Product or Process Innovation

Influence of Wage Bargaining Systems on the Distribution of Research Resources

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Abstract

The influence of collective bargaining on innovation is a long discussed issue. Nevertheless, the impacts of different centralization level of the bargaining system have yet been neglected. Following a theoretical model, the incentive of introducing labor saving process innovations are highest with centralized bargaining at sector level. However, agreements at company level affect rather negative. But what is the influence on product innovations? The development of new products is essential to the development of an economy, especially with regard to employment.

In the following paper, I try to close the research gap in respect to product innovations. Using an extension of the model, I argue that an increased incentive for process innovation leads to fewer resources available for the development of new products. Based on the data of the German Institute for Employment Research, binary panel regression models show a clear influence of different wage-setting levels on product innovations. The directions are in part actually contrary to the theoretical impacts on process innovations. The influence is much stronger, when lagged versions of the agreement variables are used. Additionally, the effects vary greatly depending on the type of product innovation. The influence is much stronger, if not just an incremental change to an existing product is made, but a drastic innovation is generated. However, the results lose significance.

Keywords: Collective bargaining, centralization, R&D, innovation

1 Introduction

The influence of the existence of unions and their impact on different micro-and macroeconomic factors – as well as innovation – has already been investigated several times. In the field of innovation research, the focus has been on the influence of union power on the level of research spending.

Following the current literature, a union acts like a tax on intangible capital returns to receive a share of quasi-rents of a company.[1] After the implementation of a successful innovation union sets higher wages in order to have a share of the innovation profits. Thereby, the expected profits after the innovation will decrease. The innovation gains are even zero, if the wage increases to the same extent the cost decreases as a result of the innovation. Before the innovation, the union cannot credibly demonstrate, not to raise the wages after innovation. Based on this hold-up problem, the incentives of a company to invest in cost-saving innovation decline before the implementation. This leads to a lack of investments and a reduction of innovations.[2] This theory has been repeatedly empirically reviewed for different industries and countries. The results vary and show a marked difference depending on which variable is used to measure the bargaining power of a union.[3] Usually, a strong negative influence of unions on the research behavior of a company can be found in U.S. studies. European studies, however, do not show these negative trends.[4] So far, the effect of unions on innovation is not unambiguous. The differences can be attributed to the complexity of comparing different bargaining systems of individual countries. Additionally, the selection of the variable as well as its point of time used to measure bargaining power is crucial. The most commonly used variables for union power are the number of memberships, the density and the coverage of a union in a company or an industry. The variable union membership contains the number of employees who are members of a union. Union density is defined as the proportion of employees who are members. Union coverage on the other hand involves all employees, who are affected by a trade union. The appointments of a collective agreement may also cover workers without a union membership.[5] That is why this variable involves more employees than the union membership. In addition, the wages of non-members are often based on the wages of union members. The election of the indicator is mostly based on the availability of data. However, the influence of different degrees of centralization of wage bargaining on innovation, particularly on product innovation, has not been covered yet.

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1 See e.g. Connolly et al. (1986)

2 See Lingens (2009)

3 See e.g. Clark (1984); Brown; Medoff (1978); Connolly et al. (1986); Freeman; Medoff (1984); Hirsch; Link (1987). For a survey see e.g. Menezes-Filho; van Reenen (2003).

4 Menezes-Filho; van Reenen (2003): p. 319.

5 More information on the definitions see e.g. Fitzenberger et al. (2008) or Hirsch; Macpherson (2003).

In principle, both the theoretical as well as the empirically research are focusing on potential cost savings by process innovations. Other types of innovation are often not considered explicitly.[6] Process innovations are targeted on the implementation of efficient and cost saving production techniques. In most cases this leads to a substitution of labor and capital. Therefore, process innovations are usually classified as labor-saving. Product innovations, however, are considered to be more job-creating.[7] From a labor market perspective, the implementation of product innovations should be encouraged. In addition to the national economy, product innovations are also of great importance for a company. Due to rapid developments on the product market, a company has to keep its product catalog up to date. Therefore, product improvements or the development of entirely new products play an increasingly important role. If a process innovation achieved cost savings, the union will increase the wages accordingly in order to gain more for their workers. In contrast, a product innovation is not cost saving for a company. Usually, they cannot automatically be associated with an immediate increase in revenue in the same amount. In addition, they require more investments than process innovation, particularly in case of drastic innovations.[8] Hence, they mean a higher risk for a company. Therefore, it can be assumed that the influence on process innovations will differ from the effect on product innovations.

In this paper, the current research is complemented by two new approaches. On the one hand, the different degrees of centralization in the wage bargaining process serve as a measurement for union power. Thus, a new and previously neglected variable is used as exogenous variable. Secondly, not the spending on research, but the innovating companies is used as endogenous variable. Therefore, it can be investigated whether the impact of bargaining levels vary by types of innovation. In addition to the distinction between process and product innovation, a subdivision into incremental and radical innovation is made. To distinguish between the individual types of innovation, the officially established definitions of the European Commission are used.[9] Following the Oslo Manual, a product innovation is a good or service, which is new or significantly improved in terms of its properties or uses. It can be based on new technologies as well as on existing knowledge or on a combination of both. A process innovation on the other side is defined as a new or significantly improved production or delivery method. It can belong to a reduction of production costs, to an increase of quality or to the production of new or significantly improved products. In both cases, an innovation can be classified as incremental or drastic. While incremental innovations lead the way in small continuous steps, radical innovations mean large and soaring changes.

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6 Exceptions see e.g. Hirsch; Link (1987); or Schnabel; Wagner (1992).

7 Information on innovation and employment see e.g. Pianta (2006) or Chennells; van Reenen (2002)

8 See e.g. Berry; Taggart (1994)

9 OECD (Organisation for Economic Co-operation and Development); Statistical Office of the European Communities (2005)

A drastic product innovation represents a completely new product whose technological characteristics or intended uses differ significantly from those of previously manufactured products. It can be a novelty for a company or for the entire market. This can be both, the addition of an already existing product on the market in the range of a company or the introduction of an entirely new product. Such innovations can be based on radically new technologies or knowledge or on combining existing technologies in new uses. In contrast, in an incremental product innovation improves an existing product. It represents merely a change in the existing production function. A product may be improved in terms of better or additional performances. In this paper, I will examine how the degree of centralization of wage bargaining influences the innovation behavior of firms, particularly with regard to different types of product innovations.

The rest of the paper is structured as follows. In chapter 2 we describe the newly developed theoretical model, based on two existing models. The data and empirical approaches to test the derived hypotheses are subject of Chapter 3. Chapter 4 is the summary of the results. Finally, in Chapter 5, some conclusions are given.

2 Theoretical model

The empirical approach of this paper is based on two theoretical models. The fundamental assumptions and the interaction between innovation incentives and centralization level of collective bargaining stem from the model of Haucap and Wey (2004)[10]. In a further step, the model of Boone (2000)[11] is used for a theoretical expansion.

