Goods-Market Competition and Profit Sharing: A Multisector Macro Approach

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A MULTISECTOR MACRO APPROACH*

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Abstract

This paper develops a theoretical model that relates the degree of goods-market competition with the extent of profit sharing. Our multisector framework indicates that increased competition in goods markets leads to an increased weighting on firm profits in an optimally indexed contract. Consequently, our model predicts that a rising extent of profit-sharing arrangements in actual U.S. contracts should accompany an increase in the degree of goods-market competition. Available, but limited, data on profit sharing in the United States is generally consistent with this fundamental implication of the model.

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GOODS-MARKET COMPETITION AND PROFIT SHARING: A MULTISECTOR MACRO APPROACH

One of the most significant changes in U.S. labor markets has been the rise of profit sharing in labor contracts. As documented by Bell and Kruse (1995), the share of union contracts with deferred profit-sharing provisions has risen from roughly 8.4 percent in 1980 to 18.3 percent in 1991 (see Figure 1).[1] This change fits with a broader pattern in which U.S. labor compensation has become more sensitive to sectoral market conditions affecting firms, as reflected in the large fall in overall union membership rates, the continuing decline of CPI indexation clauses in labor contracts, and the rise of profit sharing.

Figure 1 Goes Here

One possible explanation for this general shift is that deregulation and increased openness to trade have increased the degree of competition in U.S. goods markets, which in turn has boosted the elasticity of labor demand. With respect to profit sharing, this study demonstrates how this theoretical result can arise in a two-sector economy characterized by imperfect competition[2] and how this theoretical finding is broadly consistent with stylized empirical facts on profit sharing in the United States.

Our study differs from much of the profit-sharing literature, which focuses on work by Weitzman (1983, 1984, 1985, 1986, and 1988), who maintains that profit-

[1] Virtually all of the observed increase of profit sharing in union contracts has occurred in the form of deferred profit sharing rather than in the form of cash or bonus payments, the latter of which pose risk that many workers are not able to diversify because they lack sufficient wealth. Because much of the risk from profit sharing stems from short-run variability that dissipates over the long run, however, workers plausibly are more willing to accept profit-sharing compensation through such vehicles as defined contribution pension plans (401K) or employee stock ownership plans (ESOPs). For example, as noted in Bell and Kruse (1995, p. 13), Bureau of Labor Statistics data show that only 1 percent of surveyed workers were covered by cash profit-sharing plans, as compared with over 15 percent who were covered by deferred profit-sharing plans.

[2] In related work, we have used similar frameworks to analyze the decline in wage indexation in the United States (Duca and VanHoose, 1998) and why wage contracts may optimally contain both profit-sharing and CPI-indexation clauses (Duca and VanHoose, 1991).

sharing plans deserve tax subsidies because they pose the positive externality of reducing layoffs. As noted by Kruse (1995), other studies have raised objections to Weitzman's proposals based on factors such as insiders having incentives to restrain new hiring induced by profit-sharing arrangements (Summers, 1986), the possibility that lower average pay may reduce productivity via efficiency wage effects (Levine, 1989), and the possibility that firms may abuse tax incentives for profit sharing by packaging fixed labor payments in the form of profit sharing (Estin, *et. al.*). Our study departs from much of the profit-sharing literature by emphasizing how changes in the degree of goods-market competition could affect profit sharing. In particular, our study finds that profit sharing may have been boosted as a by-product of deregulation and increased openness to trade that have increased market incentives for profit sharing.

To establish our results, the next section presents a basic multisector model that allows for imperfect goods-market competition. The following section then analyzes the manner in which increased goods-market competition would influence how contract wages are adjusted for changing conditions (e.g., CPI indexation and profit sharing). The study then addresses these theoretical implications in light of the limited data on profit sharing.

I. Optimal Wage Indexation and Goods-Market Competition

The theoretical framework combines elements of Ball's (1988) monopolistic competition model with the multisector frameworks of Duca (1987) and Duca and VanHoose (1991)[3]. These papers, in turn, draw on the earlier, pathbreaking macroeconomic indexation frameworks developed by Gray (1976) and Karni (1979). The innovation of the multisector approach, which stems from the work of Blinder and Mankiw (1984), is that it permits at least a stylized examination of the differential

[3]For a recent empirical evaluation of multisectoral models, see Ghosal and Loungani (1996).

responses of individual sectors of the economy to changes in exogenous variables such as overall goods-market competition.

