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Real origins of the Great Depression: monopolistic competition, union power, and the American business cycle in the 1920s

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SFB 649 Discussion Paper 2007-006

Real Origins of the Great Depression: Monopolistic Competition, Union Power, and the American Business Cycle in the 1920s

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Abstract

Most treatments of the Great Depression have focused on its onset 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 1920-21 recession and the roaring 1920s boom, as well as the slide into the Great Depression after 1929, and attempt to explain these phenomena in a unified framework. The model framework combines monopolistic product market competition with search frictions and bargaining in the labor market, allowing for both individual and collective (unionized) 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. The pro-union provisions of the Clayton Act of 1914 contributed to the slide in asset prices and the depression of 1920-21, while a series of tough anti-union Supreme Court decisions in late 1921 and 1922 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 court decisions in favor of trade unions in the late 1920s, as well as political pressure on firms to adopt the welfare capitalism model of high wages, made the economy increasingly susceptible to collapsing profit expectations. 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.

Keywords: Trade unions, collective bargaining, Great Depression

JEL codes: E24, E27, J51, J64, N12, N22

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I. 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. Particularly puzzling has been the behavior of asset markets, first falling sharply until 1921, then rising to hitherto unheard of heights, 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 boom, as well as the slide into the Great Depression after 1929, and attempt to explain these 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.

The first contribution of this paper is to link collective bargaining in labor markets to the value of equity. As is well known, if firms have monopoly power in their product markets, collective bargaining in the labor market allows unions to appropriate a share of the firms' monopoly rents. In contrast, workers who bargain individually with their employers cannot influence the firm's pricing and quantity decisions. Hence, they do not have the bargaining power to extract part of their employer's monopoly rents. For this reason, firms' profits under monopolistic product market competition will be substantially affected by the labor market regime, with drastic consequences for asset prices. A switch from an individual bargaining (*laissez-*

faire) labor market to one dominated by rent-sharing unions will cause firms' profits and equity values to drop sharply. Conversely, any change in the legal framework impeding the ability of unions to bargain collectively will lead to an increase in firms' profits and equity values.

With this background, we link the long slide in the stock market between 1914 and 1921 to the enactment of the Clayton Act in October of 1914. Section 6 of the Clayton Act states that antitrust laws are not applicable to labor organizations¹, 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. At the same time, this regime switch to collective bargaining led to a sharp downward shift in firm valuations. Indeed, between the 2nd quarter of 1914 and the 3rd quarter of 1921, the Standard&Poor's 500 lost nearly half of its value.

Both this renaissance of organized labor and the long-term decline in the stock market were 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. The arguing of the first of these, the *Tri-City Trades* case² and *Truax v. Corrigan*³, before the Supreme Court coincides neatly with the end of the long 1914-

¹ 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."

² *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.

³ *Truax v. Corrigan*, 257 U.S. 312 No. 13, reargued October 5-6, 1921, decided December 19, 1921.

1921 slide in asset prices⁴, and indeed marks the advent of the long, sustained asset price boom which would peak in 1929. In this paper, we will relate the first part of the stock market boom of the 1920's to the waning of trade union influence: As firms shifted from collective back to individual bargaining, firm profits should increase, causing an upsurge in stock prices.

We also discuss the role that a landmark pro-union Supreme Court ruling, the *Texas and New Orleans Railways* case⁵, may have played in the stock market crash of 1929. The *Texas and N.O. Railways* case marked a reversal in the Supreme Court's stance on unions and set an important legal precedent, upholding unions' right to choose their own representation when bargaining under the Railway Labor Act of 1926. It was this Supreme Court ruling that paved the way for the Norris-LaGuardia Act of 1932 limiting the use of injunctions against unions, and ultimately for the New Deal legislation. Contemporary observers placed great emphasis on the importance of this ruling for the labor movement. As Berman (1930) wrote in the *American Economic Review*:

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. ”

⁴ 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.

⁵ *Texas and New Orleans Railway Co. v. Brotherhood of Railway and Steamship Clerks*, 281 U.S. 548.

In addition, further court rulings and legislative efforts at the state and federal level on the eve of the Great Depression indicated that the tide had begun to turn in the favor of unions. If these political and judicial developments affected expectations on the likelihood of a switch back to collective bargaining, then investors would have rationally expected firm profits to decline sharply, depressing stock prices.

The second contribution of this paper is to link labor bargaining institutions and macroeconomic performance in the interwar period. In particular, the interplay of a firm with monopoly power in the goods markets and a monopolistic supplier of labor leads to a restriction of output below the socially efficient level, with the corresponding macroeconomic effects. In the body of the paper, we will make these arguments more specific in the context of a general equilibrium model of monopolistic product market competition with search frictions and a choice of bargaining regimes (union or individual) in the labor market, similar to that analyzed in Ebell and Haefke (2006). We find that the shift from individual to collective bargaining is associated with a sharp drop in output, an equally sharp increase in unemployment and a moderate increase 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. Conversely, a shift from collective to individual bargaining, such as that in the wake of the Tri-City Trades and Truax rulings of 1921, should lead to an increase in output and a decrease in unemployment, such as those observed during the upswing beginning in the 4th Quarter of 1921.

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. He also carefully rules out competing explanations such as monetary, banking, taxation and productivity shocks, since all either occur too late (in the case of monetary and banking shocks, in 1931) or are too small to account for the magnitude and timing of the sharp declines in output and employment from the 4th quarter of 1929 through the 2nd quarter of 1931.

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 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 search framework, which leads to fully microfounded involuntary unemployment, in a model of monopolistic competition in the goods market. Within this framework we consider two bargaining regimes, individual and collective, between which workers are able to choose optimally.

In addition, our work is related to a large body of previous work on stock market crashes. Explanations of stock market crashes have largely been behavioral and

have focused primarily on the crash of 1929. Research by Rappoport and White (1993) argued that a stock market bubble on the New York Stock Exchange existed, where prices outpaced dividends. Together with a financial frictions and debt-deflation view, this has contributed to a conventional view of the depression in which stock market exuberance fuelled by lax monetary policy, excessive monetary tightening in 1929, and pernicious real effects of banking panics play a prominent role, see Bernanke (1983), Bernanke (1995), Bernanke (2000), as well as Bordo, Erceg and Evans (2000) and Christiano, Motto and Rostagno (2003). Our interpretation leaves room for a stock market bubble in 1929, but attributes the long stock market boom from 1921 to 1928 to the interaction between an increase in monopoly power due to lax anti-trust enforcement during the Coolidge administration and the emasculation of labor unions in the wake of the *Truax v. Corrigan* and *Tri-City Trades* rulings.

