Wage Dispersion and Productive Efficiency: Evidence for Sweden

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The Swedish record of enormous compression of relative wages under centralized "solidarity" bargaining, followed by substantial decompression of wages after central bargaining broke down, supplies observations well suited to empirical evaluation of arguments about the response of productive efficiency to shifts in wage distribution. We obtain no results supporting "fairness, morale, and cohesiveness" theories implying that wage leveling within workplaces and industries may enhance productivity. Reduction of interindustry wage differentials evidently did, however, contribute positively to aggregate output and productivity growth, most likely for the structural reasons first emphasized by Swedish trade union economists almost a half century ago.

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I. Introduction

From 1956 up to 1983, without interruption, two peak bargaining organizations, LO[1] for workers and SAF[2] for employers, negotiated detailed "framework" wage agreements covering the entire blue-collar labor force in Swedish private industry.[3] Equality of wage distribution was a vital union goal, and wage dispersion data indicate that, during this era of centralized "solidarity" bargaining, LO succeeded in obtaining large changes in the structure of relative wages.[4] In fact, as the data graphed in figure 1 illustrate, between the early 1960s and the breakdown of central wage formation in the early 1980s, the total variance of blue-collar relative wages declined by a whopping 75%.[5] At the inequality trough in 1983, the Swedish hourly wage distribution was so dense that a relative wage increase of only around 30% was enough to carry a worker from the lowest decile of the blue-collar distribution all the way to the highest. By comparison, in the same period a parallel move across the

[1] Landsorganisationen i Sverige (LO) is the central organization of blue-collar unions.

[2] Svenska Arbetsgivareföreningen (SAF) is the central confederation of private employers.

[3] The system is more precisely described as a highly integrated, three-tier process: a central framework agreement negotiated by LO and SAF (or SAF and PTK, the central organization of private white-collar workers), followed by industry bargaining, and then plant-level negotiations to implement the arrangements contracted above. The constituent organizations of LO and SAF acted like a single organization engaging in multilevel bargaining, and throughout the article we refer to this trilevel process as the "centralized" institutional regime. More details on institutional arrangements are given in Hibbs (1990) and Nilsson (1993).

[4] Extensive evidence that wage dispersion trends were driven by central agreements incorporating LO's egalitarian objectives, rather than by normal market forces, is given in Jonsson and Siven (1986); Hibbs (1990, 1991); and Edin and Topel (1997). Hibbs and Locking (1996) develop and test a model of LO-SAF bargaining in which LO's wage compression goal plays a key role.

[5] The total variance of relative wages is measured here by the squared coefficient of variation, $CV^2 = \sigma^2(w)/\bar{w}^2$, the ratio of the variance and squared mean of individual wages. When Between-industry and Between-plant variances are weighted by the respective employment shares, as in fig. 1, the total CV^2 is decomposable as

$$\text{Total } CV^2 = CV^2(W) + CV^2(B),$$

where (W) indexes Within-plant or Within-industry dispersion and (B) indexes Between-plant or Between-industry dispersion. Micro wage and dispersion data for white-collar workers are much less comprehensive than the data for blue-collar workers, but union-induced compressions of white-collar wages were most likely of comparable magnitude. See Hibbs (1990). For sources and additional information, see app. A.

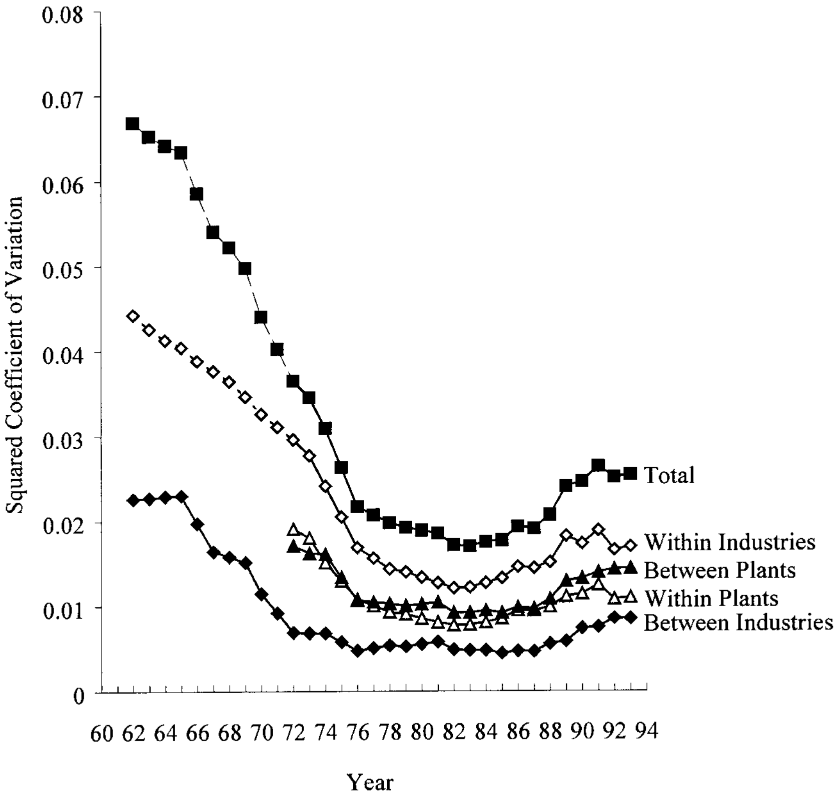

FIG. 1.—Wage dispersion among blue-collar workers in the Swedish private sector. Sources: Authors' computations and data supplied by SAF, LO, and Metall.

blue-collar hourly wage distribution in the United Kingdom would have required a relative increase of more than 200% and for a U.S. manufacturing employee the requisite increase was over 400%.[6]

The effects of wage distribution on productive efficiency is a topic rich in theoretical conjecture, has been the object of vigorous Scandinavian polemical debate, and yet at the same time is an issue almost barren of systematic econometric evidence. One provocative body of theoretical literature, prom-

[6] The computations are documented in Hibbs (1990). Broader samples of international data on individual and interindustry relative wages also show Sweden to have had exceptionally low wage dispersion by the late 1970s, which cannot be accounted for by dispersion of human capital as calibrated by application of standard models. See Krueger and Summers (1987); Hibbs (1991); Davis (1992); Edin and Zetterberg (1992); and Organization for Economic Cooperation and Development (OECD) (1996).

inently associated with the work of Akerlof and Yellen (1988, 1990) and Levine (1991, 1992), departs from traditional neoclassical thinking by proposing that within-firm wage distributions more compressed than initial condition productivity differentials may yield more harmonious labor relations, greater employee effort, and, hence, higher average output per worker. By contrast, a common supposition among those familiar with the Swedish experience is that the leveling of wage differentials across skill groups within workplaces was for the most part imposed by strong central unions on reluctant employers, creating large productivity-diminshing distortions of microeconomic incentives (Lundberg 1985; Flam 1987; Myrdal 1991). However, almost a half century ago, leading Swedish trade union economists of the day argued that central union wage policies aimed at squeezing pay differentials between industries and plants could enhance productive efficiency by speeding up the movement of labor and capital from low to high productivity activities (Turvey 1952)—a point reinforced in a more formal manner by subsequent theoretical demonstrations (Agell and Lommerud 1993; Moene and Wallerstein 1997) and empirical analyses of intersectoral resource flows (Edin and Topel 1997).

The Swedish record of enormous wage compression under the institutional regime of centralized solidarity bargaining, followed by substantial decompression of relative wages after central bargaining broke down, provides data well suited to empirical testing of these and related ideas about the response of productive efficiency to shifts in wage distribution. The remainder of the article is organized as follows. Section II gives a brief history of postwar Swedish industrial relations, which identifies three distinct phases of the wage formation process that instruct specification and interpretation of the empirical models to follow. Section III presents stylized facts about output and labor productivity performance and introduces distribution-augmented theoretical models of production, upon which estimating equations are based. Section IV reports estimation results and discusses their implications for theories linking productive efficiency to wage distribution. Section V concludes by calibrating the cumulative effects of wage dispersions—Between plants and industries, Within plants and industries, and totally—on aggregation output and labor productivity growth in Swedish industry.

