

WAGE BARGAINING IN THE PRESENCE OF SOCIAL SERVICES AND TRANSFERS

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THE welfare state is a large, nearly ubiquitous presence in the economic activity of all advanced industrialized societies. The average level of government expenditures in OECD economies grew from 28 percent of GDP in 1960 to 51 percent of GDP in 1997.¹ This expansion of the public sector has been accompanied by a commensurate growth in the level of taxes necessary to finance the associated social policy commitments. Using an average figure for OECD economies, the amount of taxes grew from 27.6 of GDP in 1960 to 39.4 percent of GDP in 1995.² The consequences of this massive expansion of the size of the welfare state on the employment performance of most economies varied significantly over time, however. During the initial decades of the postwar period, the growth in the size of the welfare state came at relatively low costs in terms of employment. The high levels of employment achieved by many European economies during the period suggested to many observers that the policy goals of full employment and welfare state expansion could be compatible.

During more recent decades, however, the trade-off between the redistributive intentions of the welfare state and the goal of full employment has been accentuated. Many governments have begun to accept the policy diagnosis that the high levels of income and payroll taxes required to finance the welfare state are one of the general causes of the economic malaise experienced by European economies in recent decades. The diagnosis that high levels of nonwage labor costs are an obstacle to employment growth is now being accepted even by social democratic governments, traditional defenders of the welfare state. As

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¹ OECD, *Taxing Wages* (Paris: OECD, 1999).

² OECD, *Statistical Compendium: Revenue Statistics* (Paris: OECD, 1995).

Fritz Scharpf concludes in a recent study, "A considerable range of perfectly decent jobs, which in the absence of payroll taxes would be commercially viable, are eliminated from the private labor market of continental welfare states."³ A number of policy changes enacted in recent years come in response to the concern that high nonwage labor costs are inimical to employment expansion and overall economic competitiveness.⁴ Consider the following examples. Both left-wing and right-wing governments in France have attempted to address persistent levels of unemployment by introducing more than forty policy measures to lower the social charges paid by employers and to exempt a number of firms from making social security contributions to various branches of the French welfare state.⁵ The Belgian and Dutch governments have recently enacted policies reducing payroll taxes of employers in both the manufacturing and the service sectors. In Germany the red-green coalition government is considering both a broad reform in the mode of financing the social insurance system (involving a partial shift to taxes, such as ecological taxes, that are not employment based) and various *Kombilohn*-proposals (that is, policy measures combining low earnings with fiscal transfers that compensate social insurance contributions at low income levels).⁶

This article seeks to provide a theoretical framework for modeling the employment consequences of the growth of the welfare state. What is the effect of the growth of taxes and social policy commitments on the employment performance of various political economies? Does it vary across countries; that is, do salient cross-national differences, such as differences in labor-market institutions, affect the sensitivity of employment to taxation? How does the growth of the tax burden affect the optimal wage choices made by unions? And what is the effect of unions' wage choices on the equilibrium level of employment, given that a high share of the total wage bill is now committed in the form of taxes?

To analyze these questions, I develop a model that explores the impact of the growth of the welfare state on the wage demands of trade unions and on the level of unemployment. In an effort to account for

³ Scharpf, *Governing in Europe: How Effective? How Democratic?* (Oxford: Oxford University Press, 1998), 142.

⁴ See, for example, Conseil Supérieur de l'Emploi, *L'allègement des charges sociales sur les bas salaires* (Paris: La Documentation française, 1996).

⁵ For an overview of these policy developments, see François Bourguignon and Dominique Bureau, eds., *L'architecture des prélèvements en France: Etat des lieux et voies de réforme* (Paris: La Documentation française, 1999).

⁶ See, for example, Gert Wanger, "Soziale Sicherung im Spannungsfeld von Demokratie und Arbeitsmarkt," in I. Nubler and H. Trabold, eds., *Herausforderungen an die Wirtschaftspolitik an der Schwelle zum 21. Jahrhundert* (Berlin: Sigma, 1999).

both cross-national and intertemporal variation in the employment performance of OECD economies, this article integrates the literatures on wage determination and on comparative systems of social protection. The results of the model can be summarized as follows. By explicitly modeling unions' concern for social policy, I show how the optimal strategy of trade unions is to deliver wage restraint in exchange for social policy expansion (given a particular mix of social policy transfers and services). This proposition *formalizes* an insight of many corporatist studies that have argued that wage moderation was a critical variable allowing most economies to reconcile welfare state expansion and full employment during the first decades of the postwar period.⁷ Moreover, I show how the structure of labor-market institutions—specifically, the level of centralization of the wage-bargaining authority—affects the magnitude of the employment effects resulting from the wage restraint of trade unions. Building on the theoretical propositions advanced by Calmfors and Driffill and further refined by other scholars of corporatism, the model predicts a parabolic relationship between the level of centralization of the wage-bargaining authority and the level of unemployment. Economies with institutions of wage bargaining centralized at the sectoral level are expected to exhibit the worst employment performance.

The model developed in this article also provides an explanation for the steady deterioration of the employment performance of European economies. It shows how demographic and fiscal developments have strained this political exchange, contributing to the gradual rise in unemployment. The article identifies two mechanisms by which the growth in the size of social policy commitments impinges on the wage strategies of trade unions and on the equilibrium level of employment. The first of these developments is the growth in the size of the tax burden. A higher proportion of wages is now committed to income or payroll taxes. As a result, the effectiveness of the wage policies pursued by unions is severely reduced. Since wages represent an ever smaller fraction of the total wage bill faced by firms, even sustained moderation of wage demands has only a modest impact on the level of employment. The second consequence of the growth of the welfare state on the wage choices made by unions is through a change in the composition of so-

⁷For a formulation of these arguments, see David Cameron, "Social Democracy, Corporatism and the Representation of Economic Interests in Advanced Capitalist Societies," in John Goldthorpe, ed., *Order and Conflict in Contemporary Capitalism* (New York: Oxford University Press, 1984); Gøsta Esping-Andersen, *Three Worlds of Welfare Capitalism* (Princeton: Princeton University Press, 1990), 105–43.

cial policy transfers. A number of economies have experienced sharp increases in the number of “labor-market outsiders”—in the form of early retirees, long-term unemployed, or persons unable to enter the labor market. If the increase in social policy expenditures committed to labor-market outsiders has lowered the net transfers and benefits received by union members, unions’ willingness to pursue a policy of wage moderation has declined. As a result, while welfare states have become more overburdened, the *willingness* of unions to sustain high levels of wage moderation and the *effectiveness* of income policies in reducing the level of unemployment have declined. In other words, the maturation of the welfare state has undermined the political exchange between unions and governments premised on wage moderation in exchange for social policy expansion. While welfare state expansion and the pursuit of full employment were compatible policy goals during the first decades of the postwar period, the presence of a high tax burden has exacerbated the trade-off between the two policy objectives.

The remainder of the article is organized as follows. I begin by reviewing recent theoretical developments in the study of wage determination in advanced industrialized economies. Next, I develop a model examining the consequences of changes in the level and composition of social policy commitments for the wage strategies pursued by unions and for the equilibrium level of employment. I then provide an empirical test of the main implications of the model using OECD data for the period 1960–95. The final section discusses implications of this analysis for future research on labor-market developments in advanced industrialized economies.

MODELS OF WAGE BARGAINING, MACROECONOMIC POLICY, AND THE WELFARE STATE: TOWARD A NEW THEORETICAL SYNTHESIS

The model developed in this article builds on and extends existing studies of wage determination in advanced industrialized democracies. To situate the contribution in the existing literature, I briefly review the main theoretical and empirical findings of this research agenda.

The foundation of the analysis is the influential economic model studying the relationship between wage-bargaining institutions and macroeconomic performance developed by Lars Calmfors and John Driffill.⁸ Building on Mancur Olson’s theory of collective action, Calm-

⁸ Calmfors and Driffill, “Bargaining Structure, Corporatism, and Economic Performance,” *Economic Policy* 6, no. 1 (1988).

fors and Driffill posit a “hump-shaped” relationship between the centralization of wage bargaining and the level of unemployment. This relationship is the consequence of two effects: the monopoly effect (resulting from an increase in union power) and the ability of large wage setters to internalize some of the negative labor-market consequences of their wage demands. According to Calmfors and Driffill, when labor markets are extremely decentralized, individual companies compete in product markets that are characterized by a high elasticity of substitution among goods. In these environments, the trade-off between unemployment and wage increases faced by trade unions is extremely steep, as a wage settlement that exceeds the wage rate paid by a competitor within the same industry contributes to a steep decline in employment in a firm. The consequence is a high level of wage restraint and a low level of unemployment in economies in which wage bargaining takes place at the firm level (decentralized labor markets). An increase in the level of centralization of a wage-bargaining system—which generally takes the form of an increase in intrasectoral centralization of wage bargaining—is associated with a decline in the elasticity of substitution for goods produced by firms that are subject to unified wage demands of trade unions. This economic and institutional environment increases the incentives of trade unions to engage in wage militancy. Calmfors and Driffill posit that the level of wage militancy is higher in economies with intermediate-level centralization of wage bargaining as compared with economies having decentralized labor markets. However, further increases in the level of centralization of wage bargaining—from industry-level to economy-level centralization—create incentives for trade unions to “internalize” some of the consequences of militancy. Calmfors and Driffill thus predict greater wage moderation and higher levels of employment in economies with highly centralized institutions of wage bargaining than in intermediately centralized wage-bargaining systems. Figure 1 presents the relationship between the structure of labor-market institutions and the equilibrium level of employment hypothesized by the Calmfors and Driffill model.⁹

⁹As will be shown below, in the Calmfors–Driffill setup, the presence of the hump is conditional on some technical details related to the elasticity of substitution of goods produced in different sectors. The hump is more pronounced in less homogenous economies (that is, producing goods that are lesser substitutes of each other). In the limit case of an economy in which all sectors produce goods that are very close substitutes for each other, the relationship between the centralization of the wage-bargaining system and the level of unemployment becomes monotonic.

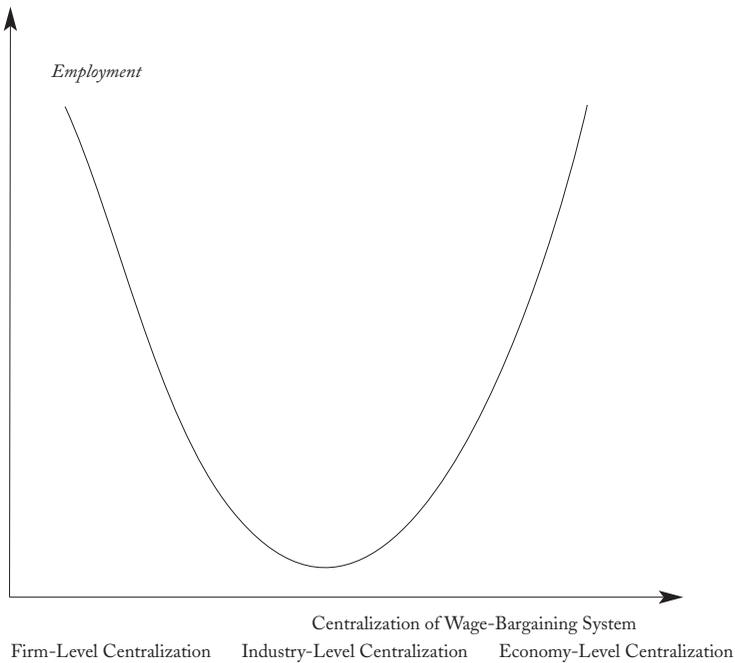


FIGURE 1
PREDICTIONS OF CALMFORS AND DRIFFILL MODEL ABOUT THE RELATIONSHIP
BETWEEN CENTRALIZATION OF WAGE BARGAINING AND UNEMPLOYMENT

A number of recent studies have posed a theoretical and empirical challenge to this model.¹⁰ They critique Calmfors and Driffill for failing to take account of the importance of monetary policy in the determination of the levels of inflation and unemployment. In a number of papers, David Soskice and Torben Iversen have returned to the original question about the impact of labor-market centralization on unem-

¹⁰For representative examples of research that attempt to model the interaction between the corporatist literature on wage bargaining and the literature on macroeconomic policy, see Fritz Scharpf, *Crisis and Choice in European Social Democracy* (Ithaca, N.Y.: Cornell University Press, 1991); Peter Hall and Robert Franzese, "Mixed Signals: Central Bank Independence, Coordinated Wage Bargaining and European Monetary Union," *International Organization* 52, no. 3 (1998); Torben Iversen, "Wage Bargaining, Central Bank Independence and the Real Effects of Money," *International Organization* 52, no. 3 (1998); idem, *Contested Economic Institutions: The Politics of Macroeconomics and Wage Bargaining in Advanced Democracies* (Cambridge: Cambridge University Press, 1999); David Soskice and Torben Iversen, "The Non-Neutrality of Money with Large Price or Wage Setters," *Quarterly Journal of Economics* 115, no. 1 (2000).

ployment posed by the Calmfors and Driffill model. Soskice and Iversen depart from Calmfors and Driffill by introducing an additional parameter modeling the degree of “accommodation” of a monetary policy. Monetary accommodation is defined as the overall responsiveness of the government to increases in the aggregate price level. In the Soskice and Iversen framework, a central bank that is completely accommodating sets the real money supply equal to the price level, whereas in the case of a totally nonaccommodating monetary policy, the money supply is entirely independent of changes in the price level.

