1991) for an overview of wage bargaining setups.

<sup>13</sup> A note on the timing is in order here. Since employment  $h_C$  is determined by the vacancies posted in the *previous* period, any bargaining over employment must be over future employment, which is controllable by the vacancies currently posted. The key assumption is that here – in contrast to the individual bargaining setup – union labor contracts are binding for the next period. In addition, if negotiations break down, the presence of a binding contract for the current period (negotiated in the previous period) implies that workers will only be able to impose their threat of shutting down the firm in the next period. These subtleties of timing do not play any role in the steady-state case, but must be taken into account when extending this setup to account for shocks.

<sup>14</sup> The microfoundation for *static* Nash bargaining is a Binmore-Rubinstein-Wolinsky alternating offer game. The bargaining power of the parties represent their relative degrees of patience. The standard choice of  $\phi = 0.50$  implies that firm owners and workers have identical discount factors.

Combining the first order conditions leads to an expression for the bargained wage as the sum of the reservation utility and a share  $\phi$  of a surplus term:

$$w_c = \frac{r}{1+r} V_U + \frac{\phi}{\sigma} A \frac{p(y_c)}{P} \quad (8)$$

Note that the surplus component of the wage curve is closely related to firm profits, and is increasing in monopoly power  $\frac{1}{\sigma}$ . In the perfect competition limit, as  $\sigma \rightarrow \infty$ , the surplus approaches zero and the worker receives only his reservation utility. Firm-level employment is given implicitly by:

$$\frac{\sigma-1}{\sigma} A \frac{p(y_c)}{P} = \frac{r}{1+r} V_U + \chi \frac{\kappa}{q(\theta)} \quad (9)$$

#### 2.4.2. Individual Bargaining

Under individual bargaining, each worker bargains separately over wages with the firm. If negotiations break down, the worker can walk away into unemployment immediately, depriving the firm of his marginal revenue product and forcing the firm to hire a new worker (to obtain the profit-maximizing employment level). Hence, under individual bargaining, the firm's surplus is the worker's *marginal* contribution to the firm's value  $\frac{\partial V}{\partial h_l}$ . The individual Nash bargaining problem becomes:

$$\max_{w_l} \phi \ln(V_{w,k}) + (1-\phi) \ln\left(\frac{\partial V}{\partial h_l}\right)$$

The worker's surplus is obtained from equation (3), while the firm's surplus term can be obtained from (5) and (6) as:<sup>15</sup>

$$\frac{\partial V_l}{\partial h_l} = \frac{1}{r+\chi} \left[ \frac{\sigma-1}{\sigma} A \frac{p(y_l)}{P} - w_l(h_l) - h_l \frac{\partial w_l}{\partial h_l} \right] \quad (10)$$

The first order condition of the individual bargaining problem yields a first-order linear differential equation:

$$w_l(h_l) = (1-\phi) \frac{r}{1+r} V_U + \phi \left[ \frac{\sigma-1}{\sigma} A \frac{p(y_l)}{P} - h_l \frac{\partial w_l}{\partial h_l} \right]$$

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<sup>15</sup> For expository reasons, we present the steady-state bargaining solution. In the appendix, we show that the steady-state and fully dynamic solutions to the individual bargaining model are identical.

with solution<sup>16</sup>

$$w_l(h_l) = (1-\phi)\frac{r}{1+r}V_U + \phi\frac{\sigma-1}{\sigma-\phi}A\frac{p(y_l)}{P} \quad (11)$$

Next, we need to obtain an expression for labor demand and a closed form for the bargained wage. We use (11) to substitute out for the  $h_l \frac{\partial w_l}{\partial h_l}$  term in (6) and apply the steady-state to obtain a closed form for the firm's Euler equation:

$$w_l(h_l) = \frac{\sigma-1}{\sigma-\phi}A\frac{p(y_l)}{P} - (r+\chi)\frac{\kappa}{q(\theta)} \quad (12)$$

The firm's labor demand equation does not satisfy the usual condition that employment costs (made up of wages and hiring costs,  $w_l + (r+\chi)\frac{\kappa}{q(\theta)}$ ) equal marginal revenue product (given by  $\frac{\sigma-1}{\sigma}A\frac{p(y_l)}{P}$ ). Rather, firms hire workers *beyond* the point at which MRP equals hiring costs. The reason is that the downward-sloping wage curve implies that by hiring an additional worker, firms are able to depress the wages of all workers (recalling that all workers are treated as the marginal worker). This results in a hiring externality, and hence an incentive to expand hiring beyond the efficient level<sup>17</sup>. This externality – and the overhiring – are stronger when monopoly power is greater, due to the greater steepness of the wage curve (which in turn derives from the greater steepness of the MRP schedule). Hence, under individual bargaining, there is a countervailing effect to the first-principles restriction of output and employment under monopoly power. We shall see in the quantitative section that this will contribute to output and employment being far less sensitive to monopoly power under individual bargaining than under collective bargaining.

Firm-level employment and bargained wages are found at the intersection of the wage curve (11) and of the labor demand schedule (12). This yields an expression for the bargained wage:

$$w_l = \frac{r}{1+r}V_U + \frac{\phi}{1-\phi}\frac{\kappa}{q(\theta)}(1+r) \quad (13)$$

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<sup>16</sup> The solution is derived in the appendix.

<sup>17</sup> Hiring externalities under individual bargaining were first described in partial equilibrium by Stole and Zwiebel (1996).

Once again, the bargained wage can be expressed as the sum of the reservation utility and a share of the surplus. Under individual bargaining, however, the surplus share is not related to profits, but rather to hiring costs. The intuition is that under individual bargaining, the worker's value to the firm is his marginal value. At the optimum of the firm's problem, this marginal value is equated to the cost to hiring that worker. Put another way, the main cost that an individually bargaining worker can impose on a firm when negotiations break down is the cost to rehiring him.

### 2.4.3. Choice of bargaining regime

We consider two labor law regimes. First, one regime restricts the ability of workers to form collective bargaining coalitions, effectively mandating the use of individual bargaining. Under the second, more liberal regime, workers may freely choose whether to form a collective bargaining coalition or not. When choosing a bargaining regime, workers compare not total wages but bargaining surpluses, as their reservation wage will be unaffected by the choice of bargaining regime at their own firm.<sup>18</sup> Hence, workers prefer collective bargaining, and will form unions when allowed if the collective bargaining surplus exceeds its individual bargaining counterpart. Using that a single worker's steady-state surplus is given by (3), workers prefer collective bargaining if:

$$\sigma < (1-\phi) Ap(y_C) \frac{1}{1+r} \frac{q(\theta_l)}{\kappa} \quad (14)$$

The intuition is that collective bargaining surpluses are profit shares, which are increasing in monopoly power.<sup>19</sup> This makes forming a collective bargaining coalition more attractive when monopoly power is greater, i.e. when demand elasticity  $\sigma$  is smaller. In the quantitative analysis of section 4, we will show that workers prefer collective bargaining, even when the degree of monopoly power is moderate.

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<sup>18</sup> The reason is that the firm is assumed to be small enough with respect to the aggregate so that its choice of bargaining regime has negligible impact on employment prospects at other firms, unemployment benefits and the value to home production.

<sup>19</sup> Of course, workers also consider job losses due to a switch in bargaining regimes. For a full treatment of the worker's optimal choice of bargaining regime, see Ebell and Haefke (2006).

#### 2.4.4. Preempting Unions

We now ask whether firms, aware that workers were gaining the legal ability to form collective bargaining coalitions, could offer wage-employment pairs to preempt such union formation. That is, we ask formally, do preemptive wage-employment pairs  $(w_P, h_P)$  exist such that both firms and workers are at least as well off as under collective bargaining? In Proposition 1, we establish that there exist no such pairs.<sup>20</sup> As a result, the only way to prevent workers from organizing is to offer the workers the (efficient) collective bargaining wage-employment pair  $(w_C, h_C)$ . We conclude that if firms believed that union organization was imminent, they would be fully rational in opting to offer  $(w_C, h_C)$  to their non-unionized workers, perhaps in order to avoid some non-pecuniary cost or disruption due to union organization.

**Proposition 1:** *There exists no wage-employment pair  $(w_P, h_P)$  such that both firms and workers are at least as well off as under collective bargaining, that is, such that*

$$\begin{aligned}\pi(w_P, h_P) &\geq \pi(w_C, h_C) \\ [V_{E,P} - V_U] h_P &\geq [V_{E,C} - V_U] h_C\end{aligned}$$

where  $\pi(w, h)$  are the firm's profits under wage-employment pair  $(w, h)$ .

**Proof:** See Appendix A.2

#### 2.5. Reservation Value of Unemployment

Next, we need to find a closed form solution for the reservation value of unemployment. This reservation value will differ, depending on whether the economy is in its individual or collective bargaining regime. The reason is that the reservation value of unemployment is composed of two terms: the flow value to unemployment  $b$  plus a term which captures the probability of obtaining a new job and the surplus obtained when employed. The second term obviously differs according to the bargaining regime.

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<sup>20</sup> Proposition 1 is simply an expression of the fact that collective bargaining is efficient, in the sense that it maximizes joint surplus of workers and firms.

Using (1) and (2) to obtain an expression for  $V_{U,I}$  as a function of  $b$  and  $w_I$ , and then combining with the individual bargaining wage (14) yields a closed form expression for  $V_{U,I}$ :

$$\frac{r}{1+r} V_{U,I} = b + \frac{\phi}{1-\phi} \kappa \theta_I \quad (15)$$

Similarly, one can obtain the reservation value for unemployment under collective bargaining by combining (1), (2), (8) and (9) to obtain:

$$\frac{r}{1+r} V_{U,C} = \frac{(r+\chi)(\sigma-1)}{(r+\chi)(\sigma-1) - \phi f(\theta_C)} b + \frac{\phi \chi}{(r+\chi)(\sigma-1) - \phi f(\theta_C)} \kappa \theta_C \quad (16)$$

## 2.6. Stock market valuations

Agents are risk-neutral, so that the value of a firm is simply the discounted sum of expected future dividends

$$p_t = E_t \sum_{\tau=1}^{\infty} \beta^\tau d_{k,t+\tau}$$

where  $d_{k,t+\tau}$  are the firm's date  $t+\tau$  dividends under bargaining regime  $k$ , with  $k \in \{C, I\}$ , representing collective and individual bargaining respectively. When agents expect the bargaining regime to be permanent, and in the absence of other shocks, the value of the firm becomes

$$p_k = \frac{\beta}{1-\beta} d_k \quad (17)$$

Clearly, the firm's valuation is proportional to the period profits associated with each bargaining regime. If period profits are higher under individual bargaining – as will be the case – then asset prices will be proportionately higher as well.