In many respects, the model is similar to those developed in Duca and VanHoose (1998; 1997a,b). In particular, each sector is composed of monopolistically competitive firms that experience *common* and sector-specific shocks. The aggregate price level then is an average of prices established by the identical firms within each sector. Here, however, we simplify by assuming, as in Duca and VanHoose (1991), that the there are two sectors in the economy. In one sector, workers and firms in some sectors set nominal wages using costlessly indexed contracts. In the other sector, workers firms instead allow wages to be market-determined. All firms in the economy are distributed over the unit interval and draw from immobile pools of workers. A fraction Ω of firms sets nominal wages through contracts, and these firms constitute the contract sector. The remaining portion of firms, 1-Ω, allows nominal wages to be market-determined.

All variables in the model are measured in logarithms, with intercepts suppressed as an expositional simplification. The production function for a representative firm *i* in the contracting sector is given by

(1a) $y_i = \alpha l_i + \mu + \theta,$

and for a representative firm *j* in the sector that does not use wage contracts, the production function is

(1b) $y_j^* = \alpha l_j^* + \theta,$

where y_i and y_j^* are the logs of the outputs of the *i*th and *j*th firms, l_i and l_j^* are the logs of employment levels at the *i*th and *j*th firms, μ is a productivity disturbance that is common to all firms in the contract sector, and θ is a productivity shock that is experienced by all firms in the economy. The sectoral productivity shock μ is distributed with a mean value of zero and a finite variance σ_μ^2. For the sake of simplicity, we assume that firms in the sector without wage contracts experience only the economy-wide productivity disturbance θ, which has zero mean and a finite variance σ_θ^2. The demand for the output of an individual firm i as a share of output in the contract sector is given by

(2a) $y_i - y = -\varepsilon(p_i - p)$,

where $y \equiv \int_0^\Omega y_i \, di$ is total output of firms in the contract sector, $p \equiv \int_0^\Omega p_i \, di$ is the price of output in the contract sector, and $\varepsilon > 1$ is the elasticity of demand for the output of the ith firm. Likewise, the demand for the output of the jth firm as a share of output in the sector with market-determined wages is given by

(2b) $y_j^* - y^* = -\varepsilon(p_j^* - p^*)$,

where $y^* \equiv \int_\Omega^1 y_j^* dj$ is total output of firms in the contract sector and $p^* \equiv \int_\Omega^1 p_j^* dj$ is the price of output in the sector without wage contracts. We assume that ε also is the elasticity of demand for the output of the jth firm.

The demand for output in the two sectors is given by

(3a) $y = m + v + \delta - p$,

and

(3b) $y^* = m + v - p^*$

where m is the log of the money stock (which henceforth we normalize at a value of unity), v is a shock common to all firms in the economy, and δ is a shock common only to firms in the contract sector. The shocks have mean values of zero and have finite variances equal to σ_v^2 and σ_δ^2. All disturbances are assumed to be i.i.d.

Our analysis of the relationship between the degree of goods-market competition and profit sharing focuses on the contract sector. Converting (1), (2), and (3) into levels (denoted by upper-case letters) and combining with the profit function, $\pi_j^i = P_j^i Y_j^i - W_j^i L_j^i$, yields labor demand for a firm j in firm i:

$$(4) \qquad l_i^d = \frac{-\varepsilon\ (w_i - p_i) + (\nu + \delta - p_i) + (\varepsilon - 1)(\theta + \mu)}{\alpha + \varepsilon - \alpha\varepsilon},$$

where w_i is the log of the nominal wage at the ith firm and where the intercept term is suppressed. Each firm is a perfect competitor in its labor market, in which it faces a pool of immobile workers who supply labor according to:

$$(5) \qquad l_i^s = \lambda(w_i - p^a),$$

where p^a is the aggregate, economy-wide price level, which is defined by $p^a \equiv \int_0^1 p_k dk$, where $p_k \equiv (p_0, \ldots, p_i, \ldots, p_\Omega, \ldots, p_j^*, \ldots\ p_1^*)$. Hence, even though workers are immobile within their labor markets, they consume the goods produced by all firms and thus compute their real wages in terms of the aggregate price level.