Iversen and Soskice’s important finding is that in nonatomistic labor markets, monetary policy has a real impact on unemployment. Moreover, they show that the impact of monetary policy on unemployment is conditional upon the centralization of the wage-bargaining system. The predictions for cross-national differences in the level of unemployment of the Soskice and Iversen model are in agreement with the Calmfors and Driffill model only for the case of an accommodating macroeconomic policy regime. In this case, both models predict that the employment performance of economies characterized by intermediately centralized wage-bargaining systems is inferior to the performance of economies in which wage bargaining is either extremely centralized or extremely decentralized. The predictions differ, however, in the case of a nonaccommodating macroeconomic policy. Soskice and Iversen argue that a nonaccommodating monetary policy can in part deter some of the wage militancy of trade unions. As Iversen argues:

If the monetary authority is nonaccommodating, higher wages can no longer be externalized to the same extent and this will deter militant union behavior. The collective action problem facing unions in intermediately centralized systems—which can lead to excessive wage demands and unemployment—is thus “solved” (or at least dissipated) by an agent that is deliberately nonaccommodating to union objectives. This crucial (and perhaps surprising) result is overlooked in all existing models of union behavior (such as Calmfors and Driffill’s application of Olson’s theory) because they fail to consider the conditioning effects of monetary policies on interunion interactions.”¹¹

The Soskice and Iversen model is extremely elegant and logically compelling. Nonetheless, the analysis suffers from an important limitation: its main empirical implications are at odds with labor-market developments in European economies. The central prediction of the model is that an increase in monetary nonaccommodation will yield substantial benefits for long-term employment. Given that most Euro-

¹¹Iversen (fn. 10, 1998), 48–49.

pean economies have de facto shifted from an accommodating to a nonaccommodating monetary policy, the level of unemployment experienced by these economies should have declined in recent decades.

The model developed in this article builds on the setup of the Calmfors and Driffill model. I also follow Soskice and Iversen in modeling the interaction of wage-bargaining agents and monetary policy authorities. The model differs in two respects from the previous studies. First, I introduce a different assumption about the utility of unions—that unions “care” not only about wages and unemployment benefits but also about a broader set of social policy services and transfers that go to union members. This additional assumption about the utility of trade unions allows me to formalize the idea of a political exchange premised on wage moderation in exchange for social policy expansion.¹² Second, I add to existing wage-bargaining models a number of variables that model cross-national differences among welfare states. As will be shown below, this allows me to overcome the limitations of current research and develop predictions that account for *both* cross-national *and* intertemporal variation in the employment performance of OECD economies. One of the implications of this model is that the growth in the level of taxes and a change in the composition of social policy transfers (more specifically a rise in expenditures going to labor-market outsiders) undermine the effectiveness of the policy of wage moderation in restoring high levels of employment. By pushing up the nonwage labor costs faced by firms and by lowering the effectiveness of wage moderation as a policy instrument, the growing tax burden accounts for the worsening employment performance of OECD economies.

THE MODEL

1. THE WAGE-BARGAINING FRAMEWORK

The formal model starts from a monopoly wage-setting model, in which unions make wage demands and employers respond by choosing the level of prices for the goods they produce. Employers' optimal decision is determined by the resulting consumer demand, which is in turn a function of the level of prices and of the elasticity of substitution among

¹² See Cameron (fn. 7); and Esping-Andersen (fn. 7). This specification of the utility of trade unions distinguishes this model from the Daveri and Tabellini model; see Francesco Daveri and Guido Tabellini, “Unemployment and Taxes: Do Taxes Affect the Rate of Unemployment?” *Economic Policy* 15, no. 30 (2000), 98.

goods produced in different sectors. In equilibrium the level of demand determines the level of employment in each sector of the economy.

The economy consists of I sectors, with J firms in each sector. There is therefore a total of $N = IJ$ unions in the economy. I assume either that the entire workforce is fully unionized or that unions' contracts are binding even for those workers who are not union members. (This assumption is standard in the literature and follows Calmfors and Driffill.)¹³ For simplicity, I also assume that all the unions have the same size; if n denotes the total labor force, then the number of members in each union is n/N .

At the heart of the Calmfors and Driffill model is the effort to understand the effect of the centralization of the wage-bargaining system on the level of unemployment. Its classification of decentralized, intermediately centralized, and fully centralized wage-bargaining systems is modeled by the above parameters I (the number of sectors) and J (the number of firms in each sector) as follows. The case of a totally decentralized political economy can be characterized as an economy in which both I and J are high. Intrasectoral centralization of wage bargaining can be modeled as a decline in J . Thus, in economies with intermediate centralization, wages are determined by sectoral-level trade unions. Finally, in an economy with national-level institutions of wage bargaining, both J and I take very low values. The limit case of this process of intersectoral centralization of wage bargaining is the case in which one union determines the level of wages for all firms in the economy. (See Figure 2.)

The distinction between intrasectoral and intersectoral centralization of the institutions of wage bargaining makes it possible to capture more systematically the mechanisms through which the actions of one trade union affect the income and employment levels in other firms or sectors. Assuming that goods produced within one sector are close substitutes for one another, higher wage demands by one union would increase demand for the goods produced by other firms in the sector, therefore providing an incentive for wage moderation. Conversely, coordinated higher wage demands in one sector may shift the equilibrium toward higher prices for goods in that sector, with the costs being borne by the other sectors. Consequently, Calmfors and Driffill argue, equi-

¹³This assumption of full unionization can easily be relaxed. More specifically, one can assume that for workers who are nonunionized, wages are determined in a decentralized setting (in other words, both I and J are very large). The equilibrium wage level of this economy is a combination of the wages set in the unionized part of the economy and of the wages that are determined in this decentralized setting.

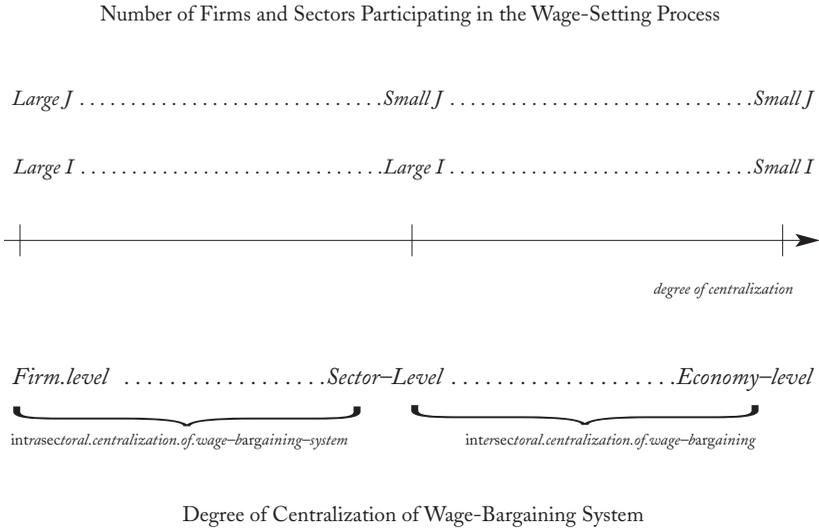


FIGURE 2
MODELING THE DEGREE OF CENTRALIZATION OF WAGE-BARGAINING SYSTEM

librium wage levels exhibit a hump-shaped dependence on centralization, which implies that employment has a U-shaped dependence on centralization. I will elaborate on this point in the theoretical setup of the formal model in section 3 of the appendix.

Wage bargaining occurs in an exogenous macroeconomic environment in which governments have already specified the level of taxes (τ) and the monetary policy regime (β). These parameters are known to the players and are assumed to be fixed throughout the game.

2. THE IMPACT OF SOCIAL POLICIES: LABOR-MARKET OUTSIDERS AND SOCIAL SERVICES

The main objective of this model is to study how social policy arrangements affect the outcomes of wage bargaining. In contrast to existing models of wage bargaining, the model assumes that social policies are in fact a crucial objective for trade unions; social policies influence their optimal wage demands and affect employment outcomes.

Before analyzing the maximization problem faced by trade unions, it is important to lay out the model's assumptions about the structure of social policy benefits. Two key dimensions are relevant to the analysis:

who the recipients of social policy benefits are and what the structure of benefits is (that is, the mix of transfers and services).

The population of an economy can be roughly divided into two major groups: workers who are currently employed or seeking employment (the size of the labor force being n) and the “inactive” population, whose total size will be denoted by m . This part of the population—which is sizable in many European economies—includes, in addition to pensioners, early retirees and persons who choose not to enter the labor market. The total population is thus $m + n$, and the active labor force ratio is $n/(m + n)$. I will denote by π the “dependency ratio” of the economy defined as $\pi = m/n$, which represents the ratio of outsiders to the labor force.

Building on an important distinction introduced by the comparative literature on social protection, the model distinguishes between “social services,” such as education and publicly provided child care, and social transfers, which include unemployment benefits, pensions, and disability benefits. To simplify notations, I will assume that the level of generosity is the same across all major welfare state transfer programs, and I will denote this level of benefits by b . In particular, the same level of benefits is available to both labor-force outsiders and insiders. Total social transfers to union members are equal to bn , whereas total transfers to outsiders equal bm .

Social transfers and services are financed through taxation. The model assumes that the level of publicly provided social services (denoted by S) is endogenously determined. I will assume that in equation 6, the level of services (S) is chosen *after* the existing transfers to union members and to the nonactive population are financed. Another reformulation of this assumption is that passive social policy expenditures are already committed, due to their entitlement-based character, while services are more discretionary in nature.

The above discussion can be summarized in a budget-constraint equation determining the balance between total social policy expenditures and tax receipts. The left-hand side of equation 1 comprises the three main categories of welfare state expenditures: transfers to the nonactive population, unemployment benefits to union members who are out of work, and social services. The right-hand side of the equation summarizes the taxes that are available to finance these expenditures:

$$bm + b \sum_{i=1}^I \sum_{j=1}^J \left(\frac{n}{N} - a_{ij} \right) + S = (\tau_U + \tau_E) \sum_{i=1}^I \sum_{j=1}^J a_{ij} w_{ij} \quad (1)$$

In this equation, a_{ij} denotes the equilibrium employment level for members of union ij , and w_{ij} denotes the equilibrium wage. Social policy expenditures are financed by two broad categories of revenue— income taxes (paid by union members) and payroll taxes (paid by unions and employers). The model does not take into account the importance of corporate taxes. The empirical justification for this assumption is the modest role played by corporate taxes in financing social policy expenditures in OECD countries. The right-hand side of equation 1 accounts for the fact that both union members and employers pay taxes ($\tau = \tau_U + \tau_E$). I will assume that the ratio of taxes paid by capital and labor is fixed throughout the game.

From equation 1 (the tax balance equation), we can derive the level of services available in the economy as

$$S = (\tau_U + \tau_E) \sum_{i=1}^I \sum_{j=1}^J a_{ij} w_{ij} + b \sum_{i=1}^I \sum_{j=1}^J a_{ij} - b(m + n). \quad (2)$$

Social services play an important role in the overall demands of trade unions. According to several studies by political scientists and sociologists, the expansion of most welfare states in advanced industrialized democracies was premised on a political exchange between unions and governments in which unions exercised wage restraint in exchange for the expansion of social policy programs. To model this political exchange, I will assume that the objective function of a trade union includes not only wages and social policy transfers to union members but also social services. For simplicity, I assume that services are divided equally among all members of the population. Given that each union has a total of n/N members and that the total size of the population is $m + n$, it follows that the social services received by the individual union are $\frac{1}{N} \frac{n}{n+m} S$. This implies that the ability of trade unions to internalize the provision of services and collectively exercise wage restraint is influenced by the degree of centralization of the labor movement and by the share of active labor-force participants in the total population. The higher the number of trade unions in the economy (N) and the higher the share of the inactive population (m) receiving social policy transfers, the lower is the ability of trade unions to internalize the provision of services.

We can now fully specify unions' utility function. As discussed above, the key assumption of the model is that three broad objectives enter the calculation of the trade unions: the net (that is, after-tax) level of wages, the passive transfers to union members, and the level of public services available to union members.

