Co-determination, Efficiency and Productivity

Felix FitzRoy and Kornelius Kraft

Abstract

We present the first panel estimates of the productivity effects of the unique German institution of parity, board-level co-determination. Although our data span two severe recessions when labour hoarding costs of co-determination are probably highest, and the panel is too short to capture the likely long-run benefits in terms of human capital formation and job satisfaction, we find positive productivity effects of the 1976 extension to parity co-determination in large firms.

1. Introduction

In contrast to the high proportion of unqualified workers in the Anglo-American economies, HRM (human resource management) has been given central importance by legislation on co-determination in the German economy. Acemoglu and Pischke (1999) argue that compression of the wage distribution in Germany encourages firms to provide more general training and supports a high-skill equilibrium. The legal framework of co-determination includes the right to elect plant level works councils with far-reaching powers in most personnel-related decisions, and since 1976, a requirement that half of the supervisory board (*Aufsichtsrat*) of firms with over 2000 employees, consist of labour representatives (though the chair, appointed by owners, retains a casting vote).

The supervisory board, essentially the non-executive and outside directors, appoints the top management board (*Vorstand*) and has to approve major strategic decisions such as acquisitions or plant closure. Ultimate corporate power thus resides with the supervisory board, and directly sharing this power with labour and union representatives represents a radical break with the neoclassical model, where maximizing shareholder value should be the (only)

Felix FitzRoy is at the Department of Economics, University of St. Andrews, and Kornelius Kraft is at the Department of Economics, University of Dortmund, Germany.

goal of the firm, and owners or their representatives hold residual power to safeguard their residual income.

Surprisingly, perhaps, board level co-determination has received little attention from economists. In contrast to the much-analysed effects of works councils, there is not much econometric evidence on co-determination. While simple comparisons of mean values before and after the 1976 legislation by Benelli *et al.* (1987) and Gurdon and Rai (1990) were inconclusive, most German commentators argue that board-level co-determination complements plant level councils and has helped to maintain co-operative labour relations, with greater weight given to HRM than in other countries (Streeck 1984, 1995). Business representatives, however, have strongly opposed the various extensions of co-determination, particularly in 1976, as primarily redistributive measures. The employers' attempt to block the 1976 law as 'unconstitutional' was finally defeated in the Federal Constitutional Court in 1979. Interest has also been raised by the 1997 report of the European Commission group, chaired by Etienne Davignon, *European Systems of Worker Involvement*, which recommended that one-fifth of seats on the supervisory boards of European public companies should be held by employee representatives (European Commission 1997).

The European Commission (EC) report explicitly rejected the idea of giving labour representatives on the supervisory board only consultative rather than voting rights, although the practice of co-determination generally seems to lead to unanimous agreement after extensive discussion. The suggested level of involvement emerged as a compromise to fit the widely differing levels of employee involvement in EU countries. Though offering much less empowerment than the German system of almost parity, it still represents a substantial departure from neoclassical and Anglo-American notions of exclusive residual control for capital owners or their representatives.

Previous econometric studies of board level co-determination by FitzRoy and Kraft (1993) and Gorton and Schmid (2000) used cross-sectional data and thus could not control for firm-specific effects. They found no evidence of productivity benefits. To overcome the problems inherent in cross-sectional data, in the present paper we use panel data for 179 firms, from 1972 to 1976 and from 1981 to 1985, allowing for adjustment to the 1976 law. Both periods contain severe recessions, as well as more normal years, so the sample is still, if anything, biased towards exaggerating the costs of co-determination, though obviously less so than the single recession year cross sections. The empirical results suggest a significant, though small, positive influence on productivity from the 1976 strengthening of co-determination law. These results reject the critique of co-determination made by some business and academic observers and provide support for the Davignon Report. In view of the likelihood of recessionary labour hoarding in our samples, the results do seem to provide indirect evidence of compensating positive productivity effects, even in the relatively short run. However, as we argue below, the legal framework of co-determination complements other characteristics of the

environment in which it operates so extension to different environments needs careful consideration.