## 2.7 Equilibrium

To close the model, a market clearing constraint for goods is needed, which guarantees that aggregate demand equals supply.

$$Y = \frac{p(y_k)}{P} y_k$$

When all firms engage in collective bargaining, the market clearing condition reduces to:

$$A = \frac{(r + \chi)\sigma}{(r + \chi)(\sigma - 1) - \phi f(\theta_c)} \left[ b + \frac{\kappa}{q(\theta_c)} \chi \right] \quad (18)$$

When all firms engage in individual bargaining, the equilibrium condition becomes:

$$A = \frac{\sigma - \phi}{\sigma - 1} \left[ b + \frac{\phi}{1 - \phi} \kappa \theta_l + \frac{1}{1 - \phi} \frac{\kappa}{q(\theta_l)} (r + \chi) \right] \quad (19)$$

In both cases, the equilibrium conditions pin down the equilibrium value of labor market tightness  $\theta_k$  as a function of parameters, including the degree of demand elasticity (a measure of monopoly power)  $\sigma$ . This closes the model. From the Beveridge curve, equilibrium unemployment  $u(\theta_k)$  is a decreasing function of tightness  $\theta_k$ . Since labor is supplied inelastically, and the population is normalized to one, equilibrium employment is simply  $h_k = 1 - u(\theta_k)$ , and equilibrium output is given by  $y_k = Ah_k$ .

## 2.8. Qualitative Results

In section 4 we will present quantitative results based on the model presented in this section. At this point, we summarize several important qualitative conclusions that emerge. First, when monopoly power is sufficiently high, workers prefer to form collective bargaining coalitions. Hence, if restrictions on union organization fall, the model predicts that union activity will increase. Moreover, since the rents to collective bargaining are increasing in monopoly power, workers have more to gain from a switch to collective bargaining, the greater is monopoly power in the economy.

Second, firms' profits must be lower under collective bargaining for two reasons: first, collectively bargaining firms must give up a profit share to workers, while individually bargaining firms do not. In addition, individually bargaining firms have an additional degree of freedom to maximize profits, due to their ability to manipulate wages via overhiring. A switch from individual bargaining to collective bargaining causes firms' profits and stock market valuations to fall.

Third, the model predicts that a switch from individual to collective bargaining leads output to be more tightly restricted by firms, provided monopoly power is sufficiently high. The reason is that when monopoly power is high enough, then (20) and

(21) guarantee that  $\theta_C < \theta_I$ , so that  $u(\theta_C) > u(\theta_I)$ , and hence  $y_C < y_I$ . In addition, the gap between  $y_C$  and  $y_I$  is increasing in the degree of monopoly power. Hence, we can conclude that the negative impact of an increase in monopoly power on employment and output is greater under collective bargaining than under individual bargaining<sup>21</sup>.

These three conclusions form an intriguing picture. Collective bargaining shifts a share of profits from firms to workers. If monopoly power is strong and profits are high, workers have strong incentives to organize and bargain collectively, while firms have equally strong incentives to restrict workers' ability to organize, so that monopoly power can be seen as sowing the seeds of labor conflict.

In addition, for a given level of monopoly power, output and employment will be greater under individual bargaining, as will profits. Hence, when restrictions on union formation are lifted, the subsequent switch from individual to collective bargaining leads to a drop in output, employment and firm values, and presents as a recession. The stronger is monopoly power, the greater the gap between the two regimes, and hence the sharper the induced slump. Conversely, a virtual prohibition of collective bargaining would lead to increases in output, employment and firm values, and would present as the sort of economic upturn experienced during the US during the roaring 20's.

### **3. Labor market and antitrust policies in the 1920s**

The Sherman Act of 1890 threatened “contracts, combinations (...) or conspiracies in restraint of trade” with severe sanctions, and treated workers' unions and producers' cartels or trusts in symmetric fashion<sup>22</sup>. However, both public and case law evolved significantly over time, at times undercutting, at times reinforcing the Sherman Act. We believe that between the immediate pre-World War I years and the New Deal, two distinct regime changes in the legal stance toward trade unions can be identified that greatly affected the wage bargaining setup. In contrast, antitrust enforcement underwent a more gradual change, and no clear structural break between World War I and

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<sup>21</sup> In a quantitative model, Ebell and Haefke (2005) show that the impact of monopoly power on employment and output under individual bargaining is very close to zero, due to the counteracting first principles and overhiring effects.

<sup>22</sup> July 2, 1890, c. 647, 26 Stat. 209.

the New Deal emerges. In the present section, we will briefly discuss the main issues and carve out the stylized facts, however without aiming to give a comprehensive overview, which would far exceed the scope of this paper. With the stylized facts in hand, the next section will trace the implications for a calibrated version of the model presented in Section 2 above.

### 3.1. Labor

Armed with the provisions of the Sherman Act, courts prior to World War I curbed strikes frequently through the use of injunctions. As a consequence, the overall degree of unionization remained low. Around 1910, union membership exceeded 10 % of the non-agricultural labor force only in mining, transport, and construction, where industry characteristics and skill requirements facilitated unionization<sup>23</sup>. This changed after the Clayton Antitrust Act of 1914 exempted organized labor from the Sherman Act's presumption of conspiracy in restraint of trade.<sup>24</sup> With a delay of one year, trade union membership began to soar. Mitigated by wartime efforts to appease organized labor and avoid disruptions in production and transport<sup>25</sup>, an upsurge in labor disputes followed, as illustrated in Table 1.

Between 1916 and 1920, union membership as a percentage of the labor force grew from less than 10 % to over 16 % . Total strike duration dipped briefly in 1917 and 1918 and then soared, as did the number of involved workers. In Table 1 we also provide a tentative estimate of the total number of workdays lost to strikes, which confirms the picture of substantial trade union activity at the end of World War I.<sup>26</sup>

Up until 1918, it is difficult to disentangle the effects of the Clayton Act from those of World War I. By 1919, however, one can assume that many wartime effects

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<sup>23</sup> See Friedman (1999).

<sup>24</sup> October 15, 1914, c. 323, 38 Stat. 730.

<sup>25</sup> These include the adoption of the eight-hour day in railroads in 1916 (Adamson Act) and, beginning in 1917, state control over the railroads, which ended only in 1920.

<sup>26</sup> Sources for the period between 1905 and 1916 seem to be shaky. They also do not provide data on the total number of days lost to strikes until 1926, when the methodology was changed, see Edwards (1981). For 1927 and 1928, the available sources report the number of lost days and the older estimate of total strike days alongside each other. We used the ratio between the two series in 1928 to backward extrapolate total workdays lost, employing the data on workers involved and total strike days in Table 1. This amounts to assuming that the proportion between the number of workers involved and the number of strike days in all years is as in 1928.

had ceased, so that the impact of increased union activity would be felt. Beginning in 1919, trade union activity increased sharply. Organized labor struck in Seattle in 1919, beginning with a shipyard strike that extended into a general strike. The Boston police went on strike, only to be discharged wholesale and replaced by new policemen. More important was the attempted reorganization of labor in U.S. coal and steel industry and a prolonged steel workers' strike in 1919 and 1920, which at one time involved over 300 thousand workers and shut down a considerable percentage of America's steel making capacity. A major coal strike in late 1919 was put down by an injunction obtained by the Federal Government, citing wartime legislation on the coal industry. The steel workers' strike ended without concessions from the employers, while the coal miners obtained a pay increase of 27 % in an arbitration process that followed the end of the strike.<sup>27</sup> Still, unions had flexed their muscles and demonstrated that given the limitation of injunctions under the Clayton Act, they could cause major disruption to economic activity. Summing up, we see the years following the passage of the Clayton Act as the first labor market regime, characterized by an increasing role for trade unions and collective bargaining.<sup>28</sup>

However, the regime created by the Clayton Act was brought to end in 1921, and a severe backlash against unions ensued. In early 1921, the Supreme Court ruled on a case in which striking workers had attempted to organize the boycott of a firm by its suppliers and customers. The court determined that this interfered with interstate commerce and violated the Sherman Act, arguing that nothing in the Clayton Act protected unions from injunctions which might be brought against them for conspiracy in restraint of trade<sup>29</sup>. This early ruling, however, did not touch on the Clayton Act's

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<sup>27</sup> See, e.g., Dulles and Dubovsky (1984).

<sup>28</sup> We note, however, that data on union *coverage* is unavailable for this period. Union membership data may be severely underestimating union coverage (the fraction of workers covered by a union contract, regardless of their membership status), much as is the case in contemporary French or Spanish data. There, union membership rates are below 20%, despite near universal union coverage.

<sup>29</sup> *Duplex Printing Press Co. v. Deering*, 254 U.S. 443 (Jan. 3, 1921). The decisive passage referring to Section VI of the Clayton Act says: "But there is nothing in the section to exempt such an organization or its members from accountability where it or they depart from its normal and legitimate objects and engage in an actual combination or conspiracy in restraint of trade. And by no fair or permissible construction can it be taken as authorizing any activity otherwise unlawful, or enabling a normally lawful organization to become a cloak for an illegal combination or conspiracy in restraint of trade as defined by the anti-trust laws." [254 U.S. 443, 469].

protections for the right of unions to organize picket lines, so that union activity remained high during 1921. Going further, in a case of picketing that was argued in October and decided in December of the 1921, the Supreme Court ruled that the Clayton Act introduced no new principles and was merely declaratory of existing practice<sup>30</sup>. This ruling had the crushing effect of reducing union activity to mere information and persuasion, and even this not anywhere near factory gates. The ruling explicitly determined that picketing was unlawful and subject to injunction, just as in the days before the Clayton Act.<sup>31</sup> In a decision handed down a few days later, the Supreme Court declared an Arizona state law unconstitutional that had allowed peaceful picketing, arguing that picketing involved considerable losses of business and therefore violated a property right under the 14<sup>th</sup> Amendment.<sup>32</sup>

As a result of these landmark decisions, the use of injunctions resumed immediately and recovered to pre-1914 levels, see Brissenden (1933), rendering the provisions of the Clayton Act almost immaterial. Consequently, trade unions were severely weakened for most of the decade, and union membership declined by one third

As Table 2 shows, trade union activity declined markedly during the 1920s by all indicators, and become an almost marginal phenomenon toward the end of the decade. In 1928, trade union density, the number of workers involved in labor disputes, and the loss of days due to strikes all were far lower than at the beginning of the decade, and indeed lower than before World War I. In line with conventional wisdom on interwar labor history, we see this return to the low pre-war levels of trade union activity as a major regime change in the U.S. labor market constitution. The Supreme Court decisions of 1921 repealed the pertinent clauses of the Clayton Act, reversed the growth of trade unionism and marginalized collective wage bargaining in large swaths of the U.S. economy for almost a decade.

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<sup>30</sup> *American Steel Foundries v. Tri-City Central Trades Council*, 257 U.S. 184 (December 5, 1921) The passage reads: “It is clear that Congress wished to forbid the use by the federal courts of their equity arm to prevent peaceable persuasion by employees, discharged or expectant, in promotion of their side of the dispute, and to secure them against judicial restraint in obtaining or communicating information in any place where they might lawfully be. This introduces no new principle into the equity jurisprudence of those courts. It is merely declaratory of what was the best practice always. Congress thought it wise to stabilize this rule of action and render it uniform.” [257 U.S. 184, 203].

<sup>31</sup> [257 U.S. 184, 205].

<sup>32</sup> *Truax v. Corrigan*, 257 U.S. 312 (December 19, 1921).

However, this reversal to individual bargaining was not to last. In what initially seemed like an isolated development, the Railway Labor Act of 1926 contained pro-union legislation, which made collective bargaining at a company level mandatory and provided for state arbitration. Railroad companies soon attempted to circumvent the provisions of the Railroad Labor Act by setting up their own company unions and staffing them with representatives of their liking.