Since unions care about the *real* level of wages and social policy benefits, it is important to divide the net utility derived by union members by the aggregate price level in the economy. Following Soskice and Iversen, I assume that the aggregate price level of the economy is a function of the degree of the accommodation of the monetary authority.¹⁴ Let the parameter β denote the level of monetary nonaccommodation. The parameter β takes values between 0 and 1. In the case of a totally nonaccommodating monetary regime, $\beta = 1$; β decreases as the level of monetary nonaccommodation decreases.¹⁵ Dividing by the aggregate price level of the economy, the utility of trade unions becomes

$$U_{ij}^U = \frac{1}{P^\beta} \left[\underbrace{(1 - \tau_U)w_{ij}a_{ij}}_{\text{NET WAGES}} + \underbrace{\left(\frac{n}{IJ} - a_{ij}\right)b}_{\text{TRANSFERS TO UNION MEMBERS}} + \underbrace{\frac{1}{IJ} \frac{n}{m+n} S}_{\text{SOCIAL SERVICES}} \right] \quad (3)$$

3. EQUILIBRIUM EMPLOYMENT AND WAGES

Unions' optimal wage demands can be derived through a standard backward induction logic. I focus here on the main steps; detailed computations are given in the appendix.

Optimal consumption (given prices) is derived from a CES (constant elasticity of substitution) utility function, as in Calmfors and Driffill. In this setup, σ denotes the elasticity of substitution among goods produced within one sector (assumed to be the same for all sectors), and ρ is the elasticity of substitution *among* sectors. Once optimal output is determined, firms' optimal prices are computed, and the choice of a simple technology function determines the resulting employment. I closely follow the approach in Mas-Colell for this part (see section 1 in the appendix).¹⁶

The final key step is finding the unions' optimal wage demands. Given that the wage demands of trade unions are conditional upon the

¹⁴I follow both the assumption of Iversen (fn. 10, 1999) and that of Iversen and Soskice; see Torben Iversen and David Soskice, "Monetary Integration, Partisanship and Macroeconomic Policy" (Paper presented at the annual meeting of the American Political Science Association, Atlanta, Ga., 1999), 5. To make the comparison of the results easier, I use the same notation.

¹⁵Iversen and Soskice (fn. 14) reformulate this assumption as follows. Assume $M = P^{1-\beta}$ where M is the nominal money supply, P is the aggregate price level, and β is the parameter measuring the degree to which the central bank follows a nonaccommodating policy rule. "If the central bank it completely accommodating, the central bank fixes the real money supply by setting M equal to the price level, whereas if the central bank is completely non-accommodating, it fixes the nominal money supply and sets M equal to unity" (p. 5). In other words, in the case of nonaccommodating monetary policy ($\beta = 1$), the money supply is independent of the price level, while in the case of accommodating monetary policy ($\beta = 0$), the money supply is set equal to the price level.

¹⁶Andreu Mas-Colell, *Microeconomic Theory* (New York: Oxford University Press, 1995), chap. 3.

level of services provided by the government, we need to substitute equation 2, which expresses the level of services provided by the government into unions' utility function (equation 3). The complete derivation of the equilibrium wage is presented in section 2 of the appendix. For simplicity, I consider only symmetric equilibria, in which all unions make the same wage demand. The result is

Proposition 1. (a) In a symmetric equilibrium, the total level of employment is given by

$$a^{\text{SYM}} = \frac{E(\sigma - 1)}{b\sigma} \frac{[I((J-1)\sigma - J) + (I-1)\rho + 1 + \beta \frac{\pi}{1+\pi}] \frac{1}{1+\tau_U} + \frac{\beta}{1+\pi}}{I(J-1)\sigma + (I-1)\rho + (1+\beta) \frac{\pi}{1+\pi}} \quad (4)$$

b) The optimal wage demand of trade unions is given by

$$w^{\text{SYM}} = b \frac{I(J-1)\sigma + (I-1)\rho + (1+\beta) \frac{\pi}{1+\pi}}{[I((J-1)\sigma - J) + (I-1)\rho + 1 + \beta \frac{\pi}{1+\pi}](1 - \tau_U) + \frac{\beta}{1+\pi}(1 + \tau_E)} \quad (5)$$

Before exploring the implications of the result, it is important to return to the assumption that distinguishes this model from existing models of wage bargaining. The main difference lies in the assumption about the utility of trade unions. Existing models assume that unions care about wages (Iversen and Soskice) or about wages and unemployment benefits for union members who are out of work (Calmfors and Driffill).¹⁷ This article assumes by contrast that social policy considerations are an important component of the utility of trade unions. Thus, in addition to wages and social policy benefits for their members, the objective function of trade unions used in this model includes a third component—denoting unions' concern for social policy. More formally, the difference between this model and the Calmfors and Driffill model can be written as follows. The utility of a trade union that cares only about wages and unemployment benefits (denoted by U^{CD}) can be written as

$$U_{ij}^{CD} = \frac{1}{P^\beta} \left[(1 - \tau_U) w_{ij} + \left(\frac{n}{J} - a_{ij} \right) b \right] \quad (6)$$

¹⁷Iversen and Soskice (fn. 14) assume that the union in sector i is $U_i = w_i^\alpha \cdot e_i$, where w_i^α is the average wage for the union members in this sector and e_i is the employment rate in sector i (p. 7); Calmfors and Driffill (fn. 8).

This article assumes, however, that trade unions also derive utility from social services, as modeled in the last term of equation 3. How does this additional assumption about the utility of trade unions affect the predictions about the level of unemployment? To answer this question, we need to study the impact of the additional term in the utility of trade unions on wages (and then employment). If we denote the additional term by U_s (shorthand for the “social services component”), section 2 of the appendix demonstrates that

Proposition 2. (a) $\partial U_s / \partial w < 0$. Consequently, the wage demands of unions that internalize concerns about the provision of social services are lower than the wage demands of unions that care only about the real wages and unemployment benefits of their members. (b) $\partial^2 U_s / \partial w \partial I > 0$ and $\partial^2 U_s / \partial w \partial J > 0$. The effect in (a) is more pronounced in economies with more centralized systems of wage bargaining (for both intra- and cross-sectoral centralization).

The result formalizes an observation of the corporatist literature, which argues that an important political exchange between unions and governments underpinned welfare state expansion during the first decades of the postwar period.¹⁸ In exchange for the expansion of social programs (the expansion of the social wage), unions delivered wage restraint. The institutional structure of the wage-bargaining system affects the employment consequences of this collective wage restraint: employment is highest in economies with the most centralized levels of wage bargaining (since $\partial U_s / \partial w$ becomes more negative as N decreases, the wage restraint effect is more pronounced). Note also that in the limit case of extremely *decentralized* labor markets (when N is very large), the provision of social services has no impact on the equilibrium level of employment as $U_s \rightarrow 0$ due to the presence of $N = IJ$ in the denominator. In this case, the model of this article reduces to the Calmfors and Driffill model. Summarizing these results, Figure 3 contrasts the employment predictions of this model against those of Calmfors and Driffill.

4. COMPARATIVE STATICS

We are now ready to explore some of the implications of the equilibrium results of proposition 1. Why has the employment performance of European economies deteriorated so dramatically during recent decades? What factors explain cross-national variation in the levels of unemployment? To answer these questions, one has to consider changes in the structure of welfare state commitments, as well as trends

¹⁸For a formulation of these arguments by “corporatist scholars,” see Cameron (fn. 7); and Esping-Andersen (fn. 7).

Equilibrium Employment (a)

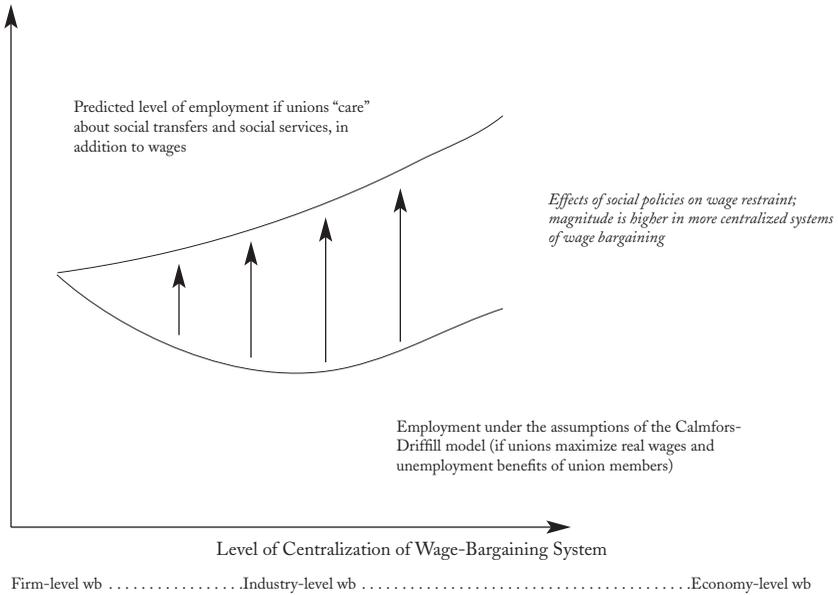


FIGURE 3
RELATIONSHIP BETWEEN EMPLOYMENT AND CENTRALIZATION OF WAGE-BARGAINING SYSTEM UNDER DIFFERENT ASSUMPTIONS ABOUT THE UTILITY OF TRADE UNIONS

in macroeconomic policy. I focus on three aspects: the increase in the number of labor-market outsiders, the increase in the level of taxes, and the shift toward less accommodating monetary policies.

The comparative statics of the model can be summarized as

Proposition 3. (a) $\partial a^{SYM} / \partial \pi < 0$. An increase in the number of labor market outsiders (dependency ratio) lowers the equilibrium employment. (b) $\partial a^{SYM} / \partial \tau < 0$. An increase in the level of taxes hurts employment. (c) $\partial a^{SYM} / \partial \beta > 0$. An increase in monetary nonaccommodation promotes employment.

The results in proposition 3 explore the determinants of unemployment in OECD economies. The results of proposition 3c are in agreement with the Soskice-Iversen finding, suggesting that the transition to a nonaccommodating monetary regime has a beneficial impact on the equilibrium level of unemployment. The underlying theoretical logic is the same as in the Soskice-Iversen setup: unions have a stronger incentive to moderate their wage demands, if the monetary authority

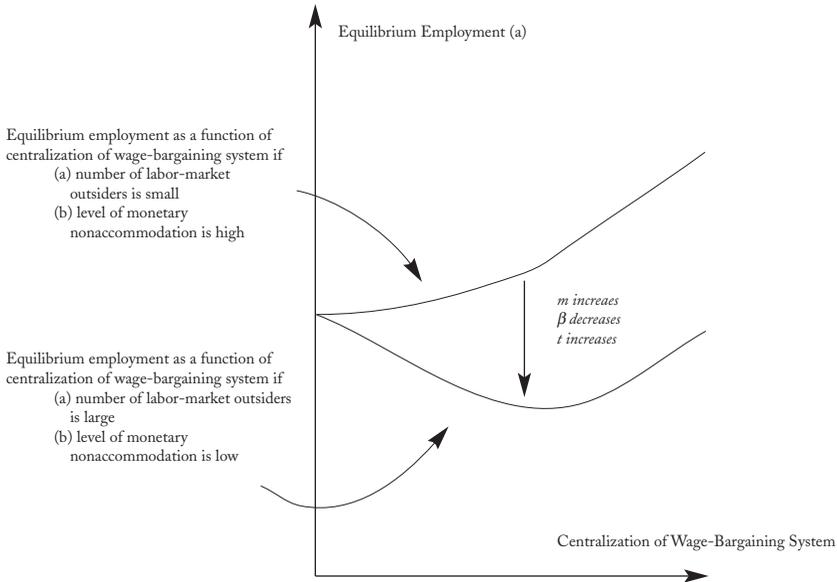


FIGURE 4

PREDICTED LEVEL OF EMPLOYMENT AS A FUNCTION OF (a) CENTRALIZATION OF THE WAGE-BARGAINING SYSTEM (b) DEGREE OF ACCOMMODATION OF MONETARY REGIME, (c) NUMBER OF LABOR-MARKET OUTSIDERS

does not accommodate price increases by a lax policy. The results in proposition 3a and 3b point to mechanisms that work in the opposite direction, leading to an increase in the equilibrium level of unemployment. Unemployment is rising as a consequence of higher taxes and a higher share of social policy expenditures devoted to labor-market outsiders. The key result of the model is that the process of welfare state maturation gradually undermines the political exchange among trade unions and governments based on wage restraint in exchange for social policy expansion. (See Figure 4.)

