Industrial relations and productivity growth: a comparative perspective

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Abstract

In this paper, we examine the relationship between economic performance and industrial relations from a comparative perspective. Specifically, we argue that the degree of co-operation vs. conflict in labour–management relations and the level of worker rights (e.g., employment and income security and union representation) are important determinants of long-run productivity growth. Based on an analysis of the seven largest capitalist economies (the G-7), we find that labour–management co-operation has positive effects on long-term productivity growth, while conflict reduces productivity growth. Furthermore, we find that low unemployment and strong worker rights raise productivity growth in the context of labour–management co-operation while they have the opposite effect in a system characterised by conflict. The impact of industrial relations on economic performance has received a great deal of attention in recent comparative studies (Brunetta and Dell'Agringa, 1991; Bruno and Sachs, 1985, chapter 11; Burtless and Flanagan, 1987; Calmfors and Driffill, 1988; Emerson, 1984; and Freeman, 1988B) as has the comparative productivity growth of the major capitalist countries (Baumol, Blackman and Wolff, 1989; Maddison, 1982 and 1987; Williamson, 1991; and Wolff, 1991). But with few exceptions, the effect of industrial relations on productivity growth has been ignored in both bodies of literature, with the former measuring economic performance in terms of inflation, unemployment, and employment growth and the latter restricting its analysis to the technical determinants of productivity growth. Our paper addresses the neglected relationship between long-run productivity growth—the *sine qua non* of economic performance—and the industrial relations system.

Our model of the impact of industrial relations on productivity is based on a critical assessment of efficiency-wage and cost-of-job-loss models of the determination of work effort.[1] In these models—which assume adversarial labour–management relations—labour productivity depends on the level of effort exerted by individual workers, which in turn depends on their fear of dismissal. We allow for the possibility of co-operation and argue that the degree of co-operation vs. conflict in labour–

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[1] For a very useful summary of both differences and similarities between neoclassical and Marxist conceptions of the production process see Green (1988).

management relations strongly influences long-run productivity growth and that the effects of unemployment and worker rights on productivity growth depend on the quality of labour relations. We construct quantitative measures of co-operation and worker rights from data on the Group of Seven (Canada, France, Germany, Italy, Japan, the UK, and the US). Estimates of a cross-country regression equation of productivity growth from the early 1960s to the late 1980s indicate that co-operation raises productivity growth, while conflict reduces it. Furthermore, low unemployment and strong worker rights increase productivity growth under co-operation and have the opposite effect in a system characterised by conflict.

1. Theoretical framework

Labour productivity depends on the efforts of the workforce and the effective organisation of work.[1] The task of management is how to get the maximum effective effort out of the workforce. In principle, work effort can be elicited either through coercion or inducement. These alternatives are reflected in what we call the conflict model and the co-operative model of labour–management relations.

a. The conflict model

Recent conflict models of the labour process assign a key role to the unemployment rates as a determinant of labour productivity.[2] The power of capital over labour—both at the bargaining table, where wages and work rules are negotiated, and in the workplace, where effort is extracted from workers—is secured by the threat of job loss. In these models, the *level* of productivity depends, in the short run, on work intensity or effort. Effort, in turn, depends on the cost of job loss, which increases as unemployment rises. Thus, increases in unemployment, *ceteris paribus*, raise labour productivity, and decreases in unemployment reduce productivity.[3]

An effort extraction model of this kind relates a sustained increase (or decrease) in the *rate of growth* of productivity to a continually rising (or falling) cost of job loss. This may result from an increasing (or decreasing) unemployment rate, a falling (or rising) 'social wage' (e.g., unemployment benefits, National Health Insurance), or a growing (or shrinking) differential between current earnings and replacement earnings. Such developments are not only a theoretical possibility, but have

[1] We recognise that such factors as technical progress, public and private investment, energy prices, etc. have a strong impact on productivity growth. However, we focus on the social determinants of productivity growth because they have generally been neglected by economists. (For an exception, see e.g. Weisskopf, Bowles, and Gordon, 1983.)

In this paper we analyse differences in productivity growth among the seven countries; we make no attempt to deal with the overall productivity slowdown in these countries during the 1970s.

[2] See Buchele and Christiansen (1993), Green and Weisskopf (1990), Weisskopf (1987), and Weisskopf, Bowles and Gordon (1983). Weisskopf's (1987) finding that the effects of unemployment on productivity growth vary among countries and his speculation that this relationship depends on the character of labour relations was an important impetus for our current research.

[3] Throughout this paper, we abstract from both the negative short-run relationship between unemployment and productivity due to overhead labour effects and the negative relationship between unemployment and long-run productivity growth due to the effect of aggregate demand on the rate of private and public investment and technical change.

actually contributed to a rising cost of job loss in the US and the UK during the past decade.[1]

In the long run, the rate of growth of productivity depends on the rate of technical change and innovation. Workers can either co-operate with (and even actively advance) technical change or they can resist it. If the rate of productivity enhancing innovation depends inversely on workers' ability to resist technical changes (including changes in work rules) that threaten jobs, then we should expect a positive long-run relationship between unemployment (which undermines workers' ability to resist) and the rate of growth of productivity.[2]

b. Critique of the conflict model: work effort and the effective organization of work

We believe that the emphasis that both radical and mainstream authors place on the effort and fear of dismissal of the *individual* worker is misplaced. Furthermore, we are critical of the narrow focus on shop floor activity that is at least implicit in most of this literature.