The theoretical model of Haucap and Wey establishes a theoretical relationship between investment in process innovation and different levels of wage bargaining. The main thesis of the paper shows that a centralized wage-setting at the industry level has a positive effect on the development of a process innovation. However, the influence of the degree of wage bargaining centralization is not linear. Following Haucap and Wey, a cooperative wage setting at the firm level has a negative effect. Industry rates are established according to the productivity of all firms in an industry. After a successful process innovation of a single company the accumulated productivity increases and the wage level increases consequently. However, wages do not rise to the same extent as the cost savings as a result of innovation. In this way the innovating firm does not lose the entire profit from innovation. This does not apply to wage-setting at firm level. Here, the union sets the wage level according to the productivity of a single company. If productivity is rising as part of a process innovation, the wage of the innovating firm to rises in the same way. The company loses the gains of the cost-saving process innovation. Thus, there are no incentives to innovate. But also a further argument explains the positive effect of industry tariffs. With centralized wage-setting the wages for all firms in an industry are on the same level. In this case, cost reductions and thus competitive advantages can only be achieved by developing a cost-efficient production process.

Haucap and Wey consider only the influences on process innovations. But how does the degree of centralization of wage bargaining affect product innovations? A separate model for product changes or the introduction of an entirely new product has not yet been developed. Therefore, I establish a new model approach to transfer the previously described hypotheses. The model is based on the theoretical background of Haucap and Wey and integrates a more general growth model of Boone (2000). In his model the form of an innovation is considered as endogenous. He distinguishes between a cost reduction and a quality increase. Boone shows that, depending on the wage negotiations of a trade union, companies will focus on a certain type of innovation.

A firm has only a limited amount of resources such as financial or human capital resources. For example, the capacity of research staff is limited to the number of workers. Working

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[10] Haucap; Wey (2004)

[11] Boone (2000)

hours invested in cost reduction can no longer be used to improve the quality. Therefore, a company must decide for allocating their resources. According to Boone, a company proceeds as follows.

At time t each firm i has a certain set of possibilities I_{it+1} for an innovation at time $t+1$.[12] An innovation has the two different dimensions, the quality q_{it} and the costs f_{it}. Labor and money are the only input variables. The company can choose to invest their resources in increasing the quality or lowering the production costs. The opportunities for innovation lie between these dimensions according to quality q_{it} and cost f_{it}. Figure 1 shows the possible set of innovations for a company at time $t+1$. The quality of a product can be increased by a factor γ_i, shown on the y-axis. Opportunities for innovation with respect to reducing the costs by a factor φ_i are on the x-axis.

- Insert Figure 1 here -

This set depends on the industry and is not fixed in time. Hence, the allocation decision also depends on the focus of the research from the individual company or from the industry. The scope for innovation is limited in both dimensions. An innovation cannot reduce the quality of a good. Therefore, γ is at least 1. On the other side, the costs cannot be reduced to zero by an innovation. Therefore, the axis starts at $\underline{\varphi}$ and $\varphi_i \geq \underline{\varphi} > 0$ holds. However, a product innovation can increase costs, for example through the recruitment of new personnel or increased research expenditures. Therefore, $\varphi_i > 1$ may also apply. Figure 1 shows that the more a company tries to reduce its costs, the less it can focus on improving the quality and vice versa.[13]

In which way does a union influence this allocation decision? According to the model of Haucap and Wey, a company with centralized wage-setting has the highest incentive to invest in labor saving innovations. A collective wage-setting at firm level, however, will rather reduce the number of process innovations. Referring now to the assumptions of Boone, this has also an impact on the implementation of product innovations. The stronger the incentive for process innovations, the more a firm will invest in cost-saving new procedures. In this case, only a few or no more resources remain for an increase in quality and vice versa. The

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[12] Boone considers the case that the incumbent is the innovating company. Most of the previous studies consider the entrant as innovator. Empirical studies show that neither of these assumptions is to be preferred. See Boone (2000): p. 588 or Tirole (1988): chapter 8. The reason for this assumption in Boone is the knowledge spillovers of the current innovation efforts of a company for future innovations. In the case that the entrant would be the innovator, the incumbent would be replaced and the does not care about possible future knowledge spillovers. In this paper, competitive pressure and possible market entrants are not considered, also due to lack of data availability. Therefore, the model of Boone and not the similar model of Aghion; Howitt (1992) is chosen.

[13] This case has, amongst others, also been made by Dougherty; Bowman (1995): p. 30.

influence of wage-setting centralization on product innovation is therefore exactly the reverse of the impact on process innovation. This result led to the following hypotheses.

Hypotheses I Collective agreements, which are negotiated at the sectoral level, have the highest incentive to invest in labor saving innovations. According to the theories of Boone, a company has only a few remaining resources that can be put into improving existing or developing new products. Accordingly, the incentives for product innovations are the lowest.

Hypotheses II Analogous to the theory of process innovations, the relationship between collective bargaining and product innovations is not linear. Wage negotiations at company level, lead to the lowest investments in process innovations. Thus, the incentive to invest in product innovations is the highest.

The contemplation of the various types of product innovation leads to the question whether the impact will vary with the type. According to the model of Haucap and Wey, the hypotheses apply only to incremental process innovations with cost reductions that do not enable a monopoly price. According to the definitions of the Oslo Manual a product innovation can also be classified as dramatic or incremental. Due to the higher required investments and the associated greater risk for the company, it is assumed that drastic product innovations call for more resources. Incremental product changes the other hand require fewer resources on average. An increased incentive to invest in process innovations must then not necessarily lead to a sharp decline in product changes. This leads to the third hypothesis.

Hypotheses III The impact will be stronger the more the product innovation will change the production curve of a company. Hence, if a product is completely new included into the production line or the company even created an entirely new product, the effect will be strongest. The impact should be minimal if the innovation changes only product details.

Following Haucap and Wey, the influence of the degree of centralization of wage bargaining on process innovations follows a U-shape. The incentives are lowest in wage-setting at company level and highest in industry negotiations. In contrast, the influence on product innovations is approximately an inverted U-shape. That is, tariffs negotiated at firm level have an impact at best. However, contracts at industry level offer the lowest incentives. No collective wage bargaining would therefore lie in between. These hypotheses are also mentioned in Figure 2.

- Insert Figure 2 here -

The listed hypotheses are then empirically tested for Germany. The used data and the regression models are presented in the following chapter 3.

3 Data and empirical approach

The Establishment Panel of the Institute for Employment Research (IABB) from the Research Institute of the Federal Employment Agency (BA) in German from 1998 to 2008 serves as database. As the only database in Germany, the IABB can give information about bargaining levels and wage levels in high quality of around 16,000 establishments. It is a representative survey for all branches and sizes.[14] For reasons of anonymity, the industry data is only available as a grouped variable. In this paper I use a classification of eleven industries listed in Table 1.

- Insert Table 1 here -

Descriptive statistics

In the considered time period, the number of companies with collective agreed wages has decreased significantly. Whereas in 1996 more than three-quarters of all surveyed companies paid a collective agreed wage, this value decreases by the year 2008 to about 42 %. A consistently high proportion can be found in the technical services as well as in the nutrition industry. The strongest decrease of collective agreement is reflected in business services such as research or consulting activities.