To explore the precise mechanism by which the change in the composition of the welfare state mix undermines unions' capacity to deliver wage restraint, consider again the budget-constraint equation (equation 1), as well as the equation specifying the utility of trade unions (equation 3). The worsening of the dependency ratio and the increase in the number of labor-market outsiders are modeled as an increase in the parameter m . As a result the first term in equation 1 (bm)—modeling the level of social policy expenditures devoted to labor-market outsiders—increases. As a consequence of this change in the composition of social

policy commitments, the level of social policy expenditures devoted to the public provision of social services (S) declines. Returning now to equation 3, this decline in the level of publicly provided social services contributes to a reduction of the third component of the utility of unions. Proposition 2 has shown that unions' concern for the provision of social services promotes wage restraint. It follows that a reduction in the level of social services (as a result of an increase in the level of transfers to labor market outsiders) undermines the incentives of unions to deliver wage moderation.

The growth in the level of taxes has two consequences for the level of employment. On the one hand, higher taxes reduce the net wages of union members. Unless all social policy expenditures are returned to union members only (that is, the term bm equals zero), the rational wage strategy of trade unions is to demand higher wages to compensate for this loss in income. On the other hand, the increase in the level of taxes decreases the effectiveness of the wage policy in affecting employment, by lowering the sensitivity of employment to taxes. Given a high level of taxes, unions' wage choices affect only a very small fraction of the total wage bill. Thus, even high cuts in the take-home pay of union members are likely to have only a modest effect in lowering unemployment. In combination, both developments lower the effectiveness of the "political exchange" premised on wage moderation in exchange for social policy expansion in mature welfare states.

What is the impact of the centralization of the wage-bargaining system on the equilibrium level of unemployment? I have deliberately set this aspect aside, as the literature offers competing views about the shape of the unemployment curve as a function of centralization. Whereas a number of studies advocate a monotonic dependence, with totally centralized systems performing best,¹⁹ the Calmfors-Driffill paper supports the idea of a hump-shaped dependence. It is important to point out that, from the point of view of the formal model, even the Calmfors and Driffill model allows both possibilities;²⁰ the hump-shaped dependence is present only under conditions that require at least the distinction between intrasectoral and intersectoral centralization modeled in a two-level economy. The technical details are elaborated in section 3 of the appendix, so here I will summarize only the key ideas.

¹⁹For these views, see Michael Bruno and Jeffrey Sachs, *Economics of Worldwide Stagflation* (Cambridge: Harvard University Press, 1985); Cameron (fn. 7); and David Soskice, "Wage Determination: The Changing Role of Institutions in Advanced Industrialized Societies," *Oxford Review of Economic Policy* 6, no. 4 (1990), 36–61.

²⁰See Calmfors and Driffill (fn. 8).

Proposition 4. (a) Under suitable technical conditions, $\partial a^{SYM}/\partial I < 0$ and $\partial a^{SYM}/\partial J > 0$, that is, equilibrium employment is a U-shaped function of centralization. (b) The U shape is less pronounced than in the Calmfors–Driffill approach, that is, if we denote the corresponding quantities in the Calmfors and Driffill model by $()^{CD}$ then

$$\frac{\partial a^{SYM}}{\partial I} < \left(\frac{\partial a^{SYM}}{\partial I} \right)^{CD} \quad \text{and} \quad \frac{\partial a^{SYM}}{\partial J} < \left(\frac{\partial a^{SYM}}{\partial J} \right)^{CD}. \quad (3)$$

The objective of this article is *not* to resolve the existing theoretical and empirical controversy about the functional specification of the relationship between the centralization of the wage-bargaining system and the level of unemployment. As I have shown elsewhere, most of the theoretical disagreement can be traced back to highly technical assumptions about the relative wage elasticities of demand.²¹ This article relies on the Calmfors–Driffill model as the baseline model because it is the more general case: using its technical assumptions one can obtain the linear case predicting a monotonic relationship between the centralization of the wage-bargaining system and the level of unemployment as a limit case. The reverse, however, is not true: one cannot obtain a nonmonotonic relationship between the centralization of the wage-bargaining system and the level of unemployment by starting from the assumptions about constant wage elasticity made, for example, by Soskice and Iversen. The main point of the analysis is, rather, to demonstrate that an increase in the level of taxes and in the number of labor-market outsiders pushes the Calmfors–Driffill curve upward, resulting in higher levels of unemployment. Cross-national and intertemporal variation in the employment performance of OECD economies can be predicted by a combination of three factors: (1) wage-bargaining institutions, (2) monetary policy, and (3) the welfare state. Adding welfare state parameters to existing wage-bargaining models allows us to explain *both* cross-national and intertemporal variation in the level of unemployment.

²¹More specifically, the models make different assumptions about the relative wage elasticities of demand, in other words, about the effects of changes in the level of wages in one sector on the level of employment in another sector. The models predicting a monotonic relationship between the centralization of the wage-bargaining system and the level of unemployment assume that changes in the level of wages in one union will have the same effect on the level of demand (and thus employment) in the remaining $N-1$ unions in the economy. By contrast, the Calmfors–Driffill model assumes that changes in the level of wages of one union will have different effects on the level of employment across different unions. Isabela Mares, *Taxation, Wage Bargaining and Unemployment* (New York: Cambridge University Press, forthcoming), chap. 2.

A CROSS-NATIONAL ANALYSIS

The model developed in this article yields implications about cross-national and temporal differences in the employment performance of advanced industrialized economies. I now turn to a test of the macrolevel hypotheses for unemployment,²² using time-series data for fourteen OECD economies, covering the period between 1960 and 1995.²³ Data availability on the incidence of tax rates has limited the number of cases in the analysis.

The goal of this section is to test three empirical predictions of the model. First, I test the prediction of a hump-shaped relationship between labor-market institutions and the level of unemployment. As hypothesized, economies with intermediately centralized wage-bargaining systems will have an employment performance that is inferior to the performance of economies with highly centralized or highly decentralized labor-market institutions. Second, an increase in the level of monetary nonaccommodation is expected to lower the level of unemployment. Finally, I test the implications of the model concerning the impact of the growth and maturation of the welfare state on the level of unemployment. An increase in the level of expenditures devoted to labor-market outsiders and an increase in the level of taxes is expected to shift the Calmfors-Driffill curve upward and to contribute to increased unemployment.

To test the first proposition we can, fortunately, rely on an extensive empirical literature measuring cross-national differences in the structure of labor-market institutions.²⁴ Recent research has generated increasingly sophisticated measures that capture cross-national differences in the level of centralization of wage-bargaining authority, the concentration of union membership, and the level of union density. While the available indices show a relatively high level of correlation, they still reflect differences in expert judgment among the various individuals or teams responsible with the coding effort.²⁵ Rather than de-

²²Given that the predictions of the theoretical model developed in this article extend (and challenge) the work of Calmfors and Driffill and Iversen and Soskice, the article pursues the same empirical strategy as the earlier research. I too test the model using unemployment as the dependent variable.

²³The countries included in the analysis are Austria, Belgium, Canada, Denmark, Finland, France, Germany, Italy, Japan, Netherlands, Norway, Sweden, Switzerland, the United Kingdom, and the United States. As is standard in the literature, I use four-year averages for each country; Iversen (fn. 10, 1998, 1999).

²⁴For an overview of these recent measures, see Lane Kenworthy, "Wage-Setting Measures: A Survey and Assessment," *World Politics* 54 (October 2001).

²⁵Miriam Golden, "The Dynamics of Trade Unionism and National Economic Performance," *American Political Science Review* 87, no. 2 (1993), 444.

veloping a new measure of the centralization of the wage-bargaining system, I have opted for a strategy that averages eight of the most widely used measures. These have been developed by Schmitter,²⁶ Cameron,²⁷ Calmfors and Driffill,²⁸ Iversen,²⁹ Hall and Franzese,³⁰ Traxler and Kittel,³¹ Golden, Lange, and Wallerstein,³² and the OECD.³³ This strategy has a number of advantages. First, it incorporates the expertise that has been accumulated over the past twenty years. The index used here combines some of the earliest measures of labor-market institutions (developed by Schmitter and Cameron more than two decades ago) with measures developed more recently. Second, as Miriam Golden has pointed out, existing differences in measurement reflect differences in expert judgment among the various individuals or teams responsible for the coding effort.³⁴ Averaging these measures can remove some of the measurement bias of individual scores. The centralization of the wage-bargaining index has been constructed as follows. For each of the individual indices, I order economies along a continuum from those with the most centralized labor-market institutions (which take low values on the centralization score) to those with

²⁶Philippe Schmitter. "Interest Intermediation and Regime Governability in Contemporary Western Europe and North America," in Suzanne Berger, ed., *Organizing Interests in Western Europe: Pluralism, Corporatism and the Transformation of Politics* (Cambridge: Cambridge University Press, 1981). Schmitter's "corporatism score" measures both the organizational centralization and the associational monopoly of the labor movement. While the first term is a measure of the level of the wage-bargaining authority, the second term captures the number and importance of competing unions at each level of bargaining or what Golden refers to as "union monopoly"; Golden (fn. 25), 444.

²⁷Cameron (fn. 7). Cameron aggregates three institutional characteristics of the labor movement: the power of the labor confederation in collective bargaining (a proxy for the locus of decision-making authority), the "organizational unity of labor" (a measure of union monopoly), and an average measure of union density.

²⁸Calmfors and Driffill (fn. 8), 52–53. Calmfors and Driffill measure the level of bargaining and the degree of coordination within organizations on both the union and the employer side.

²⁹Iversen (fn. 10, 1999), 83. Iversen's measure of centralization is computed as $(\sum w_j p_{ij}^2)^{\frac{1}{2}}$, where w_j is the weight accorded to each bargaining level j and p_{ij} is the share of workers covered by union (or federation) i at level j .

³⁰Hall and Franzese (fn. 10), 530.

³¹Franz Traxler and Bernhard Kittel, "The Bargaining System and Performance: A Comparison of Eighteen OECD Countries," *Comparative Political Studies* 33, no. 9 (2000). I used the "bargaining centralization" index from the Traxler/Kittel data set.

³²Miriam Golden, Peter Lange, and Michael Wallerstein, "Union Centralization among Advanced Industrial Societies: An Empirical Study," Data set from <http://www.shelley.polisci.ucla.edu/data> (downloaded November 1998). I have used the "overall wage-setting centralization" measure from the Golden, Lange, Wallerstein data set. To create a time-invariant measure, I have recoded the Golden, Lange, Wallerstein measure as follows. First, I created a time-invariant score for each country. Next, I rank ordered the economies (with economies having the most centralized labor-market institutions taking the highest values on this centralization score).

³³The OECD measure of centralization of wage bargaining is computed as the average of two separate indices: a bargaining centralization index and a "coordination index"; see OECD, *Employment Outlook* (Paris: OECD, 1997), 71.

³⁴Golden (fn. 25), 444.

the most centralized labor-market institutions (which take high values on the centralization score).³⁵ I then average these indices. Table 1 presents a rank ordering of individual countries according to the degree of centralization of labor-market institutions and the average of the eight different indices that is used in the analysis.

I begin by displaying some simple cross-tabulations, which describe patterns in the data. Table 2 presents data on the employment performance of economies featuring different levels of coordination of the wage-bargaining system. The countries with decentralized labor markets have an average centralization score higher than 10 and include Canada, the U.K., the U.S., France, and Switzerland. Countries with a centralization score lower than 2.5 (Austria, Sweden, and Norway) are ranked as highly centralized. The remaining six cases (Belgium, Denmark, Finland, Germany, Italy, and the Netherlands) are classified as intermediately centralized.³⁶ The figures in Table 2 provide initial support for one of the hypotheses of the model. The employment performance of economies with intermediately centralized institutions of wage bargaining is inferior to the performance of economies with either extremely centralized or extremely decentralized labor-market institutions. While the level of unemployment has risen in all economies, it is those with intermediately centralized institutions of wage bargaining that have experienced the strongest deterioration in economic performance. Average levels of unemployment rose by 1.67 percent in economies with highly centralized labor markets, by about 4 percent in economies with firm-level wage bargaining, and by 5.33 percent in economies with intermediately centralized institutions of wage bargaining.

I next test the implications of the model based on pooled cross-sectional time-series analysis. Following a recent approach to this type of analysis, I use ordinary least squares (OLS) regression with a lagged dependent variable and panel-corrected standard errors to take account of potential problems of heteroskedasticity in the data.³⁷ Omitting all controls, the simplest regression model is

$$U_{i,t} = a_i + b_1 U_{i,t-1} + b_2 CWB_i + b_3 CWB_i^2 + b_4 TRANSFERS.TO.OUTSIDERS_{i,t-1} + b_5 MONETNONACC_i + TIMETREND + b_5 \epsilon_{i,t}$$

³⁵I average the time-varying indices, such as Iversen (fn. 10) and Golden-Lange-Wallerstein (fn. 32).

³⁶Denmark and Finland are, of course, borderline cases. For a discussion of the "organizational fragmentation and the conflictual labour relations" in Finland, see Bernhard Ebbinghaus and Jelle Visser, *Trade Unions in Western Europe since 1945* (London: Macmillan, 2000), 201.