The plan of the paper is to outline the economic and institutional framework in section 2, and provide an overview of the data used in section 3. Section 4 then presents the empirical results and conclusions are summarized in the final section.

2. Economic and institutional framework

Traditionally economists see little value in state intervention into a functioning market, and are, therefore, sceptical about the efficiency effects of co-determination. The property rights theory, in general, dislikes intervention by government into the decision rights of firms. The argument is that if it were efficient, then it would emerge in an evolutionary way by itself (see among others Jensen and Meckling 1979). This argument is relevant, although there are possible situations where the market mechanism does not work. However, even if the result is a co-operative one, decisions will certainly take longer if a consensus is needed; compromises will in part limit the interests of the capital owners and flexibility is necessarily reduced. It is possible that such an environment reduces the innovativeness of an organization. Co-determination may well lead to a tendency to maintain the status quo in order to avoid any conflict. Additional support for a sceptical view concerning this law might come from a political-economic perspective. The co-determination law of 1976 was passed during the SPD/FDP (social democrats and liberals) government. Traditionally, the social democrats are associated with unions, and one could argue that this government introduced this law in order to do the unions a favour, even if the whole economy does not benefit from it. This view has some logic, if one believes in rent-seeking.

The participation theorists, on the other hand, argue that the market process does not necessarily lead to a first best solution. Co-determination enables the use of information from the employees, which would otherwise be lost. Furthermore, it will lead to a more co-operative solution, and conflict between capital owners and the workers is reduced if not solved. According to this view, productivity will increase as a result, and such firms will be successful in the market.

In a world of imperfect information and incomplete contracts, the potential benefits of employee involvement or 'voice' in decision making have long been recognized (Hirschman 1970; McCain 1980; Sertel 1982; Smith 1991; Steinherr 1977). However, involvement may also divert effort to internal rent seeking, and these 'influence costs' could in some circumstances outweigh efficiency gains (Milgrom and Roberts 1992). Even when worker participation generates net efficiency gains, employees' bargaining power over distribution of the enterprise surplus or rent is likely to increase, so that the 'share' remaining for owners or managers may decline, thus explaining the widespread opposition to employee involvement by business leaders. As Freeman

and Lazear (1995) and others have emphasized, the distributional effect will probably lead employees to demand a degree of empowerment that exceeds the social optimum, while employers will maximize their share of the surplus when employee involvement is below the socially optimal level.

The designers of co-determination seem to have been aware of these problems, because collective bargaining in Germany is formally quite separate from all aspects of co-determination. To summarize the institutional set-up, industry unions bargain with employers' associations over regional wages, and neither works councils nor employee board representatives are formally involved at any stage. However, works councillors are usually union members, and board representatives are usually also works councillors, though some outside board members are appointed by the relevant union, so there are close personnel links among the three institutions. Furthermore, the works councils are closely involved in decisions over working conditions that may affect workers' skill and pay classification. Supplementary wage and working time agreements at plant or enterprise level typically do involve works councils, and have been increasing in recent years. Works councillors are not allowed to call a strike in law, though they have been involved in unofficial strikes.

The design of the German system of co-determination has thus at least attempted to ameliorate the conflict between efficiency and distributional goals. Participants are legally enjoined to promote enterprise success and not just their own constituents' goals in internal bargaining. However, the system is now under strain as increasing numbers of employers have opted out of the industry employers' federations to conduct enterprise- or plant-level bargaining in which works councils are likely to be at least informally involved.

Since displaced workers usually suffer substantial losses of future income, employee organizations have an incentive to oppose restructuring and downsizing that would be optimal for owners. Parity co-determination may have strengthened the already strong federal labour laws and the role of works councils in limiting employers' flexibility in Germany, but also encouraged investment in firm-specific human capital and HRM. Case studies reveal wide variation in the implementation of co-determination, ranging from management hostility and deliberate restriction of information flows, to enthusiastic co-operation (Nagel *et al.* 1996). Of course, a similar range of management-labour relations is also found in firms and countries without co-determination. However, the very high average levels of blue-collar skills and training in Germany also complement the institutions of mandatory co-determination, allowing the most-skilled workers (*Facharbeiter*) to hold extensive responsibilities in production, of a kind that would be reserved for supervisory, white-collar employees in most other countries. Case studies of matched British and German plants again show that human capital deployment is the main reason for the superior productivity of the German plants (Prais 1990).