In terms of innovative behavior, Table 2 summarizes the descriptive statistics of the most important variables of the record. The data is valid for the years 2001, 2007 and the average over the entire considered period.

- Insert Table 2 here -

On average, the rate of product innovators in the observed period is approximately 45 percent. It can be seen that, on average, most of the successfully implemented product innovations are improvements of products. In some years, an addition of an existing product in a company's product offering prevails. On the average only about 30 % of all product innovations are completely new developed products. More than 60% of the product innovators are located in western Germany. Nearly half of the innovators are small companies with less than 50 employees. Producer goods and the trade sector are the most innovative industries with an innovation probability of up to 19 %.

In the entire sample, the proportion of companies with its own research department is only about 13 %. In-house R&D seems to be more important for innovating companies. Here, the

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[14] The data basis of this paper is the IAB establishment panel, wave 1996 – 2008. The data access was carried out by controlled remote data processing at the Research Data Centre (FDZ) of the German Federal Employment Agency (BA). Further information on the data, the variables and the encoding can be found at Städele; Müller (2006).

share is around 30 %. With around 80 % most of the innovating companies are older than five years. Only about 10 percent of the companies with a successful product innovation pay a wage that was negotiated at company level. Agreements at industry level can be found in 40% of the innovating companies. Also about 40 % pay no collective negotiated wage.

The probability of a product innovation in each sector turns out to be quite different. 18 % of product innovators in 2001 belong to the sector of producer goods, only 7 % are attributable to machine construction. With a share of 37 percent, the transportation industry is the weakest innovative sector.

Empirical model

With the presented data, I calculate a binary panel model.[15] The respond variable is the successful implementation of a product innovation. This includes both improved and entirely new products.

The following variables are used as predictors. The collective bargaining agreements are included as binary coded variables for the individual negotiation level at sector and company level or without any collective agreements. I estimate the models with the different reference categories "no collective agreements" and "agreements at company agreements". The size of a company makes a significant contribution to innovation. First, larger firms have more resources and more accumulated know-how of individual employees. In addition, they have more opportunities to diversify their risk and get a better chance for funding. For these reasons, a positive relationship is expected. However, above a certain size, also the hierarchy and inflexibility increase, which reduces the probability of innovation. This is achieved by the inclusion of the squared number of employees, for which a negative value is assumed. The influence of company age on innovation activities is also not unambiguous. On one side, young companies are considered to be particularly flexible and innovative. On the other side, older companies are more experienced, have more cumulative human capital and have probably better opportunities for funding its research projects. So far it is not clear, which effect will be stronger. A regional variable is integrated into the model to account for the remaining differences between companies in East- and West-Germany. Due to reduced innovation activities in the East, a negative impact is expected. Finally, I anticipate a high positive influence of the binary coded variable for a company-owned R&D-department.[16] In addition, I included sector dummies to control for different innovation conditions.

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[15] A binary random probit model is expected. A fixed effects model is not possible because too many variables are constant in time.

[16] Due to strong outliers the variable turnover is associated with difficulties and not integrated here. To exclude a possible influence, the model was also calculated with the turnover. The results show a slightly positive, but not significant influence. The competitive pressure of each sector should

$$(1) \quad P(Pd = 1 \mid X) = \Phi(\delta \cdot tariff\ indicators + \beta_0 + \beta_1 \cdot size + \beta_2 \cdot size^2 + \beta_3 \cdot age + \beta_4 \cdot region + \beta_5 \cdot research + \beta_6 \cdot age + \varphi \cdot sectors)$$

The national wage system influences the behavior of a company stronger, the less a company operates in foreign markets with different wage structures. Therefore, exporting companies are excluded in a further step.[17]

$$(2) \quad P(Pd = 1 \mid X) = \Phi(\delta \cdot tariff\ indicators + \beta_0 + \beta_1 \cdot size + \beta_2 \cdot size^2 + \beta_3 \cdot age + \beta_4 \cdot region + \beta_5 \cdot research + \beta_6 \cdot age + \varphi \cdot sectors)\ if\ exports = 0$$

A successfully implemented innovation requires a previous time for research and development. Therefore, it can be assumed that the negotiation level of the resulting years also affect the probability of an innovation. To include the question for the right point of time to measure union power, equation *(3)* uses a lagged version of the explanatory variables.

$$(3) \quad P(Pd = 1 \mid X) = \Phi(\delta \cdot tariff\ indicators_{t-1} + \beta_0 + \beta_1 \cdot size + \beta_2 \cdot size^2 + \beta_3 \cdot age + \beta_4 \cdot region + \beta_5 \cdot research + \beta_6 \cdot age + \beta_7 \cdot exports + \varphi \cdot sectors)$$

After the calculation of the equations for all product innovations, I calculate *(1)-(3)* again and then distinguish between drastic and incremental innovations to integrate the different types of product innovation into the model. As mentioned in the introduction, an incremental product innovation is merely a change in the existing production function. Therefore, product improvements are considered to be incremental product innovations. Product additions and completely new products in contrast, form a new production function and are therefore classified as drastic innovations. The calculations of incremental and drastic innovations are also based on binary panel regressions. The results of the regression models are summarized in the following chapter.

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ideally be included in the analysis. Unfortunately, this variable is raised only in the years 1998 and 2008. Due to the very limited availability, this variable is not considered. As a control, in the years 1998 and 2008, competition is integrated. The variable has a positive, significant influence. The other variables do not change in amount and significance.

17 The variable "share of exports in turnover" was also used as an explanatory variable in the model. It has a small positive and significant influence on product innovations. The results of the other variables are hardly different. But the models goodness of fit is much higher when excluding all exports.

4 Results

The described equations show a significant influence on the degree of centralization of wage bargaining on the probability of a product innovation. The results are listed first for all innovations and later separated by type of innovation.

All product innovations

In principle, the results of equation *(1)* to *(3)* show a slightly positive influence of collective bargained wages on the probability of a product innovation. But this effect is not linear with respect to the degree of centralization of wage bargaining. But what level of collective bargaining has a stronger or weaker effect? The results of the panel regression models *(1)* to *(3)* for all product innovations show different effects of the individual negotiation level, listed in Table 3.[18]

- Insert Table 3 here -

In relation to the reference category "no collective agreements", the two binary-coded variables for centralized and coordinated wage setting present a positive impact on the probability of a product innovation. In comparison to negotiations at industry level, the impact result of company agreements is much higher and more significant. Using "company agreements" as reference category, both centralized and decentralized wage bargaining has a significant negative influence. Thus, agreements at company level have the highest incentives, while no wage bargaining by a union has the greatest negative impact on the probability of a product innovation. These results confirm hypothesis II. At the same time, they contradict hypothesis I, which assumes the strongest negative influence of industry tariffs. Irrespective of the chosen reference category, most of the other integrated variables have the previously assumed effect. As expected, the probability of product innovation rises with the number of employees with a decreasing rate. Companies in eastern Germany have a much lower probability of a product innovation, while the existence of a firm's own R & D department has a strong positive effect. Young firms have a greater chance of a product innovation although the results are not significant. [19]

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[18] All panel models were calculated with an unbalanced panel data set. To test the goodness of the models, a balanced data set of 10 periods was used additionally. The results are similar with only a slight decrease of the significance level.