While it is true that many workers employed in 'secondary' jobs may be motivated by the threat of dismissal, this is not an operative, day-to-day concern of most workers. In particular, primary sector workers are typically protected by seniority rules and other due process procedures from being singled out by employers for dismissal. Individual job performance is not an issue in the mass layoffs and plant closings that cause most unemployment. The fear of job loss that led to wage and work rule concessions and the intensification of work during the early 1980s in the US and the UK, was a fear of *collective job* loss.[3] It arose out of workers' concern about permanent layoffs and plant closings in a world of intensified foreign competition, deregulation, growing non-union competition, and increasingly mobile capital.

Furthermore, in most modern production processes *individual* effort—or even the sum of individual efforts—is not the decisive determinant of overall average labour productivity. The more the production process is mechanised and the more it is organised as a continuous flow process, the less individual workers' exertions influence overall productivity. While it is true that individual workers may have the power to restrict production or damage output, increases in quantity and quality are primarily dependent on effective interaction among workers and between workers and management.

Our second (related) criticism of the conflict model is that an adequate understanding of the determinants of productivity growth has to go beyond the narrow

[1] See Rosenberg (1989B), Layard and Nickell (1989), and Rubery, Wilkinson and Tarling (1989) on the 'restructuring' of labour markets in the US and UK in the 1980s.

[2] Weisskopf (1987) argues that if it is fear of job loss that conditions labour's response to innovation, workers will be less threatened by (and thus less opposed to) labour-saving technical change when unemployment is low than when it is high. This view places greater emphasis on workers' *motives* for resisting technical change than on their *ability* to do so and suggests a negative effect of unemployment on productivity growth.

[3] Kawano (1992) makes this distinction between fear of individual and collective job loss. Thus, while the *cost* of job loss is higher in the primary sector (where workers are paid above-market wages), the *threat* of job loss is normally higher in the secondary sector (where workers have little job security). This distinction reconciles the contradiction between the dual labour market model of Bulow and Summers (1986)—which locates the threat of dismissal as a worker disciplinary device exclusively in the primary sector—with the findings of Green and Weisskopf (1990) and Rebitzer (1987) that this threat is actually more prevalent in secondary industries than in primary industries.

focus on shop floor activity that is at least implicit in most studies. If we work with an aggregate measure of labour productivity that relates output (whether of a single firm or an entire economy) to the total hours of all workers employed to produce that output, it is important that our analysis conceives of the 'production process' in the broadest sense. The potential for waste of hours as well as waste of effort is not limited to the shop floor, but exists in all departments and activities throughout the enterprise, including engineering, accounting, marketing, etc. Our critique implies that *effective* labour effort requires co-ordination and co-operation among workers and between labour and management not just on the shop floor but within and between all departments of the enterprise.[1]

In order to clarify how industrial relations influence productivity growth, we distinguish two analytically separate steps in the transformation of labour hours into final output.[2] The first step involves the transformation of hours into effort or the problem of work intensity. It is obvious that labour productivity suffers if workers 'shirk' or exert only minimum effort. This aspect has received much attention in the efficiency wage (Shapiro and Stiglitz, 1984; Bulow and Summers, 1986) and cost-of-job-loss (Bowles, 1985; Weisskopf, Bowles and Gordon, 1983) literature.[3] We call it the waste of labour hours.

The second—in our view more important—step is the transformation of actual effort into the final output. This involves the problem of the effective organisation of work.[4] Labour productivity certainly depends on individual work effort. But if workers' efforts are not appropriately organised and co-ordinated, they may exert increased efforts with little or no increase in the quantity and quality of output. We

[1] This is recognised in the Japanese practice of rotating workers among job assignments. Co-ordination between design and manufacturing, for example, is improved by rotating engineers between research and development, manufacturing, and sales. Similarly, the German apprenticeship system involves training in and rotation through many departments of the enterprise. See Dertouzos *et al.*, 1989, pp. 87–90.

Bluestone (1989, p. 70) takes the same point to its extreme, arguing that most of the US 'corporate inability to compete does not flow from plant floor practices, but from the myriad of decisions that management makes unilaterally concerning the design, the engineering, and the pricing of the product, the type of technology used in production, and the reinvestment strategies of the enterprise. . . . Workers, through elected union representatives, must fully participate in virtually all of the decisions that are currently the contractual prerogative of management'.

[2] A similar distinction has been suggested by Bowles and Edwards (1985, ch. 8), Christiansen and Naples (1986), and Naples (1988).

[3] Even within this narrow conception of work effort, the focus of the 'shirking' models is too individualistic. As Taylor himself emphasised, far more serious than 'natural laziness of men' was the problem of *systematic soldiering* in which groups collude to restrict output. (See Braverman, 1974, ch. 4; Whyte, 1955; and the extensive sociological literature on restricting output, e.g. Roy, 1952, and Mathewson, 1969.)

[4] We differ on this point with Naples (1988) who sees the transformation of labour effort into output as a purely technical problem. While we do not deny the importance of technology, we emphasise the influence of labour relations on the efficiency with which work effort is applied.