Such was the case with the Texas and New Orleans Railroad. A trade union active in this firm, the Brotherhood of Railway and Steamship Clerks, had taken a wage dispute to the U.S. Board of Mediation. As a reaction, the management shut out the union and replaced it with one of its own design. This case was taken to court in 1927, and won by the trade union against the appeals of the railway company, most importantly in the 2nd Circuit Court of Appeals on June 10, 1929.<sup>33</sup> When the case was brought to the Supreme Court in 1930, it famously upheld the rulings of the District Court and the Circuit Court of Appeals, citing as a well-established rule the principle that the Supreme Court would not overturn a lower court ruling if the two previous courts had agreed, unless clear error was shown [281 U.S. 548, 558; May 26, 1930].

Two aspects of this case are crucial. First, this case marked a major sea change in American industrial relations, as it overturned a whole string of previous Supreme Court rulings that had upheld employers' rights against trade unions<sup>34</sup>. Second, any legally sophisticated observer would have been aware that the Supreme Court was highly unlikely to overturn the 2<sup>nd</sup> Circuit's June 1929 decision. Overturning this ruling would have implied a major break with legal traditions, a step that the Supreme Court was unwilling to take.

The effects of this turnaround in the attitude of the courts towards trade unions cannot possibly be overestimated. Numerous previous attempts by state and federal legislators to regulate labor markets had been thwarted by court rulings that upheld the First and Fourth Amendment and repeatedly ruled the pertinent legislation unconstitutional, or minimized its legal enforceability (see Brissenden, 1933). With the

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<sup>33</sup> Brotherhood v. Texas and N.O. Rr. Co., 33 F (2) 13.

<sup>34</sup> Indeed, the railroad company had argued that the respective passages of the Railroad Act either conferred only an abstract, non-enforceable right or were altogether unconstitutional, citing arguments similar to those that the Supreme Court had used in *Tri-City v. Deering* in 1921 against the limitation of injunctions in the Clayton Act.

*Texas and New Orleans v. Brotherhood* case, trade union power and collective bargaining in the railroad industry were now firmly established. In addition, a precedent was set for further court rulings on industrial labor relations, and the road for more union-friendly legislation was free. As a contemporary observer, Edward Berman, wrote in the *American Economic Review* in 1930:

“The Supreme Court’s decision in the Texas and N.O. Railroad case is without doubt one of the most important rendered in a labor case in many years. Considered as a whole, it may be regarded as a great victory for organized labor. . . . It puts the Supreme Court on record in favor of legislation designed to promote collective bargaining. It promises that the court will, in the future, be more friendly to state and federal legislation designed to protect workers from the coercive activities of anti-union employers. ”

The impact of the June 1929 Circuit Court ruling was important due to its impact on the movement for anti-injunction legislation. In particular, this is true of the so-called Shipstead anti-injunction bill, a proposal for legislation that had been introduced first in 1929, was reintroduced in 1931 as the Shipstead-Norris bill, eventually passed and enacted as the Norris-LaGuardia Act of 1932. This bill reinstated limitations against the use of injunctions in labor disputes as originally intended in the Clayton Act. The Shipstead bill’s first incarnation, introduced to Congress in January 1929, was quickly tabled by the Senate Judiciary Committee because it was considered certain to be ruled unconstitutional.<sup>35</sup> In August 1929, however, shortly after the Circuit Court of Appeals had upheld the District Court’s original decision in the *Texas & N.O.* case, a subcommittee of the Senate Judiciary Committee, composed of Senators Walsh, Norris and Blaine, presented a new piece of anti-injunction legislation for approval by the Executive Council of the American Federation of Labor (AFL).<sup>36</sup> This new anti-injunction legislation was approved by the delegates to the AFL’s annual convention on October 18, 1929, clearing the way for its introduction to Congress. This new push

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<sup>35</sup> Cf. the account in the August 14, 1929 edition of the New York Times, headlined “Labor Men Revise Injunction Bill.”

<sup>36</sup> August 24, 1929 edition of the New York Times, headlined “Labor Men Revise Injunction Bill: Federation Council Believes It Now Has A Measure That Congress will Accept”.

for anti-injunction legislation was widely reported in the press during the week of October 14-19<sup>th</sup>, the week before Black Thursday, and on October 27<sup>th</sup>, the day before Black Monday.<sup>37</sup> A version of this bill ultimately passed as the Norris-LaGuardia Act. Hence, by October 1929, it should have been clear to investors and firms that labor unions were likely to re-obtain the rights to strike and picket in the near future.

Summing up, there is evidence from prominent court rulings in the late 1920s of a major sea change in the attitude toward union formation and collective bargaining which foreshadowed the New Deal and rendered it legally feasible altogether. Indeed, recent research has gone so far as to argue for major continuity between Republican policy toward trade unions on the eve of the Great Depression and the New Deal, see O'Brien (1998). Given these legislative efforts and court rulings, rational investors at the end of the 1920s had good reason to believe that a regime shift back to greater union activity was underway, and that a persistent downward shift in profits, output, and employment would follow. We see this regime change as a decisive event forming expectations about future profits on the eve of the Great Depression. By implication and in line with recent historiography, pro-union legislation and the institutionalization of collective wage bargaining under the New Deal emerge as the new labor market regime whose parameters were defined beginning already in 1929, not just in 1933.

### **3.2 Anti-Trust**

While regulation of the labor market was subject to violent swings in legal opinion, competition policy for product markets was not. Indeed, the regulatory environment of the 1920s was one of laxity in antitrust enforcement, and highly conducive to abnormally high corporate profits. The antitrust and merger policies of the Coolidge administration consisted in pre-approving mergers, although the Sherman and Clayton acts did not provide for such a measure. Profit shares, measured by the share of capital in sectoral and national income, appear to have increased substantially throughout the decade, to the effect that profits outpaced the growth of wages (on the latter, see

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<sup>37</sup> Articles appeared in the October 14<sup>th</sup>, October 15<sup>th</sup>, October 18<sup>th</sup>, October 19<sup>th</sup> and October 27<sup>th</sup> editions of the New York Times. On October 27<sup>th</sup>, the New York Times headlined a prominent article in its Sunday supplement (the precursor to today's Week in Review section): "LABOR'S MAGNA CHARTA DRAFTED FOR CONGRESS: Anti-Injunction Bill of the A.F. of L. Is Designed to Assure Workers the Right to Strike and Picket, and the Same Liberty as Farmers to Combine."

Lebergott (1964)). Keller (1973) reports that labor's share of income in electric utilities declined by about 8 percentage points between 1923 and 1929, while labor's share in manufacturing and railroads declined by about 6 percentage points over the same period. This is consistent with an increase in monopoly profits over this period.<sup>38</sup>

Although parts of this phenomenon can be explained by rapid growth of capital-intensive sectors, much of it is evidently due to increased monopoly profits. This is partly due to the fact that two of the three rapid-growing sectors in question, public utilities and railways, were heavily regulated during the 1920s, and that regulators allowed maximum profits in these industries to increase over time. Keller (1973) collects the evidence, reviews the earlier literature and notes, *inter alia*, a 33% hike in railroad freight rates imposed by the Interstate Commerce Commission in 1922, which was not reversed when input cost for railroads fell sharply later in the decade. Similar evidence is documented for utilities. In the metal-making and metal processing industry (including electrical), which Keller (1973) identifies as the third fast-growing sector of the U.S. economy of the 1920s, concentration ratios were high at the beginning of the decade and rose further: in steel making. The eight largest steel producers increased their market share from 58 percent in 1920 to 78 percent in 1930. Likewise, the three largest auto producers had a market share of 68 percent in 1920, and of 72 percent in 1930. Evidently, monopoly power in U.S. product markets was high and kept increasing markedly throughout the 1920s.

Just what the markups over cost were seems difficult to ascertain. Hanes (1996) tackles this issue indirectly by looking into the cyclical behavior of wages in manufacturing. Under monopolistic competition, markups would react procyclically, causing wages to be countercyclical. For carefully constructed, intertemporally comparable wage and price series, Hanes' (1996) finding is that wages were more countercyclical in the interwar period than during the postwar. By implication, markups over cost must have been higher and the degree of competition lower between the wars than in the postwar period. Then, postwar markups over cost would constitute a lower bound for those of the interwar period.

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<sup>38</sup> Recall that under the individual bargaining regime effective from late 1921 to 1929, firms would not have shared any increases in monopoly rents with workers.

While estimating markups from industry data is difficult and results differ widely, the available evidence suggests that markups in US. manufacturing were considerable in the postwar period. Hall (1988) arrives at estimated markups in excess of 80%, while a more conservative estimate by Roeger (1995) puts markups at a still high 45-48%. Combining these findings with the results of Hanes (1996) on the cyclical behavior of wages, markups in the interwar period must have been in the range of 50% over cost or higher.

Thus, we identify a regime of high and increasing monopoly power in the American economy during the 1920s. This leads to the obvious question of why anti-trust enforcement was so low and what the possible connections with the trade union questions were.

### **3.3 Welfare Capitalism**

In the largely union-free environment of the late 1920s, leading firms renewed attempts to establish a system of industrial relations based on voluntary benefits and above-market wages. These schemes, commonly labeled as “welfare capitalism” and seen as a paternalistic substitute for public labor market intervention, did not start in the 1920s, nor did they end with the depression.<sup>39</sup> However, they gained influence during the late 1920s, and were arguably concentrated in industries with substantial monopoly power.

One rationale for welfare capitalism is that above-average wages were highly effective in keeping unions out of the factory. These programs quickly lost significance during the New Deal<sup>40</sup>. This suggests that firms indeed often maintained company benefits to keep trade unions out, and lost interest as soon as trade union representation became more widespread.

Indeed, a political link existed between trade union and antitrust policy before the NIRA. Against the stiff resistance of the Justice Department that sought stricter antitrust enforcement, Hoover as commerce secretary had gradually extended collective bargaining and trade union representation, most notably in the 1926 Railway Act of 1926 discussed above. After his election into the White House in 1928, and again around the stock market crash of October 1929, Hoover employed carrot-and-stick

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<sup>39</sup> See Cohen (1990), Jacoby (1997).

<sup>40</sup> See e.g. Gordon (1994), Jacoby (1997).

policies to induce industry to maintain high wages and adopt a union-friendly attitude in spite of the impending recession, using tighter antitrust enforcement as a threat. The apparent hope was that by maintaining the purchasing power of labor, the level of private consumption could be stabilized<sup>41</sup>. Indeed, major business leaders followed suit, and Ford pledged to increase its daily wage from six to seven dollars (Barber, 1985).

Bittlingmayer (1992) has argued Hoover's threat of tighter antitrust policy in October 1929 may have contributed to the stock market crash. We do not rule this out. However, as will become clear in the following section, the macroeconomic consequences of a change to stricter antitrust with individual bargaining would have been radically different from the ones we see in the data. Bittlingmayer (1992) himself concedes that there is little evidence of any subsequent action on tougher anti-trust policy during the Hoover administration, so that the high degrees of monopoly power persisted through the Great Depression, and further throughout the 1930s.

Tighter antitrust was used as a threat, but not meant as a commitment. Herbert Hoover's strategic pledge, supported by the turnaround in Supreme Court opinion, was to keep wages high, promote collective wage bargaining, and turn a blind eye to collusive practices and monopolization in industry. In this, he differed not one iota from the policy of his successor in office after 1932, Franklin Roosevelt<sup>42</sup>.