A more neoclassical explanation for 1929 and the ensuing slump has argued for tax wedges, as in Chari, Kehoe and McGrattan (2002), Chari, Kehoe and McGrattan (2006), or adverse productivity shocks, as in Cole, Ohanian and Leung (2005), while rejecting the stock market overvaluation hypothesis, see McGrattan and Prescott (2004). In particular, 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 on asset pricing is loosely related to that of Danthine and Donaldson (2002), who examine the impact of fluctuations in bargaining power on the risk-sharing arrangements between workers and firms. There are three main distinctions to our work: First, we focus not on fluctuations in bargaining power under a single wage bargaining setup, but rather on shifts between two distinct wage bargaining frameworks, each associated with a distinct steady state. Secondly, and perhaps most importantly, the impact on asset prices we describe has nothing to do with risk-

portantly, the impact on asset prices we describe has nothing to do with risk-sharing. In fact, we will employ a setup in which all agents are risk neutral, so that firm values are simply the discounted sum of expected profits. Thirdly, we do not impose the restriction that workers may not own firms, so that limited participation in asset markets plays no role here.

Further, our work is 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 (2005, 2006).

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.

In addition, if firms' monopoly power were higher in 1929 than in 1920, then the drop in output due to an expected switch to collective bargaining would also have been greater. This would explain why the two depressions of the 1920s may have had

similar causes, yet differed in severity. This also meshes nicely with Cole and Ohanian (2004)'s argument that it was the combination of lax anti-trust enforcement and collective bargaining which caused the depression of the 1930s to be so persistent.

The remaining parts of the paper are structured as follows. The following section outlines the theoretical underpinnings of our reasoning. Section III 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 IV presents the results of a quantitative general equilibrium analysis of the 1920s. Section V concludes.

II. 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.

A. 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

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

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.

B. 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 η is the elasticity of the matching function with respect to unemployment and s is a scaling factor. Job matches are separated at the exogenous rate χ . 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 key intuition is that 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.⁶ Value functions for unemployed and employed workers are defined as follows⁷:

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

$$V_U = b + \frac{1}{1+r} [(1-f(\theta_k))V_U + f(\theta_k)V_{E,k}] \quad (3)$$

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 χ ⁸. 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. This continuation value takes into account the possibility of finding a job, which occurs with probability $f(\theta_k)$.

⁶ For simplicity, there is neither capital nor savings in the model.

⁷ 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).

⁸ 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.

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

$$V_{W,k} = \frac{(1+r)w_k - rV_U}{r + \chi} \quad (4)$$

C. 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:

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

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:

$$y_i = \int c_{i,n} dn = \left(\frac{p(y_i)}{P} \right)^{-\sigma} Y \quad (5)$$

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 (5) is the standard monopolistic-competition demand function where σ is the demand elasticity facing the firm. Monopoly power is measured by this demand elasticity. The lower is de-

mand 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.

D. 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 κ 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 χ , 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. Since it takes one period for a vacancy to be converted into a hire, the current employment level is fixed at the time of wage bargaining. Hence, the firm chooses employment in advance while taking the impact on future wage bargaining outcomes into account.

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.

1. Individual Bargaining Firms

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

$$V_l(h_l) = \max_v \left\{ \frac{p(y_l)}{P} y_l - w_l \cdot h_l - \kappa v_l + \frac{1}{1+r} V_l(h_l') \right\}$$

subject to:

$$\begin{aligned} \frac{p(y_l)}{P} &= \left(\frac{y_l}{Y} \right)^{\frac{1}{\sigma}} \\ h_l' &= (1-\chi) h_l + q(\theta) v_l \\ w_l &= w(h_l) \end{aligned}$$

The last constraint anticipates that individually bargained wages may depend upon the firm's steady-state factor choice h_l .⁹

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

$$\beta \frac{\partial V_l(h_l')}{\partial h_l'} = \frac{\kappa}{q(\theta)} \quad (6)$$

The cost of hiring a worker is simply the product of vacancy cost κ and the number of vacancies which must be opened to hire one worker, $\frac{1}{q(\theta)}$. The envelope condition gives the value of the marginal worker to the firm:

$$\frac{\partial V}{\partial h_l} = \frac{\sigma-1}{\sigma} A \frac{p(y_l)}{P} - w_l(h_l) + (1-\chi) \frac{\kappa}{q(\theta)} - h_l \frac{\partial w_l}{\partial h_l} \quad (7)$$

Equation (7) will be useful in the treatment of wage bargaining in the following subsection, as it gives the firm's surplus in the individual bargaining problem. Combining (6) with the envelope condition (7) yields the firm's Euler equation for employment:

$$\frac{\kappa}{q(\theta)} = \frac{1}{1+r} \left[\frac{\sigma-1}{\sigma} A \frac{p(y_l')}{P} - w_l(h_l') - h_l' \frac{\partial w_l'}{\partial h_l'} + (1-\chi) \frac{\kappa}{q(\theta')} \right] \quad (8)$$

⁹ Note that under individual bargaining, the firm's employment stock h_l 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).

This Euler equation describes the firm's optimal employment decision. The left hand side represents the current period cost of hiring the marginal worker, which is equal to the cost per vacancy κ multiplied by the number of vacancies necessary to hire a worker $\frac{1}{q(\theta)}$. 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, $h_t' \frac{\partial w_t'}{\partial h_t'}$, reflects firms' correct anticipation that the result of wage bargaining will depend upon the number of workers hired. In section II.E.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, discounted by the separation probability χ .

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:

$$V_{J,C}(h_c) = \frac{1+r}{r} \left[y_c \frac{p(y_c)}{P} - w_c h_c - \chi \frac{\kappa}{q(\theta_c)} h_c \right] \quad (9)$$

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

E. 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.¹⁰ 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. The second distinction between the two frameworks is whether employment levels are subject to negotiation. Under efficient collective bargaining, workers have sufficient leverage to bargain over the firm's total employment level, while it is assumed that an individual worker does not.

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

¹⁰ 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).

fail, so that the firm's surplus is equal to total firm profits, or equivalently its total value given by (9)¹¹ The workers' surplus is the difference between the value of employment with the collective-bargaining firm and unemployment (4), multiplied by the number of workers h_C .¹²

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

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 ϕ .¹³

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

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

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

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

¹¹ 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.

¹² 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.