Our theoretical distinction between effort and *effective* organisation of work is often blurred in practice as illustrated by the debate over NUMMI—the joint GM owned-Toyota managed automobile assembly plant in Fremont, California. NUMMI began operation in the mid-1980s with a work force drawn largely from workers who had lost their jobs when GM had closed down the plant in the early 1980s. It has achieved high levels of labour productivity and quality based on the introduction of teamwork and labour-management co-operation but also on a significant intensification of work effort. Consequently, the NUMMI system has been both praised as a beacon for a new era of worker participation and labour-management co-operation (improving the organisation of work and thus the effectiveness of labour) and condemned as a modern version of Taylorism with improved public relations (merely intensifying work effort). See Brown and Reich, 1989, for a balanced account of NUMMI's record.

call this problem the waste of labour effort. Furthermore, we argue that the effective organisation of work is inherently limited by the extent of worker participation and co-operation. While these questions have received considerable attention in management journals, the industrial relations literature (see especially Kochan, Katz and McKersie, 1986, and Katz, Kochan and Keefe, 1987), and in the recent inundation of books on Japanese management practices, they have not found their way into the conceptual framework of productivity studies by economists (whether mainstream or radical).[1]

Dertouzos *et al.* (1989, p. 94) argue along these lines in their study of selected US industries when they say that '[u]nderdeveloped cooperative relationships . . . stand out . . . as obstacles to . . . the improvement of industrial performance.' Likewise, Turner (1992) emphasises the positive role of (West) German works councils in promoting co-operative relations between labour and management. Similarly, many aspects of the Japanese production system underscore the importance of worker participation in continuously improving the organisation of work (*kaizen*). For example, the *kanban* system of just-in-time production and the *andon* system of balancing work loads on the assembly line emphasise worker initiative, responsibility, and teamwork.[2]

c. The co-operative model

The premise of the co-operative model of labour relations is that increased worker participation in decisions concerning the organisation of production (in the broadest sense) can significantly raise the rate of productivity growth.[3] This is because workers are in a position, due to their unique experience and knowledge as the actual producers, to make important contributions to the process of innovation. But workers' commitment to the goals of the enterprise presumes that they have a *stake* in its long-run competitive success. This stake may involve ownership or some form of profit or gain sharing, or it may be based on a 'bonding' arrangement with earnings rising with job tenure. Thus, in a participatory system, workers must have both the opportunity and the incentive to co-operate with management and to initiate changes that raise labour productivity and product quality.[4]

[1] In the efficiency wage literature, the work of Akerlof (1982) and Akerlof and Yellen (1990) emphasises social and psychological influences, stressing the idea that work effort depends on workers' perceptions of the fairness of their wage (or more broadly, their treatment by the employer). However, their formal models still relate productivity to the level of individual work effort.

[2] See Kawano (1992), Womack, Jones and Roos (1990), Hoerr (1989), Schonberger (1982), and for more critical perspectives, Dohse *et al.* (1988) and Parker and Slaughter (1988).

[3] We are aware of the controversy within the labour movement over the meaning and desirability (from labour's point of view) of 'co-operation' and 'participation'. Some critics of co-operation have advocated substantive participation while opposing co-operation as a variation of Taylorism, designed to appropriate the knowledge of workers. (For an illuminating debate on this question see, Banks and Metzgar, 1989 and the responses to their article in the same issue of *Labour Research Review*.)

[4] Both the potential for productivity gains from increased participation and the limitations of participation in a basically adversarial context are documented in Whyte (1955). A more recent illustration is found in the following *Wall Street Journal* report (Patterson, 1990, p. 1):

Flint, Mich.—In a gesture of trust toward 500 unionized workers at a gritty factory that stamps out truck body panels here, General Motors Corp. three years ago told them that they didn't have to punch a time clock when they left work.

GM managers allowed workers to leave once they finished banging out the day's quota of parts. The move sparked a startling jump in productivity: Employees, many on the job for more than 20 years, suddenly found ways to do a full day's work before lunch.

But management, dismayed at paying a full day's wage for a half day's work, unilaterally increased the quotas to the point that workers have to put in eight hours even at the higher production levels they had achieved when they had the incentive to finish early. The workers feel they have been tricked into a speedup, and the UAW is threatening a local strike over the issue.

In the context of such a system, the relationship between unemployment and productivity growth is quite different from that specified in the conflict model. Since a participatory approach does not rely on the threat of job loss to enforce compliance with labour-saving technical changes, there is no effect of unemployment on productivity growth that corresponds to the reserve army effect in the conflict model. Nevertheless, we would expect the basis of labour–management co-operation—especially, the long-term employment relation—to be severely compromised by sustained high unemployment. In such a situation, the 'cost of co-operation' (which includes the cost of retaining redundant workers through downturns) rises relative to the cost of an adversarial system in which workers are discharged when unemployment rises.

Effective co-operation requires that workers feel assured 'that they will not be penalized for their participation. Such acts as criticizing existing procedures or opposing proposed policy changes could invite reprisals from management' (Levine and Tyson, 1990, pp. 212–213). An environment which workers perceive as fair and legitimate and in which they feel secure in their jobs is more likely to foster participation and initiative (and consequently higher productivity growth) than a setting characterised by the legal doctrine of employment at will that has historically prevailed in the US. As Levine and Tyson (1990, p. 213) argue, a 'just cause dismissal policy is a critical right for participation'.[1]