Gorton and Schmid (2000) investigate the effects of parity co-determination on measures of firm performance relevant for capital owners, such as return on assets and equity, with cross-sectional data. Although they control for the

influence of capital (total assets) with semi-parametric regression, their finding of generally negative co-determination coefficients is subject to the usual problem of interpretation in cross-section analysis where firm-specific effects cannot be controlled for. Since only the largest firms in terms of employment are co-determined, they may be picking up a size effect rather than any direct effect of co-determination. Gorton and Schmid note that co-determination may be a way of protecting non-contractible investments in firm-specific human capital through a transfer of power to employee stakeholders, and that evidence for such a transfer is not sufficient to judge the social benefits of co-determination.

The 1976 co-determination law gives the chair of the supervisory board, who is appointed by owners, an extra vote to break a tie between the equal numbers of labour and owners' representatives on the board of companies with more than 2000 employees. This situation of 'almost parity' is considered by most observers to have substantially strengthened labour's position compared to the earlier one-third representation (for all firms with over 500 employees) and further strengthened the role of HRM. Most board decisions are by unanimous vote. Parallels can also be drawn between the organization of large Japanese firms, with no formal co-determination but extensive involvement, and the effects of co-determination combined with a highly trained workforce in Germany (FitzRoy *et al.* 1998).

Addison *et al.* (2001, 2004) and Hübler and Jirjahn (2003) survey the evidence on both the effects and determinants of works councils, which are the most studied institutions of co-determination. The results are controversial, but the effects seem to be small. In 1994 98–100 per cent of all firms with 2000 employees or more had a works council, in contrast to only 17–20 per cent of all firms. Hence the large co-determined firms will almost surely also have a works council, while this is unclear for the smaller units. Unfortunately we have no information concerning the existence of works councils in our sample.

While Freeman and Lazear (1995) and most other writers on this topic neglect the interaction between collective bargaining and co-determination, Hübler and Jirjahn (2003) follow McCain (1980) to develop a model of collective bargaining and works councils. They find that councils raise productivity only in firms under the industry collective bargain, while the main wage effect is in firms that have opted out of the industry bargain to negotiate independently with the union. However, their data does not include capital stock, so their results on productivity have to be interpreted with caution. FitzRoy and Kraft (1995) find a positive interaction between works councils and profit sharing.

The 1976 move from one-third-parity to almost-parity board level co-determination in large firms is agreed by most observers to have strengthened employee bargaining power (Rogers and Streeck 1995). More protection for non-contractible human capital investment in the form of reduced employment fluctuation would tend to lower the return to capital (as found by Gorton and Schmid 2000), unless offset by greater efficiency. Since the large firms affected by board-level co-determination in our sample almost all had

works councils, and were likely to be covered by the industry wage bargain, the question we address is: what effects, if any, do different kinds of board representation have on productivity? Most theoretical models agree that there is likely to be an optimal degree of co-determination in terms of efficiency, and 'too much' participation or employee representation will be counterproductive. There is thus no particular presumption that the two degrees of parity should have similar, or even same-signed effects, and since we have a panel of firms that changed from one-third to almost-parity after 1976, we can provide the first estimates of the *additional* effect of this controversial move, while controlling for firm-specific effects.

3. The data

We use published data for 179 public companies (not all of them traded on the stock market) from all sectors of manufacturing industry except steel, coal mining and brewing in (former) West Germany. Steel and mining firms are excluded because of their stronger co-determination rights and the particular structural problems related to these industries. Brewing is not considered because of its special circumstances, which are not representative of manufacturing in general. Overall beer consumption is declining; the smaller breweries make frequent losses, there are many mergers, large firms are gaining market share and the whole industry is subject to severe structural change. The criterion for selection of the other firms is simply the availability of the necessary data from companies that publish this information for the years in question. We include all information that is available to us.