¹³ 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.

$$w_c = \frac{r}{1+r} V_U + \frac{\phi}{\sigma} A \frac{p(y_c)}{P} \quad (10)$$

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:

$$\frac{\sigma-1}{\sigma} A \frac{p(y_c)}{P} = \frac{r}{1+r} V_U + \chi \frac{\kappa}{q(\theta)} \quad (11)$$

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 $\frac{\partial V}{\partial h_I}$. The individual Nash bargaining problem becomes:

$$\max_{w_I} \phi \ln(V^{E_I} - V^U) + (1-\phi) \ln\left(\frac{\partial V}{\partial h_I}\right)$$

The worker's surplus is obtained from equation (4), while the firm's surplus term can be obtained from the envelope condition of the firm's problem (6). The first order condition of the individual bargaining problem yields a first-order linear differential equation:

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

with solution¹⁴

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

Next, we need to obtain an expression for labor demand and a closed form for the bargained wage. We use (12) to substitute out for the $h_l \frac{\partial w_l}{\partial h_l}$ term in (8) and apply the steady-state to obtain a closed form for the firm's Euler equation:

$$w_l(h_l) = \frac{\sigma-1}{\sigma-\phi} A \frac{p(y_l)}{P} - (r+\chi) \frac{\kappa}{q(\theta)} \quad (13)$$

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 level¹⁵. 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

¹⁴ The solution is derived in the appendix.

¹⁵ Hiring externalities under individual bargaining were first described in partial equilibrium by Stole and Zwiebel (1996).

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 (12) and of the labor demand schedule (13). This yields an expression for the bargained wage:

$$w_l = \frac{r}{1+r} V_U + \frac{\phi}{1-\phi} (r + \chi) \frac{\kappa}{q(\theta)} \quad (14)$$

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.

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.¹⁶

Under each bargaining regime, the steady-state surplus may be found as:

¹⁶ 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.

$$V_{W,k} = \frac{(1+r)w_k - rV_U}{r + \chi} \quad (15)$$

Hence, workers prefer collective bargaining, and will form unions when allowed if the collective bargaining surplus exceeds its individual bargaining counterpart. This is the case whenever:

$$\sigma < (1-\phi) Ap(y_C) \frac{1}{r + \chi} \frac{q(\theta_I)}{\kappa} \quad (16)$$

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

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.¹⁷ As a result, the only way to prevent workers from organizing is to offer the workers the 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.

¹⁷ 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.

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*

F. 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.

Using (2) and (3) 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 $V_{U,I}$:

$$\frac{r}{1+r} V_{U,I} = b + \frac{\phi}{1-\phi} \kappa \theta_I \quad (17)$$

Similarly, one can obtain the reservation value for unemployment under collective bargaining by combining (2), (3), (10) and (11) to obtain:

$$\frac{r}{1+r} V_{U,C} = \frac{(r+\chi)(\sigma-1)}{(r+\chi)(\sigma-1) - \phi f(\theta_C)} b + \frac{\phi \chi}{(r+\chi)(\sigma-1) - \phi f(\theta_C)} \kappa \theta_C \quad (18)$$

G. 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:

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

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

$$A = \frac{\sigma - \phi}{\sigma - 1} \left[b + \frac{\phi}{1 - \phi} \kappa \theta_i + \frac{1}{1 - \phi} \frac{\kappa}{q(\theta_i)} (r + \chi) \right] \quad (20)$$

In both cases, the equilibrium conditions pin down the equilibrium value of labor market tightness θ_k as a function of parameters, including the degree of demand elasticity (a measure of monopoly power) σ . This closes the model. From the Beveridge curve, equilibrium unemployment $u(\theta_k)$ is a decreasing function of tightness θ_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 $y_k = Ah_k$.

G. Qualitative Results

In section IV below, 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 have strong

incentives to try to form collective bargaining coalitions. Hence, if restrictions on union organization fall, the model predicts that union activity will increase.

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 to 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 (19) and (20) 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 bargaining¹⁸.

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

¹⁸ 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.

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.

III. 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 fashion¹⁹. 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 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 II above.

¹⁹ July 2, 1890, c. 647, 26 Stat. 209.

A. 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 unionization²⁰. This changed after the Clayton Antitrust Act of 1914 exempted organized labor from the Sherman Act's presumption of conspiracy in restraint of trade.²¹ 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 transport²², an upsurge in labor disputes followed (Table 1).

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

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 pro-

²⁰ See Friedman (1999).

²¹ October 15, 1914, c. 323, 38 Stat. 730.

²² 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.

vide 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.²³

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 had ceased, so that the impact of increased union activity would be felt. At this point, the picture becomes clearer: 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.²⁴ 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

²³ 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.

²⁴ See, e.g., Dulles and Dubovsky (1984).

labor market regime, characterized by an increasing role for trade unions and collective bargaining.

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 trade²⁵. This early ruling, however, did not touch on the Clayton Act's 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 practice²⁶. 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 be-

²⁵ *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].

²⁶ *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].

fore the Clayton Act.²⁷ 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 14th Amendment.²⁸

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 (see Table 2).

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

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

²⁷ [257 U.S. 184, 205].

²⁸ *Truax v. Corrigan*, 257 U.S. 312 (December 19, 1921).

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.

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 in 1929. 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].

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 employ-

ers' rights against trade unions²⁹. Indeed, the new precedent was set, not just with the 1930 Supreme Court decision itself but already with the 1929 decision by the 2nd Circuit Court of Appeals. 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 *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. 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, but had initially been shelved for fear of being declared unconstitutional by the Supreme Court. Indeed, 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. 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

²⁹ 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.

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).³⁰ 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 for anti-injunction legislation was widely reported in the press during the week of October 14-19th, the week before Black Thursday, and on October 27th.³¹ 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

³⁰ 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".

³¹ Articles appeared in the October 14th, October 15th, October 18th, October 19th and October 27th editions of the New York Times. On October 27th, 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."

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.

B. Antitrust

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 Lebergott (1964)).

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.

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.

C. Welfare Capitalism

In the increasingly union-free environment of the 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.³² However, they were most prevalent during the 1920s, and arguably concentrated in industries with substantial monopoly power.

Welfare capitalism received much political attention and implicit government support under the Coolidge administration, with Herbert Hoover, then commerce secretary, playing a most active role in the process. Inspired by the experience of wartime planning and informed by pre-Keynesian under-consumptionist doctrines of workers’ purchasing power, Hoover’s policies as commerce secretary sought to boost wages³³, while tolerating, if not actively supporting, collusive practices in business. Prominent among his measures was the promotion of data sharing and standardization by industry associations, a measure that came close to an explicit violation of the ban on collusive behavior in the Clayton Act and was harshly criticized, both within the administration and in public.³⁴ Hoover and others strongly advocated at the time that welfare capitalism was self-financing or even profitable. Indeed, research by Raff and Sum-

³² See Cohen (1990), Jacoby (1997).

³³ See e.g. Barber (1985).

³⁴ On this see above all, Hawley (1974), Himmelberg (1976).

mers (1987) on the five dollar day at Ford has demonstrated that raising wages above market levels could generate substantial profits.

While their celebrated interpretation of the evidence was in terms of efficiency wage theory, a second element is that above-average wages were highly effective in keeping unions out of the factory. Recent research has cast doubt on the long-term viability of such schemes for less prominent firms, as these programs quickly lost significance during the depression and the New Deal³⁵. 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. 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 in 1928, and again around the stock market crash of October 1929, Hoover employed carrot-and-stick 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 stabilized³⁶. 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 conse-

³⁵ See e.g. Gordon (1994), Jacoby (1997).