#### **4. Labor power and equilibrium regime shifts**

In this section we place the historical evidence presented in Section 3 in the context of the model of monopolistic competition and labor market frictions presented in Section 2, thus putting the pieces of the puzzle together. To this end, we present a numerical example using parameter values which are standard in the search friction literature. We choose the degree of monopoly power in the economy at the times of the shifts in steady states in 1921 and in 1929 to match the asset price movements in the data. We then ask whether the shifts in macro variables in the model induced by these demand elasticities match the macro movements in the data. . We find that shifts in the bar-

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<sup>41</sup> This policy experiment failed, and private consumption declined precipitously beginning in 1930, as evidenced by the data in Romer (1990).

<sup>42</sup> On the consensus among historians about this, see Himmelberg (1976), O'Brien (1998).

gaining regime from individual to collective bargaining lead to severe recessions of the same magnitude as those observed in 1920-21 and beginning in 1929.

#### 4.1 Parameter Values

The parameter values used are summarized in Table 3. The period length is one quarter. There are eight parameters to choose: the technology parameter  $A$ , the discount factor  $\beta$ , workers' bargaining power  $\phi$ , the matching elasticity  $\eta$ , the flow value of unemployment  $b$ , the exogenous job destruction rate  $\chi$ , the matching scale parameter  $s$  and vacancy costs  $\kappa$ .

Without loss of generality,  $A$  is set to unity, and there are no shocks to productivity.<sup>43</sup> The quarterly discount factor is chosen to generate a riskless interest rate of  $r = 4.0\%$  annually, leading to a choice of  $\beta = 0.99$ . The matching elasticity  $\eta$  is set to 0.50, as is standard in the literature on search frictions and wage bargaining, and in the range of estimates  $[0.4, 0.7]$  reported in Petrongolo and Pissarides (2001). Also standard is the imposition of the Hosios condition that matching elasticity and workers' bargaining power are equal,  $\eta = \phi$ .<sup>44</sup> The flow value of unemployment  $b$  is set to 0.30, equivalent to 30% of full employment output. This low replacement rate reflects the lack of unemployment insurance in the interwar period, so that the flow value of unemployment would have derived exclusively from home production (primarily in agriculture, which still had a labor share of around 20% at the time) and charitable assistance. By comparison, analyses of the late 20<sup>th</sup>-century US labor market typically assume that  $b$  takes values in the range of 0.40 to 0.60. The exogenous rate of job destruction is set at  $\chi = 0.118$ , so that 11.8% of jobs are destroyed each quarter, corresponding to the average total separation rate between 1922 and 1930 reported in the Monthly Labor Review of July 1929 and February 1931.<sup>45</sup> The matching scale parameter  $s$  is chosen to replicate a firm's matching rate of 0.25. As emphasized by

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<sup>43</sup> This implies that our results do not depend on real business cycle type shocks to total factor productivity.

<sup>44</sup> In the collective bargaining economy, the Hosios condition is necessary and sufficient for allocative efficiency. In the individual bargaining economy, the Hosios condition is necessary but not sufficient for efficiency. For a detailed welfare analysis, see Ebell and Haefke (2005).

<sup>45</sup> By comparison, the post-war job destruction rate estimated by Shimer (2005) is 10.0% quarterly.

Shimer (2005), the choices of  $s$  and  $q$  are merely a normalization, and hence innocuous. Finally, vacancy costs  $\kappa$  are chosen so that unemployment is 5.0 % under individual bargaining in the perfect competition limit. This corresponds to a natural rate of unemployment in a laissez-faire economy. The resulting vacancy costs of  $\kappa = 0.19$ , in conjunction with the firm's matching rate  $q(\theta) = 0.25$ , yield a cost of about 0.76 units of output per hire. This corresponds to about 20% of a worker's annual wage, in line with the estimates reported in Hamermesh and Pfann (1996).

This parameterization allows us to characterize equilibrium at each degree of competition in the goods markets. Figure 1 shows the behavior of output, unemployment, asset values and wages as a function of monopoly power (measured as the demand elasticity  $\sigma$  facing firms). Clearly, when demand elasticity is lower than 14.0, or equivalently when individual bargaining markups exceed 3.8 %, a switch from individual to collective bargaining induces a recession involving a decrease in output, an increase in unemployment, an increase in wages and a drop in asset values. The magnitude of the respective macro and asset price movements are increasing in the degree of monopoly power. In the next subsection, we describe how we pin down the demand elasticities at crucial junctures using data on asset price movements. This allows us to examine the impact of changes in the bargaining regime without having to restrict the behavior of macro variables a priori.

## 4.2. Interwar asset prices

First, we describe the behavior of asset prices in the interwar period. We will then go on to use asset price data to pin down the degree of monopoly power in our model, as quantified by the elasticity of demand facing firms. Since we are interested in low-frequency changes in steady-states, we base our choice of  $\sigma$  on HP-trend values for asset prices, rather than the raw values.

The period between the Clayton Act's enactment in October of 1914 and the Stock Market Crash of 1929-32 was one of unparalleled volatility in asset prices. Figure 2a presents the Standard and Poor's 500 and Figure 2b presents the Dow Jones Industrial Average<sup>46</sup>, both deflated using the Consumer Price Index and rebased to 7/1914 =

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<sup>46</sup> The differing behavior of the Standard and Poor's stock price index due to its broader base, covering 50 industrials, 20 railroad stocks and 20 public utilities. In contrast, at the beginning of the period considered, the Dow Jones Industrials contained only twelve firms, ex-

100. The smooth red lines in Figures 2a and 2b show the Hodrick-Prescott trend with a smoothing factor of 129,600, as suggested for monthly data by Ravn and Uhlig (2004). Defining a stock market crash as a decline of at least 20% within a 12 month window, Mishkin and White (2002) identify crashes in 1914, 1915, 1917, 1920 and 1921. Although there was an intermittent wartime upswing, the trend between late 1914 and 1921 is clearly downward.<sup>47</sup> Between December<sup>48</sup> of 1914 and August of 1921, the S&P 500 lost half of its value, while the Dow lost nearly 30% of its value over the same period.

Turning to the model, Figure 3 shows the ratio between firm values under collective and individual bargaining  $\frac{V_C}{V_I}$ , when each regime is assumed to be permanent by investors. A demand elasticity of 4.0 (corresponding to an individual bargaining markup of 20 %<sup>49</sup>) would lead to a drop in firm values of 28%, while a demand elasticity of 2.6 (corresponding to an individual bargaining markup of 31.%<sup>50</sup>) would lead to a drop in firm values of 47%. We choose the more conservative value, and set demand elasticity in 1914-1921 (the pre-Coolidge years) at 4.0.

Turning to the upsurge in asset prices beginning in the 4<sup>th</sup> quarter of 1921, we note that the recovery of stock market valuations in the wake of the *Tri-City v. Deerling* and *Truax v. Corrigan* decisions was very steep. Within 8 months, by April 1922, the Dow had regained its July 1914 value. Similarly, the S&P 500 had recorded a gain

panding to 20 in October 1916 and to 30 in October 1928, and included neither railroads nor public utilities.

<sup>47</sup> As previously noted, it is probable that World War I played a role in asset price movements as well. However, it is not at all clear why WWI should have led to a drop in asset prices. In contrast, asset prices increased over the course of WWII.

<sup>48</sup> The Clayton Act was enacted in October of 1914. Stock markets, however, were closed between July 31 and December 14, 1914. Due to the beginning of World War I in July 1914, it is very difficult to isolate the direct impact of the Clayton Act.

<sup>49</sup> From the equilibrium equations under individual bargaining, the individual bargaining markup is found as  $\frac{\sigma - \phi}{\sigma - 1} = 1 + \frac{1 - \phi}{\sigma - 1}$ .

<sup>50</sup> We believe that these are conservative estimate of markups in the interwar period. By comparison, Hall (1988) estimates markups for manufacturing industries using post-war U.S. data, and finds values in excess of 86 %. Using an alternative methodology, Roeger (1995) estimates U.S. postwar markups for durable goods to be 45%, while finding the corresponding value for nondurable goods to be 48%. This suggests the markups required to rationalize the asset price drop in the wake of the Clayton Act are quite reasonable and are indeed at the lower bound of the plausible historical values.

of nearly 50% from its August 1921 trough by August 1922. Both indices then remained relatively steady until the 3<sup>rd</sup> Quarter of 1924, when they began to rise once again, culminating in the peak of September 1929.

We attribute this unprecedented boom in asset markets to two factors: the change in the bargaining environment and an increase in monopoly power. We attribute the first phase of the increase in stock market values to the Supreme Court's 1921 rulings, which severely restricted union activity, inducing a shift from collective to individual bargaining. Second, increasing monopoly power due to lax anti-trust enforcement of the Coolidge administration may also have contributed to the second phase of the run-up in stock prices. Indeed, in his famed remarks on the eve of Black Thursday, Irving Fisher attributed the rise in the stock market to the lax anti-trust policies of the Coolidge and Hoover administrations.<sup>51</sup>

Hence, we pin down the demand elasticity at the peak of the stock market run up in 1929 as that value which is necessary to justify the peak stock market valuation under individual bargaining.. These values are given in Table 4 below. In order to generate asset price increases reaching the Dow's 1929:3 peak, a decrease in demand elasticity to 2.4 by the fall of 1929 is necessary in the model. Demand elasticity of 2.4 corresponds to a markup of 35.7%. In order for a switch in bargaining regime and an increase in monopoly power to jointly account for the S&P's 1929:3 peak, demand elasticity must have fallen to 2.2 by the fall of 1929, corresponding to a markup of 41.7%. Once again, both of these markup values are well within the range of markups estimated for post-war US data by Hall (1988) and Roeger (1995).

### 4.3 Interwar Macroeconomic Fluctuations

Figures 5 and 6 present data on key macroeconomic variables over the period between 1913 (the last full year before passage and enactment of the Clayton Act) and 1934 (the beginning of the New Deal). We identify three clear regimes. First, between 1914 and 1921, GNP is substantially below trend<sup>52</sup>. Although the picture is blurred by the impact of World War I, we find it reasonable to view this period as one in which out-

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<sup>51</sup> In its October 24, 1929 edition, the New York Times writes: *He (Fisher) gave as one reason why security values were so high, "that we are living in the age of mergers under the Coolidge and Hoover administrations, and the old 'trust-busting' sentiment has lapsed almost completely,..."*

<sup>52</sup> We use Kendrick's measures of real private non-farm GNP and private investment.

put was about 10% below trend.<sup>53</sup> Figure 6 shows that unemployment also rises during this period, with the exception of the years 1916-19, during which the impact of World War I on the labor force would have been strongest.

We identify a second regime, from 1922 to 1929, during which output is at trend and unemployment is low, hovering around 5%. This regime corresponds to the *laissez-faire* era under the Coolidge administration, during which wage bargaining is primarily individual.

The third regime begins in 1930, with the onset of the Great Depression and the accompanying spike in unemployment rates. After dropping to less than 60% of trend in 1933, output remains at about 80% of trend until the beginning of the Second World War.

Similarly to Ohanian (2006), we argue that firms offered workers wage-employment pairs that were similar to collective bargaining outcomes, in order to preempt unions from reorganizing.

The next challenge for our model framework is to compare model predictions with the three regimes identified in the data. In the experiments, we use the demand elasticities which are pinned down by asset price movements, as detailed in the previous subsection.