II. A Brief History of Postwar Swedish Wage Formation

The concept of a centrally coordinated, "solidarity" wage policy in Sweden evidently was first voiced at the 1936 LO congress by the metal workers union as a mechanism for leveling wages across the entire labor force in order to make feasible wage equalization within their own industry (Meidner 1974; Swenson 1991). Right from the start SAF also took a leading role in promoting the development of national bargaining, because large-scale manufacturing firms comprising SAF's most important constituency believed that centralization would inhibit wage pressure from powerful unions in sheltered sectors from spilling over to wage settlements in the competitive, traded goods sectors.[7] By the 1950s these objectives had taken strong institutional form and, as already noted, between 1956 and 1983 LO and SAF forged framework agreements specifying the wages of all private blue-collar workers.

The history of Swedish wage formation since the 1950s is usefully divided into three phases: two phases of centralized, solidarity bargaining associated with the enormous compression of relative wages just reviewed, which were followed in the last dozen years by a regime of decentralized industry and local-level bargaining during which wage dispersion rapidly escalated.

A. Phase I: Wage Leveling between Industries and Plants

In the initial phase of solidarity bargaining, which dates from the first comprehensive framework agreement in 1956 up to the end of the 1960s, central bargaining was guided by the principle of "equal pay for equal work" regardless of firms' profitability or "ability to pay," as advocated in the late 1940s and early 1950s by the LO economists Gösta Rehn and Rudolf Meidner. Under Phase I solidarity wage policy, weak industries and firms were therefore not permitted to survive by paying wages commensurate with their subpar productivity and profitability. An active labor market policy, providing extensive job placement and retraining services, would ease the pain to dislocated workers created by the forced demise of inefficient firms as human and physical resources flowed to more efficient ones. Consistent with the policy, wage equalization during the 1960s in comparison to later years was disproportionately between industries and plants, rather than within industries and plants and across occupations and skill grades (see fig. 1 and table 1).

The effects of Phase I central union pay policy may explain at least partly why wage levels across firms and industries in Sweden, by contrast to the United States and other countries with decentralized industrial relations, do not exhibit any "noncompetitive" correlations with profitability, average productivity, and capital intensity. Figure 2 presents 1983 data for Swedish industrial forms documenting the absence of any relation between net value added per worker (average productivity) and wage costs worker.[8] Figure 3 graphs the same sort of relation from a different

[7] In fact, SAF's initial adamant insistence on centralization was probably decisive to its implementation. As an LO official would later observe, "SAF's uncompromising [favorable] attitude on the question of a central wage bargain was immensely helpful to us. Without this position we would not have been able to convince the unions" (Heclo and Madsen 1987, galley copy at p. 115).

[8] Data assembled by the Swedish National Industrial Board (SIND) demon-

Table 1
Percentage Changes in Wage Dispersions (CV^2) (Blue-Collar Industrial Workers)

	Phase I 1962–70	Phase II 1970–83	Phase III 1983–93
Total dispersion (%)	−34	−61	+49
Within industries	−26	−63	+39
Within plants	NA	−60	+41
Between industries	−50	−58	+76
Between plants	NA	−46	+56

NOTE.—See fig. 1 and app. A. Changes computed $(CV_t^2/CV_{t-n}^2 - 1) \cdot 100$; Phase II changes in plant dispersions are for 1972–83.

angle for Sweden and the United States, with data aggregated to the industry-sectoral level after the underlying individual wages were purged of the effects of a broad set of human capital and working conditions variables. The Swedish wage premia exhibit no systematic relation to average productivity (or profitability), whereas in the United States an interindustry rent-sharing pattern is pronounced.[9] This evidence suggests that Phase I centralized solidarity bargaining may have helped create a national wage market more closely corresponding to the neoclassical competitive model than the pattern that seems to arise in decentralized wage formation systems, with or without the presence of trade unions.[10]

Noncompensating profit- and productivity-related wage premia obviously provide an incentive for labor to migrate out of stagnating sectors to expanding and efficient ones, at the cost of "wage-taxing" profitable enterprises. But LO's Phase I wage policy could in principle achieve the same efficiency enhancing movements of labor (and capital) by squeezing such wage premia to nil, thereby depriving older or inherently unproductive enterprises of a cheap labor lifeline without imposing any relative wage tax on newer, more profitable ones. For this reason the policy has

strate that the profitability and productivity of Swedish enterprises were uncorrelated with average enterprise wage levels from the late 1960s through the early 1980s. This is what one would expect from the data in fig. 1 showing that nearly all of the great compression of interindustry wage differentials took place between the early 1960s and early 1970s, leaving between industry wage dispersion flat until the breakdown of central bargaining in 1983.

[9] See Katz and Summers (1989) for extended analysis of the well-documented U.S. pattern.

[10] A comprehensive study by Teulings and Hartog (1998) shows that the implication of the Sweden-U.S. contrast is quite general: the magnitude of interindustry and interfirm wage differentials, and their sensitivity to product market conditions, falls internationally with the degree of centralization of wage formation.

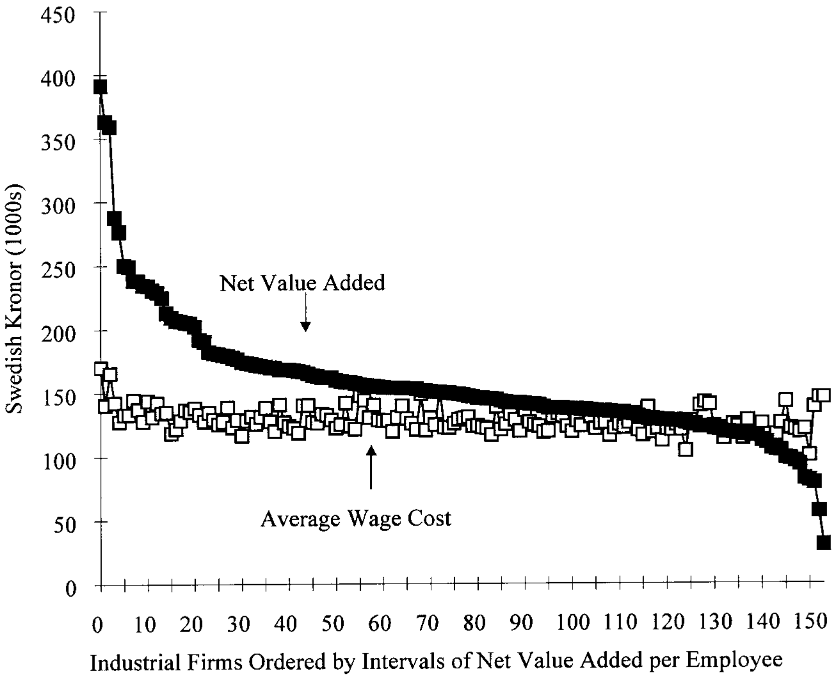

FIG. 2.—Wage costs and net value added per employee, Sweden, 1983. Source: Statens Industriverk (SIND), Stockholm.

been interpreted theoretically as akin to an industrial policy that rewarded "sunrise industries" (Agell and Lommerud 1993), which, if wage levels were sufficiently restrained in the expanding sectors, might have boosted industrial output as well as productivity growth (Moene and Wallerstein 1997). Hence stylized interpretations of the Phase I union pay policy appear to have some attractive properties in theory. Whether an egalitarian wage formation regime that essentially sacrificed the carrot of wage premia in favor of the stick of wage-induced shrinkage and outright bankruptcy in practice benefited aggregate output as well as productivity performance, however, is controversial.[11] At bottom the issue can only be resolved empirically.