³⁶ This policy experiment failed, and private consumption declined precipitously beginning in 1930, as evidenced by the data in Romer (1990).

quences 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 Roosevelt³⁷.

IV. Labor power and equilibrium regime shifts

In this section we place the historical evidence presented in Section III in the context of the model of monopolistic competition and labor market frictions presented in Section II, 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 bargaining regime from individual to collective bargaining lead to severe recessions of the same magnitude as those observed in 1920-21 and beginning in 1929.

³⁷ On the consensus among historians about this, see Himmelberg (1976), O'Brien (1998).

A. 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 β , workers' bargaining power φ , the matching elasticity η , the flow value of unemployment b , the exogenous job destruction rate χ , the matching scale parameter s and vacancy costs κ .

Parameter	Description	Value	Comment
A	Technology level	1.0	Normalization
B	Discount factor	0.99	4.0 % annual interest rate
Φ	Bargaining power	0.50	Standard
η	Matching elasticity	0.50	Data
B	Flow value of unemploymt	0.30	post-war b between 0.40 and 0.60.
χ	Separation rate	0.10	Data
s	Scaling factor	0.46	Normalization
K	Vacancy posting cost	0.19	natural rate of unemployment 5.0 %

Table 3: Interwar parameterization

Without loss of generality, A is set to unity, and there are no shocks to productivity.³⁸

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 η 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' bargain-

³⁸ This implies that our results do not depend on real business cycle type shocks to total factor productivity.

ing power are equal, $\eta = \phi$.³⁹ 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 20th-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 1931.⁴⁰ The matching scale parameter s is chosen to replicate a firm's matching rate of 0.25. As emphasized by Shimer (2005), the choices of s and q are merely a normalization, and hence innocuous. Finally, vacancy costs κ 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 $\kappa = 0.18$, in conjunction with the firm's matching rate $q(\theta) = 0.25$, yield a cost of about 0.72 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 de-

³⁹ 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).

⁴⁰ By comparison, the post-war job destruction rate estimated by Shimer (2005) is 10.0% quarterly.

mand elasticity σ 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.

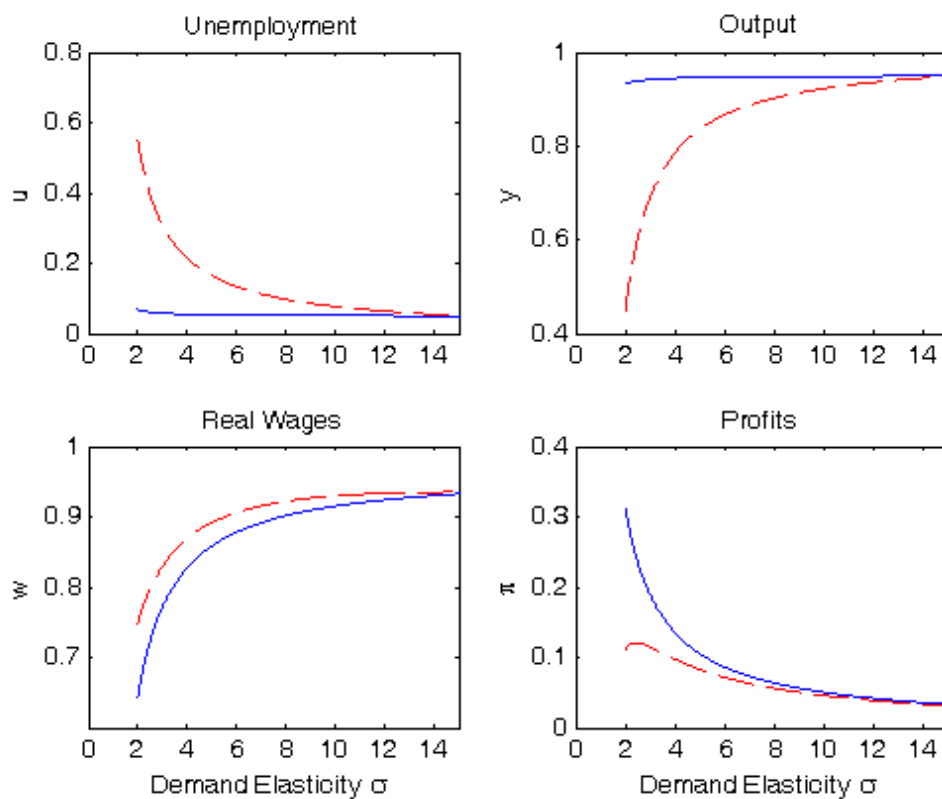


Figure 1: Unemployment, output, wages, and asset values as a function of demand elasticity

B. 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 σ 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 Average⁴¹, both deflated using the Consumer Price Index and rebased to 7/1914 = 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.⁴² Between December⁴³ 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.

⁴¹ 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, expanding to 20 in October 1916 and to 30 in October 1928, and included neither railroads nor public utilities.

⁴² 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.

⁴³ 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.