Our first quantitative question is: Can the switch from individual to collective bargaining due to the pro-union Clayton Act account for the decline in output and increase in unemployment observed? When demand elasticity has been pinned down by the decline in the Dow at 4.0, a switch from individual to collective bargaining implies a decrease in output of 17 % and an increase in unemployment from 5.5% to 21.4 % in the model, as illustrated in the top panels of Figure 7. Hence, when demand elasticity (monopoly power) is chosen so that the model is able to fully explain the stock index movements, the model matches the decline in output quite well, while overstating the increase in unemployment. In particular, real private non-farm per capita GNP was at most 16.0% below a 2% trend extrapolated from 1913, and unemployment increased either by 3.8 (Romer) or by 7.4 percentage points (Lebergott).<sup>54</sup>

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<sup>53</sup> The exception is GNP in 1916, at the height of the war effort, which is close to trend.

<sup>54</sup> Although both Lebergott and Romer take great care in constructing their unemployment estimates, it should be noted that comprehensive data on unemployment of post-war quality is simply not available for this period.

Now let us turn attention to our interpretation of the 1922 to 1929 expansion as being due to a combination of a shift in the bargaining regime from collective back to individual bargaining and an increase in monopoly power. Between the trough of 1921 and 1926, real per capita GNP climbed by about 16%, beginning at 86% of trend in 1921 and rejoining the trend extrapolated from 1913 in 1926. This is quite similar to the output increase of about 19 % predicted by the model when both the bargaining regime switches from collective to individual. Unemployment also drops sharply in the data, decreasing from nearly 12 % to just over 2% between 1921 and 1923 (according to Lebergott) or from 8.7% to 4.8% (according to Romer). Our model predicts that unemployment returns to a level of 6.2 %.

From 1926 to 1928, real per capita GNP stagnated, dipping about 4% below trend again, while asset prices continued their upward climb. This is consistent with an increase in monopoly power under individual bargaining, as illustrated in the top panels of Figure 7. Under individual bargaining, an increase in monopoly power should both drive asset values up and cause real output to stagnate.. An increase in monopoly power during the 1920s will also set the stage for the Great Depression, as it will increase the impact on profits and output of an expected or realized switch from individual to collective bargaining.

To summarize, we find the model predictions to be quite consistent with the accepted stylized facts on the American economy during the 1920s<sup>55</sup>.

#### 4.4 Real Origins of the Great Depression?

In Sections 4.2 and 4.3, we established that the run-up in asset prices, accompanied by stagnant output, during the late 1920s is consistent with an increase in monopoly power under individual bargaining. In order to account for the all of the increases in HP-trend stock-prices, demand elasticity would have to have decreased from about 4.0 to 2.4, corresponding to an increase in markups from 20 % to 36 %.<sup>56</sup> An expected switch to collective bargaining at such a high degree of monopoly power would have catastrophic consequences for output and unemployment, as illustrated by

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<sup>55</sup> For a typical account from the vast older literature, see Schlesinger (1964).

<sup>56</sup> In order to account for the full stock market boom up to October 1929 in the raw data, demand elasticity would have to fall below 1.5, equivalent to an increase in mark-ups in excess of 100 %. Hence, by calibrating to the HP-trend rather than the raw values, we choose conservative estimates for the increase in monopoly power.

the top panels of Figure 7. A switch to collective bargaining when demand elasticity is 2.4 would cause output to drop by 38 %, and unemployment to increase by 36 percentage points to 42.2%. Hence, the model matches the severity of the output decline very well, while overstating the increase in unemployment in the Great Depression somewhat.

Although the expansion of collective bargaining on a large scale commences in the 1930s, after the enactment of the NRA and Wagner Acts, there is good reason to believe that in the late 1920s, the writing for this imminent regime switch was already on the wall , as laid out in Section 3 above. At the same time, there is ample evidence (cf Hanes (1996)) that real wages were increasing during the early years of the great depression. As Ohanian (2006) emphasizes, such wage increases were part of a drive by the Hoover administration to introduce welfare capitalism schemes.

The previous section has discussed recent findings relating these schemes to the desire to maintain a union-free shop. In our model economy, this behavior is rationalized by the attempt of firms to preempt union formation by offering higher wages and restricting hiring, mimicking the outcome of collective bargaining, as described in detail in Section 3. This mimicking behavior would also be consistent with the evidence of such schemes losing significance as mandatory collective bargaining was introduced. Recent research discussed in the previous section has deemphasized the effects of the NRA and the Wagner Act on the relative position of labor by pointing to the substitution of private with public welfare programs. This is exactly in line with our model's predictions.

The picture we obtain is one of an anticipated end to the artificial boom of the 1920s, once word spread that the weakening of America's trade unions, and hence its exceptionalism in labor relations, would only be temporary. In general equilibrium with monopolistic competition, this anticipation may be captured as a regime switch from an equilibrium with individual wage bargaining to another one with collective wage bargaining, as described above. The imminent increase in union power at the end of the 1920s would then have led to adjustments in expectations. In particular, expectations of reduced profits under collective bargaining would have caused a drop in stock market valuations of firms, while expectations of lower future output levels and higher wages would lead firms to cut back drastically on investment and to lay off workers. All of these are phenomena that are associated with the onset of the Great Depression.

#### **4.5. A counterfactual**

The results from this section also provide a policy counterfactual for a more favorable trajectory. Bittlingmayer (1992) mentions the possible announcement effects on the 1929 stock market of an intended tightening in antitrust policy, which in the end did not materialize. While we agree that more effective antitrust enforcement could indeed have contributed to falling stock market prices, the effects on the business cycle would have been highly beneficial. To see this, consider a counterfactual in Figure 7 under which the degree of competition in the U.S. economy had increased. Beginning on the individual bargaining locus of the early 1920s, the economy would have evolved along the individual bargaining scheme towards the right, eating away at monopoly profits and reducing the incentive for labor to organize. The output and employment gains would have been modest, while the drop in profits would have been considerable. Hence, had Hoover truly implemented his threats to strengthen anti-trust enforcement, then the stock market might still have crashed, but with scant consequences for output and unemployment.

Even if the increase in competition had been unsuccessful at preventing increased pressure by organized labor for the right to bargain collectively, the counterfactual scenario would have been relatively favorable. Moving Northeast from the far left of the individual bargaining locus to a point corresponding to greater competition on the collective bargaining locus would have led to a more moderate decrease in output and a more modest increase in unemployment, despite a somewhat sharper fall in stock market valuations. Our equilibrium model has the clear implication that strict antitrust policy would have been the preferred way for the U.S. economy to get out of the recession, both for 1921 and post-1929.

Our results are reminiscent of a policy dilemma for the New Dealers described and analyzed in Cole and Ohanian (2004) for the 1930s. Policy makers in the 1930s employed the threat of stricter antitrust enforcement as a lever to push through with a high-wage collective bargaining setting. Cole and Ohanian show how this policy contributed to the persistence of unemployment and slowed down the speed of recovery. Very much the same bad policy choices had already been made in the late 1920s, where again, leniency in antitrust enforcement combined with high-wage doctrines, attempting to cure the evil of monopoly power in goods markets with the evil of monopoly power in labor markets.

## 5. Conclusions

This paper has studied the interplay of monopoly power in goods markets and bargaining regimes in labor markets in the 1920s and their possible effects on the American business cycle between 1920 and 1930. In the Ebell and Haefke (2006) framework of monopolistic competition between producers and search frictions in the labor market, we identified individual and collective wage bargaining as two relevant wage bargaining regimes. We interpreted the violent swings in business activity at the beginning and the end of the decade as regime switches between different bargaining modes. We saw the intermediate period as characterized by stable, if repressive, labor market institutions and rising corporate profits, and related these to increases in monopoly power due to lax anti-trust policies during the Coolidge administration.

In this paper, we also briefly reviewed evidence on U.S. labor and antitrust history of the 1920s, and argued from prominent court cases that there is evidence for rapidly mounting pressure to reunite at the end of the decade. With these court rulings, a decade-long blockade against pro-union legislation was lifted, signaling an end to the American exceptionalism in labor relations that had characterized the early 20<sup>th</sup> century. Indeed, it is difficult to see how any of the laws from the 1930s that regulated labor relations could have passed muster as constitutional without these landmark court decisions of 1927-30.

Our view of the two severe depressions surrounding the 1920s is also consistent with the stylized facts on the American economy during that period. We argue that recovery from the 1920 recession was facilitated by Supreme Court rulings that curbed collective wage bargaining quite effectively, while monopoly power in product markets grew steadily throughout the decade. As a consequence of rising monopoly power, profits would tend to increase further after a ceiling in output and employment had been reached, which seems to describe the evidence from the 1920s very well. We also see reversal of Supreme Court jurisdiction towards unions in the late 1920s and the expected end of the repression of trade unions as a major contributing factor in the collapse of profit and output expectations at the end of the decade.

Our model predicts a decline in output by nearly 40%, while unemployment would increase from a 5 percent natural rate to over 40 percent. These predictions are well in line with the well-known stylized facts on the slump in output, employment,

and stock prices during the Great Depression. This also implies that we see the bulk of the stock market rise and decline of the late 1920s, not as a bubble but rather as a rational response to expected changes in the wage bargaining and anti-trust environments that indeed materialized.

Our analysis also highlights the policy choices of decision makers at the time. Policy makers perceived a trade-off between laxity in antitrust policy and leniency toward trade unions. Cole and Ohanian (2004) have prominently made the case for the 1930s, arguing forcefully that the purportedly pro-business, pro-union attitudes during the New Deal led to protracted unemployment and delayed recovery. Evidence suggests that the same policy trade-offs were perceived already during the 1920s, and the same bad policy choices were made. As a consequence, the same principal mechanisms that underlie the incomplete recovery of the 1930s apply already to the early phase of the Great Depression.

This also gives rise to a counterfactual about a different set of possible policy choices. We find that stricter antitrust enforcement could at all times have helped alleviate the inefficiencies generated by monopoly power and wage bargaining, both under individual bargaining and in the presence of unions. In both cases, employment and output would have increased, and the wedge between collective and individual bargaining been reduced to the point where hardly any monopoly profits were left over that unions could have preyed on. Throughout the interwar period, policy took a different course, sending the U.S. economy on a roller coaster of the most violent business fluctuations experienced in the 20<sup>th</sup> century.

Table 1  
Indicators of U.S. Trade Union Activity, 1916 to 1920

		1916	1917	1918	1919	1920
Trade union density (percent of labor force)	(1)	9.9	10.9	12.6	14.3	16.7
Number of workers involved in strikes (1000)	(2)	1599	1227	1240	4160	1463
Average duration (days)	(3)	23	19	17	34	39
Total days lost	(4)	29201	14396	16735	98452	33848
Sources and Methods:	(1)	Wolman (1936), Bain and Price (1980)				
	(2)	Peterson (1938)				
	(3)	<i>BLS Monthly Labor Review</i> , July 1929				
	(4)	Own calculations from the sources in (3), using 1928 proportions.				