[11] For example, Erik Lundberg, among the most eminent postwar Swedish economists, asserted (without reference to systematic evidence), "The rapid rise in productivity, especially during the second half of the 1960's [Phase I policy], was achieved at the cost of growth in total industrial production" (1985, p. 20). Jonsson and Siven, make the same assertion: "Increase in productivity in industry has occurred at the price of lower industrial employment and stagnating industrial output" (1986, p. 98).

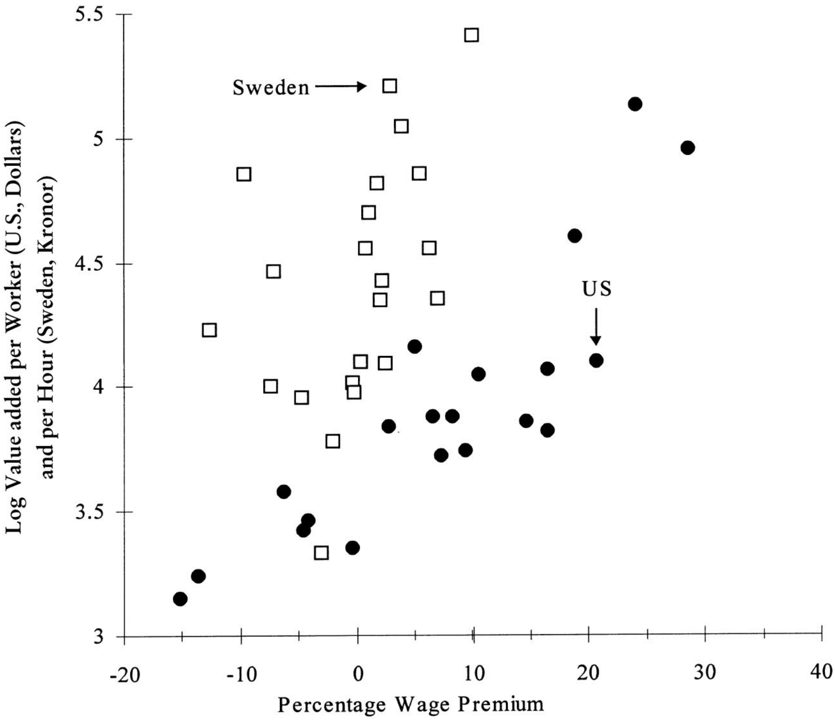

FIG. 3.—Value added and net interindustry wage premia, Sweden and United States, 1984. Sources: Computed by authors from data in Edin and Zetterberg (1992), Katz and Summers (1989), and *Statistics Sweden* (1993).

B. Phase II: Wage Leveling within Industries and Plants

At the end of the 1960s wage solidarity took a more radically egalitarian form, moving away from the initial concept of leveling wages among jobs of comparable difficulty, risk, and skill, in the direction of compressing relative wages more or less across the board. The shift to Phase II solidarity wage policy, which might be caricatured as a transformation of the idea "equal pay for equal work" to "equal pay for all work,"[12] was marked by a concerted drive to improve the relative wages of the low paid, which clearly shows up in the distributional profiles of the central wage agreements negotiated by LO with SAF (see Hibbs 1990; and Hibbs and Locking 1996). Framework agreements with pronounced low-wage provisions were a distinguishing feature of wage formation in Sweden from 1969–70 all the way up to 1983,

[12] Our use of "caricatured" may be unnecessarily reserved. Rudolf Meidner, LO's former director of research, described the policy shift as "a simple striving for the elimination of all wage differentials, however caused" (1974, p. 41).

when central bargaining broke down and the emphasis on equality in the wage formation process began to diminish.

By contrast to Phase I solidarity policy, which as noted above was associated with deep compressions of wage differentials between industries and plants, Phase II policy promoted dramatic leveling of relative wages within plants and industries and across occupations and skill grades. (Direct evidence of interoccupational wage leveling is reported in Lindbeck 1983; Jonsson and Siven 1986; and Hibbs 1991.) Although LO for the most part exercised leadership in the drive for wage leveling, the central private white-collar union cartel Privat Tjämstemammakartellen (PTK) followed suit (especially the unions representing public-sector white-collar workers and lower echelon clerical employees), and probably for pretty much the same reason: during these years most Swedish trade union leaders and large numbers of their members shared a deep ideological commitment to equality.[13]

It is easy by appeal to economic first principles to identify unattractive consequences of union-imposed wage leveling that opens up large gaps between wage and marginal productivity distributions (see Flam [1987] and Siven [1987] for arguments oriented to Swedish experience), though, as noted in the introduction and explained in Section III, "morale and cohesiveness" theories propose that within-firm wage compression may enhance productive efficiency (Akerlof and Yellen 1988; Levine 1991). In any case, the radicalization of union wage policy during the Phase II period prompted the employers confederation (SAF) to abandon its historical support of central bargaining and to launch throughout the 1970s an increasingly vigorous campaign to dismantle the traditional system. An SAF director, Hans-Göran Myrdal, summed up the disillusionment of large-scale employers in the tradables sector with central bargaining after the transition from Phase I policy (during which "a generally encouraging climate of understanding and cooperation between the two sides" prevailed) to Phase II policy, by writing: "From around 1970, or thereabouts . . . Swedish labour relations began to look quite different. . . . 'Solidaristic wage policy' agreements . . . included low-wage compensation of various types. Compared with the 50's and 60's, the structure of agreements in the 70's . . . became increasingly rigid and detailed. . . . Wage settlements were to a large extent looked upon as part of the political process for income distribution" (1991, pp. 196, 198).

[13] Some data on union members' preferences about wage leveling are reported in Olsson (1989, chap. 6).

C. Phase III: The Dissolution of Central Bargaining

Whatever benefits in the form of wage restraint the dominant players in SAF got from Phase I solidarity policy were perceived by the mid-1970s as having been overwhelmed by union-imposed relative wage rigidity during an era of increasingly differentiated, "post-Fordist" industrial production (Martin [1984], de Geer [1992], and Pontusson and Swenson [1996] supply extended discussions). Central bargaining was formally broken in 1983, when the employer's association for engineering and fabricated metals (Verkstadsföreningen), which includes such firms as Volvo, Saab-Scania, Asea, and accounts for one-third of the LO-SAF (private blue-collar) labor force, succeeded in prying the industry's blue- and white-collar unions away from their central organizations, by negotiating separate agreements (see Ahlén [1989] for details). Appealing to distributional tensions within and between blue- and white-collar unions, the 1983 metal industry agreement provided for much wider wage differentials than previously, and in subsequent years strongly egalitarian rules for within-plant leveling of wages, the hallmark of Phase II solidarity wage policy, disappeared from industrial wage agreements.

After 1982 central influence on wages therefore began to dissolve and Sweden experienced a change of wage formation regime—from trilevel bargaining with powerful central coordination to a system dominated by industry- and firm-level bargaining. Although central "wage frames" covering the whole private blue-collar workforce were negotiated by LO and SAF in 1985 and 1986–87, the agreements were largely notional. Parties at industry negotiations were under no obligation to adhere to the distributional profiles of the frames, which in any event did not contain any "low wage" rules for within-plant, interoccupational leveling. Traditional equality-oriented solidarity bargaining, which expired de facto in 1983, was terminated de jure in 1990 when the SAF Board of Directors simply shut down its bargaining unit. The devolution of power over wage setting to industry and local levels meant that central union authorities lost the institutional capacity to promote egalitarian wage policies. At the same time strong local and industrial unions, no longer constrained by central framework contracts, were free to exercise their market power in subnational bargaining. The ideas of "different pay for different work," extra compensation for the (high-skilled) "wrongly paid," and earnings based on company profitability ("ability to pay") began to drive the wage formation process. Consequently, as Edin and Holmlund's (1995) empirical work shows, after 1983 a correlation began to arise between firm and industry wage levels and productivity and profitability.