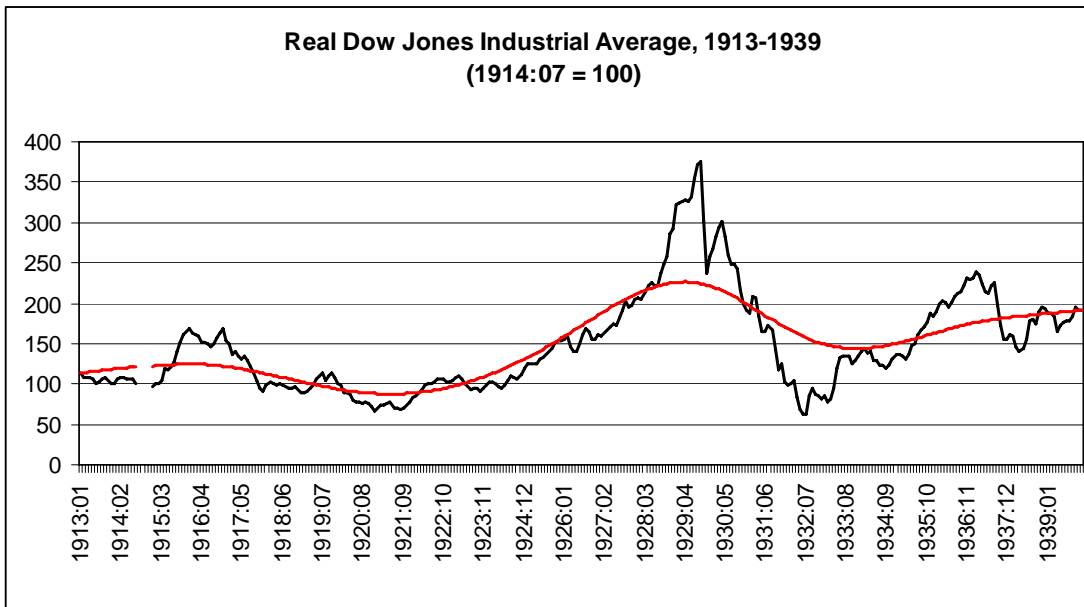
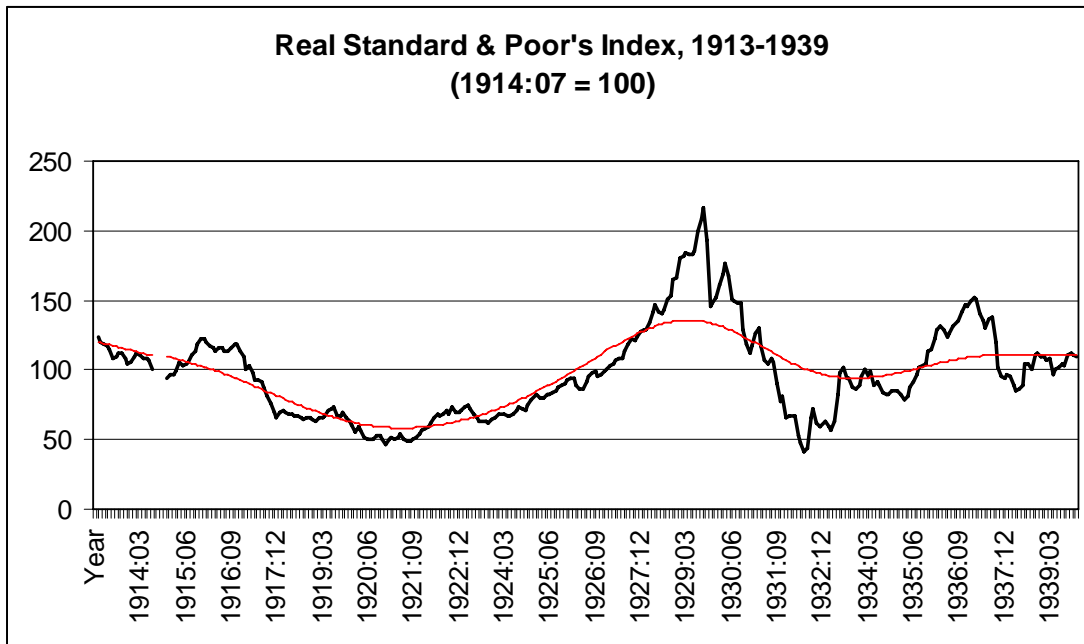


Figure 2a and b: Real Dow Jones and Standard & Poor's stock market indices, 1913-1939.

Turning to the model, Figure 3 below 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 %⁴⁴) 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.%) would lead to a drop in firm values of 47%. 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.

Turning to the upsurge in asset prices beginning in the 4th 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 of nearly 50% from its August 1921 trough by August 1922. Both indices then remained relatively steady until the 3rd Quarter of 1924, when they began to rise once again, culminating in the peak of September 1929. The HP-trend of the S&P index rose to more than double their trough values, exceeding their pre-war peaks.

We identify two factors that played a role in this unprecedented boom in asset markets, 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. Second, increasing monopoly power due to lax anti-trust enforcement of the Coolidge administration

⁴⁴ From the equilibrium equations under individual bargaining, the individual bargaining markup is found as $\frac{\sigma - \phi}{\sigma - 1} = 1 + \frac{1 - \phi}{\sigma - 1}$.

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.⁴⁵

Hence, we pin down the demand elasticity at the peak of the stock market run up as that value which is necessary to justify the peak stock market valuation under individual bargaining.. These values are given in Table 4 below.

	S&P	S&P Δ	Implied σ	Dow	Dow Δ	Implied σ
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

Table 4: Calibrating demand elasticity to asset price movements.

⁴⁵ 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,..."*

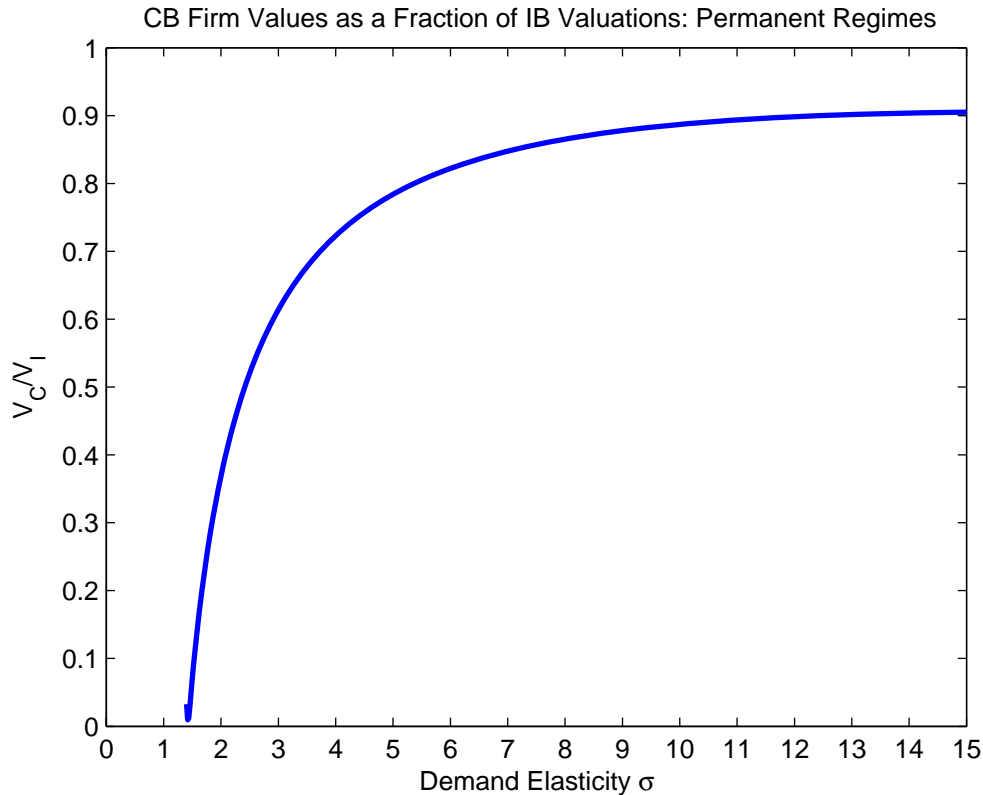


Figure 3: Equilibrium value of collective bargaining firms as a fraction of their value under individual bargaining when agents expect that regimes will be permanent.