Table 2  
Indicators of U.S. Trade Union Activity, 1921 to 1928

		1921	1924	1926	1928
Trade union density (percent of labor force)	(1)	15.5	10.7	10.2	9.6
Number of workers involved in strikes (1000)	(2)	1099	655	330	314
Average duration (days)	(3)	51	30	25	27
Total days lost	(4)	39521	20930	7767	12600
Sources and Methods:	(1)	Wolman (1936), Bain and Price (1980)			
	(2)	Peterson (1938)			
	(3)	<i>BLS Monthly Labor Review</i> , July 1929			
	(4)	Own calculations from the sources in (3), using 1928 proportions.			

Table 3

## Interwar parameterization

Parameter	Description	Value	Comment
$A$	Technology level	1.0	Normalization
$\beta$	Discount factor	0.99	4.0 % annual interest rate
$\varphi$	Bargaining power	0.50	Standard
$\eta$	Matching elasticity	0.50	Data
$b$	Flow value of unemploymt	0.30	post-war $b$ between 0.40 and 0.60.
$\chi$	Separation rate	0.118	Data
$s$	Scaling factor	0.46	Normalization
$\kappa$	Vacancy posting cost	0.19	natural rate of unemployment 5.0 %

Table 4

## Calibrating demand elasticity to asset price movements.

	S&P	S&P $\Delta$	Implied $\sigma$	Dow	Dow $\Delta$	Implied $\sigma$
Peak 1914:Q3	100			100		
Trough 1921:Q3	53.0	- 47.0 %	2.6	72.3	-27.7 %	4.0
Peak 1929:3	123.0	+ 130.1 %	2.2	185.1	+156.0 %	2.4

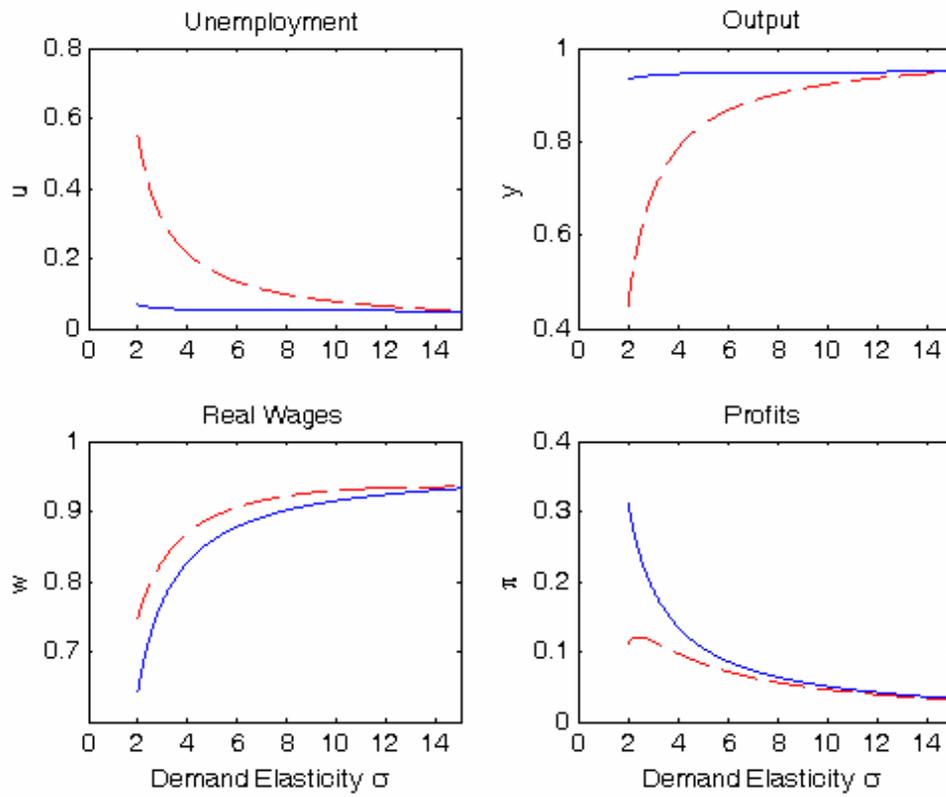
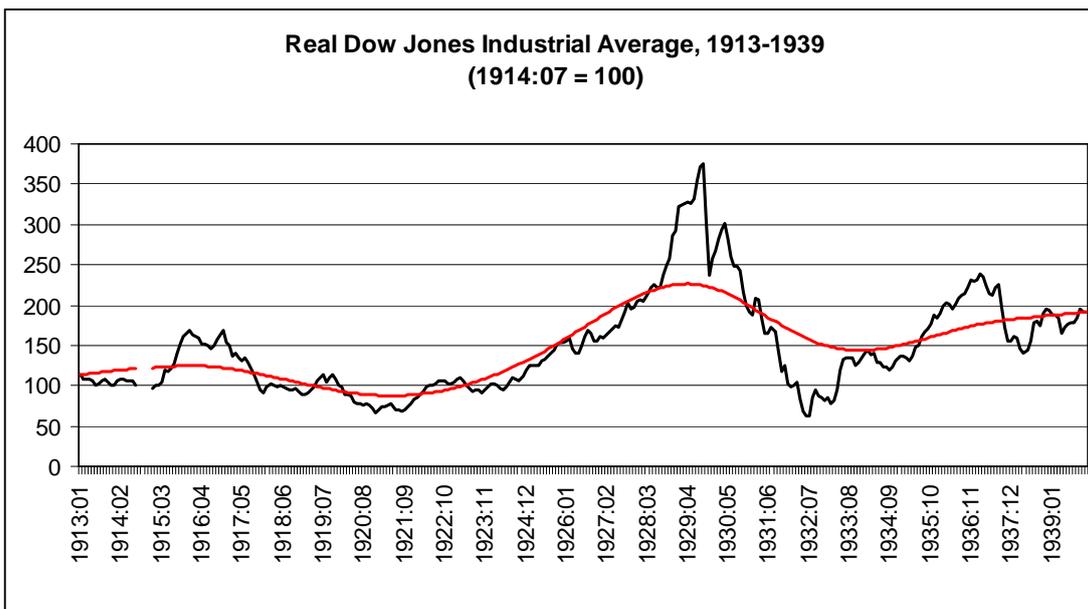
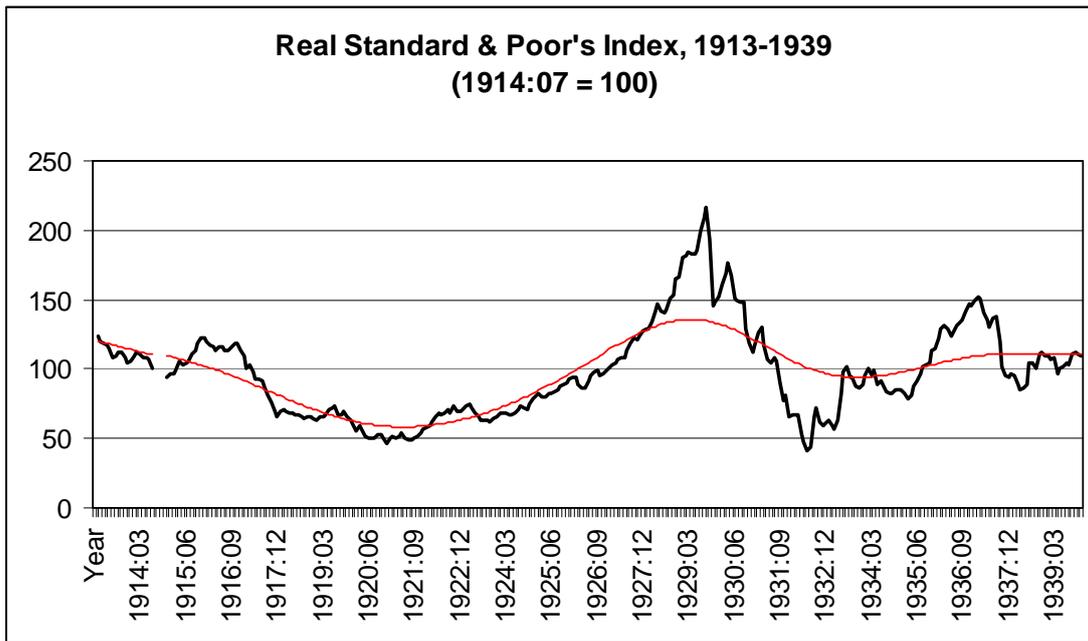


Figure 1: Unemployment, output, wages, and asset values as a function of demand elasticity



Figures 2a and b:  
Real Dow Jones and Standard & Poor's stock market indices, 1913-1939.

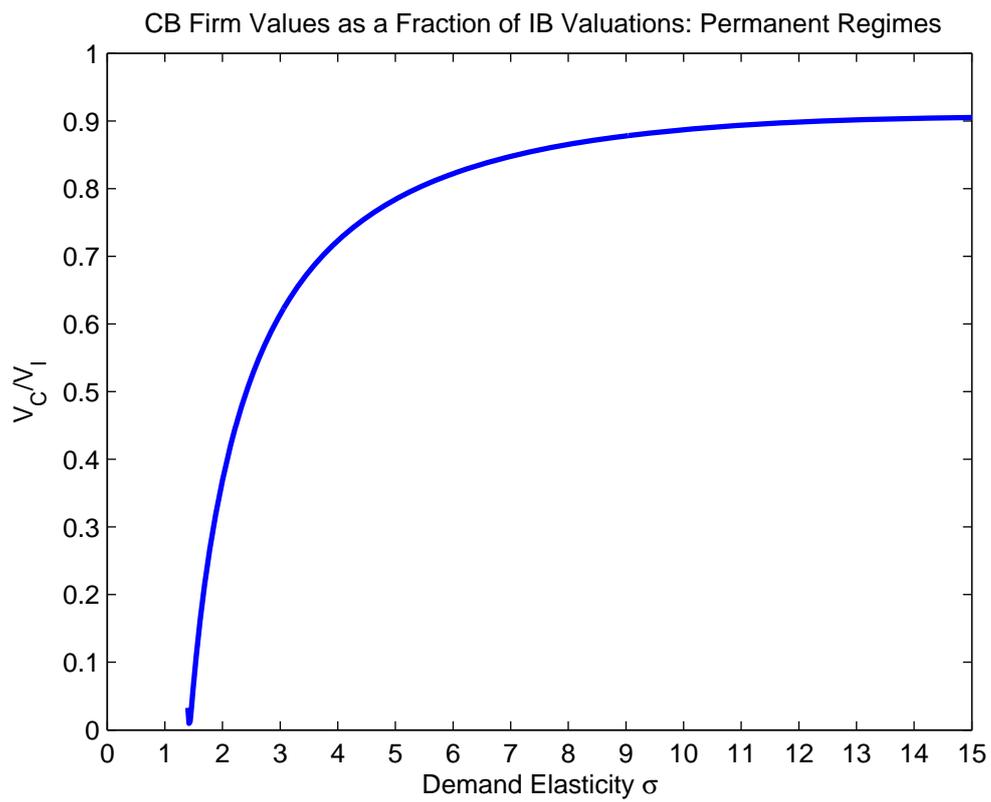


Figure 3: Equilibrium value of collective bargaining firms as a fraction of their value under individual bargaining when agents expect that regimes will be permanent.