In summary, we argue that productivity growth depends on the degree of co-operation vs. conflict in labour–management relations, with relations based on co-operation achieving higher productivity growth than those characterised by conflict. Furthermore, we argue that the effects of unemployment and worker rights on productivity growth are *a priori* neither positive nor negative. Instead, they depend on the quality of labour relations.[2] Where labour relations are antagonistic, management's upper hand is predicated on workers' vulnerability and thus full employment and strong worker rights undermine labour discipline and productivity growth. Where labour–management relations are co-operative, participation is based on job security and fair treatment, and these are enhanced by full employment and safeguarded by strong worker rights. Finally, the quality of labour relations itself depends on labour market conditions and on the state of worker rights. Sustained full employment and strong worker rights are incompatible with labour discipline in an antagonistic setting. Likewise, high and fluctuating unemployment and weak rights undermine co-operation and put competitive pressures on employers with participatory systems to switch to disciplinary systems based on the threat of job loss.[3]

[1] Eaton and Voos (1992) argue that workplace innovations have greater potential in unionised settings in part because unions can secure a share of the gains for workers (through productivity bargaining). Kelley and Harrison (1992) investigate the joint effect of (1) a particular form of labour-management co-operation (joint problem solving committees) and (2) unionisation on machinists' productivity on a large sample of metalworking plants in the US, with inconclusive results about their interaction.

[2] Freeman and Medoff (1984, p. 179) make the same point in their discussion of the effects of unions on productivity, *viz.* 'unionism *per se* is neither a plus nor a minus to productivity. What matters is how unions and management interact at the work place'.

[3] Note that even in a country such as Japan that we characterise as having long-term employment relations and a 'co-operative' orientation toward labour relations, there still exists a large 'secondary' sector with relatively low wages and high turnover (see Hashimoto, 1990). To some extent these two systems are symbiotic, with the stability of the co-operative sector underwritten by wage and employment 'flexibility' in the secondary sector. Our point here is that prolonged high unemployment increases the incentive for primary sector employers to abandon co-operation or at least to shift more jobs to the secondary sector.

Table 1. *Average annual rate of growth of real GDP per hour worked*

	%/year		
	1960–73	1973–79	1979–88
Canada	3·1	1·9	1·3
France	5·4	3·5	2·7
Germany	5·3	3·9	2·1
Italy	6·5	2·7	1·8
Japan	9·0	3·5	3·2
UK	3·4	2·1	2·8
US	2·2	0·6	0·9

Sources: GDP/employment is taken from *OECD Economic Surveys*, United Kingdom 1988–89, Table 12 (p. 58). These data are adjusted by average annual hours per person in employment from *OECD Employment Outlook*, September 1988, Table L (p. 202) and July 1990, Table L (p. 202).

Table 2. *Distribution of tenure in current job*

	Over ten years (%)	Under one year (%)
A. Males:		
Canada (1986)	31·6	25·0
France (1986)	46·6	11·9
Japan (1987)	54·4	8·7
UK (1986)	37·5	14·8
US (1987)	31·2	25·9
B. Both sexes:		
France (1978)	35·2	17·8
Germany (1978)	37·7	18·6
Italy (1978)	36·7	12·9
UK (1984)	29·4	27·5
US (1983)	27·3	38·5

Sources: Table A: *OECD Employment Outlook*, July 1989, Tables 5.13 (p. 187) and 5.14 (p. 188). Table B: Martin, 1987 (pp. 219–20).

2. Empirical measures of labour–management co-operation and worker rights

To investigate our argument that the long-run effect of unemployment and worker rights on productivity growth depends on the character of labour relations, we have assembled data on the seven largest O.E.C.D. countries covering the period from 1960 to the late 1980s. These data are presented in Tables 1–12. Table 1 reports the

Table 3. *Ratio of managers and administrators to production workers*

Canada (1975)	0·056
France (1972)	0·141
Germany (1972)	0·120
Italy (1972)	0·073
Japan (1974)	0·118
UK (1971)	0·102
US (1974)	0·254

Source: For France, Germany, and Italy, *OECD Employment Outlook*, September 1987, Table 3.5 (p. 81). For other countries, ILO, *Yearbook of Labour Statistics*, 1975 and 1979.

Table 4. *Composition of compensation for production workers in manufacturing*

	Wages and salaries (%)	Bonuses (%)	Benefits (%)	Total (%)
Canada (1971)	83·1	0·2	16·7	100·0
France (1981)	56·6	5·4	38·0	100·0
Germany (1981)	57·7	9·1	33·2	100·0
Italy (1981)	54·4	8·9	36·7	100·0
Japan (1978)	56·7	20·3	23·0	100·0
UK (1981)	71·8	0·7	27·5	100·0
US (1977)	74·8	0·4	24·8	100·0

Source: Hashimoto (1990), Table 5 (p. 257).

annual rate of growth of labour productivity for the economy as a whole (real GDP per hour).[1] We follow convention in distinguishing three subperiods of productivity growth: Period I from 1960 to the first oil price shock in 1973, Period II between 1973 and the second oil price shock in 1979, and Period III from 1979 to 1988.[2]

[1] There has been an ongoing debate over the quality of this kind of aggregate productivity data. Critics have pointed to conceptual and measurement problems, including index number problems and the effects of quality changes in output and sectorial shifts in employment. Bailey (1986) evaluates these arguments and defends the conclusion that a productivity slowdown has occurred. Furthermore, we note that to the extent that these problems plague productivity measurement in all the countries in our sample, they will tend to 'cancel out' in any analysis of *differences* in productivity growth rates among them.