III. The Theoretical Relationship between Competition and Profit Sharing

Although it is possible to solve this type of multisector model for reduced-form expressions for all firm, sectoral, and economy-wide variables (see, for instance, Duca and VanHoose, 1991 and 1998), we can make our fundamental points concerning the relationship between goods-market competition and profit sharing without analyzing these reduced-form expressions.[4] Normalizing $m = 0$ and solving (4) and (5) yields the full-information, market-clearing nominal wage[5]:

[4]By expanding the model to allow for greater heterogeneity of the disturbances, it is also possible to endogenously determine the portions of firms in each sector; see Duca and VanHoose, 1997b).

[5]For $\delta = \mu = 0$, this is also the nominal wage at an exogenous fraction, $1-\Omega$, of the sector in which workers and firms allow market forces to determine wages.

$$(6) \qquad w_i^* = \left(\frac{\varepsilon}{\lambda(\alpha+\varepsilon-\alpha\varepsilon)+\varepsilon}\right)\left[p_i + \frac{1}{\varepsilon}(\nu+\delta-p_i) + \frac{(\varepsilon-1)}{\varepsilon}(\theta+\mu)\right] + \left(\frac{\lambda(\alpha+\varepsilon-\alpha\varepsilon)}{\lambda(\alpha+\varepsilon-\alpha\varepsilon)+\varepsilon}\right)p^a.$$

At a representative contracting firm the contract wage is

$$(7) \qquad w_i = \gamma^s\left[p_i + \frac{1}{\varepsilon}(\nu+\delta-p_i) + \frac{(\varepsilon-1)}{\varepsilon}(\theta+\mu)\right] + \gamma^a p^a,$$

where, if we follow Gray (1976), Karni (1979), and the subsequent macroeconomic indexation literature by assuming that the optimal contract minimizes deviations from the market-clearing wage and employment level[6],

$$(8) \qquad \gamma^s = \frac{\varepsilon\xi^s}{\lambda(\alpha+\varepsilon-\alpha\varepsilon)+\varepsilon}, \quad \gamma^a = \frac{\lambda(\alpha+\varepsilon-\alpha\varepsilon)\xi^a}{\lambda(\alpha+\varepsilon-\alpha\varepsilon)+\varepsilon},$$

and ξ^s and ξ^a are choice parameters for the wage contract.

The weight γ^s on the non-CPI terms in the expression for the indexed contract wage can be interpreted as the relative importance placed on sector-specific factors of that matter to firms, while the CPI weight γ^a can be viewed as the relative importance placed on the cost-of-living concerns of workers. It is easy to verify that if $\xi^s = \xi^a = 1$, then the nominal wage at a contracting firm is $w_i = w_i^*$, so that the contract wage exactly replicates the Walrasian, market-clearing wage. Consequently (7) and (8) together specify the optimal contract for workers and firms in each representative contracting sector.[7]

Assuming for the moment that workers and firms can implement the optimal contract given by (7) and (8), then it is straightforward to determine how the terms of the optimal contract respond to variations in ε:

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[6]See Aizenman and Frenkel (1985) for a discussion of this criterion.

[7] Note that by adjusting contract wages to be in line with the Walrasian wage, profit sharing under this optimal contract reduces layoffs if firms experience negative demand or supply shocks. This is consistent with a recent micro study by Kruse (1995), who, after controlling for heterogeneity across workers, finds that among a pool of young workers who are in jobs that pay benefits, profit sharing does not affect average wages but does reduce the likelihood of layoffs.