The Phase III shift to decentralized bargaining arrangements is readily identified in the wage dispersion data graphed in figure 1 (see also the computations in table 1). The year 1983 marks the end of the decades of long history of wage leveling. By the early 1990s the variance of relative wages among LO-SAF workers had risen by almost 50% from the 1983 trough, taking wage dispersion back to the levels of the early to mid-1970s.[14] All by itself this is persuasive evidence of the historical influence of centralized, solidarity bargaining arrangements on the structure of relative wages in Swedish industry; an interpretation that finds strong support in international analyses of institutional influences on wage dispersion.[15]

III. Facts, Theories, and Models

Trends in Swedish output and labor productivity growth over the last 3 to 4 decades conform at least superficially to the view that productive efficiency was, on balance, affected positively by wage dispersion trends associated with Phase I solidarity policy but was impaired by dispersion trends under Phase II policy, especially during its later years. The cumulative growth paths of Swedish manufacturing output and labor productivity, deviated from the corresponding national and international average growth rates for the performance, are graphed in figure 4. By either standard of comparison—national or international—output and labor productivity growth were relatively favorable in the 1960s (upward sloping trend lines), began to deteriorate at some point during the late 1960s to mid-1970s (downward sloping trend lines), and exhibited mixed patterns after the breakdown of central wage formation in the early 1980s.

Yet movements in labor and capital inputs to production, in average wage levels, in the cost of capital, and in other established determinants of output and productivity performance may be sufficient to account for the patterns, obviating the need to consider unconventional wage dispersion variables. We address this issue by estimation of distribution-augmented production and labor productivity functions.

A. Predictions from Theory and Observation

In standard neoclassical theory, workers are emotionless commodities, conceptually equivalent to machines, whose notional marginal productivities are predetermined with respect to wages (and wage distributions). Positively,

[14] The data may understate the decompression of the wage structure after 1983 as they do not include all remuneration in the form of bonus payments, profit sharing, savings schemes, and similar profit and productivity related earnings components introduced by employers after the erosion of central bargaining.

[15] The most comprehensive international analysis (of the U.S. and 15 other advanced industrial countries) is by Wallerstein (1999), who finds that centralization of wage formation is by far the most important institutional variable accounting for international differences in pay inequality. Blau and Kahn's (1996) study of the U.S. and eight other countries, which calibrated the effects of supply and demand forces and the personal characteristics of workers, arrived at a similar conclusion.

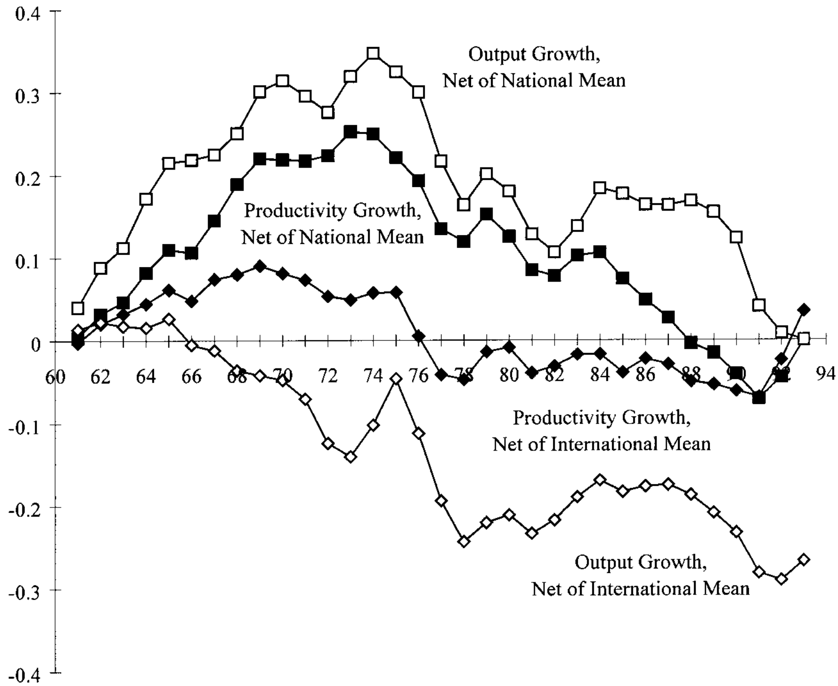

FIG. 4.—Cumulative growth of log manufacturing output and log manufacturing labor productivity, 1961–93. Cumulative manufacturing output and productivity growth, net of international means, are computed $\ln(X_t/X_{1960})^{\text{Swe}} - \overline{\ln(X_t/X_{1960})}^{\text{Int}}$, the growth in X (output or productivity) in Sweden from 1960 to year t less the average of growth in 11 countries from 1960 to year t. Net of national means, the computations are $\ln(X_t/X_{1960})^{\text{Swe}} - (t - 1960) \cdot \overline{\ln(X/X_{-1})}^{\text{Swe}}$, the cumulative growth in Sweden at year t less the cumulative growth for Sweden obtained by summing to year t the mean annual growth rate for the 1961–93 period. Net of national means data points must sum to zero. Source: Data from U.S. Bureau of Labor Statistics 1994. International means based on United States, Canada, Belgium, Netherlands, Germany, Italy, United Kingdom, Norway, Denmark, France, and Japan.

the theory asserts that factors of production in a competitive economy are, in equilibrium, paid their marginal revenue products. Normatively, the neoclassical tradition holds that factor payments should be equated to marginal productivities in order to sustain economic efficiency.

During the last decade such mainstream thinking has been challenged. Drawing on social exchange theory, equity theory, and related thinking in sociology and social psychology, as well as on firm-level case studies and laboratory research by experimental psychologists, Akerlof and Yellen argue that a policy of wage leveling within a firm may yield favorable effects on output and productivity. They begin by maintaining the empirical proposition that "workers regard a fair wage system as one with pay differentials which are more compressed than productivity differentials." Hence, "firms with less variance in their compensation will have more harmonious labor relations and thus achieve higher output per worker. . . . Effort increases as a consequence of the decrease in the variance of wages" (Akerlof and Yellen 1988, pp. 45, 48; see also Akerlof and Yellen 1990). Similarly, Levine (1991, p. 237), perusing the same literature, devises theoretical demonstrations of the closely related hypothesis that "narrowing wage dispersion can increase cohesiveness, and in participatory firms cohesiveness can increase productivity."[16]

These notions lead Levine, Akerlof and Yellen, and others to propose (firm-level) production functions of the form

$$Q = \mathrm{Ef}(\sigma^2(w))\, F(L, \ldots), \tag{1}$$

where Q is real value added, Ef denotes Within-firm, wage-distribution-dependent labor effectiveness, L denotes labor inputs to production, and it is postulated that $\mathrm{Ef}' < 0$ ($\mathrm{Ef}'' > 0$). Thus the firm's productivity depends positively on the effectiveness (cohesiveness, morale) of labor, and effectiveness depends negatively on wage dispersion. Accordingly, under "fairness" theory, firms in principle have motivation to promote a distribution of wages more compressed than initial-condition marginal productivities.

It is clear from the Swedish historical record, however, that firms did not look favorably on the wage leveling associated with the Phase II period of Swedish wage formation, which, as we showed before, drastically compressed within-plant, interoccupational wage differentials. (See Sec. II and the studies there cited.) On the contrary, the Phase II wage compressions were promoted by a radicalized and powerful trade union movement that imposed egalitarian wage objectives ("equal pay for all work") on recalcitrant employers in central bargaining. Moreover, the general presumption in the Swedish debate about Phase II LO wage policy is that Within-plant (and industry) wage compression substantially distorted conventional microeconomic effort-reward incentives, thereby diminishing the effectiveness of labor inputs to production; and perhaps by intention from the unions' point of view, if equality of wage distribution was consciously traded off against productive efficiency (and hence the sustainable rate of growth of average wages). This presumption may of course be wrong. Swedish firms might in

[16] Such reasoning can be traced back at least to Hicks (1963, app., p. 334), who wrote, "The purely economic correspondence between the wage paid to a particular worker and his value to the employer is not a sufficient condition for efficiency; it is also necessary that there should not be strong feelings of injustice about the relative treatment of different employees, since these would diminish the efficiency of the team." Related themes are also developed in Frank (1985), Solow (1990), Agell and Lundbourg (1995), and Agell (1999).

fact have benefited from productivity enhancing "fairness" effects induced by "Within" wage compressions forced on them by a powerful central trade union organization.