³⁷Nathaniel Beck and Jonathan Katz, "What to Do (and Not to Do) with Time-Series Cross-Section Data," *American Political Science Review* 89, no. 3 (1995).

TABLE 1
CENTRALIZATION OF WAGE BARGAINING

	Schmitter (1981)	Cameron (1984)	Calmfors- Driffill (1988)	Iversen (1999)	Hall and Franzese (1988)	OECD (1994, 1997)	Traxler and Kittel (2000)	Golden, Lange, Wallerstein (1998)	Average
Austria	1	3	1	5	1	1	6	8	3.25
Belgium	7	4	8	8	8	7	11	7	7.5
Canada	11	12	13	13	12	14	14	13	12.75
Denmark	4	6	4	3	4	5	5	2	4.125
Finland	4	5	5	4	4	6	2	6	4.5
France	12	14	9	12	10	10	10	9	10.75
Germany	8	8	6	7	4	3	8	10	6.75
Italy	15	11	11	10	10	9	4	5	9.25
Norway	2	2	2	1	1	2	1	1	1.5
Netherlands	6	7	7	6	8	10	8	4	7.00
Sweden	4	1	3	2	1	4	3	3	2.625
Switzerland	9	10	12	10	4	10	6	10	8.75
U.K.	13	9	10	11	12	8	12	12	10.875
U.S.A.	11	13	14	14	12	14	14	14	13.25

SOURCES: Schmitter (fn. 26), 284; Cameron (fn. 7), 165; Calmfors and Driffill (fn. 8), 52-53; Iversen (fn. 10, 1999), 56; Hall and Franzese (fn. 10), 530; Traxler and Kittel (fn. 31), 1164-67; OECD (fn. 33), 71; Golden Lange, and Wallerstein (fn. 32).

TABLE 2
 AVERAGE LEVELS OF UNEMPLOYMENT IN OECD ECONOMIES UNDER
 ALTERNATIVE WAGE-BARGAINING ARRANGEMENTS AND SOCIAL
 POLICY ARRANGEMENTS

Time Period	Level of Unemployment		
	Centralization of Wage-Bargaining System		
	Decentralized ^a	Intermediately Centralized ^b	Highly Centralized ^c
1960–75	3.04	3.135	1.49
1976–95	6.986	8.4616	3.166

^aDecentralized countries: U.K., U.S., France, and Switzerland (centralization score > 10).

^bIntermediately centralized countries: Belgium, Denmark, Finland, Germany, Italy, Netherlands.

^cHighly centralized countries: Austria, Norway, Sweden (centralization score < 4.0).

where $U_{i,t}$ is the unemployment rate for country i at period t , CWB_i is the index measuring the level of centralization of the wage-bargaining system, $TRANSFERS.TO.OUTSIDERS_{i,t-1}$ is a measure of social policy transfers to outsiders (lagged by one period), $MONETNONACC_i$ a measure of the monetary nonaccommodation, and $\varepsilon_{i,t}$ is an error term. The predictions about the impact of the structure of wage-bargaining systems on the level of unemployment imply that the signs of the coefficients b_2 and b_3 should be + and –, respectively. All specifications also include a time trend (*TIMETREND*) that attempts to capture the effect of variables that are not directly observable but that are correlated with time and might affect the dependent variable. In a second set of models, I estimate both the impact of the growth in the level of taxes and the impact of the growth in the level of expenditures devoted to labor-market outsiders on the level of unemployment.

The variable *MONETNONACC* operationalizes the degree of monetary nonaccommodation of the government (parameter β of the model). I have relied on Iversen's measure of the degree of conservatism monetary policy regime.³⁸ Table 3 presents the values of the Iversen's hard currency index for the countries in the sample. The empirical results are virtually unchanged if one uses the measure of central bank independence developed by Robert Franzese, which is an average of frequently used indices.³⁹

³⁸For the development of this measure, see Iversen (fn. 10, 1999), 57–60.

³⁹Robert Franzese, *Macroeconomic Policies of Developed Democracies* (New York: Cambridge University Press, 2002).

TABLE 3
COUNTRY AVERAGES

COUNTRY	UNEM	CHB	MONET/NONACC	TAX RATE	TRANSFERS TO OUTSIDERS	LEFT CAB	COGRAFTY	OPEN	CAPFLOWS
Austria	2.4	3.25	.52	38.14	0.38	67.9	2.4	65.9	13.60
Belgium	7.4	7.5	.47	40.10	1.26	30.6	2.9	108.1	46.21
Canada	7.6	12.75	.35	23.4	0.75		3.4	48.4	11.68
Denmark	6.1	4.125	.42	33.55	0.53	52.3	2.9	63.2	18.76
Finland	5.0	4.5	.38	28.8	0.13	37.4	2.7	52.5	14.29
France	5.4	10.75	.39	39.36	0.65	27.5	3.5	37.3	11.47
Germany	4.4	6.75	.60	36.95	0.50	34.2	3.2	51.5	10.79
Italy	7.9	9.25	.29	34.5	0.34	14.2	2.8	38.2	13.77
Norway	2.4	1.5	.40	38.55	0.06	66.3	2.5	81.9	18.66
Netherlands	5.3	7	.54	47.1	1.91	17.9	3	98.2	21.98
Sweden	2.4	2.625	.29	47.65	0.1	72.5	2.3	55.8	19.60
Switzerland	0.7	8.75	.67	29.1	0.07	29.3	3.4	66.6	15.96
U.K.	6.4	10.875	.15	25.7	0.21	30.1	3.4	48.9	22.94
U.S.A.	6.1	13.25	.47	27.2	0.38		3.6	15.9	5.03
Mean	4.77	7.34	0.44	33.22	0.47	32.11	3.06	57.04	16.87
St.Dev.	3.48	3.63	0.147	9.12	0.54	33.96	0.643	26.43	17.33

The model developed in this article predicts that both the growth in the level of taxes and an increase in the social policy transfers going to labor-market outsiders have an adverse impact on the employment performance of OECD economies. A few considerations about the operationalization of the variable denoting social policy expenditures going to labor-market outsiders are necessary at this point. To meet the definition of labor-market outsiders proposed by this model, two separate criteria must be met. First, these labor-market groups have to receive some benefits, such as unemployment benefits, long-term disability benefits, and so on. The second criterion ascribing groups to the outsider category is intrinsic to unions' choices. If unions are unwilling to forgo wage increases in exchange for increases in the social policy transfers, then the group can be classified as labor-market outsiders. By contrast, if unions respond to an increase in the social policy benefits by moderating their wage demands, the group cannot be classified as outsiders, and an increase in expenditures devoted to this group is not expected to lead to an increase in unemployment.

To establish the boundaries of this group, I began by separating demographic and labor-market outsiders. Let *demographic outsiders* be defined as persons aged over sixty-five. By contrast, *labor-market outsiders* are persons who fulfill the age requirement for participation in the labor market (that is, persons between eighteen and sixty-five) but who are not in the labor force.⁴⁰ I computed the ratio of demographic and labor-market outsiders to the working-age population based on data reported in OECD statistics (various years). To estimate the expenditures devoted to demographic and labor-market outsiders, respectively, I multiplied the resulting number by the level of expenditures on pensions (for demographic outsiders) and unemployment benefits (for labor-market outsiders). Next, I ran a number of preliminary statistical analyses to determine which variable has a significant effect on the level of unemployment. The results of these preliminary analyses (reported in Table 4) suggest that only expenditures on labor-market outsiders have a statistically significant positive impact on the level of unemployment. By contrast, transfers going to demographic outsiders do not have a statistically significant effect on unemployment.⁴¹ These findings suggest that unions approach labor-market and demographic outsiders in different ways. While unions are willing to respond to an increase in benefits to demographic outsiders by exercising a policy of wage mod-

⁴⁰I am grateful to an anonymous reviewer for recommending this strategy.

⁴¹These results are robust to the inclusion of a number of additional control variables. For additional results, see Mares (fn. 21).

TABLE 4
WHO ARE OUTSIDERS? DEMOGRAPHIC VERSUS LABOR-MARKET OUTSIDERS

<i>Variables</i>	<i>Predicted Sign</i>	<i>Regression Estimates and Standard Errors</i>	
		<i>Model 1</i>	<i>Model 2</i>
CONSTANT		-3.13 (2.13)	-2.21 (2.77)
UNEM _{<i>i,t-1</i>}		0.90*** (0.12)	0.75*** (0.15)
CWB _{<i>i</i>}	+	0.41** (0.17)	0.45** (0.22)
CWB _{<i>i</i>} ²	-	-0.02** (0.11)	-0.02** (0.01)
MONETNONACC _{<i>i</i>}	-	-1.67** (0.74)	-2.38** (1.11)
TRANSFERS.TO.DEMOGRAPHIC.OUTSIDERS _{<i>i,t-1</i>}	+	0.22 (0.72)	
TRANSFERS.TO.LABOR.MARKET.OUTSIDERS _{<i>i,t-1</i>}	+		0.86*** (0.27)
TIME TREND		0.37 (0.28)	0.33 (0.34)
N		73	73
Adj.R ²		0.89	0.83

*** p<0.01; ** p<0.05; *p<0.1; period dummies included, not reported; standard errors in parentheses

eration, they are unwilling to exercise the same restraint in the case of an increase in expenditures to labor-market outsiders. Several qualitative studies—analyzing the linkages between pension reforms and unions' wage strategies—have reported results that are in agreement with this finding.⁴²

In the extended models (reported in Tables 5 and 6), the variable *TRANSFERS.TO.OUTSIDERS* measures expenditures for labor-market outsiders (and attempts to capture the parameter *bm* of the theoretical model). To avoid potential endogeneity problems, I have lagged the variable by one period in all empirical estimations. Descriptive statistics (and country summaries) are presented in Table 3. As discussed above, one expects a positive relationship between this variable and the level of unemployment.

⁴²See Lucio Baccaro, "The Organizational Consequences of Democracy: Labor Unions and Economic Reforms in Contemporary Italy" (Ph.D. diss., Sloan School of Management, MIT, 1999); Julia Lynch and Karen Anderson, "Internal Institutions and the Policy Preferences of Organized Labor: The Effects of Workforce Aging on Unions' Support for Pension Reform" (Paper presented at the Conference of Europeanists, Chicago, April 2004).

The second pathway by which the growth in the level of social policy commitments affects the level of unemployment is through growth in the tax burden. As a recent survey of empirical estimates of tax rates in OECD economies points out, the calculation of tax ratios poses immense methodological challenges because of the complexity of tax codes.⁴³ The most widely used measures for marginal effective tax rates were developed by Mendoza, Razin, and Tesar and serve as the basis for tax measures used by the European Commission and the OECD.⁴⁴ The tax measure used in this article is the effective average labor tax rate developed by Mendoza, Razin, and Tesar. The time series used in the empirical analysis updates Mendoza's measure and has been developed (and generously provided) by Tom Cusack.⁴⁵ To avoid potential endogeneity problems, I have lagged the tax measures by one period ($TAXRATE_{i,t-1}$).

I have added a number of political and economic control variables to the analysis. The first variable *LEFTCAB* is a measure of the number of cabinet seats held by left-wing parties as a percentage of all cabinet portfolios. The variable has been developed by Huber, Ragin, and Stephens using data compiled in Browne and Dreijmanis and Keesings' Contemporary Archives.⁴⁶ A vast body of research has shown that left-wing parties exhibit a higher level of concern for unemployment than

⁴³Bjorn Volkerink and Jacob de Haan, *Tax Ratios: A Critical Survey* (Paris: OECD, 2000); Bjorn Volkerink, Jan-Egbert Sturm, and Jacob de Haan, "Tax Ratios in Macroeconomics: Do Taxes Really Matter?" Working Paper 7/2001 (Madrid: European Economy Group, 2001); Eurostat (Statistical Office of the European Communities), *Structures of the Taxation Systems in the European Union, 1970–1995* (Luxembourg: Eurostat, 1997); European Commission, "Effective Taxation and Tax Convergence in the EU and the OECD," Memo 5/1997 (Brussels: Directorate General II of the European Commission, 1997); OECD, *Tax Burdens: Alternative Measures* (Paris: OECD, 2000).

⁴⁴Enrique Mendoza, Assaf Razin, and Linda Tesar, "Effective Tax Rates in Macroeconomics: Cross-Country Estimates of Tax Rates on Factor Incomes and Consumption," *Journal of Monetary Economics* 34, no. 2 (1994). The time series used in this model updates Mendoza's average labor tax rates series and has been developed and generously provided by Tom Cusack. Corporate taxes play only a minor role in financing the major welfare state programs; see Martin Schludi and Steffen Ganghoff, database (Cologne: Max-Planck Institute for the Study of Societies, 1998), Table 2.2.2.2. Thus, labor tax rates are an appropriate measure of the tax effort necessary to finance social policy commitments.