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), suggesting that such markups might well have been plausible.

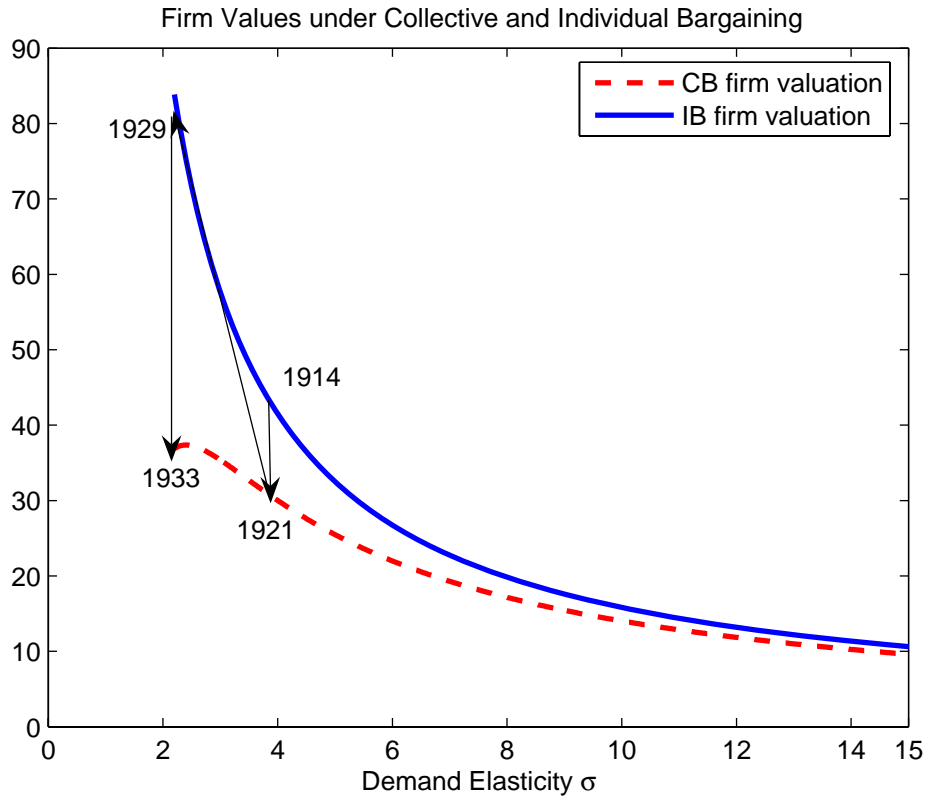


Figure 4: Impact on asset prices of regime switches between individual and collective wage bargaining in a model of monopolistic competition with search frictions in labor markets

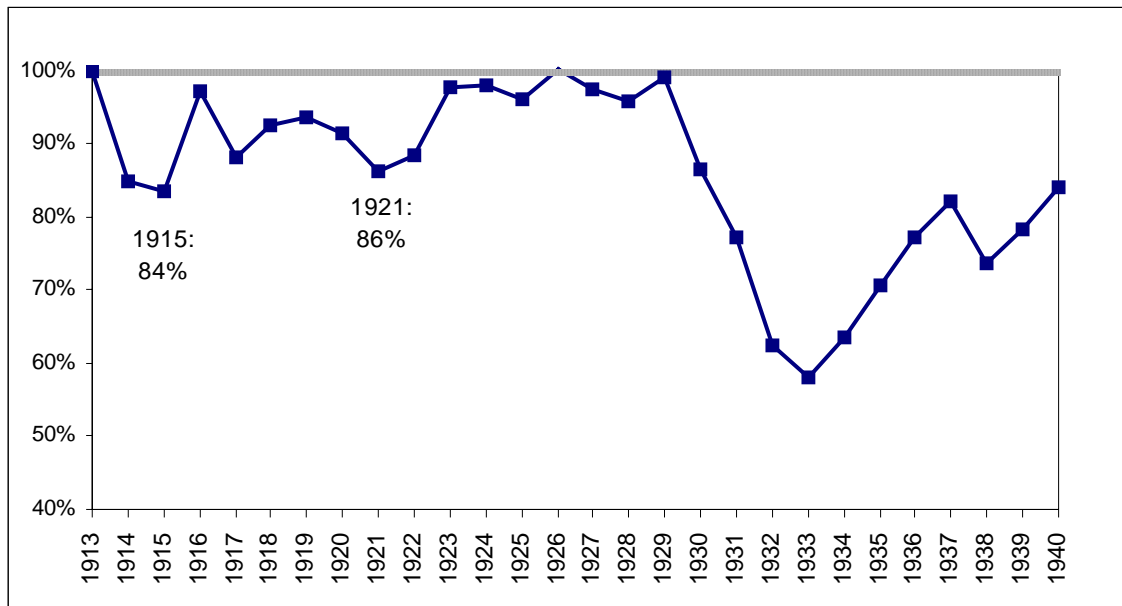
C. Interwar Macroeconomic Fluctuations

Figures 5 to 7 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 and the investment-output ratio are substantially below trend⁴⁶. Although the picture is blurred by the impact of World War I, we find it reasonable to view this period as one in which output was about 10% below trend.⁴⁷ The behavior of investment is in line with such a drop in output, as the investment-output ratio

⁴⁶ We use Kendrick's measures of real private non-farm GNP and private investment.

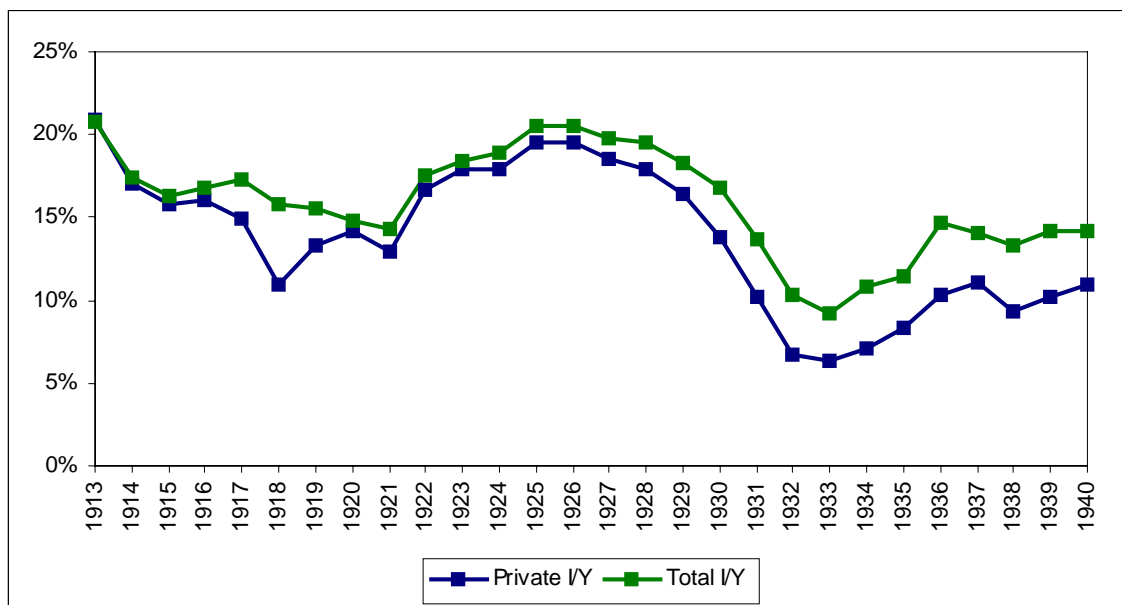
⁴⁷ The exception is GNP in 1916, at the height of the war effort, which is close to trend.