(9) $$\frac{\partial\gamma^s}{\partial\varepsilon} = \frac{\lambda\alpha}{[\lambda(\alpha + \varepsilon - \alpha\varepsilon) + \varepsilon]^2} > 0,$$

and

(10) $$\frac{\partial\gamma^a}{\partial\varepsilon} = -\frac{\lambda\alpha}{[\lambda(\alpha + \varepsilon - \alpha\varepsilon) + \varepsilon]^2} < 0.$$

Consequently, as the degree of goods-market competition rises, the relative weight placed on sectoral conditions increases in the optimal indexation formula, and the relative weight placed on aggregate, cost-of-living conditions decreases. The intuition behind this result is that as goods markets become more competitive, firms' labor demand is more sensitive to *variations in the marginal* product of labor. Because the optimal contract wage exactly equates the quantity of labor demanded with the quantity of labor supplied (thereby replicating the Walrasian, market-clearing wage), the marginal product of labor has a greater effect on the market-clearing wage as labor demand becomes more elastic. Thus, the optimal contract places more weight on changes in sectoral conditions as the degree of goods-market competition increases.

A key problem posed by the optimal indexation formula in (7) and (8) is that it is difficult to observe and verify the marginal product of labor within a given period. Moreover, under highly imperfect competition the optimal indexation formula cannot be implemented solely via profit-sharing and CPI-indexation arrangements. Nevertheless, as the degree of goods-market competition increases, the marginal product of labor approaches proportionality with firm profits.

This result can be demonstrated in several steps. First, note that as goods markets approach perfect competition ($\varepsilon \rightarrow \infty$), the limit of the Walrasian, market-clearing wage, which corresponds to the optimal contract wage for the *i*th firm with a wage contract, is equal to

(11) $$w_i^* = \left(\frac{1}{\lambda(1-\alpha)+1}\right)[p_i + (\theta + \mu)] + \left(\frac{\lambda(1-\alpha)}{\lambda(1-\alpha)+1}\right)p^a.$$

The industry-specific component of the contract-wage weighting scheme (the marginal product of labor) now reduces to an equality of the log sum of the firm's price (which, because firms are identical, will equal the sectoral price p in equilibrium), the economy-wide productivity shock θ, and the contract sector productivity shock μ. In the second step, solving the competitive limit of the basic model for profits in logs (the derivation is available in a separate appendix available from the authors upon request) yields

$$(12) \quad \ln(\pi) = \text{constant} + \{1 + [\alpha/(1-\alpha)](1-\gamma^{s})\}(p_i + \theta + \mu) - [\alpha/(1-\alpha)]p^{a}.$$

Thus, in the limit of perfect competition, profits increase in proportion to the marginal product of labor and decline with any upward adjustments in wages owing to contractual cost-of-living adjustment to aggregate price-level movements.

Therefore, equations (11) and (12) imply that the as goods markets become more competitive, the relationship between profits and the marginal product of labor within an optimally indexed contract becomes more direct, making profits a more desirable indicator to use for adjusting wages. This is especially true in that profits account for any automatic CPI-indexation adjustment to wages, as reflected in the last term of equation (12). In addition, as goods markets become more competitive, labor demand becomes increasingly sensitive to the sectoral marginal product of labor. Together these conclusions indicate that contract wages should become more closely linked to profitability as goods markers become more competitive.

III. Profit Sharing and Indexation in Practice

Our model's implications are consistent with two broad stylized facts about changes in U.S. compensation patterns. First, the model predicts that as goods markets become more competitive, contract wages will become less frequently indexed to a cost of living index, as empirically demonstrated by Duca and VanHoose (1998), who develop a richer model of CPI wage indexation.

Second, and more importantly, our model's implication that higher goods-market competition will boost profit sharing is consistent with the limited available data. At the aggregate level, the share of union workers having some form of broadly defined, deferred profit sharing (see Bell and Kruse, 1995) has risen since 1980, largely in line with an index for aggregate goods market competition in the U.S. economy used in other work by Duca and VanHoose (1997a,b and 1998), as depicted in Figure 2. This index is derived from nonfinancial corporate profits data, where a markup ratio has been adjusted for fluctuations in GDP growth, real oil prices, net interest payments, and real exchange rates using net capital depreciation as a measure of fixed costs. Because the index is defined as the inverse of the cyclically adjusted markup, a rise in this index implies a higher aggregate degree of goods market competition