⁴⁵A number of recent papers have examined the impact of the growth in the tax burden on the employment performance of OECD economies. These papers differ, however, in the specification of the theoretical model and in the sample size. See Daveri and Tabellini, "Unemployment and Taxes," *Economic Policy* 15 (2000); Stephen Nickell and Richard Layard, "Labour Market Institutions and Economic Performance," in O. Ashenfelter, and D. Card, eds., *Handbook of Labour Economics* (Amsterdam: North Holland, 1999). In the case of Nickell and Layard, the sample consists of twenty OECD countries over two five-year periods, 1983–88 and 1989–94. Thus, the sample size is much smaller than the sample size of this article. Daveri and Tabellini examine fourteen countries over six five-year periods. The labor-market variables used in their analysis are a variable measuring employment protection and a variable measuring the duration of unemployment benefits. As such, they do not test hypotheses about the hump-shaped relationship between labor-market institutions and unemployment.

⁴⁶Evelyne Huber, Charles Ragin, and John Stephens, Comparative Welfare States Dataset, 1997, available at <http://www.lisproject.org/publications/welfaredata/welfaredata/welfareaccess.htm>, updated April 2004; Eric Browne and John Dreijmanis, eds., *Government Coalitions in Western Democracies* (New York: Logman, 1982).

TABLE 5
 OLS ESTIMATES OF IMPACT OF EXPENDITURES ON LABOR-MARKET OUTSIDERS
 ON THE LEVEL OF UNEMPLOYMENT
 (POOLED CROSS-SECTIONAL TIME SERIES 1960-95 WITH PANEL-CORRECTED
 STANDARD ERRORS)

Variables	Predicted Sign	Regression Estimates and Standard Errors				
		Model 1	Model 2	Model 3	Model 4	Model 5
CONSTANT		-2.21 (2.77)	-1.95 (2.93)	-2.73 (2.56)	-2.72 (2.72)	-2.11 (2.85)
UNEM _{i,t-1}		0.75*** (0.15)	0.74*** (0.16)	0.73*** (0.15)	0.79*** (0.15)	0.74*** (0.15)
CWB _i	+	0.45** (0.22)	0.45** (0.22)	0.45** (0.22)	0.44* (0.23)	0.47** (0.23)
CWB _i ²	-	-0.02** (0.01)	-0.02** (0.01)	-0.02** (0.01)	-0.02* (0.01)	-0.02** (0.01)
MONETNONACC _i	-	-2.38** (1.11)	-2.45** (1.09)	-2.65** (1.19)	-2.16* (1.10)	-2.56* (1.39)
TRANSFERS.TO.OUTSIDERS _{i,t-1}	+	0.86*** (0.27)	0.86*** (0.26)	0.91*** (0.31)	0.52* (0.31)	0.96** (0.41)
LEFTCAB _{i,t}			-0.00 (0.00)			
COGRAVITY _{i,t}				0.28 (0.49)		
OPEN _{i,t}	+				0.08* (0.00)	
CAPFLOWS _{i,t}	+					-0.00 (0.00)
TIME TREND		0.33 (0.34)	0.33 (0.34)	0.32 (0.34)	0.30 (0.33)	0.33 (0.35)
N		73	73	73	73	73
Adj.R ²		0.83	0.83	0.83	0.83	0.83

***p < 0.01; **p < 0.05; *p < 0.1; period effects are included, but not reported; standard errors in parentheses

do conservative parties and that the theoretical and empirical results are robust even under assumptions of rational expectations.⁴⁷ Thus, I expect a negative relationship between this variable and the equilibrium level of unemployment. The second political control variable, *COGRAVITY*, is a measure of the “center of gravity of the govern-

⁴⁷Douglas Hibbs, “Political Parties and Macroeconomic Policy,” *American Political Science Review* 71, no. 4 (1977); idem, “Partisan Theory after Fifteen Years,” *European Journal of Political Economy* 8 no. 2 (1992); Alberto Alesina, “Politics and Business Cycles in Industrial Democracies,” *Economic Policy* 8 (1989).

TABLE 6
OLS ESTIMATES OF IMPACT OF TAXES AND EXPENDITURES ON LABOR-MARKET
OUTSIDERS ON THE LEVEL OF UNEMPLOYMENT
(POOLED CROSS-SECTIONAL TIME SERIES 1960–95 WITH PANEL-CORRECTED
STANDARD ERRORS)

<i>Variables</i>	<i>Predicted Sign</i>	<i>Regression Estimates and Standard Errors</i>				
		<i>Model 1</i>	<i>Model 2</i>	<i>Model 3</i>	<i>Model 4</i>	<i>Model 5</i>
CONSTANT		-3.55 (2.68)	-3.38 (2.73)	-3.97 (2.72)	-3.67 (2.92)	-2.84 (2.92)
UNEM _{i,t-1}		0.71*** (0.17)	0.70*** (0.17)	0.70*** (0.16)	0.72*** (0.19)	0.66*** (0.17)
CWB _i		0.45** (0.19)	0.44** (0.19)	0.44** (0.19)	0.44** (0.20)	0.50** (0.20)
CWB _i ²	-	-0.02** (0.00)	-0.02** (0.00)	-0.02*** (0.00)	-0.02* (0.01)	-0.02** (0.01)
MONETNONACC _i	-	-2.77** (1.27)	-2.84** (1.22)	-2.94** (1.27)	-2.72* (1.39)	-3.59** (1.67)
TRANSFERS.TO.OUTSIDERS _{i,t-1}	+	1.32** (0.53)	1.30** (0.52)	1.32** (0.52)	1.24* (0.75)	1.90*** (0.64)
TAXES _{i,t-1}	+	0.03** (0.01)	0.03** (0.01)	0.03** (0.01)	0.03* (0.01)	0.02* (0.01)
LEFTCAB _{i,t}			-0.00 (0.00)			
COGRAVITY _{i,t}				0.20 (0.46)		
OPEN _{i,t}	+				0.00 (0.00)	
CAPFLOWS _{i,t}	+					-0.01 (0.00)
TIME TREND		0.35 (0.30)	0.35 (0.30)	0.34 (0.31)	0.35 (0.30)	0.40 (0.31)
N		71	71	71	71	71
Adj.R ²		0.85	0.85	0.85	0.85	0.85

***p < 0.01; **p < 0.05; *p < 0.1; period effects are included, but not reported; standard errors in parentheses

ment.” This variable is computed by multiplying the share of seats of parties in government with an expert ranking of their ideological position. The ideological scale positioning various parties along a left-right dimension has been constructed by Francis Castles and Peter Mair based on “expert judgments” of these parties.⁴⁸ The scale ranks from 5

⁴⁸Francis Castles and Peter Mair, “Left-Right Political Scales: Some ‘Expert’ Judgments,” *European Journal of Political Research* 12, no. 1 (1984).

(parties on the extreme right) to 1 (parties on the extreme left). As the summary presentation of the data reported in Table 3 shows, the variable takes the lowest average value for Sweden (2.3) and Austria (2.4) and the highest values for the United States.

The additional economic variables examine the impact of various aspects of economic globalization on the aggregate level of unemployment. First, I control for the impact of the trade exposure of an economy. The variable *OPENNESS* is computed as the sum of exports and imports as a percentage of GDP (using data reported in the IMF International Financial Statistics). The second variable—*CAPFLOWS*—measures the exposure of an economy to capital movements. It is calculated as the percentage of cross-border capital flows of GDP. One expects both measures to be positively associated with unemployment.

In Table 5, I present the results of a number of regressions that study the impact of the growth of expenditures devoted to labor-market outsiders on the level of unemployment. Model 1 is a baseline model that includes the measure of the centralization of the wage-bargaining system, the stringency of the monetary regime, and the variable measuring transfers to labor-market outsiders. The results confirm the key hypotheses advanced in this article. First, in agreement with the Calmfors and Driffill hypothesis, we find an inversely U-shaped relationship between the centralization of the wage-bargaining system and the level of unemployment. Second, an increase in the level of central bank independence leads to a reduction in the level of unemployment. Finally, an increase in the level of expenditures to labor-market outsiders contributes to a rise in unemployment. The results remain robust to the introduction of additional controls. In model 2 I examine the impact of left-wing participation in government on the level of employment. While the sign of the coefficient is in the predicted direction, surprisingly the effect of left-wing partisanship is not statistically significant. The level of the ideological polarization of the government also has no effect on the level of unemployment. In models 4 and 5, I introduce successively two additional economic controls, measuring the exposure of the economy to trade and capital flows. An increase in the level of trade openness is associated with higher levels of unemployment and the variable has a statistically significant impact. By contrast, the exposure of the economy to capital movements does not affect the overall employment level.

Table 6 displays the results of a number of models that examine the effect exerted by the growth of expenditures devoted to labor-market outsiders and the impact of an increase in the level of taxes on the level

TABLE 7
SIMULATION RESULTS OF MODEL 1 IN TABLE 4

		<i>Centralization of Wage Bargaining</i>		
		<i>1.5 (Norway)</i>	<i>7.34 (Netherlands)</i>	<i>13.25 (U.S.A.)</i>
Labor-market outsiders	low (0.10)	4.10	5.16	5.26
	mean (0.47)	4.50	5.57	5.66
Expenditures on unemployment insurance benefits	high (2.77)	6.49	7.56	7.65

of unemployment.⁴⁹ The results of the baseline model reported in the first column of Table 6 support the hypothesis suggesting that the deterioration of the employment performance of European economies in recent years can be attributed both to an increase in the tax burden and to a change in the composition of social policy expenditures and an increase in the transfers to labor-market outsiders. By contrast, an increase in the level of central bank independence has a positive impact on the equilibrium level of unemployment. As in the models reported in Table 5, we also find evidence that the impact of wage-bargaining institutions on employment outcomes is U-shaped, whereby economies with intermediately centralized wage-bargaining systems have the worst employment performance. The results of the initial model are robust to the introduction of additional control variables. None of the political control variables (the measure of left participation in cabinet and of the ideological composition) has a significant impact. Models 4 and 5 control for the impact of changes in the level of capital and trade flows but find no statistical effect of these variables.

In Tables 7 and 8 I report the estimated impact of increases in the level of social policy commitments to labor-market outsiders and of increases in the labor tax rate on the equilibrium level of unemployment, for economies with different levels of the centralization of the wage bargaining system. Both variables measuring the level of transfers to labor-market outsiders and the tax variable have a lognormal distribution. I report the results of the simulation for the mean value as well as

⁴⁹The correlation between these two variables is .42. I also ran separate models (not reported here) that examined only the impact of higher taxes on unemployment. The analysis produced results that are very similar to the results reported here.

TABLE 8
SIMULATION RESULTS OF TABLE 5, MODEL 1

		<i>Centralization of Wage Bargaining</i>		
		<i>1.5 (Norway)</i>	<i>7.34 (Netherlands)</i>	<i>13.25 (U.S.A)</i>
Welfare effort and tax rate	low transfers to outsiders			
	low taxes	3.22	4.46	4.89
	mean transfers to outsiders			
	mean taxes	4.30	5.54	5.90
	high transfers to outsiders			
	high taxes	7.80	9.04	9.47

the highest and lowest values in the sample, respectively. Holding all other variables at their mean level, an increase in the level of expenditures to labor-market outsiders contributes to an increase in the equilibrium level of unemployment by about 3 percentage points. Simulations of model 1 from Table 5 (reported in Table 8) suggest that an increase in the average tax rate and the expenditures to labor-market outsiders lead to an increase in the equilibrium level of unemployment by 3.5 percentage points.

These empirical results support the propositions advanced in this article. Consistent with the findings of earlier approaches, labor-market institutions explain cross-national differences in the employment performance of OECD economies. The new variables added to existing models—measuring the growth in the level of social policy commitments to labor-market outsiders and the growth in the level of taxes—help account for the deterioration of the employment performance of these economies over time and for the upward shift in the Calmfors-Driffill curve. The combination of labor-market institutions, macroeconomic policies, and welfare state transfers to labor-market outsiders can explain the cross-national and intertemporal variation in the employment performance of OECD economies.

CONCLUSION

During the last two decades the literature examining cross-national differences in the structure of labor-market institutions has generated important insights for the understanding of variation in economic performance across advanced industrialized democracies. By formalizing the Olsonian logic of collective action, these studies have specified the

incentives for wage moderation of large wage-bargaining actors and have provided an explanation for the superior employment performance of economies with centralized institutions of wage bargaining during the first decades of the postwar period. A number of more recent studies have added institutional complexity to earlier models, by specifying the strategic interaction between wage-bargaining actors and monetary authorities. Yet while this literature has been especially successful in explaining cross-national differences in economic performance *until the first oil shock*, it is less successful in accounting for the deterioration of the employment performance of European economies in recent decades. The most significant limitation of this literature is its inability to specify the factors that have *undermined* the effectiveness of the policy of wage moderation in economies with corporatist institutions of wage bargaining and that account for the rise in unemployment in European economies during recent decades.