drops sharply over this period, from about 0.20 in 1913 to a post-war low of 0.13 in 1921.



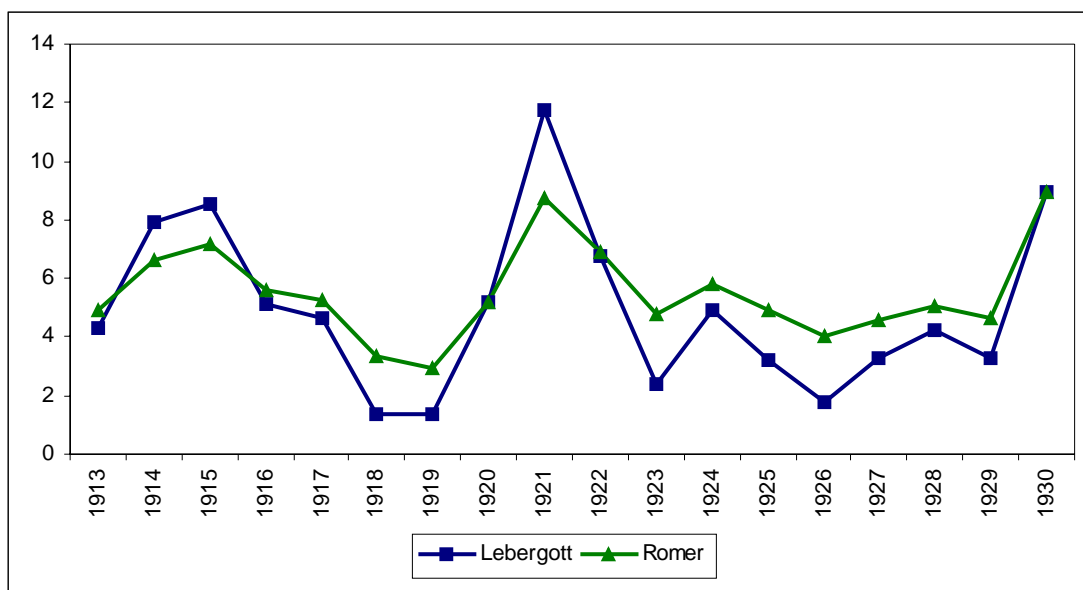
Source: Kendrick (1961), own calculations

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



Source: Kendrick (1961), own calculations

Figure 6: Investment-to-Output Ratio, 1913-1940



Source: Lebergott (1964), Romer (1986)

Figure 7: Unemployment Rates, 1913-1930

Figure 7 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.

By the same token, we see a connection between the Supreme Court's neutralization of the Clayton Act's pro-union provisions in late 1921 and the subsequent economic recovery. Investment and asset prices reacted immediately, while the salutatory effects on output were not fully felt until 1923. We identify a second regime, from 1922 to 1929, during which output is at trend, the investment-output once again approaches 0.20 and unemployment is low, hovering around 5%.

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. We relate the onset of the Great Depression to expectations that the increasingly organized labor-friendly judicial and legislative environment would lead to

a switch back to a low-output and high-unemployment collective bargaining regime . 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 examine the quantitative implications of a switch in bargaining regimes from collective to individual and an increase in monopoly power on the behavior of output and unemployment, and to compare these 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 Dow at 4.0, a switch from individual to collective bargaining would imply a decrease in output of 17 % and an increase in unemployment from 5.5% to 21.4 %, as illustrated in the top panels of Figure 8. 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).⁴⁸

⁴⁸ 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.

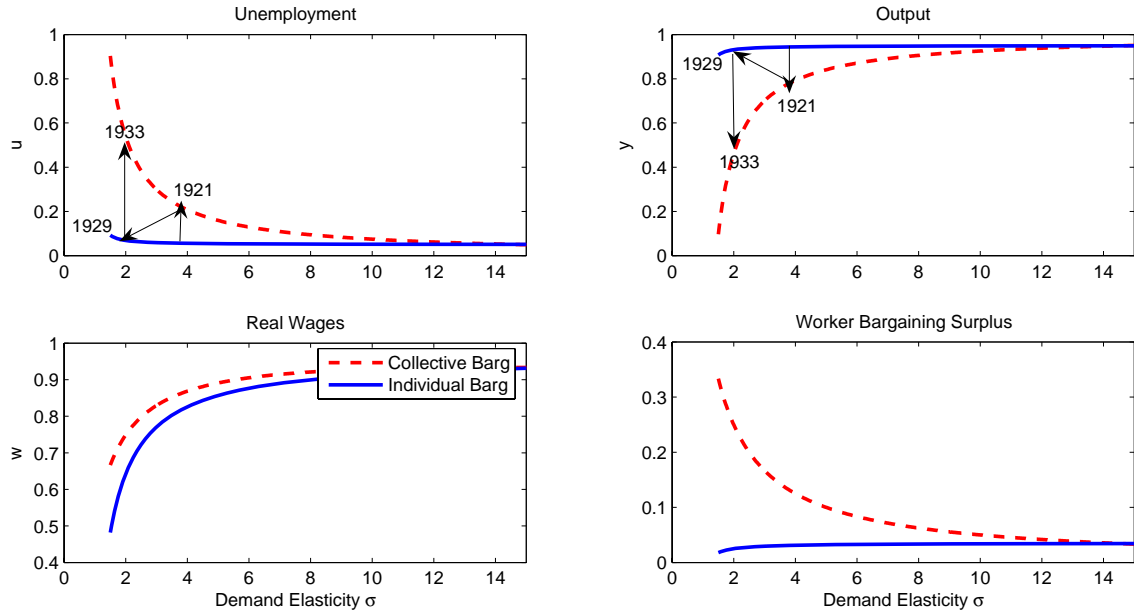


Figure 8: Regime switches between individual and collective wage bargaining in a model of monopolistic competition with search frictions in labor markets

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 and demand elasticity declines to 2.4. 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 8. Under individual bargaining, an increase in monopoly power

should both drive asset values up and cause real output to stagnate, consistent with the behavior of the US economy in the period 1926-28⁴⁹. 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 interwar years⁵⁰.