Figure 2 Goes Here

Our model's prediction that the degree of profit sharing will rise more in industries experiencing greater increases in competition is also broadly consistent with the pattern of sectoral changes in profit sharing. As shown in Table 1, which lists data from Bell and Kruse (1995), the industries posting above average increases in the incidence of profit sharing were either industries that experienced widespread deregulation since the late 1970s [trucking, communications, utilities, mining (oil), and FIRE (finance, insurance, and real estate)], or increased vulnerability to international competitiveness associated with swings in the real exchange value of the dollar or liberalization of international trade barriers (manufacturing). In contrast, nonagricultural industries that have experienced little change in regulation (wholesale trade, retail trade, and construction), posted below-average rises in the extent of profit sharing. Obviously, factors other than goods market competition, such as differences in the ability to monitor worker effort and other efficiency- wage considerations, may explain cross-industry differences in profit sharing. However, the nature of production in many industries with respect to efficiency-wage considerations appears not to have changed as much since the late-1970s as the degree of regulation or openness to foreign competition. For this reason, changes in cross-industry patterns of profit-sharing since the early 1980s plausibly owe, in part, to changes in intra- and/or international trade barriers.

Table 1 Goes Here

IV. Conclusion

This paper theoretically demonstrates that a greater degree of goods-market competition induces a shift toward profit sharing and a shift away from CPI indexation in labor contracts. These results essentially arise because greater goods market competition makes both labor demand more sensitive to the marginal product of labor and industry profits more correlated with the sectoral marginal of product of labor. Consequently, profit sharing is bolstered because greater goods market competition makes the market-clearing wage more sensitive to shocks affecting labor demand and the marginal product of labor more observable in the form of profits.

On two counts, the empirical evidence generally accords with these theoretical conclusions. First, the overall incidence of profit sharing in union contracts moves with an aggregate index of U.S. goods market competition. While this finding is broadly consistent with our theoretical framework, we currently lack enough time-series data to formally verify such a connection, because data for 1987 and years prior to 1980 are not available. Second, disaggregated data indicate that profit sharing has risen most dramatically in industries in which goods-market competition has likely intensified due to deregulation or increased competition. While both stylized facts are consistent with the implications of our theoretical model, the evidence, so far, is more suggestive rather than conclusive. We leave formal cross-industry testing of our theoretical approach to future research.