[19] In the IABB questionnaire, the innovation indicators are included only every third year. The panel nature of the data set can only be maintained with keeping these variables constant over a 3 year period. The true development of the variables in the intervening years is unknown. To exclude possible biases, the equations are also calculated in cross-section models. The results are nearly the same. See Table 6 in the Appendix with the results for the year 2001.

The exclusion of exporting companies actually increases the effects of the individual bargaining levels. Company agreements affect even more positive. In contrast, the effects of centralized and decentralized levels are more strongly negative. Additionally, the level of significance increases. The other variables remain broadly unchanged at the same level of significance. Only the negative influence of the variable region and the influence of a company's own R&D department fall slightly.

To take into account that collective bargaining structures of prior periods may also have an impact on the innovation behavior, lagged versions of the collective agreement variables are inserted in a further step. The last column of Table 3 shows the results for the first lagged stage. It turns out that the wage structure from the previous year has a much stronger influence on the current likelihood of innovation. The coefficients of each centralization level of wage bargaining rise clearly. And again the significance level increases. The other variables remain roughly the same.[20]

Studying the effects of unions on research and innovation behavior of firms possibly induces problems with endogeneity. It is also conceivable that a company first decides on certain innovative activities and then makes the choice of a collective bargaining level. In this case, a reverse causality is present. This has been repeatedly discussed in the theoretical as well as the empirical literature.[21] To include the issue of possible endogeneity into the analysis, I have applied a two-step process.[22] The coefficients of the estimated two-step model show a much higher effect of the collective variables as before associated with a slight increase of the standard errors. The values of the other explanatory variables remain the same. Thus, the previously described results can be confirmed.

Incremental versus drastic product innovations

Does the effect of different negotiation levels on the innovative behavior change according to the different types of product innovation? To answer this question, the probit models *(1)-(3)* are repeatedly calculated with a distinction between incremental and drastic innovation. The results in Table 4 and Table 5 show that the influence of tariff structures is particularly

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[20] The effect as well as the level of significance of previous agreements decreases clearly, when wage negotiations from two or more years ago are included.

[21] See e.g. Hirsch (1992): p. 111, Menezes-Filho; van Reenen (2003): pp. 311–312 or Lu et al. (2010): pp. 208–209. Ideally, a possible endogeneity can be considered in the analysis by using instrumental variables. In this case, a variable should be found as an instrument, which is closely connected with the different bargaining levels, but has also a very low correlation with the innovation activities of a company. Due to the lack of such a variable in the dataset, this approach could not be chosen.

[22] In a two-step analysis, I have regressed collective bargaining status on innovations with and without other control variables. In a second step, the predicted values for the bargaining levels are used in the probit models.

stronger on innovations that change the production function of a company. This includes both, product additions as well as entirely new products. At the same time, however, the level of significance of these findings decreases clearly.[23]

- Insert Table 4 and Table 5 here -

The restriction of the model to incremental product changes leads to a significant decrease of the influence of the union variables. In addition, also the directions of causality of the individual negotiation levels appear to change. Negotiations at both at companies as well as at industry level mostly have a negative influence. However, these results are not significant. Only in model *(3)*, agreements at industry level have a slightly positive and significant effect.[24] Furthermore, the results of the other explanatory variables also differ. As before, the negative influence of the regional variable also decreases from model *(1)* to *(3)*. However, the total effect is significantly more negative. In addition, the previously found strong positive influence of a company's research department is here negative. This negative impact increases from step model *(1)* to *(3)*.

In contrast to incremental innovations, the coefficients of drastic innovations correspond clearly to the previously found results. The influence of the different wage bargaining level is a little lower, but always at least twice as high as for incremental innovations. However, the results are less significant. But the significance level increases from model *(1)* to *(3).* the results of negotiations at company level as well as for any negotiations already significant in model 2 at a level of 10%.Also the influence of the other consolidated variable does not change much. However, the negative effect of the regional variable Eastern Germany is significantly lower.

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[23] Also these results were tested for possible reverse causality with no evidence.

[24] These results were also recalculated in a cross section ordered probit model. Table 7 to Table 9 in the appendix show the marginal effects for the individual product-innovation stages for the year 2001.

5 Conclusions

The influence of unions on the innovation behavior of a company is often, both in theory and empirically, assumed to be negative. The different level of centralization of wage bargaining as a measurement of union power were not considered yet.

The regression models confirm most of the hypotheses set out in chapter 2 with a negative influence of agreements at industry and a positive impact of negotiations at company level. No collective agreements have the most negative influence. Thus, the positive effects seem to outweigh the negative impacts of unions. Hypothesis I assumes the least incentive for product innovation for centralized bargaining at industry level. This could not be found. This could be attributed to possible exemption clauses for industry tariffs in the German collective bargaining system. The achieved effects of the individual negotiation levels are stronger the more a company operates in the domestic market and the less it exports in foreign markets. The integration of the bargaining levels from the previous year increases the coefficients. Further, the effects appear to be strongest when the product innovation is drastic, although the results no longer significant.

Based on the results of the regression models, conclusions can be drawn for trade union organization, innovation economics as well as the labor market. Following the model of Haucap and Wey, companies, that negotiate their wages at the industry level, have a particularly high incentive to invest in cost-saving process innovations.[25] Under the assumptions of Boone only a partial or no resources remain that could be invested in product innovation.[26] In this case, a concentration will be held on process innovations. The regression models can confirm these assumptions. Hence, the firms over-invest in improving efficiency and cutting labour costs. In the short run, process innovations improve efficiency and productivity of a company. By diffusion, imitation, patents or licenses it will increase accordingly the productivity of the industry and thus of the country. But in a long run, focusing on labor saving innovations reduces the labor demand. This not only increases unemployment. This also leads to a decline in a company's human capital and may therefore ultimately lead to a decrease also of product innovations, which are mostly strong knowledge-based. A focus on one type of innovation, therefore, should be avoided.

Based on the empirical results of this paper, a balanced system of collective wage bargaining should be supported. This is contrary to the current requirements for a much more flexible wage system in Germany, which has already become blurred with many exemption clauses. Apart from wages and their influence on the innovative behavior, it should not be forgotten

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[25] Haucap; Wey (2004): pp. C152.
[26] Boone (2000): p. 589.

that tariff negotiations still offer the necessary representation of employees. A strong competitive pressure between companies would be possible without conditions determined by collective bargaining. Unbalanced working conditions would not be controllable. A minimum wage, as discussed recently among German policymakers and in parliament, might be the reaction. For this reason, a stabilizing policy for confining wage differences and company specific modifications is recommended.

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Figures

Figure 1: Possible set of innovation. Source: Boone: 588.