To explain both cross-sectional and intertemporal variation in the employment performance of OECD economies, this article has developed a model that explores the impact of the process of welfare state maturation on the equilibrium level of employment. The key insight is that the *wage demands of trade unions are affected by the structure of welfare state commitments*. I show that the rational strategy of trade unions is to deliver wage restraint in exchange for the expansion of social policy commitments *if* a sizable part of these transfers affect union members and *if* the magnitude of the net benefits derived by unions from the provision of social policy transfers and services exceeds labor's share of the tax burden necessary to finance these commitments. This argument, stressing the importance of social policy as a source of wage moderation formalizes a number of existing observations formulated by students of the welfare state. However, I show that this political exchange premised on wage moderation is less effective in combating unemployment in an environment characterized by high levels of taxes and sizable social policy commitments devoted to labor-market outsiders. In other words, the maturation of the welfare state *undermines* the effectiveness of the political exchange that was at the base of welfare state expansion during the first decades of the postwar period.

This article identifies two directions of social policy reform that could attenuate the negative impact of the welfare state on the employment performance of European economies. First, future reforms need to reduce the size of labor-market outsiders. Policies that aim to improve the employment performance of occupational groups situated at the demographic extremes of the labor market—by stopping the trend

toward early retirement or by improving the skill mix of younger workers and, thus, reducing youth unemployment—could simultaneously lower the fiscal burden of declining labor-force participation rates. Second, the article points to the importance of reforms of the mode of financing of social insurance. Potentially, these reforms could increase the effectiveness of the policy of wage moderation in improving employment.

APPENDIX

1. EQUILIBRIUM PRICES AND CONSUMPTION

This section summarizes the derivation of equilibrium prices and demand for goods, along the lines of Mas-Colell.⁵⁰ The only modification is the use of a two-level constant elasticity of substitution (CES) utility function, in line with the Calmfors-Driffill approach to modeling differences within and across sectors resulting from the wage choices made by unions. The utility function of consumers is

$$U^C = \left(\sum_{i=1}^I \sum_{j=1}^J x_{ij}^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}} \left(\frac{\rho-1}{\rho} \right)^{\frac{\rho}{\rho-1}}. \quad (7)$$

Recall that the double index ij denotes the j -th firm in sector i . In equation 7, x_{ij} denotes the consumption of good ij , σ denotes the elasticity of substitution among goods produced within one sector (assumed to be the same for all sectors), and ρ is the elasticity of substitution *among* sectors. Since goods produced in the same sector are closer substitutes for each other than goods produced in different sectors, it is natural to assume that $\sigma > \rho$. In order to have a well-posed maximization problem for the firms, it is necessary to assume that $\sigma, \rho > 1$.

Consumers' utility function is constructed through a two-step aggregation process: first, goods produced in sector i are combined into a CES basket in the form

$$\left(\sum_{j=1}^J x_{ij}^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}}.$$

This consumption basket can be thought of as an aggregate or synthetic good produced in sector i . At a second stage aggregate goods produced in each sector are combined into a basket according to the CES rule.

⁵⁰Mas-Colell (fn. 16).

If E denotes the total spending in the economy (or total wealth) and p_{ij} denotes the price of good j in sector i , it follows that consumers maximize their utility, U^C , subject to the budget constraint

$$\sum_{i=1}^I \sum_{j=1}^J p_{ij} x_{ij} = E.$$

Prices are set by the firms in order to maximize total revenue minus labor costs. In other words, employers maximize

$$U_{ij}^E = p_{ij} x_{ij} - w_{ij} (1 + \tau_E) a_{ij},$$

where w_{ij} represent wages (chosen by trade unions) and a_{ij} is the level of employment in firm ij . I will use a linear technology function, $x_{ij} = \alpha a_{ij}$, with the same productivity factor α for all firms.

The aggregate price level of the economy can be defined as the weighted average of the prices of each sector i . Thus, if the price level in sector i is

$$P_i = \left(\sum_{j=1}^J p_{ij}^{1-\sigma} \right)^{\frac{1}{1-\sigma}}, \quad (8)$$

the aggregate price level of the economy becomes

$$P = \left(\sum_{i=1}^I P_i^{1-\rho} \right)^{\frac{1}{1-\rho}}. \quad (9)$$

Equations 10 and 11 now summarize the optimal choices for consumers and firms, which follow from the first-order conditions for their utility functions. Equilibrium demand for goods is given by

$$x_{ij} = \frac{E}{NP} \left(\frac{P_i}{P} \right)^{-\rho} \left(\frac{p_{ij}}{P_i} \right)^{-\sigma}. \quad (10)$$

Substituting equation 10 into firms' utility function and maximizing with respect to p_{ij} lead to

$$p_{ij} = \left(\frac{\sigma}{\sigma - 1} \right) \alpha (1 + \tau_E) w_{ij}. \quad (11)$$

By substituting equation 11 into equations 8 and 9, we can determine the price level in the economy and the level of demand for the goods produced by each firm:

$$P = \frac{\sigma(1 + \tau_E)}{(\sigma - 1)\alpha} \left(\sum_{i=1}^I \sum_{j=1}^J w_{ij}^{1-\sigma} \right)^{\frac{1-\rho}{1-\sigma}} \frac{1}{1-\rho} \quad (12)$$

$$x_{ij} = \frac{E(\sigma - 1)}{\sigma(1 + \tau_E)} \frac{w_{ij}^{-\sigma} \left(\sum_{j=1}^J w_{ij}^{1-\sigma} \right)^{\frac{\sigma-\rho}{1-\sigma}}}{\sum_{i=1}^I \left(\sum_{j=1}^J w_{ij}^{1-\sigma} \right)^{\frac{1-\rho}{1-\sigma}}} \quad (13)$$

Since the level of employment for firm j in sector i is equal to $a_{ij} = x_{ij}/\alpha$, it follows from equation 13 that

$$a_{ij}(w) = \frac{E(\sigma - 1)}{\sigma(1 + \tau_E)} \frac{w_{ij}^{-\sigma} \left(\sum_{j=1}^J w_{ij}^{1-\sigma} \right)^{\frac{\sigma-\rho}{1-\sigma}}}{\sum_{i=1}^I \left(\sum_{j=1}^J w_{ij}^{1-\sigma} \right)^{\frac{1-\rho}{1-\sigma}}} \cdot \quad (14)$$

Note that equation 14 represents the level of employment in firm ij resulting from the firms' optimal choice of prices once the trade unions' wage demands w_{ij} are known. (The notation on the left-hand side emphasizes the fact that employment in firm ij depends on the wage demands in *all* other firms.) The final step in the backward induction argument, that is, unions' optimal demands, is developed in the next section.

2. DERIVATION OF THE OPTIMAL WAGE DEMANDS OF THE TRADE UNIONS

Equation 14 specifies the employment outcome for each trade union as a function of the wage demands w_{ij} . In order to solve the unions' maximization problem, it is necessary to express the level of social services S defined in equation 2 in terms of wages and then substitute it into equation 3. As a result this substitution and after rearranging some terms, the utility function of unions becomes

$$U_{ij}^U = \frac{1}{P^\beta} \left[\left(1 - \tau_U + \frac{1}{IJ} \frac{1}{1 + \pi} (\tau_U + \tau_E) \right) a_{ij}(w) w_{ij} \left(-b + b \frac{1}{IJ} \frac{1}{1 + \pi} \right) a_{ij}(w) \right. \\ \left. + \frac{1}{IJ} \frac{1}{1 + \pi} (\tau_U + \tau_E) \sum_{k,l \neq i,j} a_{kl}(w) w_{kl} + b \frac{1}{IJ} \frac{1}{1 + \pi} \sum_{k,l \neq i,j} a_{kl}(w) \right]. \quad (15)$$

Note that equation 15 uses the dependency ratio π rather than the total sizes of the active and inactive population n, m through the relation $\frac{n}{m+n} = \frac{1}{1+\pi}$. Also note that using the notation $a_{ij}(w)$ signifies that equation 14 has to be substituted into equation 15 before solving the unions' optimization problem.

The next step is to maximize equation 15 with respect to the union's wage demand w_{ij} . For reasons of analytical tractability, I will restrict the analysis to symmetric equilibria, that is, equilibria in which $w_{11}^* = w_{12}^* = \dots = w_{ij}^* = w^{SYM}$. In order to derive the optimal wage demand (equation 5) from the utility function of trade unions (equation 15), we have to solve for the first-order condition and check the second-order conditions. Equation 15 can be rewritten as

$$U_{ij}^U = C_1 \frac{a_{ij} w_{ij}}{P^\beta} + C_2 \frac{a_{ij} w_{ij}}{P^\beta} + C_3 \frac{\sum_{k,l \neq i,j} a_{kl} w_{kl}}{P^\beta} + C_4 \frac{\sum_{k,l \neq i,j} a_{kl}}{P^\beta}, \quad (16)$$

where the employment levels a_{ij} , a_{kl} , ($kl \neq ij$) and the aggregated level of prices P depend on w_{ij} , as described in equations 12 and 14. The constants $C_1 \dots C_4$ are given by

$$\begin{aligned} C_1 &= 1 - \tau_U + \frac{1}{IJ} \frac{1}{1+\pi} (\tau_U + \tau_E) \\ C_2 &= b \left(-1 + \frac{1}{IJ} \frac{1}{1+\pi} \right) \\ C_3 &= \frac{1}{IJ} \frac{1}{1+\pi} (\tau_U + \tau_E) \\ C_4 &= b \frac{1}{IJ} \frac{1}{1+\pi}. \end{aligned}$$

To compute the derivative of each of the terms in equation 16 with respect to w_{ij} , it is easier to work with elasticities and rely on the formula

$$\frac{\partial f}{\partial w} = \Pi_w f \cdot \frac{f}{w}, \quad (17)$$

where f is a function of w and $\Pi_w f$ denotes its elasticity with respect to w .

The computation of elasticities is made simpler by the usual product/quotient rules, for instance

$$\begin{aligned}
\Pi_{w_{ij}} \left(\frac{a_{ij} \tau_{ij}}{P^\beta} \right) &= \Pi_{w_{ij}} a_{ij} + 1 - \beta \Pi_{w_{ij}} P \\
\Pi_{w_{ij}} \left(\frac{a_{kl} \tau_{kl}}{P^\beta} \right) &= \Pi_{w_{ij}} a_{kl} - \beta \Pi_{w_{ij}} P, & kl \neq ij \\
\Pi_{w_{ij}} \left(\frac{a_{kl}}{P^\beta} \right) &= \Pi_{w_{ij}} a_{kl} - \beta \Pi_{w_{ij}} P \\
\Pi_{w_{ij}} \left(\frac{1}{P^\beta} \right) &= -\beta \Pi_{w_{ij}} P. & (18)
\end{aligned}$$

Therefore, the calculation requires the elasticities $\Pi_{w_{ij}} a_{ij}$, $\Pi_{w_{ij}} a_{kl}$, $kl \neq ij$, and $\Pi_{w_{ij}} P$. These elasticities are quite complicated in general, but major simplifications occur in the case of symmetric equilibria, that is, when the calculated elasticities are restricted to the case of equal wages. Denoting by $\Pi_{w_{ij}}^{SYM}$ the elasticity restricted to the situation in which $\tau_{ij} = \tau^{SYM}$ for all ij , equations 12, 14, and 18 lead to

$$\begin{aligned}
\Pi_{w_{ij}}^{SYM}(a_{ij}) &= -\frac{1}{IJ} [I(J-1)\sigma + (I-1)\rho + 1] \\
\Pi_{w_{ij}}^{SYM}(a_{il}) &= \frac{1}{IJ} [I\sigma - (I-1)\rho - 1], & l \neq j \\
\Pi_{w_{ij}}^{SYM}(a_{kl}) &= \frac{\rho - 1}{IJ}, & k \neq i \\
\Pi_{w_{ij}}^{SYM}(P) &= \frac{1}{IJ}. & (19)
\end{aligned}$$

In the symmetric case, equations 12 and 14 reduce to

$$\begin{aligned}
P^{SYM} &= \frac{\sigma(1 + \tau_E)}{(\sigma - 1)\alpha} I^{\frac{1}{1-\rho}} J^{\frac{1}{1-\sigma}} \tau^{SYM} \\
a_{ij}^{SYM} &= \frac{E(\sigma - 1)}{\sigma(1 + tE)} \frac{1}{IJ} \frac{1}{\tau^{SYM}}, & \text{for all } ij. & (20)
\end{aligned}$$

After substituting equations 17, 19, and 20 into 16, it follows that, in the symmetric case,

$$\frac{\partial U_{ij}^U}{\partial w_{ij}} = K_1(\tau^{SYM})^{-2-\beta} - K_2(\tau^{SYM})^{-1-\beta} = (\tau^{SYM})^{-2-\beta}(K_1 - K_2\tau^{SYM}), \quad (21)$$

where

$$K_1 = \frac{b}{IJ} \left[I(J-1)\sigma + (I-1)\rho + (1+\beta) \frac{\pi}{1+\pi} \right] \text{ and} \quad (22)$$

$$K_2 = \frac{1}{IJ} \left[(I(J-1)\sigma + (I-1)\rho + (1+\beta) - IJ)(1 - \tau_U) + \frac{\beta}{1+\pi} (\tau_U + \tau_E) \right]$$

Equation 21 shows that the unique symmetric solution for the first order conditions is

$$w^{SYM} = \frac{K_1}{K_2},$$

which is equivalent to equation 5. The second-order condition (for a maximum) is also satisfied, since $K_1 - K_2 w > 0$ for $w < w^{SYM}$ and $K_1 - K_2 w < 0$ for $w > w^{SYM}$.