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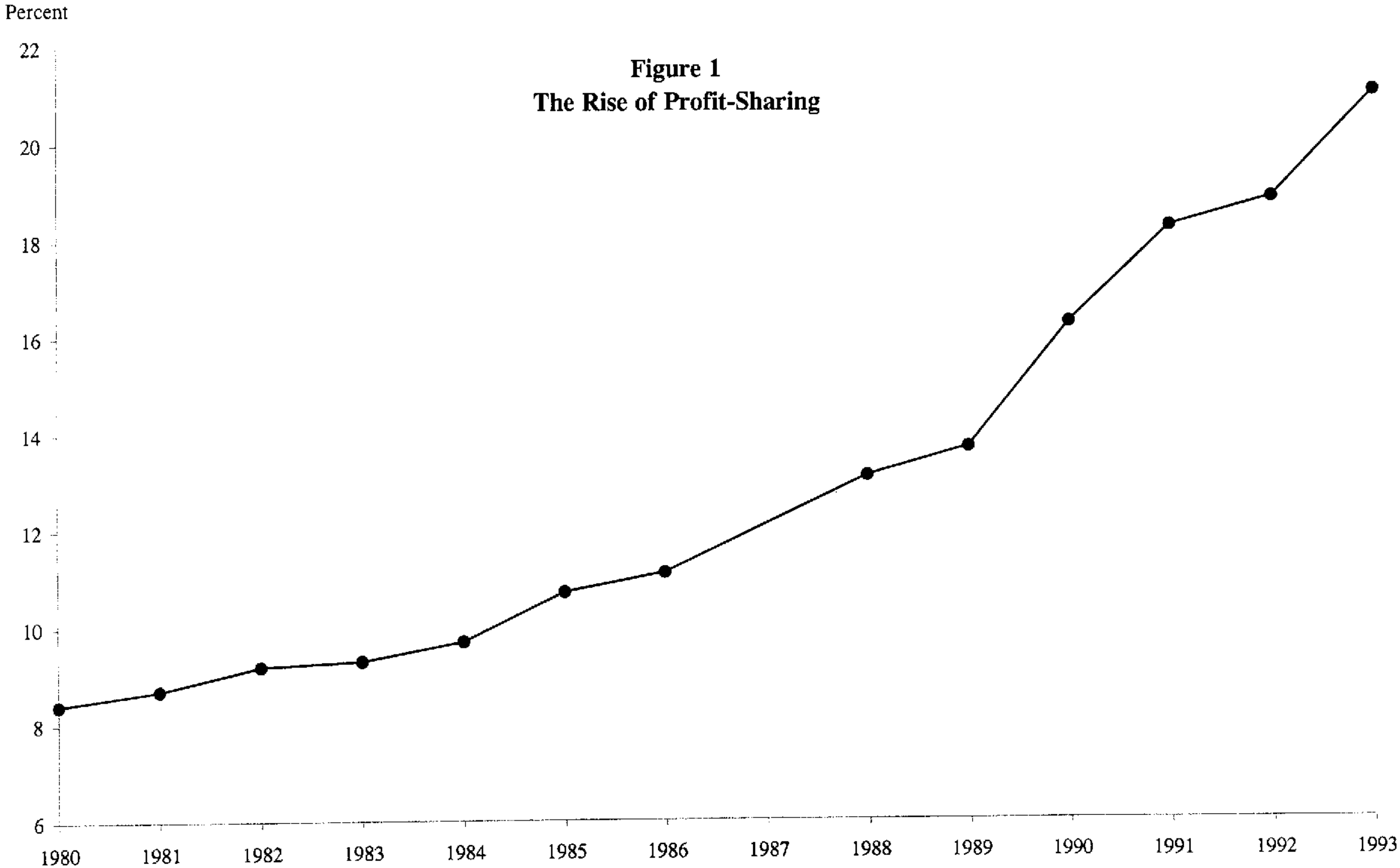
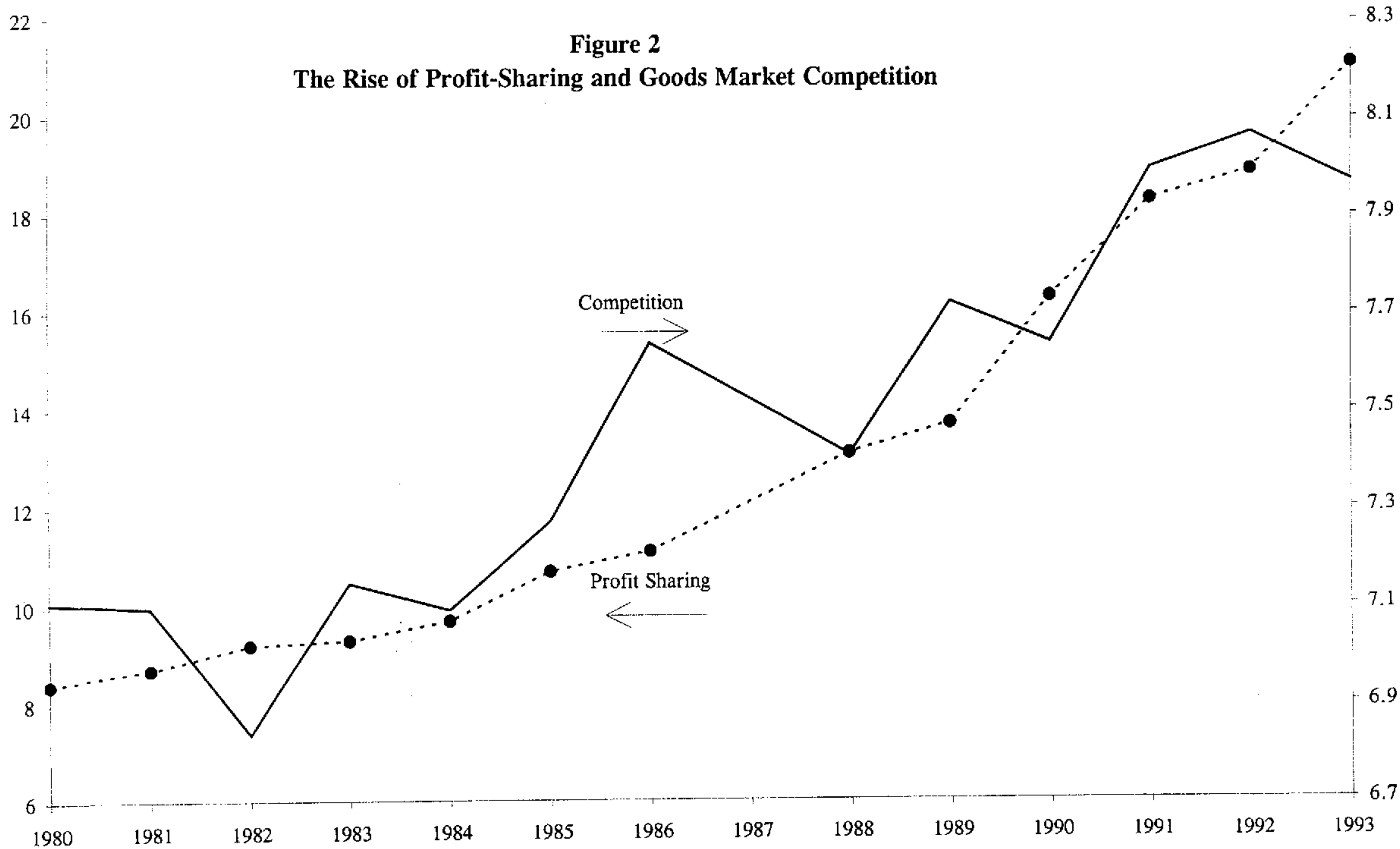
Figure 1
The Rise of Profit-Sharing



