Profit-sharing and the financial performance of firms: Evidence from Germany

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Abstract: This study examines the relationship between profit sharing and profitability using a nationally representative German panel dataset. Applying a matched difference-in-differences approach, we find that an introduction of profit sharing positively affects profitability.

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1. Introduction

The relationship between profit sharing and productivity has been discussed widely in the economic literature. The primary motive for an introduction of profit sharing is the employer's intent to pass on a share of the profits to the employees in order to align their interests with her own. As a result, employees' effort and willingness to cooperate should increase thus raising the firm's overall efficiency (Kruse, 1992). Several empirical studies have investigated this relationship and come to a strikingly clear result attributing profit sharing a significant impact on productivity (for an overview see e.g. OECD, 1995). Central to the success of a profit sharing scheme seems to be the fact that employees are rewarded for their additional effort by extra income (for empirical evidence see e.g. Bhargava and Jenkinson, 1995, Kraft and Ugarkovic, 2005). If employees, however, are rewarded financially for their increased effort, it seems plausible to assume that owners would like to see the implementation of such a scheme pay off as well. This is the more so as the implementation of an adequate sharing scheme is associated with further costs in terms of time, effort and other resources (Bhargava, 1994). Despite the importance of the issue the impact of profit sharing on the financial performance of firms and thus the question whether a more efficient utilization of labor in the production process is also reflected in a firm's higher profitability has rarely been explored in the literature.[1]

Moreover, most studies evaluating the effects of profit sharing ignore the fact that firms self-select into sharing schemes. If it is the more productive and more profitable firms that introduce profit sharing as is suggested by several authors (e.g. Kruse, 1992, Prendergast, 1999) then a simple comparison of sharing with non-sharing firms is likely to be biased. A remedy for this problem is to construct a control group of firms that is as similar as possible before the introduction of profit sharing and to

[1] For empirical evidence based on panel data see Bell and Hanson (1987) or Bhargava (1994).

conduct a before-after comparison for both groups. Differences in outcomes can then be attributed to the measure introduced (Heckman et al., 1998). The objective of this paper is to contribute to the existing literature by applying (to the best of our knowledge for the first time in connection with profit sharing) an extension of this matching approach to investigate the impact of an introduction of profit sharing on firms' profitability.

2. Empirical analysis

Our empirical analysis is based on the German nationally representative IAB Establishment Panel provided by the Institute for Employment Research (IAB) of the German Federal Labour Office. Since 1993, several thousand German firms from 16 industries and 10 size classes have been surveyed annually on a wide range of questions. While a core of questions such as general establishment information or information on turnover, investments and the profit situation is provided annually, other topics are covered only irregularly (Bellmann, 1997, Kölling, 2000). Data on profit sharing is available for the years 1998, 2000 and 2001.

For the purpose of our analysis we identify all establishments that have been surveyed continuously from 1998 to 2002. Establishments are defined as profit sharing if they reported to have no profit sharing in 1998 but had introduced it subsequently. Non-sharing firms on the other hand include all those establishments that reported to have no profit sharing scheme implemented throughout the whole period. This leaves us with 87 sharing and 1831 non-sharing firms.

In light of the productivity-enhancing effects that have been attributed to profit sharing, it seems quite surprising that only a small fraction of firms considers introducing such a scheme. Other studies report similar findings (see e.g. OECD, 1995). A plausible explanation might be that firms have specific (dis-)advantages with

respect to the introduction of different remuneration schemes and thus choose the incentive scheme that best suits their needs. An exploration of the literature on the determinants of profit sharing suggests that several groups of variables such as e.g. firm size, organizational structure, industrial relations and the external environment promote an introduction of profit sharing (see e.g. OECD, 1995, Pendleton et al., 2003). Table 1 reports the results from a comparison of both groups in our sample and confirms these findings: The share of larger, exporting firms with an innovative organizational structure that have set up a works council and/or are covered by a collective agreement is significantly higher among the sharing firms. Moreover, the profit situation which is a categorical measure reported by the firm's top management and can take five values ranging from 'very good' to 'very bad', is more favorable in sharing firms.

Table1 – Mean values of variables for firms (not) introducing profit sharing in 1998

Variable	Firms with profit sharing	Firms without profit sharing	Matched firms without profit sharing
Number of employees	359	79***	263
Shift responsibilities (yes/no)	0.37	0.16***	0.28
Teamwork (yes/no)	0.21	0.11**	0.14
Independent work groups (yes/no)	0.22	0.07***	0.14
Share of qualified employees	0.66	0.58***	0.69
Collective bargaining (yes/no)	0.78	0.54***	0.81
Works council (yes/no)	0.55	0.21***	0.56
Competition (yes/no)	0.91	0.86	0.87
Exporter (yes/no)	0.45	0.14***	0.47
Investment in ICT (yes/no)	0.70	0.41***	0.59
Limited liability (yes/no)	0.71	0.45***	0.69
Age (founded after 1990, yes/no)	0.40	0.46	0.40
East German establishment (yes/no)	0.44	0.55**	0.50
Profitability (1 – 'very good', 5 – 'very bad')	2.83	3.05*	3.01

*/**/*** indicate that means differ with statistical significance in a two-tailed t-test at the 10%, 5% or 1% level between the establishments from the two groups

Source: IAB-Establishment Panel, wave 1998, controlled remote data access via the Research Data Center (FDZ) of the Federal Employment Service (BA) in the Institute for Employment Research (IAB).