The data form two unbalanced panels, with at least three, and, at most, five annual observations in the two periods, 1972–76 and 1981–85, before and after the 1976 Co-determination Act. The 65 largest co-determined companies all switched from one-third labour representation before 1976 to 'almost parity' after 1976. This is the strongest form of co-determination which we use as a benchmark for productivity comparison, so that our 'parity co-determined' sub-sample consists of all those firms with employment exceeding 2000 after 1976 (by a generally large margin). The rest of our sample consists of firms which are all much smaller, mostly with fewer than 500 employees, and thus not covered by the first (1952) law on co-determination which mandated 'one-third parity' or board representation by labour. We denote these the 'non-co-determined' firms. Since we wish to compare the effects of parity co-determination (post-1976) with the effects of weak co-determination (one-third parity) for the 'same' sub-sample, thus controlling for firm effects, in order to identify any influence of the 1976 legislation, we include a few firms with one-third parity in the 114 'non-co-determined' pre-1976 sub-sample. We consider one-third parity separately below. None of our firms has changed its legal status, has reduced employment below the 2000 employees limit, or split up in legally separated firms in order to escape from the co-determination law.

Table 1 lists definitions of variables used and presents descriptive statistics for the six sub-samples. We use sales as our gross output measure, and include materials and intermediate goods as an input in addition to labour and capital, thus avoiding the problems of bias from published value-added data in an imperfectly competitive environment (Basu and Fernald 1995). Estimations of production functions are frequently plagued by the reverse causality running from output to factor demand. In order to avoid a possible simultaneous equation bias, we use lagged values of the production factors — labour, capital and materials. The production factors are in this case predetermined and can be used as a simple way to avoid a simultaneous equation bias. However, none of our results depend on the use of lagged variables. The sales volume and materials are divided by the price index of the relevant industry and are therefore real values. Since our three factors are all related to firm size, we are also less likely to conflate co-determination effects with firm size effects on productivity. Since size is a major determinant of works council election (Addison *et al.* 1997), our large co-determined firms almost certainly all have works councils.

Our general strategy is to consider the relative performance of non-co-determined firms compared with the co-determined ones before and after the 1976 legislation. One possible reason for firm size effects not captured by the production factors is that our non-co-determinated, smaller firms may not all have works councils — though we have no data on this. There is thus a possibility that any cross-sectional productivity differences may also be affected by the presence or absence of works councils. Since councils are rarely disbanded or newly elected, we focus on the 'change' in productivity measured before and after the 1976 law. Nevertheless, as we and most other students of these institutions have emphasized, plant- and board-level co-determination are likely to be complementary.

4. Empirical results

Given the limitations of the data, our empirical strategy is to estimate the effects of co-determination on total factor productivity in the pooled data of the pre-1976 and post-1976 panels. In view of the major size differences between co-determined and non-co-determined firms, our main interest is in testing for a 'change' in the effect of co-determination on large firms as a result of moving from one-third parity to almost parity in 1976. Opponents of co-determination argue that this move, supported by the social democratic West German government of the time, went beyond efficient involvement in order to redistribute more surplus to labour. However, as argued above, redistribution does not exclude efficiency gains as well through improved co-operation and human capital formation.

By focusing on the change in board representation in a given subset of 65 firms, our co-determination dummy variable is obviously defined as time invariant. The usual firm fixed effects thus cannot be distinguished from