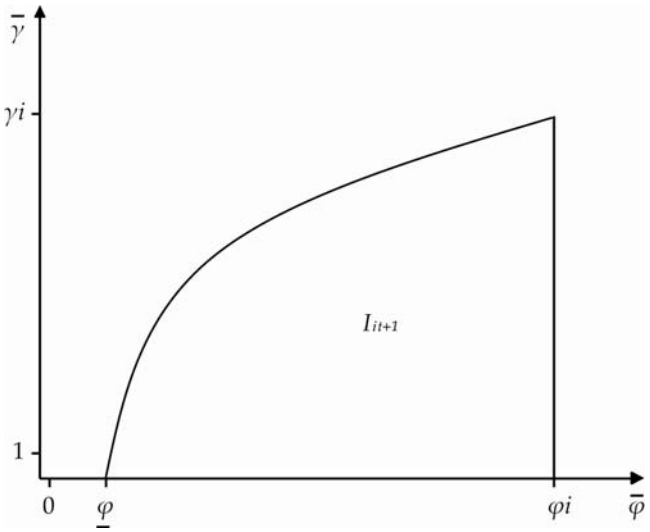


Figure 2: Theoretical relationship between process and product innovation and level of wage bargaining. Source: (Haucap; Wey (2004): pp. C152.) and (Boone (2000): p. 589.).

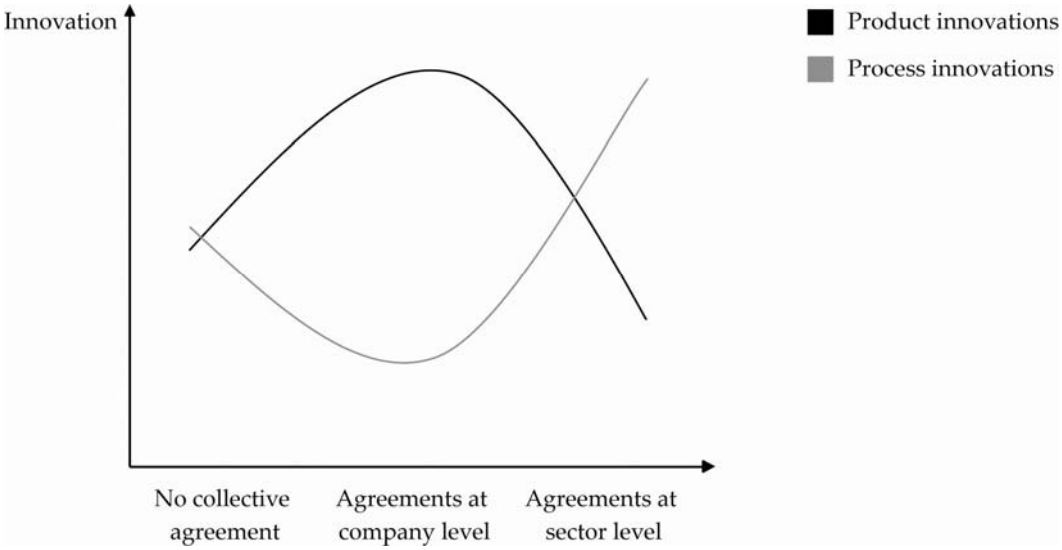
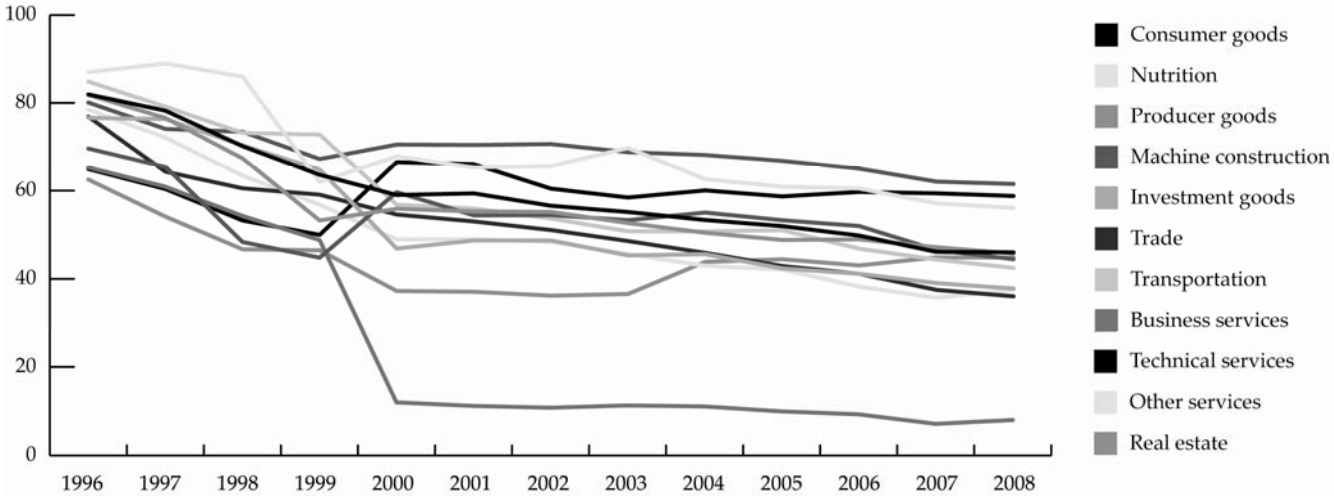


Figure 3: Share of companies with collective agreements by industry. Source: IABB.



Tables

Table 1: Industry classification. Based on NACE Rev. 1 systematic.

	Industry notation	Contents
1	Consumer goods	Textiles, furniture, energy
2	Nutrition	foodstuffs, drinks, tobacco
3	Producer goods	Basic materials: synthetics, glass, ceramics, metal, chemistry
4	Machine construction	Engineering
5	Investment goods	Electrical engineering, vehicle construction
6	Trade	Retail, wholesale
7	Transportation	Traffic, mailing
8	Business services	Consulting, advertising, research
9	Technical services	Data handling, constructions
10	Other services	Recycling, disposal
11	Real estate	Dwelling, renting

Table 2: Summary of descriptive statistics. Source: IABB.

Descriptive Variables	2001	2007	Average
N	15783	16181	13582
Product Innovators	43,63	49,38	44,57
Product improvement	42,34	34,08	40,94
Product addition	38,18	39,74	38,54
Entirely new product	19,49	26,18	20,52
Western Germany	65,1	64,91	61,15
Eastern Germany	34,9	35,09	38,86
Small sized company	47,3	55,45	49,48
Medium sized company	28,99	26,55	27,45
Big sized company	23,71	18	23,08
Consumer goods	10,49	8,89	10,71
Nutrition	4,94	4,70	4,30
Producer goods	18,32	15,32	16,71
Machine construction	6,89	6,02	5,75
Investment goods	11,47	9,74	11,23
Trade	14,66	18,75	13,91
Transportation	4,27	4,14	3,83
Business services	5,92	6,05	7,17
Technical services	9,00	9,02	11,86
Other services	7,25	8,82	8,36
Real estate	6,80	8,55	6,20
No own R&D department	68,56	74,76	69,42
Own R&D department	31,44	25,24	30,58
Company older than 5 years	80,91	76,39	83,63
Company younger than 5 years	19,09	23,61	16,37
No collective agreements	41,02	49,29	42,10
Company level agreements	9,12	8,86	9,24
Sector level agreements	49,86	41,85	48,66

Table 3: Results of the panel probit-regression for all product innovations. (1) With exports, (2) excluding exporting companies, (3) using lagged bargaining variables. Source: IABB, 1996-2008. Own calculations. Standard errors in parentheses. * Dummy variable. Significance levels: ‘’’/’’/’ 1%/5%/10%.