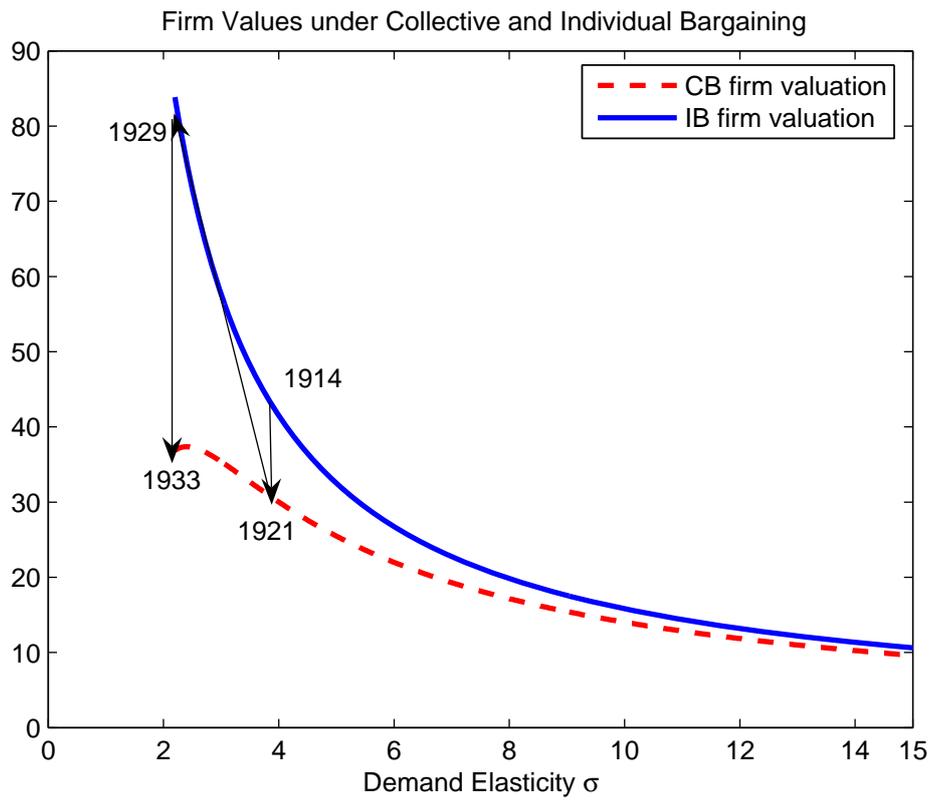
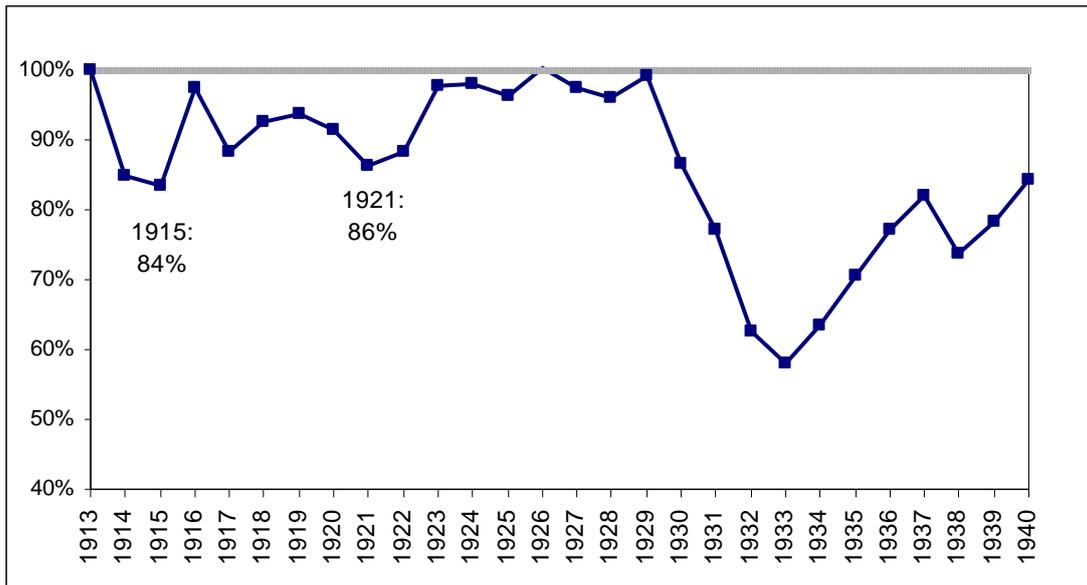
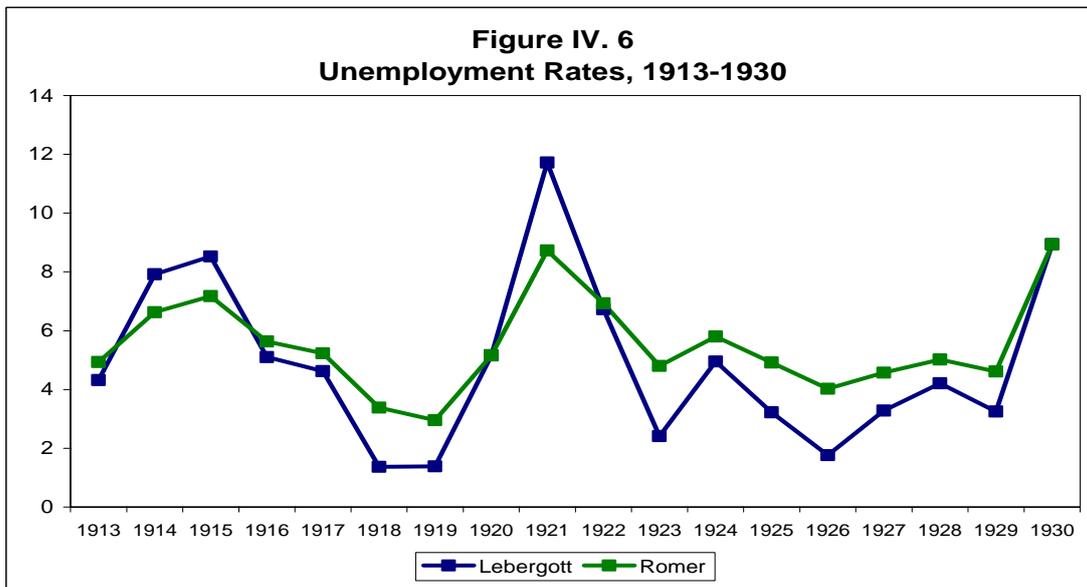


Figure 4: Impact on asset prices of regime switches between individual and collective wage bargaining in a model of monopolistic competition with search frictions in labor markets



Source: Kendrick (1961), own calculations

Figure 5: Real Private Non-Farm GNP as % of Trend, 1913-1940



Source: Lebergott (1964), Romer (1986)

Figure 6: Unemployment Rates, 1913-1930

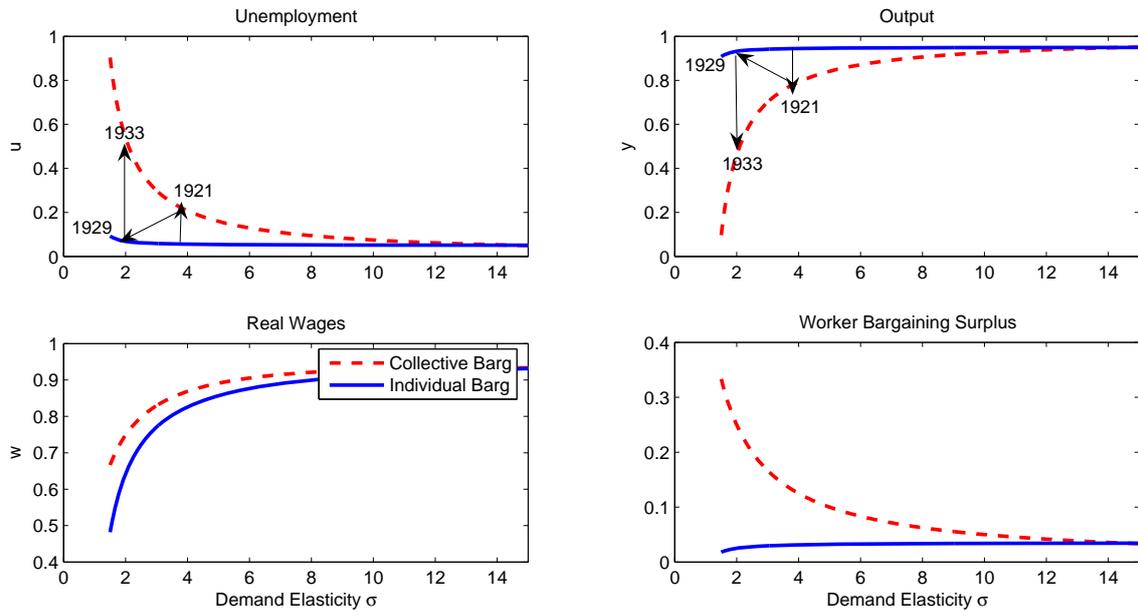


Figure 7: Regime switches between individual and collective wage bargaining in a model of monopolistic competition with search frictions in labor markets

## Appendix A1: Fully Dynamic Individual Bargaining

Value functions for unemployed and employed workers are defined as follows:

$$V_{E,I} = w_I + \frac{1}{1+r} \left[ (1-\chi)V'_{E,I} + \chi V'_{U} \right] \quad (\text{A1.1})$$

$$V_U = b + \frac{1}{1+r} \left[ (1-f(\theta_I))V'_{U} + f(\theta_I)V'_{E,I} \right] \quad (\text{A1.2})$$

so that workers' surplus is given by:

$$V_{W,I} = w_I - b + \frac{1}{1+r} \left[ 1 - \chi - f(\theta_I) \right] V'_{W,I} \quad (\text{A1.3})$$

Firms' surplus is given by the envelope condition to the firm's problem:

$$\frac{\partial V_I}{\partial h_I} = \frac{\sigma-1}{\sigma} A \frac{P(y_I)}{P} - w_I(h_I) - h_I \frac{\partial w_I}{\partial h_I} + (1-\chi) \frac{\kappa}{q(\theta)} \quad (\text{A1.4})$$

The Nash bargaining problem is:

$$\max_{w_I} \phi \ln(V_{W,I}) + (1-\phi) \ln\left(\frac{\partial V_I}{\partial h_I}\right)$$

where the surpluses are given by (A1.3) and (A1.4). Taking the first order condition leads to a first-order linear differential equation:

$$w_I = (1-\phi)b + \phi \left[ \frac{\sigma-1}{\sigma} A \frac{P(y_I)}{P} - h_I \frac{\partial w_I}{\partial h_I} + (1-\chi) \frac{\kappa}{q(\theta_I)} \right] - (1-\phi) \frac{1}{1+r} \left[ 1 - \chi - f(\theta_I) \right] V'_{W,I}$$

with solution

$$w_I = (1-\phi)b + \phi \left[ \frac{\sigma-1}{\sigma-\phi} A \frac{P(y_I)}{P} + (1-\chi) \frac{\kappa}{q(\theta_I)} \right] - (1-\phi) \frac{1}{1+r} \left[ 1 - \chi - f(\theta_I) \right] V'_{W,I} \quad (\text{A1.5})$$