TABLE 1
Descriptive Statistics for 1972–76 and 1981–85

Variable	Co-determined firms (N = 65)	Third parity-co-determined firms (N = 61)	Non-co-determined firms (N = 53)
1972–76			
COD	1	0	0
(= 1 if the employment is ≥2000)			
LABOUR	17586	1137	321
Number of employees	(26926)	(547)	(126)
CAPITAL	1320188	65906	16949
Total capital stock in TDM	(2187755)	(40753)	(12092)
(thousand deutsche mark)			
MAT	963477	46217	14674
Material input in TDM	(1631943)	(51503)	(10618)
SALES	1879424	95906	28248
Total sales volume in TDM	(3096734)	(64853)	(16677)
OVER	2.30	2.44	2.57
Average number of overtime hours	(0.94)	(1.03)	(1.20)
per week and worker at industry			
level			
CONC	33.58	22.80	21.65
Percentage market share of the six	(18.88)	(15.06)	(16.72)
largest firms — industry level			
IMP	0.17	0.19	0.22
(Value of imported goods/total	(0.11)	(0.12)	(0.17)
production) — industry level			
EXP	0.33	0.30	0.30
(Value of exported goods/total sales	(0.10)	(0.06)	(0.12)
volume) — firm level			
1981–85			
COD	1	0	0
(=1 if the employment is ≥2000)			
LABOUR	18918	1100	315
Number of employees	(37834)	(450)	(117)
CAPITAL	2246018	117990	28904
Total capital stock in TDM	(3865700)	(89117)	(22076)
MAT	2082503	90468	30746
Material input in TDM	(3862749)	(98639)	(43039)
SALES	3729622	175726	53270
Total sales volume in TDM	(6706128)	(130640)	(48942)
OVER	1.43	1.57	1.71
Average number of overtime hours	(0.59)	(0.63)	(0.79)
per week and worker at industry			
level			
CONC	33.43	23.55	23.30
Percentage market share of the six	(18.65)	(15.37)	(16.95)
largest firms — industry level			
IMP	0.25	0.28	0.34
(Value of imported goods/total	(0.16)	(0.19)	(0.22)
production) — industry level			
EXP	0.44	0.42	0.42
(Value of exported goods/total sales	(0.17)	(0.18)	(0.18)
volume) — firm level			

Mean values (standard deviation in parentheses).

co-determination effects, and the fixed effects or 'within' estimator cannot be used. We shall thus use the solution suggested by Hausman and Taylor (1981) for such a situation. This model allows for some of the explanatory variables to be related to the firm-specific effects, while others are not. In particular, they consider four groups of explanatory variables. The variables in the first group are time varying and uncorrelated with the firm-specific effects. The second group considers time-varying variables that are related to the specific effects. In the third category, the variables are time-invariant and uncorrelated with the fixed effects. And finally, there are variables which are time-invariant and correlated with the fixed effects. The Hausman–Taylor model is an instrumental variable approach, where the group two variables are instrumented by the deviations from their individual means and the time-invariant variables from category four are instrumented by the individual averages of the exogenous variables. In the latter case, we use probit instead of a least squares procedure.

Now the question arises as to how the researcher knows which variables are affected by the individual effects (group two variables) and which ones are not (group one variables)? The Hausman–Taylor approach can be varied with respect to the variables classified into the two groups, then two estimations are carried out — one based on a within and one based on a random effects model — and Hausman tests on differences between coefficient vectors show whether the coefficients are affected by the modification of the estimation method. Our specification is accepted by the appropriate Hausman (1978) test on a possible correlation between the fixed effects and our explanatory variables. Although this approach is very useful in many circumstances, it is rarely used in practice. Short expositions of the econometric model can be found in Verbeek (2000), Wooldridge (2002) and a more detailed description is found in Baltagi (1995).

As the model is already quite involved, we have not tried to use more complicated production functions like CES or translog, but use instead the simple Cobb-Douglas function. In our case, the dependent variable is sales, and the explanatory variables include the production factors labour, capital and materials.

To identify the effects of parity in the COD sub-sample, we now define an additional dummy variable COD80, which takes the value one for co-determined firms *only after 1980*. This variable thus measures the *additional effect* of moving from one-third to almost parity after 1976 in the given subset of firms with over 2000 employees. The idea of this specification is to control for any possible size effect present at the 2000 employee limit, which is not captured by the production factors. If COD has a significant coefficient, there is such an effect. Wooldridge (2002: 129–30) shows that this specification is a difference-in-difference estimator. A combination of size effects with the impact of the co-determination law is now only possible for the situation, that something linked to size has *changed* from the 1970s to the 1980s. One possible reason might be different developments of the qualification structure. Data on this topic is very hard to obtain as it has to be differentiated

according to firm size classes, and cover the 1970s and 1980s. We obtained information from the Bundesinstitut für Berufsbildung in Berlin (private communication) on the incidence of apprenticeship in 1980 and 1985. The share of firms with 50–499 employees with apprentices increased from 73 to 77 per cent, while for larger firms, with 500 or more employees, the percentage rose from 93 to 94 per cent (we have no separate information for firms with 2000+ employees). Hence, according to these figures, there was no dramatic change in the number of firms with apprentices, and as the qualification structure changes rather slowly over time, we do not think that such a change could affect our results.