As noted earlier, Scandinavian theoretical work points to the influence of pay compression on industrial structure, rather than to the behavioral mechanisms featured in the Akerlof and Yellen and Levine stories, as the place to look for productivity-enhancing wage-leveling effects. In Swedish context, this means looking to the Phase I LO wage policy ("equal pay for equal work"), which squeezed wage differentials between industries and plants, potentially accelerating the flow of labor and capital out of low productivity enterprises.

Our empirical analyses of aggregate industrial productive efficiency therefore admit the possibility of "good" (efficiency increasing) and "bad" (efficiency diminishing) wage compressions by decomposing the variance of individual relative wages Within and Between plants and industries:

$$\mathrm{Ef} = \mathrm{Ef}(CV^2(W),\, CV^2(B)), \tag{2}$$

where, as before, $CV^2(W)$ denotes the Within component and $CV^2(B)$ the Between component of the total variance of relative wages (squared coefficient of variation) among workers arrayed by industries or plants. The behavioral reasoning of Akerlof and Yellen and Levine, which pertains mainly to enterprise wage structures, implies that compression of wages Within plants (and Within industries)[17] may enhance productive efficiency, $\partial\mathrm{Ef}/\partial CV^2(W) < 0$, and is silent about the effects of wage dispersions Between plants (or Between industries), $\partial\mathrm{Ef}/\partial CV^2(B)$. Results obtained in a number of structurally oriented Scandinavian theoretical models (Flam 1987; Agell and Lommerud 1993; Moene and Wallerstein 1997), as well as the conventionally grounded observations of partisans to Swedish central bargaining (e.g., Myrdal 1991), are taken together more compatible with the hypotheses that Within plant and Within industry wage leveling adversely affected productive efficiency, $\partial\mathrm{Ef}/\partial CV^2(W) > 0$, whereas union policies achieving compression of wages Between plants and industries exerted favorable effects, $\partial\mathrm{Ef}/\partial CV^2(B) < 0$.

The conventional arguments of Lundberg (1985) and Jonsson and Siven

[17] Though Akerlof and Yellen, like Levine, write mostly about relations within firms or workplaces, they occasionally also refer to industries ("in industries where it is advantageous to pay some employees highly, it is considered fair [by employees] to also pay other employees well" [1988, p. 44]). Their reasoning therefore seems to imply $\partial\mathrm{Ef}/\partial CV^2(W) < 0$ for wage data arrayed by industries as well as plants.

Table 2
Predicted Effects of Shifts in Wage Dispersions on Output and Productivity: Different Theoretical Views

	Increase in:	
	Dispersion Between Industries or Plants $CV^2(B)$	Dispersion Within Industries or Plants $CV^2(W)$
Response of:		
Output	"fairness": NA	"fairness": < 0
	"structural": < 0 (if wage moderation in expanding sectors)	"structural": NA
	"conventional": > 0	"conventional": > 0
Labor productivity	"fairness": NA	"fairness": < 0
	"structural": < 0	"structural": NA
	"conventional": < 0	"conventional": > 0

NOTE.—NA = not applicable.

(1986) also imply negative output and productivity responses to Within-plant and Within-industry wage equalization, $\partial \mathrm{Ef}/\partial CV^2(W) > 0$, and at the same time acknowledge that LO's Phase I policy of interindustry wage leveling likely enhanced labor productivity, $\partial \mathrm{Ef}/\partial CV^2(B) < 0$. However, because they believe that such improvements to labor productivity were achieved at the price of stagnating aggregate industrial output (in the same way that, say, a monetary-policy-led contraction may simultaneously raise labor productivity and lower output by driving the least productive firms into bankruptcy and the least productive workers out of employment), the wage compression effect claimed on industry-level output is negative.[18] Table 2 summarizes the predictions associated with the "fairness," "structural," and more "conventional" views.

B. Industrial Production and Derived Labor Productivity Functions

As before let Ef denote wage distribution effects, let conventional inputs to production consists of blue-collar labor hours, L, and the (real) capital stock net of depreciation, K, and let the rate of technological

[18] In other words, by this argument there will be "survivor bias" of precisely the sort we want to pick up in aggregate regressions. Note also that the predictions of increased output from between plant and between industry wage leveling in the theoretical models of Agell and Lommerud and Moene and Wallerstein are conditional on union policy delivering real wage restraint in expanding sectors. Absent restraint, wage distribution effects on both output and labor productivity are the same as those claimed by Jonsson and Siven, Lundberg, and others holding the conventional view.

progress be indexed by an exponential trend.[19] We entertain production functions for log industrial output net of intermediate inputs (log real value added) in the form of equation (1),

$$\ln[Q] = \ln[\mathrm{Ef}(\sigma^2(w))\, F(\cdot)],$$

for $F(\cdot)$ specified as Cobb-Douglas,[20]

$$\ln Q = \delta_0 + \delta_1 \mathrm{trend} + \alpha_1 \ln L + \alpha_2 \ln K + \ln \mathrm{Ef}. \tag{3}$$

Equation (3) is conditioned on the assumption of a fixed productivity trend. In view of the worldwide productivity slowdown in the 1970s, which is correlated to some degree with the phases of Swedish wage formation discussed in Section II (see table 1), we investigated the robustness of results to relaxation of the fixed trend assumption. Following Gordon (1987), the fixed trend setup $\delta_0 + \delta_1 t$ was allowed to vary by the wage formation regimes discussed earlier by applying discrete shift variables, yielding the specification:

$$\begin{gathered}\ln Q = \delta_{0\tau} + \delta_{1\tau}\, \mathrm{trend}_\tau + \alpha_1 \ln L + \alpha_2 \ln K + \ln \mathrm{Ef}, \\ \tau = 1964\text{–}93,\ 1970\text{–}82,\ 1983\text{–}93.\end{gathered} \tag{4}$$

We assess the labor productivity effects of trends in wage distribution by first deriving optimal labor demand under the assumption that producers minimize costs by varying all inputs, subject to given production, the distribution-based effectiveness shifter Ef and the real prices of labor and capital services (w and r). For generalized Cobb-Douglas production the desired stock of labor input, L^*, may therefore be written as

$$\begin{aligned}\ln L^* = \ln A + \frac{1}{v}[-(\delta_{0(\tau)} + \delta_{1(\tau)}\, \mathrm{trend}) + \ln Q \\ + \alpha_2 \ln r - \alpha_2 \ln w - \ln \mathrm{Ef}],\end{aligned} \tag{5}$$

where $\upsilon = (\alpha_1 + \alpha_2)$ and A is a constant composed of the parameters of

[19] Swedish white-collar hours of labor input are measured with great imprecision and so we implicitly subsume them in specifications of trend.