Product innovations	*(1)*		*(2)*		*(3)*	
Agreements at sector level$_t$*	0,03056	-0,12199‘’’	0.05249‘	-0.13524‘‘		
	(0,02717)	(0,04033)	(0.03096)	(0.05369)		
Agreements at company level$_t$*	0,15256‘’’		0.18774‘’’			
	(0,04068)		(0.05369)			
No collective agreements$_t$*		-0,15256‘’’		-0.18774‘’’		
		(0,04068)		(0.05369)		
Agreements at sector level$_{t-1}$*					0.11736‘’’	-0.08898
					(0.03768)	(0.05951)
Agreements at company level$_{t-1}$*					0.20634‘’’	
					(0.05955)	
No collective agreements$_{t-1}$*						-0.20634‘’’
						(0.05955)
Company size	0,00074‘’’	0,00074‘’’	0.00105‘’’	0.00105‘’’	0.00108‘’’	0.00108‘’’
	(0,00004)	(0,00004)	(0.00009)	(0.00009)	(0.00010)	(0.00010)
Company size^2	-1,56e^{-08}‘’’	-1,56e^{-08}‘’’	-5.56e^{-08}‘’’	-5.56e^{-08}‘’’	-5.53e^{-08}‘’’	-5.53e^{-08}‘’’
	(1,18e^{-09})	(1,18e^{-09})	(6.83e^{-09})	(6.83e^{-09})	(7.49e^{-09})	(7.49e^{-09})
Region*	-0,42292‘’’	-0,42292‘’’	-0.21291‘’’	-0.21291‘’’	-0.15076‘’’	-0.15076‘’’
	(0,03813)	(0,03813)	(0.03891)	(0.03891)	(0.04881)	(0.04881)
R&D-department*	1,821004‘’’	1,82100‘’’	1.58011‘’’	1.58011‘’’	1.53243‘’’	1.53243‘’’
	(0,04031)	(0,04031)	(0.05468)	(0.05468)	(0.06711)	(0.06711)
Age*	0,04390	0,04390	0.06546	0.06546	0.04028	0.04028
	(0,04152)	(0,04152)	(0.04573)	(0.04573)	(0.06069)	(0.06069)
Constant	-0,51830‘’’	-0,75481‘’’	-1.16015‘’’	-0.97242‘’’	-1.10284‘’’	-0.89650‘’’
	(0,07531)	(0,07961)	(0.06872)	(0.08381)	(0.08733)	(0.10109)
Sectors*	Yes	Yes	Yes	Yes	Yes	Yes
Years*	Yes	Yes	Yes	Yes	Yes	Yes
N	65283		38860		30004	
P-R^2	.57521483		.71704169		.78753974	
LL	-29905.549		-19920.713		-14957.539	

Table 4: Results of the panel probit-regression for incremental product innovations. (1) With exports, (2) excluding exporting companies, (3) using lagged bargaining variables. Source: IABB, 1996-2008. Own calculations. Standard errors in parentheses. * Dummy variable. Significance levels: ‘’’/’’/’ 1%/5%/10%.

Incremental product innovations	*(1)*		*(2)*		*(3)*	
Agreements at sector level$_t$*	0.00937	0.01976	-0.06623	0.01603		
	(0.04514)	(0.05844)	(0.05836)	(0.09202)		
Agreements at company level$_t$*	-0.01040		-0.08226			
	(0.05984)		(0.09265)			
No collective agreements$_t$*		0.01040		0.08226		
		(0.05984)		(0.09265)		
Agreements at sector level$_{t-1}$*					-0.15177‘‘	-0.14061
					(0.07043)	(0.10299)
Agreements at company level$_{t-1}$*					-0.01116	
					(0.10437)	
No collective agreements$_{t-1}$*						0.01116
						(0.10437)
Company size	0.00012‘‘	0.00012‘‘	0.00025‘‘	0.00025‘‘	0.00035‘‘‘	0.00035‘‘‘
	(0.00005)	(0.00005)	(0.00011)	(0.00011)	(0.00013)	(0.00013)
Company size^2	-6.01e^{-09}‘‘	-6.01e^{-09}‘‘	-1.62e^{-08}‘	-1.62e^{-08}‘	-2.06e^{-08}‘	-2.06e^{-08}‘
	(2.75e^{-09})	(2.75e^{-09})	(9.64e^{-09})	(9.64e^{-09})	(1.08e^{-08})	(1.08e^{-08})
Region*	-0.39187‘‘‘	-0.39187‘‘‘	-0.33411‘‘‘	-0.33411‘‘‘	-0.36827‘‘‘	-0.36827‘‘‘
	(0.05853)	(0.05853)	(0.06903)	(0.06903)	(0.08535)	(0.08535)
R&D-department*	-0.34672‘‘‘	-0.34672‘‘‘	-0.40396‘‘‘	-0.40396‘‘‘	-0.45333‘‘‘	-0.45333‘‘‘
	(0.04513)	(0.04513)	(0.06911)	(0.06911)	(0.08611)	(0.08611)
Age*	-0.09132	-0.09132	-0.07316	-0.07316	-0.05448	-0.05448
	(0.06534)	(0.06534)	(0.08378)	(0.08378)	(0.11168)	(0.11168)
Constant	0.05971	1.69773	1.49048‘‘‘	0.57471‘‘‘	0.42984‘‘	0.41868‘‘
	(0.11927)	(0.03144)	(0.05510)	(0.14600)	(0.16639)	(0.18647)
Sectors*	Yes	Yes	Yes	Yes	Yes	Yes
Years*	Yes	Yes	Yes	Yes	Yes	Yes
N	29801		13895		10519	
P-R^2	.50358382		.74601596		.81374069	
LL	-15137.714		-7744.9888		-5679.7911	

Table 5: Results of the panel probit-regression for drastic product innovations. (1) With exports, (2) excluding exporting companies, (3) using lagged bargaining variables. Source: IABB, 1996-2008. Own calculations. Standard errors in parentheses. * Dummy variable. Significance levels: ‘’’/’’/’ 1%/5%/10%.