NOTE: Profit sharing is the percent of workers with profit sharing in labor contracts covering at least 100 workers [source: Bell and Kruse (1995)].

Figure 2
The Rise of Profit-Sharing and Goods Market Competition



NOTES: Profit sharing is the percent of workers with profit sharing in labor contracts covering at least 100 workers [source: Bell and Kruse (1995)]. Competition is an index of competition based on work by Duca and Van Hoose (1998).

Table 1

Industry Breakdown of the Share of Workers Covered by Deferred Profit Sharing

Industry	1980 Share Of Workers	1993 Share of Workers	Absolute Change Since 1980[1]	Deregulated since late-70s?[2]
Overall	8.4%	21.0%	+12.6	5 of 11 Industries
Agriculture	8.2%	6.3%	-1.9	No
Mining	10.5%	49.0%	+38.5	Yes
Construction	3.0%	9.2%	+6.2	No
Manufacturing	16.3%	44.1%	+27.8	No
Transportation	5.2%	23.4%	+18.2	Yes
Communications	2.5%	35.3%	+32.8	Yes
Utilities	13.9%	48.1%	+34.2	Yes
Wholesale	4.3%	13.4%	+9.1	No
Retail	6.4%	11.6%	+5.2	No
FIRE (Finance, Insurance, & Real Estate)	19.9%	41.0%	+21.1	Yes
Service	1.8%	11.7%	+9.9	No

Memo:

Simple Average Absolute Change Over 1980-93 for

Deregulated and Manufacturing Sectors:	+28.8
Other Sectors:	+5.7

[1]Percentage point change over 1980-1993.

[2]As listed in table 1 from Winston (1993):
1) Trucking was deregulated by the ICC liberalization of truck rates in the late-1970s and the Motor Carrier Reform Act (1980).
2) Airlines were largely deregulated by the Airline Deregulation Act of 1978, which allowed entry in 1982 and deregulated air fares in 1983.
3) Railroads were deregulated by the ICC liberalization of rail rates in the late 1970s and the Staggers Rail Act of 1981.
4) Telecommunications were largely deregulated in the wake of the ATT court settlement of 1982.
5) Cable television was deregulated in a series of FCC rulings in the late-1970s and by the Cable Television Deregulation Act of 1984.
6) Banking was deregulated by the Depository Institution Deregulation and Monetary Control Act of 1980 and the Garn-St. Germain Depository Institutions Act of 1982.
7) Mining was deregulated by a series of presidential executive orders which deregulated oil prices beginning in 1979 and by the Natural Gas Policy Act of 1978 which began a phased deregulation of natural gas prices.

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