[20] The longer working paper on which this article is based investigated a number of other functional forms (including Translog, constant elasticity of substitution (CES), and pure time-series models), but these analyses deliver the same basic results concerning wage dispersion effects as those reported ahead for test equations based on generalized Cobb-Douglas setups.

production. We assume also that aggregate labor demand is adequately characterized by quadratic adjustment costs of proportional quantities (see Hamermesh [1993], chaps. 7 and 8, for a review of the topic) and, therefore, write

$$\Delta \ln L = \theta(\ln L^{*} - \ln L_{-1}), \qquad 0 < \theta \leq 1. \tag{6}$$

Further, because we believe tight specifications of output and optimal labor demand functions should not be taken literally (on this score, see Roemer's 1993 review essay, along with the associated comments and discussion), parameter constraints implied by strict application of (3)–(6) were not imposed when deriving labor productivity estimating equations. Hence (5) and (6) are used to obtain the following unrestricted log linear labor productivity equation:

$$\ln(Q/L) = \beta_{0(\tau)} + \beta_{1(\tau)}\,\text{trend} + \beta_2 \ln Q + \beta_3 \ln w + \beta_4 \ln r + \beta_5 \ln \text{Ef} + \beta_6 L_{-1}, \tag{7}$$

where coefficients should be signed $\beta_4, \beta_6 < 0 < \beta_0, \beta_1, \beta_2, \beta_3, \beta_5$ and the right-side $\ln Q$ must be treated as endogenous in regression experiments.

Note that distinctions drawn between dispersion effects on output and labor productivity in regression experiments based on (4) and (7) are somewhat arbitrary. The labor productivity models are derived for output given, so they are just rearrangements of conditional labor demand functions. Consequently, regression experiments based on (7) could just as well be interpreted as delivering the effects of wage dispersion on employment. Analogously, output production functions like (4) are indistinguishable from direct productivity equations obtained by subtracting $\ln L$ from both sides of (3), and so wage dispersion coefficients obtained in regressions based on them could be interpreted as estimating effects on productivity. As Gordon (1987) and Pehkonen (1995) do, however, we want to condition productivity responses to wage distribution on real wage levels; therefore we also adopt the derived view of productivity.

IV. Empirical Results

Regression models were fit to two time ranges—1964–1993 and 1972–1993—which were determined by the availability of data available for calculation of Within and Between variance components of wages arrayed by plants or industries (see app. A). As we have seen, theory and opinion concerning potential responses of productive efficiency (Ef) to shifts in wage distribution (CV^2) lack consensus, even as to sights of effects, and provide no guidance about precise functional forms for empirical investigation.

Table 3
Dispersion Augmented Cobb-Douglas Production Functions Log Real Value Added [ln Q] in Swedish Industry

	Period							
	1964–93 (Industries)				1972–93 (Plants)			
	Model				Model			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Constant	7.712	9.73	7.789	7.177	7.532	8.595	7.738	8.023
	[3.30]	[4.14]	[7.72]	[9.68]	[3.41]	[4.26]	[4.87]	[4.74]
Dummy (1983–93)			−.267	−.444			NS	NS
			[9.57]	[11.79]				
$CV^2(B)$	**−20.66**		**−15.21**		−6.311		**−9.689**	
	[10.4]		[7.95]		[1.35]		[2.51]	
$CV^2(W)$	**7.17**		−1.24		**14.45**		**9.913**	
	[7.04]		[0.59]		[4.81]		[5.19]	
ln $CV^2(B)$		**−.228**		**−.151**		−.095		**−.119**
		[7.85]		[8.06]		[1.66]		[2.68]
ln $CV^2(W)$		**.213**		**.057**		.180		**.119**
		[8.43]		[2.77]		[4.41]		[5.70]
ln L	.241	.08	.240	.231	.241	.197	.240	.218
	[1.36]	[.49]	[3.11]	[4.29]	[1.44]	[1.35]	[2.01]	[1.96]
ln K	.06	.056	.068	.061	.072	.075	.075	.076
	[2.92]	[2.52]	[5.08]	[7.23]	[4.93]	[5.67]	[9.80]	[10.35]
Trend	.021	.018	.028	.045	.018	.017	.009	.009
	[4.94]	[4.16]	[6.13]	[11.98]	[3.43]	[3.49]	[2.24]	[2.42]
Trend (1970–82)			−.021	−.03				
			[8.36]	[10.38]				
Trend (1983–93)			−.001	−.019			.014	.013
			[.24]	[3.81]			[2.28]	[2.21]
Adjusted R^2	.981	.972	.988	.988	.961	.963	.966	.966
Durbin-Watson	1.35	1.26	1.36	1.32	1.24	1.26	1.20	1.21
Significance level of Box-Pierce Q	.72	.62	.02	.02	.09	.07	.01	.01

NOTE.—Based on eqq. (3) and (4). Bold coefficients for dispersion variables are significant at the 5% level; t-ratios in brackets; estimation method is ordinary least squares (OLS) with robust errors; NS means coefficient not significant, very close to zero, and hence omitted from specification reported; definitions and sources of variables are given in app. A.

Regression experiments were undertaken for two quite flexible specifications:

$$\ln \text{Ef} = b_0 + b_1 \ln CV^2(W) + b_2 \ln CV^2(B) \quad (8a)$$

and

$$\ln \text{Ef} = b_0 + b_1 CV^2(W) + b_2 CV^2(B). \quad (8b)$$

Table 3 reports estimates of the response of log industrial output to wage dispersions in regression experiments based on equations (3) and

Table 4
Dispersion Augmented Cobb-Douglas Derived Productivity Functions Log Labor Productivity [ln(Q/L)] in Swedish Industry

	Period							
	1964–93 (Industries)				1972–93 (Plants)			
	Model				Model			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Constant	3.89	3.73	4.01	5.59	4.08	5.77	6.37	5.88
	[2.98]	[1.98]	[3.32]	[5.02]	[3.20]	[8.20]	[4.36]	[5.43]
Dummy (1983–93)			−.06	−.206			NS	NS
			[.59]	[1.70]				
$CV^2(B)$	**−11.66**		−4.59		**−12.73**		**−17.68**	
	[3.52]		[1.07]		[3.16]		[3.46]	
$CV^2(W)$	**6.80**		**6.02**		**16.87**		**8.88**	
	[5.94]		[3.00]		[5.19]		[1.77]	
ln $CV^2(B)$		−.071		−.06		**−.181**		**−.203**
		[1.48]		[1.55]		[3.86]		[3.04]
ln $CV^2(W)$		**.121**		**.120**		**.229**		.098
		[2.63]		[2.69]		[5.84]		[1.43]
ln r	−.026	−.035	−.045	−.036	−.024	−.018	.007	.009
	[2.25]	[2.76]	[3.08]	[2.59]	[2.02]	[2.85]	[.47]	[.72]
ln w	.218	.268	.389	.308	.130	.058	−.129	−.144
	[3.17]	[3.19]	[2.76]	[2.87]	[1.72]	[.83]	[.77]	[1.08]
ln Q	.299	.406	.312	.181	.250	.108	.055	−.095
	[2.16]	[2.01]	[2.50]	[1.45]	[2.62]	[1.76]	[.24]	[.50]
ln $L(t-1)$	−.684	−.747	−.701	−.692	−.662	−.647	−.552	−.525
	[8.27]	[11.79]	[11.66]	[12.73]	[6.92]	[6.70]	[4.77]	[4.44]
Trend	.016	.012	.021	.033	.019	.022	.014	.015
	[3.80]	[2.53]	[2.86]	[3.51]	[4.83]	[5.77]	[5.92]	[4.98]
Trend (1970–82)			−.010	−.021				
			[1.56]	[2.65]				
Trend (1983–93)			−.017	−.024			.025	.024
			[5.69]	[6.04]			[2.16]	[2.38]
Adjusted R^2	.997	.996	.998	.998	.994	.994	.995	.994
Durbin-Watson	1.80	1.36	2.17	2.27	1.67	1.88	2.22	2.35
Significance level of Box-Pierce Q	.27	.06	.64	.59	.29	.59	.29	.22

NOTE.—Based on eqq. (7), (8a), and (8b). Bold coefficients for dispersion variables are significant at the 5% level; t-ratios in brackets; estimation method is instrumental variables least squares with robust errors, where output (ln Q) is instrumented using log real imports for Organization for Economic Cooperation and Development (OECD) countries (external demand for Swedish tradables) and lagged output; NS means coefficient not significant, very close to zero, and hence omitted from specification reported; definitions and sources of variables are given in app. A.