Note that in order to solve the differential equation, we assumed that future surplus  $V'_{W,I}$  is independent of the current wage and employment pair  $(w_I, h_I)$ . To confirm

this, solve (A1.5) for  $\frac{1}{1+r} \left[ 1 - \chi - f(\theta_I) \right] V'_{W,I}$  and substitute back into (A1.3) to obtain:

$$V_{W,I} = \frac{\phi}{1-\phi} \left[ \frac{\sigma-1}{\sigma-\phi} A \frac{P(y_I)}{P} - w_I + (1-\chi) \frac{\kappa}{q(\theta_I)} \right] \quad (\text{A1.6})$$

Taking (A1.6) ahead one period and multiplying by  $\frac{1}{1+r}$  yields

$$\frac{1}{1+r} V'_{w,t} = \frac{\phi}{1-\phi} \frac{1}{1+r} \left[ \frac{\sigma-1}{\sigma-\phi} A \frac{p(y_t')}{P} - w_t' + (1-\chi) \frac{\kappa}{q(\theta_t')} \right] \quad (\text{A1.7})$$

Now compare (A1.7) to the Euler equation for the firm's problem (6), where we have differentiated (A1.5) to substitute out for  $h_t \frac{\partial w_t}{\partial h_t}$ :

$$\frac{\kappa}{q(\theta)} = \frac{1}{1+r} \left[ \frac{\sigma-1}{\sigma-\phi} A \frac{p(y_t')}{P} - w_t' + (1-\chi) \frac{\kappa}{q(\theta')} \right] \quad (\text{A1.8})$$

Clearly, together (A1.7) and (A1.8) imply that

$$\frac{1}{1+r} V'_{w} = \frac{\phi}{1-\phi} \frac{\kappa}{q(\theta_t)} \quad (\text{A1.9})$$

This confirms that future surplus is indeed independent of the current wage-employment pair. Next, substitute (A1.9) back into the solution of the differential equation (A1.5) to obtain the wage curve:

$$w_t = (1-\phi)b + \phi \left[ \frac{\sigma-1}{\sigma-\phi} A \frac{p(y_t)}{P} + \kappa \theta_t \right] \quad (\text{A1.10})$$

Now impose the steady-state to check for equivalence of the bargained wage to that derived in the body of the paper. Do this by taking the steady-state version of the firm's Euler equation (A1.8)

$$w_t = \frac{\sigma-1}{\sigma-\phi} A \frac{p(y_t)}{P} - (r+\chi) \frac{\kappa}{q(\theta_t)} \quad (\text{A1.11})$$

Combining the wage curve (A1.10) with steady-state labor demand (A1.11) leads to the bargained wage

$$w_t = b + \frac{\phi}{1-\phi} \kappa \theta_t + \frac{\phi}{1-\phi} (r+\chi) \frac{\kappa}{q(\theta_t)} \quad (\text{A1.12})$$

Clearly, (A1.12) coincides with the wage from the steady-state derivation of the wage (13) in the body of the paper if:

$$\frac{rV_U}{1+r} = b + \frac{\phi}{1-\phi} \kappa \theta_t \quad (\text{A1.13})$$

It is straightforward to confirm that (A1.13) does indeed hold.

## Appendix A2: Solving the Differential Equation

The differential equation to be solved is:

$$w_I(h_I) = (1-\phi) \frac{r}{1+r} V_U + \phi \left[ \frac{\sigma-1}{\sigma} A \frac{p(y_I)}{P} - h_I \frac{\partial w_I}{\partial h_I} \right]$$

The solution method is standard, and this exposition follows Cahuc, Marque and Wasmer (2004). Begin by noting that one can initially disregard the constant terms (those terms which do not depend upon  $h$ ), and simply add them back in later. Hence, we are looking for a solution to:

$$w_I(h_I) = \phi \frac{\sigma-1}{\sigma} A \frac{p(y_I)}{P} - \phi h_I \frac{\partial w_I}{\partial h_I} \quad (\text{A2.1})$$

Rearranging slightly and using the demand function facing the firm to substitute out for  $\frac{p(y_I)}{P}$  yields:

$$\frac{w(h_I)}{\phi h_I} + \frac{\partial w_I}{\partial h_I} - \frac{\sigma-1}{\sigma} \frac{A^{1-\frac{1}{\sigma}}}{Y^{\frac{1}{\sigma}}} (h_I)^{-\frac{1}{\sigma}-1} = 0 \quad (\text{A2.2})$$

Next, write down the homogeneous version:

$$\frac{w(h_I)}{\phi h_I} + \frac{\partial w_I}{\partial h_I} = 0 \quad (\text{A2.3})$$

which has the well known solution

$$w(h_I) = K h_I^{-\frac{1}{\phi}} \quad (\text{A2.4})$$

Take the derivative of (A2.4), using the fact that  $K$  may depend upon  $h_I$ :

$$\frac{\partial w_I}{\partial h_I} = -K \frac{1}{\phi} h_I^{-\frac{1}{\phi}-1} + h_I^{-\frac{1}{\phi}} \frac{\partial K}{\partial h_I} \quad (\text{A2.5})$$

Now, substitute (A2.4) and (A2.5) back into (A2.2) to obtain:

$$\frac{\partial K}{\partial h_t} = \frac{\sigma-1}{\sigma} \frac{A^{\frac{1-\frac{1}{\sigma}}{\sigma}}}{Y^{\frac{1}{\sigma}}} (h_t)^{-\frac{1}{\sigma}-1+\frac{1}{\phi}} \quad (\text{A2.6})$$

Taking the integral over both sides of (A2.6) yields

$$K = \phi \frac{\sigma-1}{\sigma-\phi} \left( \frac{Ah}{Y} \right)^{-\frac{1}{\sigma}} A (h_t)^{\frac{1}{\phi}} + J \quad (\text{A2.7})$$

where  $J$  is a constant of integration. Now substitute (A2.7) into (A2.4) to obtain

$$w_t(h_t) = \phi \frac{\sigma-1}{\sigma-\phi} A \frac{p(y_t)}{P} + J h_t^{-\frac{1}{\phi}} \quad (\text{A2.8})$$

Finally, we need to pin down  $J$  using a terminal condition. Following Cahuc, et. al. (2004), we choose the condition that  $\lim_{h_t \rightarrow 0} h_t w_t = 0$ , that is, the firm-level bargained wage should not explode as firm-level employment  $h_t$  approaches zero. This implies that  $J = 0$ . Adding back the constant terms yields the solution to the differential equation:

$$w_t(h_t) = (1-\phi) \frac{r}{1+r} V_U + \phi \frac{\sigma-1}{\sigma-\phi} A \frac{p(y_t)}{P} \quad (11)$$

### Appendix A.3: Proof of Proposition 1

**Proposition 1:** *There exists no wage-employment pair  $(w_P, h_P)$  such that both firms and workers are at least as well off as under collective bargaining, that is, such that*

$$\pi(w_P, h_P) \geq \pi(w_C, h_C) \quad (\text{A3.1})$$

$$[V_{E,P} - V_U] h_P \geq [V_{E,C} - V_U] h_C \quad (\text{A3.2})$$

where  $\pi(w, h)$  are the firm's profits under wage-employment pair  $(w, h)$ .

**Proof:** *From the definition of worker's surplus (3), (A3.2) is equivalent to:*

$$[(1+r)w_P - rV_U] h_P \geq [(1+r)w_C - rV_U] h_C \quad (\text{A3.3})$$

Assume that the preemptive wage involves a surplus which differs from the CB surplus by a factor  $\gamma \neq 1$ , so that

$$(1+r)w_p - rV_U = \gamma[(1+r)w_c - rV_U] \quad (\text{A3.4})$$

and (A3.3) becomes

$$\gamma h_p \geq h_c \quad (\text{A3.5})$$

Hence, workers are just indifferent between pairs  $(w_p, h_p)$  and  $(w_c, h_c)$  if  $h_p = \frac{1}{\gamma} h_c$ . In

order for the preemptive pair to be strictly preferable for firms, it must be the case that (A3.1) is satisfied, which is equivalent to:

$$\left[ A \frac{p(h_p)}{P} - w_p h_p - \frac{\kappa \chi}{q(\theta)} \right] h_p > \left[ A \frac{p(h_c)}{P} - w_c h_c - \frac{\kappa \chi}{q(\theta)} \right] h_c \quad (\text{A3.6})$$

Substituting in from (A3.4) and (A3.5) yields

$$A \frac{p(h_p)}{P} - \gamma A \frac{p(h_c)}{P} > (1-\gamma) \left[ \frac{r}{1+r} V_U + \frac{\kappa \chi}{q(\theta)} \right] \quad (\text{A3.7})$$

Substituting in from the firm's demand function  $\frac{p(h)}{P} = \left( \frac{y}{Y} \right)^{-\frac{1}{\sigma}}$  and from (A3.5) leads

to

$$\frac{\left[ \left( \frac{1}{\gamma} \right)^{-\frac{1}{\sigma}} - \gamma \right]}{1-\gamma} > \left[ \frac{\frac{r}{1+r} V_U + \frac{\kappa \chi}{q(\theta)}}{A \frac{p(y_c)}{P}} \right] \quad (\text{A3.8})$$

Finally, using (9) to substitute out for the right-hand side of (A3.8) yields a condition under which a preemptive pair  $(w_p, h_p)$  is strictly improving for the firm while keeping workers indifferent:

$$\frac{\gamma^{\frac{1}{\sigma}} - \gamma}{1 - \gamma} > \frac{\sigma - 1}{\sigma} \quad (\text{A3.9})$$

First take  $\sigma = 1$ : (A3.9) holds with equality everywhere. First take the case that  $\gamma > 1$ .

In order to establish that (A3.9) does not hold for  $\gamma > 1$ , it suffices to show that increasing  $\sigma$  causes the RHS to increase, but the LHS to decrease. The latter is clearly

the case, while the former holds due to  $\frac{\partial \frac{\sigma - 1}{\sigma}}{\partial \sigma} = \frac{1}{\sigma^2} > 0$ .

Next, note that (A3.9) must hold with equality in the limit as  $\gamma \rightarrow 1$ . (It is straightforward to confirm this using l'Hopital's rule.) In order to establish that (A3.9) does not hold for  $\gamma < 1$ , it suffices to show that the LHS is increasing in  $\gamma$ :

$$\frac{\partial \frac{\gamma^{\frac{1}{\sigma}} - \gamma}{1 - \gamma}}{\partial \gamma} = \frac{(1 - \gamma) \left[ \frac{1}{\sigma} \gamma^{\frac{1}{\sigma} - 1} - 1 \right] + \left( \gamma^{\frac{1}{\sigma}} - \gamma \right)}{(1 - \gamma)^2} > 0$$

whenever

$$(1 - \gamma) \left[ \frac{1}{\sigma} \gamma^{\frac{1}{\sigma} - 1} - 1 \right] + \gamma \left( \gamma^{\frac{1}{\sigma} - 1} - 1 \right) > 0 \quad (\text{A3.10})$$

(A3.10) holds with equality when  $\sigma = 1$ . To establish our claim, it suffices to show that the derivative of (A3.10) with respect to  $\sigma$  is positive. The derivative of (A3.10) with respect to  $\sigma$  is:

$$\left[ (1 - \gamma) \frac{1}{\sigma} \gamma^{\frac{1}{\sigma} - 1} + \gamma^{\frac{1}{\sigma}} \right] \ln \gamma \frac{-1}{\sigma^2} > 0$$

Since  $\gamma < 1$  implies that  $\ln \gamma < 0$ , the inequality clearly holds for  $\gamma < 1$ .

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