[2] The argument that the relatively low productivity growth of the US in the post–WW II period (documented in Table 1) is due to the shift in employment from the relatively high productivity manufacturing sector to the lower productivity service sector is not supported by empirical evidence. In fact, the US experienced the smallest increase in the service sector's share of employment between 1960 and 1988 of any of the countries in our sample (20·8% for the US and an average 52·6% for the other six countries). The shift to services may have slowed productivity growth, but it does not account for the poor record of the US as compared to the other countries of our sample.

Table 5. *Income replacement rates for unemployed workers, 1975*

	Normal maximum duration of benefits (weeks)	Percentage of earnings replaced	Percentage of annual earnings replaced
Canada	51	68	67
France	52	73	73
Germany	52	66	66
Italy	26	80	40
Japan	30	62	36
UK	52	54	54
US	26	50	25

Sources: Sorrentino (1976), Burtless (1987). The earnings replacement ratio in column 2 is the weekly benefit as a percentage of average earnings in manufacturing. The percentage of annual earnings replaced (column 3) is column 1 (expressed in years) times column 2.

Table 6. *Legal restrictions on layoffs*

	Government permission to layoff workers	Advance notice required for plant closings and layoff	Mandatory severance benefits	Row sum
Canada	0	0	1	1
France	1	1	1	3
Germany	1	1	1	3
Italy	0	1	1	2
Japan	0	0	1	1
UK	0	1	1	2
US	0	0	0	0

Sources: Kaufman (1978), Lazear (1990), Burtless (1987), Emerson (1988). A 'one' denotes presence of the legal restriction; a 'zero' denotes its absence.

Tables 2–4 present three measures of the relative degree of conflict vs. co-operation in labour–management relations. Conflict and co-operation are intangible concepts that are not easily measured or quantified. The variables we have collected are best viewed as indicators or 'correlates' of co-operation, rather than direct measures. They include the distribution of current job tenure (Table 2), the overall ratio of supervisors to production workers (Table 3), and the importance of contingent pay or bonuses in total compensation (Table 4).

We argue that co-operation on the part of workers depends on their perception that their economic well-being is tied up with the long-run competitive success of their

Table 7. *Percentage of total health care expenditure paid by government*

	1960	1970	1980	1987
Canada	44	71	76	74
France	58	70	82	75
Germany	67	75	80	79
Italy	82	87	84	79
Japan	60	65	70	72
UK	87	87	90	87
US	25	39	42	54

Source: *OECD Economic Surveys*, France 1989–1990, Table 22 (p. 77).

Table 8. *Public spending on labour market programmes in 1987 (in per cent of GDP)*

Canada	0·57
France	0·74
Germany	0·99
Italy	0·46
Japan	0·17
UK	0·89
US	0·24

Source: *OECD Employment Outlook*, September 1988, Table 3.1 (p. 86). Programmes include employment services, labour market training, special youth measures, direct job creation and employment subsidies, and special measures for the disabled.

firm. The sense that one has a personal stake in the success of the enterprise is fostered by the expectation of long-term employment. Our measure of the relative prevalence of long-term employment relations in each country (TENURE) is given by the ratio of employees who have ten or more years with their current employer to those who have one year or less.[1]

Workers need not be as closely monitored and are better able to co-ordinate their own activities without close supervision where labour–management relations are

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[1] The countries in Table 2 for which both the percentage of employees with less than one year (T_1) and less than two years (T_2) tenure are reported were used to construct estimates of T_1 for the two countries for which only T_2 is reported (Germany and Italy).

Table 9. *Union membership as a percentage of non-agricultural employees*

	1970	1979	1986–87
Canada	32	36	36
France	22	28	—
Alt.	26	24	21*
Germany	37	42	43
Alt.	37	40	37*
Italy	39	51	45
Japan	35	32	28
UK	51	58	50
Alt.	49	54	43*
US	31	25	17

Sources: Blanchflower and Freeman (1990), Table 1 (p. 42). Alternate estimates for France are from Freeman (1990), Table 12.1 (p. 307). Alternate estimates for Germany and the UK are from Bean (1989), pp. 163 and 178.
  *Alternate estimates in column 3 are for 1985.

Table 10. *Interindustry wage dispersion*

	1972	1982
Canada	23·2	25·5
France	14·6	12·3
Germany	12·8	12·8
Italy	18·3	10·5
Japan	23·1	26·4
UK	14·7	17·1
US	23·9	25·2

Source: Flanagan (1987), p. 216. Wage dispersion is measured by the coefficient of variation of inter-industry wages for blue-collar workers.

co-operative and worker participation is encouraged than in the case of labour–management conflict. We therefore take the ratio of supervisors to production workers (BOSSES) in each country as our second 'correlate of co-operation'. A relatively high ratio indicates labour–management conflict, and a low ratio points to greater co-operation.

Table 11. *Average unemployment rates (percentage of civilian labour force, approximating US concepts)*

	1961–73	1974–79	1980–88
Canada	4·9	7·2	9·3
France	1·9	4·6	9·2
Germany	0·6	3·0	6·0
Italy	3·2	3·8	6·2
Japan	1·3	2·0	2·5
UK	2·9	5·2	10·3
US	4·8	6·7	7·5

Sources: Kaufman (1989), p. 726 and *Monthly Labor Review*, April 1990, Table 49.