The total level of employment a^{SYM} (equation 4) can now be found by substituting w^{SYM} into the second equation in equation 20, as $a^{SYM} = IJ a_{ij}^{SYM}$.

I turn now to the proof of proposition 2. Recall that $U_S = S/(IJ(1 + \pi))$, so it suffices to look at $\partial S/\partial w_{kl}$ (where kl denotes one of the unions in the economy). Given the wage demands w_{ij} , the resulting level of services S (which is assumed to be the same for all unions) can be computed from equation 2, after substituting the implied employment levels (equation 14):

$$S(w_{kl}) = (\tau_U + \tau_E) \frac{E(\sigma - 1)}{\sigma(1 + \tau_E)} + \frac{Eb(\sigma - 1)}{\sigma(1 + \tau_E)} S_2(w_{ij}) - b(m + n),$$

where

$$S_2(w_{ij}) = \frac{\sum_{i=1}^I \left(\sum_{j=1}^J w_{ij}^{-\sigma} \right) \left(\sum_{j=1}^J w_{ij}^{1-\sigma} \right)^{\frac{\sigma-\rho}{1-\sigma}}}{\sum_{i=1}^I \left(\sum_{j=1}^J w_{ij}^{1-\sigma} \right)^{\frac{1-\rho}{1-\sigma}}}.$$

Note that only the middle term in the above equation depends on the wage demands w_{ij} and on the variables modeling the centralization of the wage bargaining system (I, J). Therefore, it is sufficient to restrict to this term when checking the assertions of proposition 2.

For part a, differentiating the above expression with respect to τ_{kl} and restricting to the symmetric case $\tau_{ij} = \tau^{SYM}$ for all i, j , leads to

$$\left(\frac{\partial S_2}{\partial \tau_{kl}}\right)^{SYM} = -\frac{1}{I^2 J^2 (\tau^{SYM})^2} < 0,$$

which shows that $\partial U_S / \partial \tau < 0$. Note that the absolute value of $(\partial S_2 / \partial \tau_{kl})^{SYM}$ is decreasing in both I and J, therefore proving part b of the proposition.

3. PROOFS OF COMPARATIVE STATICS RESULTS

This section contains the proof of proposition 3. When computing the sensitivity of a^{SYM} to the various parameters in the model, the following observation will be used repeatedly: if $f(x)$ is a function of the form $f(x) = (k_0 x + l_0) / (k_1 x + l_1)$ then $f'(x) = (k_0 l_1 - k_1 l_0) / (k_1 x + l_1)^2$, so the sign of its derivative with respect to x is given by

$$\text{sgn } f'(x) = k_0 l_1 - k_1 l_0. \quad (23)$$

Let us start with part a of proposition 3. Since $\pi / (1 + \pi)$ is a strictly increasing function of π , it is enough to prove that $\partial a^{SYM} / \partial (\pi / (1 + \pi))$ is negative. Note that the equilibrium employment a^{SYM} (equation 4) can be rewritten as

$$a^{SYM} = \frac{1 - \tau_U}{1 + \tau_E} \left[1 + \frac{(1 + \beta(1 + \tau_E) / (1 - \tau_U))(1 - \pi / (1 + \pi)) - IJ}{I(J-1)\sigma + (I-1)\rho + (1 + \beta)\pi / (1 + \pi)} \right] \quad (24)$$

hence equation 23 applies. Namely, if $t = (1 + \tau_E) / (1 - \tau_U) \geq 1$ then

$$\text{sgn} \left(\frac{\partial a^{SYM}}{\partial (\pi / (1 + \pi))} \right) = -\text{sgn} \left((1 + \beta t)(I(J-1)\sigma + (I-1)\rho) + (1 + \beta)(1 + \beta t - IJ) \right). \quad (25)$$

The aim is to show that the expression on the right-hand side of equation 25 is positive (so that the overall sign is negative). A simple argument can be given by looking at limit cases and the sign of the various coefficients. First, note that the coefficient of t equals $\beta(I(J-1)\sigma + (I-1)\rho + 1 + \beta)$, which is strictly positive since $1 + \beta > 0$ and $I(J-1)\sigma + (I-1)\rho \geq I(J-1)\rho + (I-1)\rho = (IJ-1)\rho \geq 0$ due to the fact that $I, J \geq 1$ and $\sigma > \rho$ (intrasectoral elasticity of substitution of goods is higher than the inter-

sectoral elasticity of substitution). Therefore, it is enough to check positivity for $t = 1$ (which is the minimum possible value of t since tax rates are nonnegative). In this case, the right-hand side of equation 25 reduces to

$$(1 + \beta)[I(J - 1)\sigma + (I - 1)\rho + 1 + \beta - IJ]. \quad (26)$$

The coefficient of J in the above expression equals $I(\sigma - 1)$, which is positive since $\sigma > 1$, so it suffices to prove that equation 26 is positive for $J = 1$. In this case, equation 26 reduces to

$$(1 + \beta)((I - 1)\rho + 1 + \beta - I) = (1 + \beta)(I(\rho - 1) + 1 - \rho + \beta) \\ \geq (1 + \beta)\beta \geq 0,$$

where the first inequality uses the facts that $\rho > 1$ and $I \geq 1$, and the second one follows from $\beta \geq 0$. This proves that the right-hand side of equation 25 is positive and completes the proof of part a of proposition 3.

Part b of the proposition follows immediately from equation 4 if we notice that the equilibrium employment is an increasing linear function in $1/t = (1 - \tau_U)/(1 + \tau_E)$; an increase in taxes (either in τ_U or in τ_E) increases t and therefore reduces a^{SYM} .

Part c of proposition 3 is proved by using once again equation 23, in this case for the derivative with respect to β :

$$\operatorname{sgn}\left(\frac{\partial a^{SYM}}{\partial \beta}\right) = \operatorname{sgn}\left(\frac{t}{1 + \pi}\left(I(J - 1)\sigma + (I - 1)\rho + \frac{\pi}{1 + \pi}\right) - \frac{\pi}{1 + \pi}\left(\frac{1}{1 + \pi} - IJ\right)\right) > 0,$$

since $I \geq 1$, $J \geq 1$, and $1/(1 + \pi) - IJ \leq 1 - IJ \leq 0$.

4. CENTRALIZATION OF THE WAGE-BARGAINING SYSTEM: A

COMPARISON WITH THE CALMFORS AND DRIFFILL APPROACH

This section focuses on the impact of centralization (as modeled by I and J) on equilibrium wages and employment levels. I briefly summarize the logic of the original Calmfors and Driffill argument in the context of the two-level economy introduced in section 1 of the appendix.

The predictions of the Calmfors and Driffill model can be recovered by replacing the trade unions' utility function (equation 3) with the "utilitarian" form (equation 6) and repeating the argument in section 2. The analog of equation 24 is

$$(a^{SYM})^{CD} = \frac{1 - \tau_U}{1 + \tau_E} \left[1 - \frac{IJ}{I(J-1)\sigma + (I-1)\sigma + 1 + \beta} \right]. \quad (27)$$

Equation 23 shows that

$$\begin{aligned} \operatorname{sgn} \left(\frac{\partial a^{SYM}}{\partial I} \right)^{CD} &= \operatorname{sgn}(\rho - 1 - \beta) \\ \operatorname{sgn} \left(\frac{\partial a^{SYM}}{\partial I} \right)^{CD} &= \operatorname{sgn}(I(\sigma - \rho) + \rho - 1 - \beta). \end{aligned} \quad (28)$$

The significance of the quantities of the right-hand side of equation 28 can be understood in terms of cross-elasticities of union-level real incomes to wage demands. Namely, it follows from the second and third relations in equation 19 that

$$\begin{aligned} \Pi_{w_{ij}}^{SYM}(a_{il}w_{il}/P^\beta) &= [I(\sigma - \rho) + \rho - 1 - \beta]/IJ, & l \neq j \\ \Pi_{w_{ij}}^{SYM}(a_{kl}w_{kl}/P^\beta) &= [\rho - 1 - \beta]/IJ, & k \neq i. \end{aligned} \quad (29)$$

The expressions on the left-hand side of equation 29 represent the elasticities to wage demands by union ij of total real incomes for other trade unions in the same sector and trade unions in different sectors. Let us denote this quantities by Π_i (intrasectoral) and Π_c (intersectoral). It follows from equations 28 and 29 that the slope of the employment curve in terms of centralization depends on the signs and of Π_i and Π_c as

$$\operatorname{sgn}(\partial a^{SYM}/\partial I)^{CD} = \operatorname{sgn}(\Pi_c) \text{ and } \operatorname{sgn}(\partial a^{SYM}/\partial J)^{CD} = \operatorname{sgn}(\Pi_i). \quad (30)$$

The assumption that goods produced within one sector are closer substitutes than those produced in different sectors ($\sigma > \rho$) implies that $\Pi_i > \Pi_c$. However, the *sign* of Π_i and Π_c depends on the values of the elasticities themselves, which may be very hard, if not impossible, to determine in practice, especially in interaction with the other parameters of the model. In fact, Calmfors and Driffill provide examples in which the signs change, in order to emphasize the idea that the theoretical model does not necessarily lead to a U-shaped relationship. In order to have a U-shaped relationship, it is necessary, according to equation 28, that

$$\Pi_i > 0 > \Pi_c. \quad (31)$$

The assumptions needed to satisfy equation 31 have a very natural interpretation based on equation 29: if goods produced within one sector are close enough substitutes for each other, higher wage demands by one union shift demand away from the good it produces to other goods produced by unions in the same sector; if this increase exceeds the resulting rise in the general level of prices, then the first inequality in equation 31 holds. A similar assumption leads to the second inequality in equation 31—the lower the cross-sectoral elasticity of substitution, the more likely it is that a (coordinated) higher wage demand in one sector lowers the real income in other sectors through a rise in the general level of prices. These stylized assumptions can in fact be regarded as the minimal set of conditions that guarantee a U-shaped dependence of employment on centralization.

Returning to the model of this paper, equation 23 applied to equation 24 yields

$$\begin{aligned} \operatorname{sgn}\left(\frac{\partial a^{SYM}}{\partial I}\right) &= \operatorname{sgn}\left(J(\rho - 1 - \beta) + \frac{1}{1 + \pi}(J(1 + \beta) - ((J - 1)\sigma + \rho)(1 + \beta t))\right) \\ \operatorname{sgn}\left(\frac{\partial a^{SYM}}{\partial J}\right) &= \operatorname{sgn}\left(I(\sigma - \rho) + \rho - 1 - \beta + \frac{1}{1 + \pi}((1 + \beta) - \sigma(1 + \beta t))\right). \end{aligned}$$

In a more compact form, these can be rewritten as

$$\begin{aligned} \operatorname{sgn}\left(\frac{\partial a^{SYM}}{\partial I}\right) &= \operatorname{sgn}(IJ\Pi_c - \Lambda_c / (1 + \pi)) \\ \operatorname{sgn}\left(\frac{\partial a^{SYM}}{\partial J}\right) &= \operatorname{sgn}(IJ\Pi_i - \Lambda_i / (1 + \pi)), \end{aligned} \tag{32}$$

where Λ_c and Λ_i are easily seen to be positive since $\sigma > \rho > 1$, $t \geq 1$, and $\beta \geq 0$. Equations 32 prove part b of proposition 4 and offer some additional insights into the predictions of the model. Namely, in extremely decentralized systems, the terms $IJ\Pi_c$ and $IJ\Pi_i$ dominate the right-hand sides of equation 31, and therefore the model converges to the Calmfors and Driffill one. The same is true if the number of outsiders π is large, as then the second terms in the right-hand sides of equation 32 approach zero. These implications are in agreement with the basic intuition that the share of social services allocated to each trade union becomes smaller in a totally decentralized system or in a system with significant social transfer commitments to the population outside the labor market.