Drastic product innovations	*(1)*		*(2)*		*(3)*	
Agreements at sector level$_t$*	-0.02779	-0.06974	0.04394	-0.08853		
	(0.03534)	(0.05047)	(0.04307)	(0.07362)		
Agreements at company level$_t$*	0.04195		0.13247’			
	(0.05108)		(0.07339)			
No collective agreements$_t$*		-0.04195		-0.13247’		
		(0.05108)		(0.07339)		
Agreements at sector level$_{t-1}$*					0.06568	-0.09776
					(0.05059)	(0.07993)
Agreements at company level$_{t-1}$*					0.16344‘’	
					(0.07998)	
No collective agreements$_{t-1}$*						-0.16344‘’
						(0.07998)
Company size	0.00021‘’’	0.00021‘’’	0.00043‘’’	0.00043‘’’	0.00041‘’’	0.00041‘’’
	(0.00003)	(0.00003)	(0.00009)	(0.00009)	(0.00010)	(0.00010)
Company size^2	-3.53e^{-09}‘’’	-3.53e^{-09}‘’’	-3.31e^{-08}‘’’	-3.31e^{-08}‘’’	-3.12e^{-08}‘’	-3.12e^{-08}‘’
	(8.89e^{-10})	(8.89e^{-10})	(1.19e^{-08})	(1.19e^{-08})	(1.28e^{-08})	(1.28e^{-08})
Region*	-0.14183‘’’	-0.14183‘’’	-0.11898‘’’	-0.11898‘’’	-0.07196	-0.07196
	(0.03999)	(0.03999)	(0.04558)	(0.04558)	(0.05322)	(0.05322)
R&D-department*	1.34483‘’’	1.34483‘’’	1.29817‘’’	1.29817‘’’	1.33856‘’’	1.33856‘’’
	(0.03782)	(0.03782)	(0.05349)	(0.05349)	(0.06425)	(0.06425)
Age*	0.04557	0.04557	0.06960	0.06960	0.06776	0.06776
	(0.05265)	(0.05265)	(0.06238)	(0.06238)	(0.08189)	(0.08189)
Constant	-3.53833‘’’	-3.30134‘’’	-3.14780‘’’	-3.31887‘’’	-3.25654‘’’	-3.05661‘’’
	(0.09613)	(0.10423)	(0.10800)	(0.11827)	(0.11631)	(0.14156)
Sectors*	Yes	Yes	Yes	Yes	Yes	Yes
Years*	Yes	Yes	Yes	Yes	Yes	Yes
N	65343		38921		30047	
P-R^2	.50566657		.75515909		.81997346	
LL	-14296.165		-7080.82		-5206.3829	

Table 6: Results of the cross-section probit-regression for all product innovations, 2001. Source: IABB. Own calculations. Standard errors in parentheses. * Dummy variable. Significance levels: ‘’’/’’/’ 1%/5%/10%.

2001	*(1)*		*(2)*		*(3)*	
Agreements at sector level$_t$*	0.06496	-0.12915	0.06763	-0.12333		
	(0.02868)	(0.05298)	(0.03377)	(0.06454)		
Agreements at company level$_t$*	0.19412		0.19096			
	(0.05293)		(0.06450)			
No collective agreements$_t$*		-0.19412		-0.19096		
		(0.05293)		(0.06450)		
Agreements at sector level$_{t-1}$*					0.06645	-0.04435
					(0.04008)	(0.07615)
Agreements at company level$_{t-1}$*					0.11081	
					(0.07570)	
No collective agreements$_{t-1}$*						-0.11081
						(0.07570)
Company size	0.00032	0.00032	0.00110	0.00110	0.00091	0.00091
	(0.00004)	(0.00004)	(0.00011)	(0.00011)	(0.00013)	(0.00013)
Company size^2	-6.78e^{-09}	-6.78e^{-09}	-2.07e^{-07}	-2.07e^{-07}	-1.58e^{-07}	-1.58e^{-07}
	(1.03e^{-09})	(1.03e^{-09})	(2.94e^{-08})	(2.94e^{-08})	(3.22e^{-08})	(3.22e^{-08})
Region*	-0.18077	-0.18077	-0.09925	-0.09925	-0.02919	-0.02919
	(0.02771)	(0.02771)	(0.03190)	(0.03190)	(0.03765)	(0.03765)
R&D-department*	1.26096	1.26096	1.14474	1.14474	1.14845	1.14845
	(0.04019)	(0.04019)	(0.05845)	(0.05845)	(0.07133)	(0.07133)
Age*	0.03040	0.03040	0.07352	0.07352	0.10559	0.10559
	(0.03165)	(0.03165)	(0.03568)	(0.03568)	(0.04232)	(0.04232)
Constant	-0.46132	-0.26721	-0.60159	-0.41063	-0.67662	-0.56582
	(0.03541)	(0.05824)	(0.03991)	(0.07044)	(0.04888)	(0.08363)
Sectors*	Yes	Yes	Yes	Yes	Yes	Yes
N	11201		8021		5861	
P-R^2	0.1602		0.0842		0.0774	
LL	-6491.1748		-4787.6321		-3426.5583	

Table 7: Marginal effects of the cross-section ordered probit-regression model (1), 2001. Source: IABB. Own calculations. Standard errors in parentheses. * Dummy variable. Significance levels: ‘’’/’’/’ 1%/5%/10%.

2001	*(1)*							
	No product innovation		*Product improvement*		*Product addition*		*Entirely new product*	
Agreements at sector level$_t$*	-0.02112’’’	0.03196’’’	0.00373’’’	-0.00649’’’	0.00845’’’	-0.01290’’’	0.00894’’’	-0.01257’’’
	(0.00227)	(0.00389)	(0.00038)	(0.00085)	(0.00090)	(0.00158)	(0.00099)	(0.00147)
Agreements at company level$_t$*	-0.05366’’’		0.00858’’’		0.02130’’’		0.02378’’’	
	(0.00402)		(0.00053)		(0.00157)		(0.00192)	
No collective agreements$_t$*		0.05252’’’		-0.01119’’’		-0.02124’’’		-0.02009’’’
		(0.00385)		(0.00092)		(0.00157)		(0.00137)
Company size	-2.69e^{-05}’’’	-2.69e^{-05}’’’	5.04e^{-06}’’’	5.04e^{-06}’’’	1.08e^{-05}’’’	1.08e^{-05}’’’	1.11e^{-05}’’’	1.11e^{-05}’’’
	(2.03e^{-06})	(2.03e^{-06})	(3.84e^{-07})	(3.84e^{-07})	(8.17e^{-07})	(8.17e^{-07})	(8.34e^{-07})	(8.34e^{-07})
Company size^2	4.91e^{-10}’’’	4.91e^{-10}’’’	-9.21e^{-11}’’’	-9.21e^{-11}’’’	-1.97e^{-10}’’’	-1.97e^{-10}’’’	-2.02e^{-10}’’’	-2.02e^{-10}’’’
	(6.36e^{-11})	(6.36e^{-11})	(1.19e^{-11})	(1.19e^{-11})	(2.55e^{-11})	(2.55e^{-11})	(2.61e^{-11})	(2.61e^{-11})
Region*	0.03498’’’	0.03498’’’	-0.00716’’’	-0.00716’’’	-0.01412’’’	-0.01412’’’	-0.01370’’’	-0.01370’’’
	(0.00215)	(0.00215)	(0.00048)	(0.00048)	(0.00087)	(0.00087)	(0.00081)	(0.00081)
R&D-department*	-0.32286’’’	-0.32286’’’	-0.00401’’’	-0.00401’’’	0.10402’’’	0.10402’’’	0.22286’’’	0.22286’’’
	(0.00200)	(0.00200)	(0.00060)	(0.00060)	(0.00074)	(0.00074)	(0.00081)	(0.00223)
Age*	-0.00621’’	-0.00621’’	0.00115’’	0.00115’’	0.00249’’	0.00249’’	0.00257’’	0.00257’’
	(0.00251)	(0.00251)	(0.00046)	(0.00046)	(0.00101)	(0.00101)	(0.00105)	(0.00105)
Sectors*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	11201							
P-R^2	0.0819							
LL	-12121.733							

Table 8: Marginal effects of the cross-section ordered probit-regression model (2), 2001. Source: IABB. Own calculations. Standard errors in parentheses. * Dummy variable. Significance levels: ‘’’/’’/’ 1%/5%/10%.