D. Speculations on real origins of the Great Depression

In Sections IV B and C, 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 all of the increases in HP-trend stock-prices, demand elasticity would have to have decreased from about 4.0 to 2.5, corresponding to an increase in markups from 17 % to 33 %.⁵¹ 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 the top panels of Figure 8. A switch to collective bargaining when demand elasticity is 2.5 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 and the increase in unemployment in the Great Depression very well.

⁴⁹ An increase in monopoly power during the 1920s has been documented by Keller (1973), as discussed earlier in the present paper.

⁵⁰ For a typical account from the vast older literature, see Schlesinger (1964).

⁵¹ 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.

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 III 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 III. 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.

E. 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 8 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 out-

put 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.

V. 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 (2005) 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 20th 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 20th century.

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Appendix A1: Solving the Differential Equation

The differential equation to be solved is:

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

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:

$$w_l(h_l) = \phi \frac{\sigma-1}{\sigma} A \frac{p(y_l)}{P} - \phi h_l \frac{\partial w_l}{\partial h_l} \quad (\text{A1.1})$$

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

$$\frac{w_l(h_l)}{\phi h_l} + \frac{\partial w_l}{\partial h_l} - \frac{\sigma-1}{\sigma} \frac{A^{1-\frac{1}{\sigma}}}{Y^{\frac{1}{\sigma}}} (h_l)^{-\frac{1}{\sigma}-1} = 0 \quad (\text{A1.2})$$

Next, write down the homogeneous version:

$$\frac{w_l(h_l)}{\phi h_l} + \frac{\partial w_l}{\partial h_l} = 0 \quad (\text{A1.3})$$

which has the well known solution

$$w_l(h_l) = K h_l^{-\frac{1}{\phi}} \quad (\text{A1.4})$$

Take the derivative of (A1.4), using the fact that K may depend upon h_l :

$$\frac{\partial w_l}{\partial h_l} = -K \frac{1}{\phi} h_l^{-\frac{1}{\phi}-1} + h_l^{-\frac{1}{\phi}} \frac{\partial K}{\partial h_l} \quad (\text{A1.5})$$

Now, substitute (A1.4) and (A1.5) back into (A1.2) to obtain:

$$\frac{\partial K}{\partial h_l} = \frac{\sigma-1}{\sigma} \frac{A^{\frac{1}{\sigma}}}{Y^{\frac{1}{\sigma}}} (h_l)^{-\frac{1}{\sigma}-1+\frac{1}{\phi}} \quad (\text{A1.6})$$

Taking the integral over both sides of (A1.6) yields

$$K = \phi \frac{\sigma-1}{\sigma-\phi} \left(\frac{Ah}{Y} \right)^{-\frac{1}{\sigma}} A (h_l)^{\frac{1}{\phi}} + J \quad (\text{A1.7})$$

where J is a constant of integration. Now substitute (A1.7) into (A1.4) to obtain

$$w_l(h_l) = \phi \frac{\sigma-1}{\sigma-\phi} A \frac{p(y_l)}{P} + J h_l^{-\frac{1}{\phi}} \quad (\text{A1.8})$$

Finally, we need to pin down J using a terminal condition. Following Cahuc, et. al. (2004), we choose the condition that $\lim_{h_l \rightarrow 0} h_l w_l = 0$, that is, the firm-level bargained wage should not explode as firm-level employment h_l approaches zero. This implies that $J = 0$. Adding back the constant terms yields the solution to the differential equation (10):

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

Appendix A.2: 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*

$$\pi(w_P, h_P) \geq \pi(w_C, h_C) \quad (\text{A2.1})$$

$$[V_{E,P} - V_U] h_P \geq [V_{E,C} - V_U] h_C \quad (\text{A2.2})$$

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

Proof: *From the definition of worker's surplus (4), (A2.2) is equivalent to:*

$$[(1+r)w_P - rV_U] h_P \geq [(1+r)w_C - rV_U] h_C \quad (\text{A2.3})$$

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

$$(1+r)w_P - rV_U = \gamma [(1+r)w_C - rV_U] \quad (\text{A2.4})$$

and (A2.3) becomes

$$\gamma h_P \geq h_C \quad (\text{A2.5})$$

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 (A2.1) is satisfied, which is equivalent to:

$$\left[A \frac{p(h_P)}{P} - w_P h_P - \frac{\kappa \chi}{q(\theta)} \right] h_P > \left[A \frac{p(h_C)}{P} - w_C h_C - \frac{\kappa \chi}{q(\theta)} \right] h_C \quad (\text{A2.6})$$

Substituting in from (A2.4) and (A2.5) yields

$$A \frac{p(h_P)}{P} - \gamma A \frac{p(h_C)}{P} > (1-\gamma) \left[\frac{r}{1+r} V_U + \frac{\kappa \chi}{q(\theta)} \right] \quad (\text{A2.7})$$

Substituting in from the firm's demand function $\frac{p(h)}{P} = \left(\frac{y}{Y}\right)^{\frac{1}{\sigma}}$ and from (A2.5) leads

to

$$\frac{\left[\left(\frac{1}{\gamma}\right)^{\frac{1}{\sigma}} - \gamma\right]}{1-\gamma} > \frac{\left[\frac{r}{1+r}V_U + \frac{\kappa\chi}{q(\theta)}\right]}{A\frac{p(y_C)}{P}} \quad (\text{A2.8})$$

Finally, using (11) to substitute out for the right-hand side of (A2.8) yields a condition under which a preemptive pair (w_p, h_p) is strictly improving for the firm while keeping workers indifferent:

$$\frac{\gamma^{\frac{1}{\sigma}} - \gamma}{1-\gamma} > \frac{\sigma-1}{\sigma} \quad (\text{A2.9})$$

First take $\sigma = 1$: (A2.9) holds with equality everywhere. First take the case that $\gamma > 1$.

In order to establish that (A2.9) does not hold for $\gamma > 1$, it suffices to show that increasing σ 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 (A2.9) 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 (A2.9) does not hold for $\gamma < 1$, it suffices to show that the LHS is increasing in γ :

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

whenever

$$(1-\gamma)\left[\frac{1}{\sigma}\gamma^{\frac{1}{\sigma}-1}-1\right]+\gamma\left(\gamma^{\frac{1}{\sigma}-1}-1\right)>0 \quad (A2.10)$$

(A2.10) holds with equality when $\sigma = 1$. To establish our claim, it suffices to show that the derivative of (A2.10) with respect to σ is positive. The derivative of (A2.10) with respect to σ 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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