Table 12. *Average annual rate of growth of capital-labour ratio**

	0%/year		
	1960–73	1973–79	1979–mid '80s
Canada	1·71	2·27	2·91
France	4·36	4·50	3·98
Germany	5·66	4·04	3·58
Italy	6·77	3·00	2·70
Japan	11·70	6·11	6·59
UK	3·40	3·07	2·50
US	1·64	1·14	1·92

Source: Data provided by Thomas Weisskopf. See Weisskopf (1987).
*Rate of growth of total business sector capital stock per worker.

Finally, the use of group bonuses (or some form of profit or gain sharing) should foster a sense on the part of workers that their economic well-being depends on their collective effort and the economic success of their firm. Hashimoto (1990) also suggests that bonuses may promote wage flexibility by allowing labour costs to respond more closely to changes in economic conditions. Our third indicator of co-operation is thus the portion of total compensation that is paid in the form of bonuses (BONUS). We suppose that co-operation is positively associated with long-term employment relations (TENURE ratio) and the use of bonuses

Table 13. *Factor analysis of measures of labour–management co-operation*

Factor	Eigenvalue	Percentage of variance	Cumulative variance
1	2·017	67·2	67·2
2	0·897	29·9	97·1
3	0·086	2·9	100·0

Factor matrix (one factor with eigenvalue > 1):

TENURE	0·969
BOSSES	−0·456
BONUS	0·933

Factor scores (from most antagonistic to most co-operative):

US	−1·385
UK	−0·757
Canada	−0·587
France	0·016
Germany	0·343
Italy	0·838
Japan	1·531

(BONUSES), and negatively associated with a high ratio of supervisors to workers (BOSSES).[1]

We use factor analysis to distill these three indicators of co-operation into a single index that reflects the degree of co-operation vs. conflict in each country's industrial relations system.[2] The results of this factor analysis are reported in Table 13. The first factor accounts for over two-thirds of the variation in the three variables, and it 'loads' highly (and positively) on TENURE and BONUS and moderately (and negatively) on BOSSES. The factor scores yield an index of the degree of conflict vs. co-operation characterising each country's industrial relations system. These scores are standardised to have a mean of zero and a standard deviation of 0·949. Negative scores (for the US, the UK, and Canada) imply relatively antagonistic labour–management relations, and positive scores (for Germany, Italy, and Japan) relatively co-operative relations.

Tables 5–10 describe six indicators of the extent of worker rights in each country. Our worker rights measures emphasise employment and income security, access to

[1] This clearly does not exhaust the list of possible indicators of co-operative labour relations. Other appropriate measures would include (1) intra-firm wage dispersion (controlling for job tenure), (2) employers' investment in employee training, and (3) the steepness of wage-tenure profiles. Unfortunately, we have not been able to find comparative data on these measures.

[2] We are well aware that within each country, indeed within many individual firms, examples of both co-operative and antagonistic labour relations can be found. Our analysis is based on the (admittedly heroic) premise that internal differences 'average out' so that whole countries can be characterised as having relatively co-operative or antagonistic labour–management relations.

Note also that we do not have separate measures of co-operation for each of the subperiods identified in Table 1. We are thus forced (in the absence of the appropriate data) to assume that the conditions measured by these variables have been relatively invariant throughout the entire period under study.

Table 14. *Factor analysis of measures of worker rights*

Factor	Eigenvalue	Percentage of variance	Cumulative variance
1	4·080	68·0	68·0
2	1·193	19·9	87·9
3	0·458	7·6	95·5
4	0·236	3·9	99·4
5	0·022	0·4	99·8
6	0·012	0·2	100·0

Factor matrix (two factors with eigenvalues > 1):

	1	2
U.I. REPLACEMENT RATE	0·735	−0·528
HEALTH CARE	0·852	0·443
LAYOFF RESTRICTION	0·926	−0·249
LABOUR PROGRAMME EXPENDITURE	0·907	−0·166
UNION DENSITY	0·575	0·790
WAGE DISPERSION	−0·895	0·069

Factor scores (from weakest rights to strongest rights):

US	−1·634
Japan	−0·941
Canada	−0·301
Italy	0·326
France	0·634
UK	0·872
Germany	1·043

publicly funded health care, retraining, and job creation programmes, labour's collective bargaining power, and the degree of centralisation of wage setting. Specifically, they include the annualised unemployment insurance replacement rate (U.I. REPLACEMENT RATE is reported in the third column of Table 5), legal restrictions on layoffs (LAYOFF RESTRICTIONS is the row sum in Table 6), percent of health care expenditures funded by government (HEALTH CARE is the row average in Table 7), public expenditures on labour market programmes (LABOUR PROGRAMME EXPENDITURES, Table 8), union density (UNION DENSITY is the row average in Table 9), and inter-industry wage dispersion (WAGE DISPERSION is the row average in Table 10). Overall, these variables are meant to reflect the state of worker rights and labour's bargaining power *vis-à-vis* employers.[1]

[1] Many of these measures of what we call worker rights are interpreted by others as indicators of labour market rigidity which have contributed to high unemployment and stagflation in Western Europe (see the OECD *Employment Outlook* and the volumes cited in the first sentence of this paper). We have this earlier work to thank for these data being so readily available to us.