2001	*(2)*							
	No product innovation		*Product improvement*		*Product addition*		*Entirely new product*	
Agreements at sector level$_t$*	-0.02490‘’’	0.03349‘’’	0.00398‘’’	-0.00612‘’’	0.01016‘’’	-0.01389‘’’	0.01076‘’’	-0.01347‘’’
	(0.00274)	(0.00484)	(0.00041)	(0.00095)	(0.00111)	(0.00203)	(0.00122)	(0.00187)
Agreements at company level$_t$*	-0.05971‘’’		0.00868‘’’		0.02407‘’’		0.02696‘’’	
	(0.00516)		(0.00063)		(0.00204)		(0.00251)	
No collective agreements$_t$*		0.05716‘’’		-0.01097‘’’		-0.02384‘’’		-0.02235‘’’
		(0.00473)		(0.00101)		(0.00200)		(0.00173)
Company size	-2.70e^{-04}‘’’	-2.70e^{-04}‘’’	4.57e^{-05}‘’’	4.57e^{-05}‘’’	1.11e^{-04}‘’’	1.11e^{-04}‘’’	1.13e^{-04}‘’’	1.13e^{-04}‘’’
	(7.82e^{-06})	(7.82e^{-06})	(1.39e^{-06})	(1.39e^{-06})	(3.25e^{-06})	(3.25e^{-06})	(3.40e^{-06})	(3.40e^{-06})
Company size^2	5.71e^{-08}‘’’	5.71e^{-08}‘’’	-9.69e^{-09}‘’’	-9.69e^{-09}‘’’	-2.35e^{-08}‘’’	-2.35e^{-08}‘’’	-2.39e^{-08}‘’’	-2.39e^{-08}‘’’
	(2.29e^{-09})	(2.29e^{-09})	(3.97e^{-10})	(3.97e^{-10})	(9.47e^{-10})	(9.47e^{-10})	(9.80e^{-10})	(9.80e^{-10})
Region*	0.02091‘’’	0.02091‘’’	-0.00372‘’’	-0.00372‘’’	-0.00865‘’’	-0.00865‘’’	-0.00854‘’’	-0.00854‘’’
	(0.00250)	(0.00250)	(0.00046)	(0.00046)	(0.00104)	(0.00104)	(0.00100)	(0.00100)
R&D-department*	-0.32735‘’’	-0.32735‘’’	0.00564‘’’	0.00564‘’’	0.10509‘’’	0.10509‘’’	0.21661‘’’	0.21661‘’’
	(0.00318)	(0.00318)	(0.00064)	(0.00064)	(0.00096)	(0.00096)	(0.00344)	(0.00344)
Age*	-0.01791‘’’	-0.01791‘’’	0.00297‘’’	0.00297‘’’	0.00734‘’’	0.00734‘’’	0.00761‘’’	0.00761‘’’
	(0.00286)	(0.00286)	(0.00046)	(0.00046)	(0.00117)	(0.00117)	(0.00124)	(0.00124)
Sectors*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	8021							
P-R^2	0.0534							
LL	-7765.342							

Table 9: Marginal effects of the cross-section ordered probit -regression model (3), 2001. Source: IABB. Own calculations. Standard errors in parentheses. * Dummy variable. Significance levels: ‘’’/’’/’ 1%/5%/10%.

2001	*(3)*							
	No product innovation		*Product improvement*		*Product addition*		*Entirely new product*	
Agreements at sector level$_{t-1}$*	-0.02830‘’’	0.00639‘’’	0.00516‘’’	-0.00125‘’’	0.01174‘’’	-0.00267‘’’	0.01140‘’’	-0.00246‘’’
	(0.00233)	(0.00417)	(0.00040)	(0.00083)	(0.00096)	(0.00175)	(0.00097)	(0.00160)
Agreements at company level$_{t-1}$*	-0.03488‘’’		0.00627‘’’		0.01445‘’’		0.01416‘’’	
	(0.00430)		(0.00071)		(0.00177)		(0.00182)	
No collective agreements$_t$*		0.03376‘’’		-0.00698‘’’		-0.01420‘’’		-0.01259‘’’
		(0.00403)		(0.00089)		(0.00171)		(0.00144)
Company size	-2.17e^{-04}‘’’	-2.17e^{-04}‘’’	4.20e^{-05}‘’’	4.20e^{-05}‘’’	9.06e^{-05}‘’’	9.06e^{-05}‘’’	8.43e^{-05}‘’’	8.43e^{-05}‘’’
	(6.49e^{-06})	(6.49e^{-06})	(1.29e^{-06})	(1.29e^{-06})	(2.72e^{-06})	(2.72e^{-06})	(2.62e^{-06})	(2.62e^{-06})
Company size^2	4.16e^{-08}‘’’	4.16e^{-08}‘’’	-8.05e^{-09}‘’’	-8.05e^{-09}‘’’	-1.74e^{-08}‘’’	-1.74e^{-08}‘’’	-1.62e^{-08}‘’’	-1.62e^{-08}‘’’
	(1.78e^{-09})	(1.78e^{-09})	(3.48e^{-10})	(3.48e^{-10})	(7.44e^{-10})	(7.44e^{-10})	(7.06e^{-10})	(7.06e^{-10})
Region*	-0.00012	-0.00012	0.00002	2.38e^{-05}	0.00005	5.14e^{-05}	0.00005	4.78e^{-05}
	(0.00213)	(0.00213)	(0.00041)	(0.00041)	(0.00089)	(0.00089)	(0.00083)	(0.00083)
R&D-department*	-0.33240‘’’	-0.33240‘’’	0.01437‘’’	0.01437‘’’	0.11346‘’’	0.11346‘’’	0.20456‘’’	0.20456‘’’
	(0.00296)	(0.00296)	(0.00052)	(0.00052)	(0.00092)	(0.00092)	(0.00299)	(0.00299)
Age*	-0.02160‘’’	-0.02160‘’’	0.00408‘’’	0.00408‘’’	0.00899‘’’	0.00899‘’’	0.00853‘’’	0.00853‘’’
	(0.00243)	(0.00243)	(0.00044)	(0.00044)	(0.00101)	(0.00101)	(0.00098)	(0.00098)
Sectors*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	5861							
P-R^2	0.049							
LL	-5416.1998							