Our presumption that self-selection takes place is thus confirmed. As has been indicated above a simple comparison of sharing and non-sharing firms will most likely lead to biased results. In the absence of information on the counterfactual situation, however, we can construct a control group which is as similar as possible to our group of sharing firms to determine the causal effect of profit sharing on profitability. Instead of matching the firms on a vector X of variables, Rosenbaum and Rubin (1983) prove that one can also match on the propensity score, i.e. the probability of introducing profit sharing given a set of individual characteristics of a firm p(X). This propensity score can be estimated via probit regression.

Several matching algorithms have been proposed in the literature. The difference lies in the weights attached to the comparison group observations. Typically, the more dissimilar a control group observation is the lower the weight attached to it in constructing the match. The two extremes among the matching estimators are nearest neighbor and kernel matching. While nearest neighbor matching attaches unity weight to the nearest observation in terms of the propensity score and zero to all other observations, kernel matching weights *all* observations according to the relative proximity of the non-sharing firms' observations to the sharing ones (Dehejia and Wahba, 2002). To control for the robustness of our results, we apply both estimators.

We amend propensity score matching by employing a difference-in-differences matching estimator. Instead of comparing the difference in outcomes between the two groups *after* the introduction of profit sharing, the matched difference-in-differences estimator compares the *before-after change* in outcomes of sharing and matched non-sharing firms. The causal effect that has also been denoted in the literature as the *average treatment effect on the treated* can then be estimated according to:

$$\frac{1}{N_1}\sum_{i\in\{D=1\}}\left\{\left(Y_{1,t1}-Y_{1,t0}\right)-\sum_{j\in\{D=0\}}W_{N_0}(i,j)\left(Y_{0,t1}-Y_{0,t0}\right)\right\}$$

where N_1 and N_0 denote the number of sharing and non-sharing firms, Y_1 and Y_0 represent the outcomes of both groups and t0 and t1 refer to the period before and after the introduction of profit sharing. $W_{N0}(i,j)$ represents a weight function that gives higher weight to comparison observations j that are more similar to the sharing firm i in terms of the propensity score. The advantage of this approach is that unobserved individual-specific effects as well as common macro trends are additionally accounted for (see Heckman et al., 1997, 1998a).

Table 2 presents the results of our estimations. The outcome variable is defined as the change in profitability between 1997 and 2001 and takes a value of one if the firm reported an improvement (deterioration) in its' profit situation and zero otherwise.

Table 2 – Results from matched difference-in-differences estimation

Change in profit situation (dummy: 1= improvement)	**Firms with profit sharing**	**Matched firms without profit sharing**	**causal effect**	**t-value**
Nearest neighbor matching	0.40	0.23	0.17	2.15**
Kernel matching	0.40	0.26	0.14	2.43**
Change in profit situation (dummy: 1= deterioration)				
Nearest neighbor matching	0.29	0.41	-0.13	1.34
Kernel matching	0.29	0.40	-0.11	2.26**

***/**/* indicates statistical significance at the 1%, 5% and 10% level.
Source: IAB Establishment Panel, waves 1998-2002, own calculations (controlled remote data access via FDZ).

Kernel as well as nearest neighbor matching results indicate a significantly positive effect of profit sharing on profitability: Approximately forty percent of the firms that have introduced a profit sharing scheme report an improvement of their profit situation in 2001 as compared to 1997. This share is significantly lower in the case of non-sharing firms.

Since employees' efforts to improve their firms' situation can be counterbalanced by

external events, an overall deterioration in terms of profitability despite an introduction of profit sharing cannot be excluded. The lower part of table 2, however, indicates that the fraction of sharing firms that report a deterioration of their profit situation would have been significantly higher had profit sharing not been introduced.

In order to ensure that the matching procedure was successful in balancing the two groups, we compare the group of sharing and matched non-sharing firms after matching. The quality of matching is assured as the results which are reported in the right column of table 1 indicate no differences in means between both groups.

3. Concluding remarks

Numerous studies focus on the impact of profit sharing on productivity. Far less attention, however, has been given to the question how the financial performance of firms is affected by profit sharing. If an introduction of profit sharing is associated with higher efficiency, one would expect that these gains in efficiency materialize in the form of higher profitability as well. We investigate this question using nationally representative German panel data. To account for selectivity due to observable as well as unobservable factors, we apply a matched difference-in-differences approach. We find that an introduction of profit sharing is associated with an increase in profitability.

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