The Role of Business Expectations for New Product Introductions: A Panel Analysis for the German Food Industry

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Theory suggests that business expectations are crucial for investment in research and development (R&D) as well as for process and product innovations. However, there are controversial theoretical predictions about the causal linkage between business expectations and new product introductions. In addition, most empirical studies have so far neglected business expectations as an important determinant of new product introductions due to absence of data. To address this shortcoming, this study investigates whether business expectations do affect new product introductions and whether the net impact is positive or negative. The empirical analysis is based on panel data from 14 branches of the German food industry over six years (1993–1998). Our findings suggest that a strong pressure exists in stagnating or declining food industries to respond to unfavourable expectations thorugh new product introductions. In addition, we identify the influence of market structure and industry-specific variables as significant for new product introductions.

Product innovations represent a major share of the technical progress in an economy. Consequently, a vast literature has dealt with the determinants of product innovations theoretically and empirically (see Kamien and Schwartz 1982; Cohen and Levin 1989; Janz and Licht 2003). One part of this literature pertains to a "demand-pull" model of innovation, in which changes in expected demand play a key role for firms' investment in R&D. However, aside from the fact that the importance of demand is discussed controversially in the literature, different views exist about whether expected demand makes innovative activity pro-cyclical or anti-cyclical. In other words, are firm innovation activities higher when expected demand is favorable or unfavorable?

To shed some light on this question, we analyze the causal linkage between demand (business) expectations and new product introductions based on data from the German food industry. In particular, we explore whether demand expectations matter and whether they affect new product introductions positively or negatively. Moreover, the influence of market structure and industry-specific variables on new product introductions is analyzed. We also test whether the introduction of an expectation variable affects the measured influence of the other determinants of innovation. To accomplish these objectives, we conduct a panel analysis with data from 14 branches of the German food industry for 1993–1998.

So far, demand expectations have been widely ignored as a determinant of new product introductions. One reason is that empirical information on business expectations is rarely available. Hence, most studies have either neglected the role of expectations or have introduced variables characterizing the general economic environment, like past demand, growth or profits, as an explicit or implicit approximation of business expectations (Connor 1981; Geroski and Walters 1995; Röder, Herrmann, and Connor 2000; Traill and Meulenberg 2002; Smolny 2003).

In the next section, theoretical hypotheses on the influence of business expectations on new product introductions are developed and the empirical literature conceiving the individual hypotheses is surveyed. In the third section, we discuss market-structure and industry-specific variables as determinants of innovative activity. The model specification is introduced next, followed by the description of data on business expectations and the other variables. Major results are then presented and compared to those of earlier studies. The final section includes major conclusions and recommendations for future research.

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Linkage between Business Expectations and New Product Introductions

Theoretical Hypotheses

Our theoretical hypotheses are in contrast to "technology-push" models of innovative activity, which suggest that innovative activity is driven by exogenous advances in basic knowledge. Technological change is considered in those models as following certain internal laws of its own, independent of economic forces. Alternative theories treat innovative activity mostly as endogenous (Elßer 1993). In these models, the causal linkage runs usually from fluctuations in economic activity to innovative activity. Most prominently, Schmookler (1966) emphasized in his "demand-pull" model of innovation the importance of economic forces as determinants of innovation. "Demand-pull" summarizes a range of effects on innovative activity driven by changes in expected demand, the competitive structure of markets, and factors which affect the valuation of new products or the ability of firms to realize economic benefits (Geroski and Walters 1995). The extent to which business forces can explain innovative activity is supposed to depend on the type of innovation. Thus the influence of economic forces might be less strong for truly new or significantly improved products, since they represent a more extensive investment and their life cycle is longer than the business cycle. Alternatively, it is expected that the influence of the economic activity might be particularly strong for extensions or updates of existing products (Devinney 1990). This study focuses on the latter type of innovation, since product modifications and improvements rather than truly novel products are predominant in the food industry (Galizzi and Venturini 1996).

According to the "demand-pull" theory, business expectations as an indicator of future fluctuations of demand and market conditions should play a crucial role for the innovative activity. However, differential theoretical linkages between business expectations and innovative activities have been stressed in the literature and they may well work in opposite directions. Following these hypotheses, innovative activities may be fostered by either favorable or unfavorable economic expectations, and the net effect has to be determined empirically (Röder, Herrmann, and Connor 2000).

Some arguments of the "demand-pull" theory suggest the introduction of new products is likely to succeed when economic growth generates a strong market expansion. It is argued that positive revenue expectations increase the likelihood of higher profits for newly introduced products and, therefore, lead to a higher innovation rate (Elßer 1993; Axarloglou 2003). Two particular arguments are expressed in this context.