Table 15. *Regression results (ordinary least squares estimates)*

	Regression 1		Regression 2			
	Estim. coeff. (Std. Error)	F-Stat. for joint signif. (signif. level)	Estim. coeff. (Std. Error)	F-Stat. for joint signif. (signif. level)	Mean	Standard deviation
Dependent variable:						
Annual rate of growth of						
LABOUR PRODUCTIVITY					3·230	1·973
Constant	1·661†		4·213†			
	(0·554)		(0·502)			
CO-OPERATION	1·352†	2·47	3·391†	12·91	0·000	0·949
	(0·545)	(0·112)	(0·691)	(0·001)		
UNEMPLOYMENT	0·147†	4·58	0·109†	6·97	4·910	2·754
	(0·078)	(0·033)	(0·138)	(0·009)		
UNEMPLOYMENT ·	−0·191*		−0·461**		−1·396	4·539
CO-OPERATION	(0·088)		(0·128)			
RIGHTS	0·635†	8·38	0·780†	4·69	0·000	0·949
	(0·155)	(0·005)	(0·270)	(0·030)		
RIGHTS · CO-OPERATION	0·273*		0·147		0·140	1·077
	(0·147)		(0·258)			
CAPITAL-LABOUR-RATIO	0·534**		—		3·979	2·399
	(0·100)					
D_{23}	−1·902**		−2·807**		0·667	0·483
	(0·323)		(0·488)			
D_3	−0·942**		−0·928		0·333	0·483
	(0·312)		(0·552)			
SEE	0·439		0·777			
R^2	0·951		0·845			
F	49·1**		16·6**			
N	21		21			

Notes: †denotes that *t*-tests of significance are inappropriate. * and ** denote statistical significance at the five and one per cent levels in a one-tailed *t*-test of significance.

The results of a factor analysis of these six variables are reported in Table 14. The first factor accounts for over two-thirds of the variance in the six variables with high positive loadings on U.I. REPLACEMENT RATE, HEALTH CARE, LAYOFF RESTRICTIONS, LABOUR PROGRAMME EXPENDITURES, and UNION DENSITY, and a high negative loading on WAGE DISPERSION. The factor scores (again standardised with a mean of zero and a standard deviation of 0·949) range from negative for the countries with the weakest rights (the US and Japan) to positive for the countries with the strongest rights (the UK and Germany).[1]

The foregoing factor analyses have produced two indices: CO-OPERATION, measuring the extent of labour–management co-operation vs. conflict, and RIGHTS, measuring the degree of worker rights in the industrial relations systems of our seven-country sample. These indices are admittedly derived from fragmentary data as we lack information on some further indicators of labour–management co-operation and on how CO-OPERATION and RIGHTS have changed over time. They do, however, capture significant qualitative differences in the industrial relations systems of the countries in our sample. Whatever their deficiencies, these indices are derived from actual data, as opposed to the subjective rankings that have been used in recent studies on labour market structure and performance of corporatist vs. decentralised economies. (See, for example, Bruno and Sachs, 1985; Calmfors and Driffill, 1988; and Freeman's critique [1988B, p. 69] of these measures.)

3. Econometric evidence

In the remainder of this paper, we report the results of two regressions of labour productivity on these two indices, on the average unemployment rate for each subperiod (UNEMPLOYMENT), and on variables representing the interaction of CO-OPERATION with UNEMPLOYMENT and RIGHTS.

We specify the following regression model of productivity growth:

$$\text{LABOUR PRODUCTIVITY}_{it} = \beta_0 + \beta_1 \text{CO-OPERATION}_i +$$
$$\beta_2 \text{UNEMPLOYMENT}_{it} + \beta_3 \text{UNEMPLOYMENT} \cdot \text{CO-OPERATION}_{it} +$$
$$\beta_4 \text{RIGHTS}_i + \beta_5 \text{RIGHTS} \cdot \text{CO-OPERATION}_i +$$
$$\beta_6 \text{CAPITAL-LABOUR-RATIO}_{it} + \beta_7 D_{23} + \beta_8 D_3 + \varepsilon_{it}$$

where

$i = 1, 2, \ldots, 7$ and $t = 1, 2, 3$.

LABOUR PRODUCTIVITY$_{it}$ = average annual growth rate of labour productivity (real GDP per hour worked) in country i during time period t;
CO-OPERATION$_i$ = an index of the degree of co-operation vs. conflict in industrial relations (scaled with a mean of zero and with algebraically higher values

representing more co-operation) for country i (reported as factor scores in Table 13);

UNEMPLOYMENT$_{it}$ = average annual rate of unemployment in country i during period t (reported in Table 11);

UNEMPLOYMENT $\cdot$ CO-OPERATION$_{it}$ = the interaction term (product) of CO-OPERATION$_i$ and UNEMPLOYMENTit;

RIGHTS$_i$ = an index of the level of worker rights (scaled with a mean of zero with algebraically higher values representing greater rights and security) for country i (reported as factor scores in Table 14);

RIGHTS $\cdot$ CO-OPERATION$_i$ = the interaction term (product) of RIGHTS$_i$ and CO-OPERATION$_i$;

CAPITAL-LABOUR-RATIO$_{it}$ = average annual rate of growth of the capital labour ratio (total business sector capital stock per worker) in country i during period t (reported in Table 12);[1]

D_{23} = a dummy variable with a value of 1 in time periods II and III and zero in period I;

D_3 = a dummy variable with a value of 1 in time period III and zero in periods I and II;

ε_{it} = a random disturbance assumed to be normally distributed with zero mean, constant variance, and zero covariance.