In addition to the co-determination dummies, we add industry overtime OVER, as an index of capacity utilization, and the four-firm industry concentration ratio, CONC, as an index of market power. The role of international trade is represented by the share of sales from foreign firms divided by total sales volume, IMP, measured at the two-digit industry level. The share of sales exported is calculated at the individual firm level and added as EXP. Time dummies are also included to control for inflation and macroeconomic conditions.

In terms of the Hausman–Taylor model, our group one variables are the industry variables OVER, CONC, IMP, EXP and the time dummies; in group two, we have the production factors; in group three are the industry dummies; and finally, in the fourth group, we put the co-determination dummies. Hausman and Taylor (1981) suggest that a time-invariant variable such as either of our co-determination dummies in the relevant years could be instrumented using explanatory variables that are correlated with it, but not with firm effects. This suggestion is followed by instrumenting the co-determination variable by the individual mean values of IMP, EXP; OVER, CONC and industry dummies, which is then denoted $\hat{\text{COD}}$ (for the years 1972–85) and $\hat{\text{COD}}$80 (for the years 1981–85). The additional productivity effect of co-determination is thus estimated by β_2, independently of the size effect that is captured by β_1. Our final specification is thus:

$$\begin{aligned}
\ln \text{SALES} = {} & \beta_0 + \beta_1 \hat{\text{COD}} + \beta_2 \hat{\text{COD}}80 + \beta_3 \ln \text{LABOUR} \\
& + \beta_4 \ln \text{CAPITAL} + \beta_5 \ln \text{MAT} + \beta_6 \text{OVER} \\
& + \beta_7 \text{CONC} + \beta_8 \text{IMP} + \beta_9 \text{EXP} + \text{time dummies} \\
& + \text{random firm effect} + \text{error}
\end{aligned} \qquad (1)$$

The results, presented in Table 2, show that parity co-determination does have a small, significant and positive additional effect on productivity after 1976, thus rejecting the hypothesis of purely redistributive effects. As the Hausman–Taylor approach is rather complex and involves a number of variable transformations, we also present simple random effects estimations without the many data purifications in order to check the robustness of the results. The basic results with respect to the co-determination variables remain unchanged. We also performed the Hausman–Taylor procedure without the IV transformation of the COD variables. The basic results were not affected.

TABLE 2
Cobb–Douglas Production Functions, with Pooled Data: Dependent Variable Sales

Period variable	Hausman–Taylor 1972–76, 1981–85	Random effects 1972–76, 1981–85
Constant	3.17 (11.12)	2.51 (20.42)
CÔD	0.24 (4.06)	0.005 (0.22)
CÔD80	0.06 (3.48)	0.04 (2.84)
InN	0.27 (6.49)	0.29 (14.11)
InK	0.27 (5.82)	0.27 (8.12)
InMAT	0.32 (5.51)	0.37 (8.48)
IMP	−0.13 (−1.15)	−0.21 (−2.33)
EXP	0.20 (2.54)	0.25 (3.25)
OVER	−0.0003 (−0.03)	0.006 (0.51)
CONC	−0.0003 (−0.10)	0.0001 (0.06)
R^2		0.998
χ^2 (P-value) Hausman test on Hausman–Taylor–RE versus Within Estimation of all time-varying variables	4.17 (0.999)	—

Notes: *t*-values (respectively probability value for the χ^2 statistic) in brackets, $n = 1630$, 179 firms, time dummies not reported.

The coefficient of the CÔD80 dummy represents the productivity gain of the co-determined firms that switched from one-third to 'almost parity', after 1976. The effect is rather small, but we interpret the significance of this coefficient as evidence against the hypothesis that co-determination is necessarily bad for efficiency. In our view, this result has considerable policy relevance. In light of the recent controversial discussion on the introduction of a co-determination law at the EU level, according to our data and testing, this will not disadvantage the European firms in question. Column one presents the results from a regression without the co-determination variables, which is made in order to test for the robustness of the results and to show the result of the Hausman test.