(4). Table 4 reports corresponding estimates for log labor productivity responses in regressions based on equations (7) and (8). Regression models (1)–(2) and (5)–(6) in the tables are specified with period invariant output and productivity trends. It is clear from tables 3 and 4 that both specifications of the wage dispersion terms (CV^2, ln CV^2) yield broadly similar results in these experiments. The parameter estimates for Within plant and Within industry dispersion effects are uniformly positive in sign, whereas estimates for Between plant and Between industry dispersion effects are in every case negative. Thirteen of the 16 CV^2 wage dispersion test coefficients are significant in these regressions.

Models (3) and (4) and (7) and (8) in tables 3 and 4 allow period shifts in output and productivity trends. Recall that the trend shift variables correspond exactly to the phases of Swedish wage formation discussed in Section II, and therefore these specifications pose stringent baselines for estimation of dispersion effects, particularly given the relatively high covariation of the Within and Between dispersion variables and the modest sample sizes available for testing.[21] In 15 of the 16 regression experiments specified with multiple trends, the estimated signs of the dispersion variables are the same as in the time invariant trend models: Between dispersions exhibit negative effects and Within dispersions positive effects. As would be expected, there is some tendency for the magnitudes of the effects to be attenuated by comparison to the uniform trend models, yet 12 of the 16 test coefficients are significant.

Taken as a whole, evidence from the regression experiments supports the conclusion that the large reductions in the variances of relative wages Within plants and Within industries, which from the early 1960s until the breakdown of central bargaining in the first part of the 1980s were on the order of 72%, most likely depressed output and labor productivity growth in Swedish industry. Hence the regressions yield no support of the thesis promoted by Akerlof and Yellen and Levine that wage leveling Within workplaces or Within industries enhances productive efficiency; at least when interest focuses on macroeconomic effects and so output, productivity, wage dispersions, and other relevant variables are aggregated up to the industry level, as is the case here.[22]

Yet it is likely that wage leveling in Sweden went far beyond the unspecified, but clearly "at the margin," magnitudes that advocates of "fairness, morale, and cohesiveness" theories have in mind. Moreover, equity theories speak most forcefully to the potential enhancements of labor effectiveness accompanying Within plant pay compression, and plant wage dispersion data were available only for the shorter of the two sample periods, 1972–93. But as late as 1968 wage inequality in Sweden

[21] Notwithstanding the difference in rates of Within and Between relative wage compression during Phases I and II of centralized bargaining (described in Sec. II), the shared variance of Within and Between dispersions is about 80% in both the industry and plant samples. Given the relatively high collinearity, the pattern of significant effects reported in the tables means that the net dispersion signals were quite strong in relation to residual noise in most of the models estimated. Appendix B shows that results featured in the main text are not sensitive to particular observations.

[22] Unfortunately sufficient data for more disaggregated analyses are not available.

was roughly equivalent to that in the United States (Edin and Topel 1997), and much of the Within plant (and industry) wage leveling took place following the radicalization of LO wage policy in 1969–70 (the beginning of the Phase II regime described earlier). In any case, no functional form we were able to devise (including specifications with lagged dispersion terms and parabolic forms allowing sign reversals, threshold effects, and so on) managed to detect any positive output or productivity response to the large movements of Within plant and Within industry wage dispersion observed in the 1972–93 and 1964–93 data samples.[23]

Estimation results for the effects of wage compressions Between plants and industries, however, conform wholly to the arguments first advanced by the LO economists Gösta Rehn and Rudolf Meidner in the 1940s, which were written down with more formal precision almost a half century later by Agell and Lommerud (1993) and Moene and Wallerstein (1997). Equalization of relative wages Between plants and industries evidently raised aggregate output and productivity significantly, most likely, as Edin and Topel's (1997) sectoral empirical analyses indicate, by expediting the flow of labor and capital resources from less to more efficient activities.

V. Implications and Conclusions

What about the magnitudes of distribution effects on productive efficiency? We roughly calibrate the scale of effects implied by the regression evidence by applying the relevant coefficient estimates to observed changes in Within and Between variance components, which were then cumulated over the period studied:

$$\ln \text{Total Cumulative Effect}_t = \sum_{\tau=0}^{t} b_W \Delta f(CV^2(W))_\tau + b_B \Delta f(CV^2(B))_\tau,$$

where f indexes the functional form for ln Ef in (8a) and (8b), Δ denotes year-to-year changes, and b_W and b_B denote the associated wage dispersion

[23] David Levine has emphasized to us that since the Within-industries variance is composed of Within plants given industry and Between plants given industry components, equity theory might receive greater support from analyses based on a tripartite decomposition of total wage variance by industry: Within plants given industry + Between plants given industry + Between industries. However, regressions using this decomposition of total relative wage variance by industry (which, because of data limitations, were confined to the shorter 1972–93 sample), consistently yielded significant positive coefficients for the Within plants component and consistently negative significant coefficients for at least one of the Between variance components, thus sustaining the pattern of results reported in tables 3 and 4.

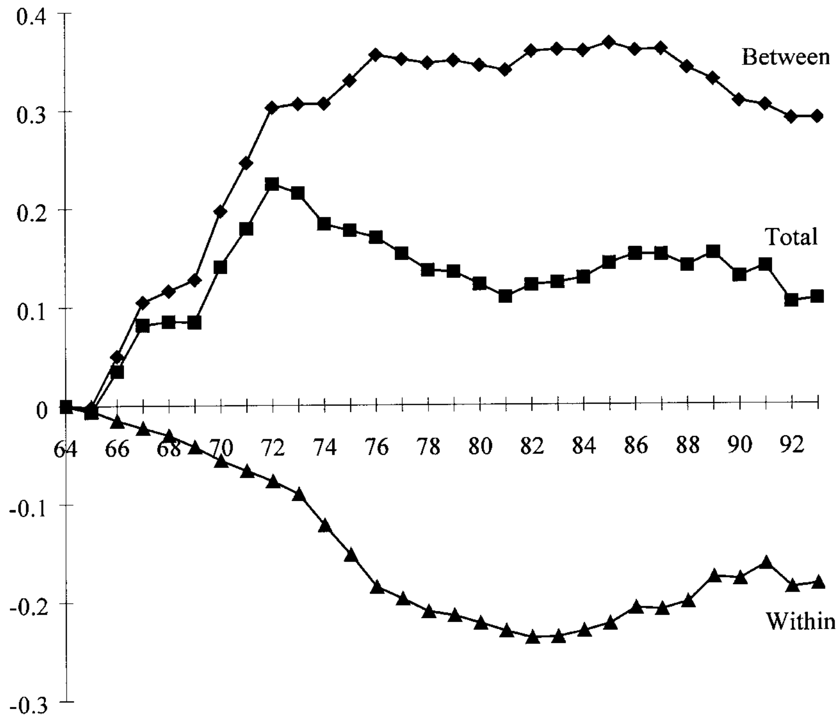

FIG. 5.—Cumulative wage dispersion effects on log output, 1964–93

parameter estimates in the log output and log labor productivity regressions reported in tables 3 and 4. The time paths of cumulative effects, averaged over all estimates reported in the tables, are graphed in figures 5 and 6.[24]

In view of the stylized theoretical foundations of the output and productivity models,[25] it should be emphasized that the figures convey only a rough idea of magnitudes, though the time profiles of the cumulative dispersion effects are probably tracked with fairly good accuracy. As would be anticipated from the brief account of Swedish wage formation history given in Section I, the positive effect of between industry wage compression dominated total dispersion effects from the 1960s up to the early 1970s. The LO's Phase I solidarity policy of "equal pay for equal work" therefore appears to have augmented industrial productive effi-

[24] Taking averages is, of course, a somewhat arbitrary way of summarizing the regression results.