Our hypothesis that the effects of unemployment and worker rights on long-run productivity growth depend on the degree of co-operation in labour–management relations suggests that

$\beta_3 < 0$, unemployment raises productivity growth in conflict-based systems (where labour discipline is secured through the threat of dismissal) and reduces productivity growth where labour relations are co-operative;

$\beta_5 > 0$, strengthened worker rights undermine labour discipline and productivity growth where labour–management relations are antagonistic and foster co-operative practices and productivity growth where they are co-operative.

The effects of CO-OPERATION, UNEMPLOYMENT, and RIGHTS on LABOUR PRODUCTIVITY cannot be evaluated independently of the values of the variables with which they are interacted. For example, the net effect of a one unit increase in CO-OPERATION is the first partial derivative of LABOUR PRODUC-TIVITY with respect to CO-OPERATION, viz., $\beta_1 + \beta_3$UNEMPLOYMENT + β_5RIGHTS. An additional complication arises from the fact that the two variables which measure the degree of labour–management co-operation and worker rights (CO-OPERATION and RIGHTS) are arbitrarily scaled factor scores. These variables are arbitrarily scaled in the sense that their validity as measures of labour–management co-operation and worker rights is unaffected by adding any constant to

[1] The inclusion of the CAPITAL-LABOUR-RATIO acknowledges the importance of increases in capital intensity for productivity growth. This variable is highly correlated with CO-OPERATION ($r = \cdot774$), and its inclusion sharply diminishes the estimated effect and statistical significance of CO-OPERATION. In Table 15, we report two regression results: with and without the CAPITAL-LABOUR-RATIO.

either of them. If we do add a constant to (say) CO-OPERATION, it will not affect the coefficient of CO-OPERATION nor the coefficients of the interaction terms UNEMPLOYMENT · CO-OPERATION and RIGHTS · CO-OPERATION. It will, however, affect the coefficients (and standard errors) of the variables with which CO-OPERATION is interacted, *viz.* UNEMPLOYMENT and RIGHTS. Thus, any rescaling of the variables RIGHTS and CO-OPERATION would affect our estimates of β_1, β_2, and β_4 and their respective standard errors and *t*-statistics. Our estimates of these coefficients and their statistical significance are therefore meaningless.[1]

Table 15 reports ordinary least squares regression estimates for the equation specified above (Regression 1 includes, Regression 2 excludes the CAPITAL-LABOUR-RATIO). The coefficient of the CAPITAL-LABOUR-RATIO (in Regression 1) is positive and statistically significant, as expected. The negative and (mostly) statistically significant coefficients of D_{23} and D_3 document the widespread productivity slowdown of the 1970s and '80s. The signs and statistical significance of the coefficients of UNEMPLOYMENT · CO-OPERATION and RIGHTS · CO-OPERATION support our hypotheses about the interactive effects of labour–management co-operation with unemployment and worker rights.

In place of the usual *t*-tests of significance on β_1, β_2, and β_4, columns 2 and 4 of Table 15 report *F*-statistics on the joint significance of the relevant groups of independent variables. For example, the appropriate test of significance for the combined net effect of co-operation is an *F*-test on the explanatory power of CO-OPERATION and the two interaction variables, UNEMPLOYMENT · CO-OPERATION, and RIGHTS · CO-OPERATION, i.e., an *F*-test on the null hypothesis that $\beta_1 = \beta_3 = \beta_5 = 0$. Likewise, Table 15 reports *F*-tests for the combined net effect of UNEMPLOYMENT and UNEMPLOYMENT · CO-OPERATION (null hypothesis: $\beta_2 = \beta_3 = 0$) and the combined net effect of RIGHTS and RIGHTS · CO-OPERATION (null hypothesis: $\beta_4 = \beta_5 = 0$). In general, the *F*-tests reported in Table 15 support our arguments concerning the effects of co-operation, unemployment, and worker rights on productivity growth.

4. Conclusion

We argue that labour relations have an important effect on productivity growth. Specifically, increased worker participation in decisions concerning all aspects of the organisation of production and increased teamwork and labour–management co-operation can significantly raise the rate of growth of labour productivity. Furthermore, our analysis implies that what is good for workers—low unemployment, employment and income security, and union representation—may be either bad or good for overall economic performance depending on the nature of labour–management relations.

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[1] These coefficients can still be used to evaluate the net sample mean effects of the right-hand side variables, however. For example, the estimated net sample mean effect of CO-OPERATION is $\beta_1 + \beta_3$ $\overline{\text{UNEMPLOYMENT}} + \beta_5\overline{\text{RIGHTS}}$. Although β_1 is affected by adding a constant to RIGHTS, the effect on β_1 is exactly offset by an equal and opposite effect on $\beta_5\overline{\text{RIGHTS}}$. Our estimate of the net sample mean effect of CO-OPERATION—and the *F*-test on the combined (i.e. direct and interactive) effects of CO-OPERATION on productivity growth—remain unaffected and valid.

While our key measures of co-operation vs. conflict and worker rights are based on admittedly fragmentary evidence, our results support the hypotheses that (1) co-operation fosters productivity growth and (2) the effects of unemployment and worker rights on productivity growth are conditioned by the extent of co-operation vs. conflict in labour relations. Where labour relations are characterised by conflict and work is motivated by the threat of dismissal and loss of income, low unemployment and measures that make workers more secure undermine labour discipline and productivity growth. Where labour relations are co-operative and workers have a secure stake in their employer's long-run competitive success, low unemployment and improvements in worker rights actually appear to reinforce the positive relationship between co-operation and productivity growth.

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