The coefficients of the production factors are relatively small in particular if the results of the Hausman–Taylor model are considered. It is not uncommon that fixed effects estimations (or deviations from the mean) affect the magnitude of the coefficients of the production factors and reduce them. The coefficient of CÔD is much larger in the case of the Hausman–Taylor estimations, and apparently, a part of the size effect is captured by this variable and reduces the magnitudes of the coefficients of the production factors. Imports and exports have a relatively strong impact.

In the next step, we test for another possible co-determination effect. It might be the case that the weaker, one-third parity co-determination rights relevant for firms with 500 or more employees before 1976 had some impact. In order to test for this possibility, we (re)define the following variables: COD5-20 is now a dummy for firms with more than 500 but less than 2000

TABLE 3
Cobb–Douglas Production Function with Pooled Data, Dependent Variable Sales

Period variable	Hausman–Taylor 1972–76, 1981–85	Random effects 1972–76, 1981–85
Constant	3.18 (11.10)	2.48 (19.22)
CÔD	0.25 (4.03)	0.033 (1.14)
COD5-20	0.07 (2.02)	0.03 (1.65)
CÔD80	0.06 (3.45)	0.04 (2.80)
InN	0.27 (6.38)	0.29 (13.98)
InK	0.26 (5.71)	0.26 (8.05)
InMAT	0.32 (5.50)	0.37 (8.46)
IMP	−0.11 (−0.93)	−0.13 (−1.24)
EXP	0.17 (2.05)	0.21 (2.69)
OVER	−0.003 (−0.29)	0.008 (0.75)
CONC	−0.0007 (−0.32)	0.0006 (0.31)
R^2		0.998
χ^2 (P-value)	4.17 (0.999)	—
Hausman test on Hausman–Taylor–RE versus Within Estimation of all time-varying variables		

Notes: See Table 2.

workers; COD and COD80 are defined as above for firms with over 2000 employees. The small firms with fewer than 500 employees are the control group. The dummy variables are again instrumented by the individual mean values of IMP, EXP; OVER, CONC and industry dummies. Aside from the results of the Hausman–Taylor model, simple random effects estimations are presented as well. All results are shown in Table 3.

This alternative estimation does not alter the conclusions. Almost-parity co-determination remains significant. The coefficient of one-third co-determination in the Hausman–Taylor specification also has a significant coefficient. However, we are unable to carry out a before-after comparison as the relevant legislation was introduced in 1952. As already noted, the co-determination that we consider is restricted to the supervisory board, and this body does not determine wages (except the salaries of top management). Wages are set at industry level. Therefore rent sharing can only be implemented by job protection or labour hoarding, on which we have no empirical evidence.

5. Conclusion

We have explored the impact of two kinds of board-level, worker co-determination on the productivity of firms. The move to almost parity after 1976 seems to increase productivity slightly in the affected firms. One-third co-determination also has a positive coefficient in one specification. There is certainly no suggestion of the negative effects predicted by opponents in both industry and academia.

As emphasized initially, our short panels both include major recessions, and are thus likely to exaggerate the short-term costs of co-determination in the form of more labour hoarding. This could not be explicitly tested due to lack of data on working time at the individual firm level. The long-term benefits from greater job security and consequent worker commitment and investment in firm-specific skills noted by Gorton and Schmid (2000), Freeman and Lazear (1995) and many earlier writers would probably require longer data series to be identified. Although co-determination had a statistically significant positive effect only after 1976, the fact that we find no evidence of any deterioration in productivity or growth following the move to almost parity in 1976 provides reason to reject the critical view that this (political) move was primarily redistributional. Theoretical arguments suggests there is scope for real efficiency gains in terms of both productivity and job satisfaction. The latter is notoriously difficult to measure, and the former is probably most evident in a long-run context that goes beyond our static model and limited data. More research is clearly needed to explore the ramifications of employee involvement.

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