[25] Addison and Hirsch (1989) supply an excellent review of the limitations of production-function-based investigations, such as this one, that try to assess the effects of outside "union-related" variables on growth and productivity.

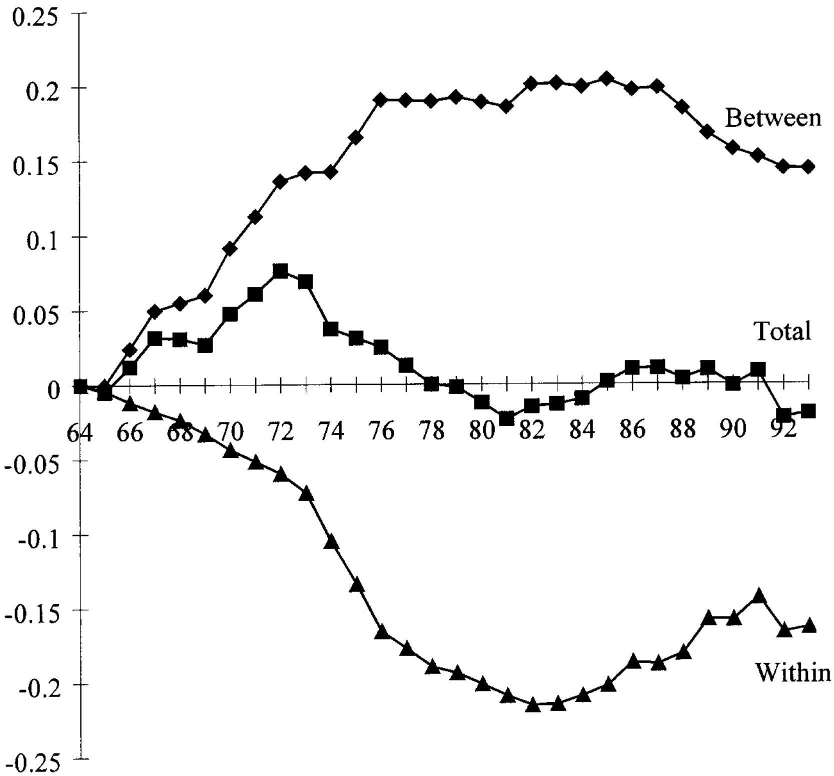

FIG. 6.—Cumulative wage dispersion effects on log labor productivity, 1964–93

ciency, at the peaks cumulatively raising industrial productivity by around 8 percentage points and output on the order of 20 percentage points, if the total effects graphed in figures 5 and 6 are taken at face value (recall also fig. 4). Whatever the precise magnitudes, wage-distribution-induced enhancements to productivity during Sweden's "golden decade" from the early 1960s to the early 1970s, evidently were not achieved at the cost of lower aggregate output, as Lundberg (1985) and Jonsson and Siven (1986), among others, had asserted.

The radicalization of solidarity wage policy during the 1970s, however, appears to have eroded much, if not all, of the favorable legacy of Phase I policy. Wage differentials Within plants and Within industries (across occupations and skill grades) were leveled drastically—by around 60 percentage points when measured by CV^2—during the Phase II period (see table 1). The computations reported in figures 5 and 6 indicate that improvements to industrial productivity under Phase I policy were as a result offset completely (and maybe worse) and that Phase I enhancements to gross output were reduced by more than half.

Yet the dissolution of traditional centralized wage formation after 1982, which ushered in an era of local- and industry-specific bargaining that nullified the institutional capacity to influence wage distribution from the top, yielded large increases in pay dispersion both Between and Within plants and industries (see fig. 1 and table 1). Consequently, the calculations depicted in figures 5 and 6 imply that the positive (most likely incentive-based) effects arising from widening of wage differentials across occupations and skill groups Within plants and industries were neutralized almost entirely during the last dozen years by the negative (most likely structurally based) effects created by the growth of interindustry pay differentials. Viewed from the mid-1990s, it is as if union wage distribution policies had never existed, leaving output and productivity not very far from where they would have been in the absence of the great compression and decompression of Swedish industrial wages.

Appendix A

Record of Notation (Principal Variables)

Wage Dispersion Variables

Based on individual wages of LO-SAF private sector workers recorded in the second quarter of each year. Construction is omitted, as individual wages are not available for this sector. Dispersion statistics are from authors' computations and computations and data supplied by SAF, LO, and Metall.

$CV^2(B)$: Squared coefficient of variation between LO-SAF plants for 1972–93 sample and between LO–SAF contract areas (industries) for 1963–93 samples. Weighted by employment shares.

$CV^2(W)$: Squared coefficient of variation within LO-SAF plants for 1972–93 sample and within LO-SAF contract areas (industries) for 1963–93 samples. For the years 1963–72, $CV^2(W)$ are estimated from microdata for the engineering and fabricated metals industry (Verkstadsföreningen).

Macroeconomic Variables

All pertain to manufacturing plus mining (ISIC 2 + 3); Q, N, L, K, and w are from SCB Central Bureau of Statistics, *Statistics Sweden*, assembled by project SNEP at Uppsala University.

Q = real value added;
L = blue-collar hours;
K = real capital stock, net of depreciation and adjusted for utilization;
r = real user cost of capital (from Professor Jan Södersten, Uppsala University); and
w = average blue-collar real product wage, inclusive of payroll taxes.

The OECD import volumes (used as one instrument for ln Q in table 4) are from International Financial Statistics, various volumes.

Appendix B

Parameter Stability

Table B1 reports tests of the joint null hypotheses that the wage dispersion parameter estimates for model 1 of tables 3 and 4 are equivalent to estimates obtained in parallel regression experiments in which adjacent sets of three observations were omitted. In only one of the 20 regressions reported can the null of parameter equivalence be rejected formally. However, even in that case (the last regression for log real value added; years 1991–93 omitted), the estimates obtained are obviously substantively similar to the full sample estimates. Similar experiments undertaken with the log dispersion variables and for the shorter "plants" samples also demonstrate that the results featured in the article are quite robust to deletion of observations.

Table B1
Parameter Stability Tests (Model 1, Tables 3 and 4)

	Log Real Value Added [ln Q]			Log Labor Productivity [ln(Q/L)]		
	$CV^2(W)$	$CV^2(B)$	Significance Level for Null of Parameter Equivalence	$CV^2(W)$	$CV^2(B)$	Significance Level for Null of Parameter Equivalence
Full sample estimates:						
1964–93	7.17	−20.66		6.80	−11.66	
	[7.04]	[10.04]		[5.94]	[3.52]	
Estimates with years omitted:						
1964–66	6.884	−19.68	.949	6.349	−10.86	.9407
	[5.36]	[6.35]		[4.49]	[2.87]	
1967–69	7.539	−21.23	.9325	6.815	−12.77	.8867
	[7.65]	[11.69]		[3.89]	[2.45]	
1970–72	8.8	−23.18	.4844	6.121	−10.35	.929
	[6.48]	[10.07]		[3.45]	[2.51]	
1973–75	6.371	−18.585	.4863	5.716	−7.717	.4814
	[7.04]	[10.73]		[4.84]	[2.36]	
1976–78	7.063	−19.875	.9231	6.391	−10.81	.9561
	[7.5]	[9.4]		[4.71]	[3.09]	
1979–81	6.672	−20.22	.9127	6.412	−11.4	.9209
	[5.47]	[10.28]		[5.32]	[3.9]	
1982–84	6.977	−20.628	.9702	6.705	−8.397	.6092
	[6.08]	[10.59]		[5.5]	[2.13]	
1985–87	7.053	−20.54	.9939	7.083	−11.32	.8598
	[6.27]	[10.63]		[7.63]	[3.53]	
1988–90	7.833	−21.13	.7191	7.499	−12.83	.7125
	[7.946]	[11.59]		[7.44]	[3.99]	
1991–93	5.086	−21.62	.008	6.602	−15.63	.4954
	[4.84]	[17.93]		[4.59]	[3.43]	

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