First, in times of economic growth there is a higher capacity of markets to absorb new products (Judd 1985). Thus new product introductions are more likely to occur when economic growth generates enough market demand to absorb new products. In this sense, a market growth would put pressure on firms to take advantage of the demand expansion, resulting in a positive link between business expectations and new product introductions.

Second, if appropriability conditions are taken into account, firms would again introduce new products when demand conditions are favorable. Innovators only have a limited window of opportunity in which to generate profits from their innovative activities, so firms have an incentive to introduce new products when market conditions are favorable, i.e., during periods of high demand. In these cases, firms would anticipate future growth of demand in order to introduce new products in good times, i.e., innovations would be fostered by boom-driven expectations (Schleifer 1986).

However, some theories emphasize an opposite relationship between new product introductions and the business cycle. Negative business expectations might affect new product introductions positively due to the following arguments.

Recessions might have positive effects due to opportunity costs. Productivity-increasing activities such as reorganizations or training often divert resources from current productive activities. The return of the latter is relatively lower in recession due to lower demand for the manufactured goods. That means the opportunity cost in terms of forgone profits of reorganization activities will be lower in recessions than in boom periods. Another point of the opportunity-cost hypothesis is based on the argument that no new product introductions are conducted if they displace existing rents. Since the value of existing rents is usually lower in a recession, it is more likely that firms implement new products in downturns of the economy (Kleinknecht 1987).

A negative sign would also be consistent with the classical literature in a Schumpeterian sense, which emphasizes the role of innovations as a solution to downturns of the economy (Schumpeter 1982). Thus the demand function of a firm depends not only on market size but also on the firm's innovation activity as well as on the innovation activity of its competitors. In case of a declining industry demand, firms can use new products as an important tool of non-price competition to counter negative market growth by gains in market share. Thus, one could argue that innovations—as the driving forces behind an economic success—are increased under negative business expectations.

Empirical Evidence

Empirically, a number of studies confirmed a positive relationship between demand growth and innovations (Devinney 1990; Irsch 1991; Stühmeyer 1997; Röder, Herrmann, and Connor 2000; Radas and Shugan 1998; Axarloglou 2003). However, none of the studies used industry-specific business-expectation data; in fact, most studies are based on past demand, growth, or profit data as an explicit or implicit approximation of business expectations.

Devinney (1990), e.g., investigated the influence of business-cycle demand fluctuations on innovation activity. The analysis is based on aggregate demand data; industry demand is not specified. His findings indicate that companies introduce significantly more new products in anticipation of the revival of the economy. However, it is difficult to discern whether companies anticipate the cycle for the timing of new product introductions or whether these innovations are the driving force behind the cycle. The causal link between innovation and economic growth remains unclear.

In a similar study, Axarloglou (2003) examined the influence of cyclical demand fluctuations (seasonal and business cycle) on new product introductions in the U.S. manufacturing industry. The author shows that seasonal expansions of the aggregate as well as the industry demand have a significantly positive influence on new product introductions. In addition, non-seasonal components of aggregate and market demand fluctuations are positively related to the innovation rate. Results also indicate that new product introductions are more responsive to aggregate rather than to market demand fluctuations.

Irsch (1991) discussed determinants of innovations in small- and medium-sized firms of the German manufacturing and construction industries. Among other variables, the author included firm sales expectations in the model. His findings indicate a positive relationship between sales expectations and innovations.

Several studies used the growth of a market as an explanatory variable of innovation (Stühmeyer 1997; Röder, Herrmann, and Connor 2000). Stühmeyer (1997) found a positive relationship between market growth and innovation for the German food industry. Again, results indicate that firms synchronize innovations with expansions of the market demand. Röder, Herrmann, and Connor (2000), however, reported the influence of market growth on innovations as insignificant for the U.S. food industry.

On the other side, the empirical literature shows some evidence that firms increase their innovation activity with expectation of declining demand. Saint-Paul (1993) concludes in an analysis of the business cycle of 22 countries that the growth effects emphasized in opportunity-cost models may be quantitatively more important than those considered in traditional models.

In addition, Christensen, Rama, and von Tunzelmann (1996) investigated the relationship between profitability of a firm and its innovation activity for the European food industry. Their results show that the influence of the innovation activity on firms' profitability depends on the business cycle: during the 1982–85 crisis, firms' innovation rates were significantly and positively related to their profits, but during the following recovering period they were insignificant. The authors conclude that innovation activity became less crucial to firms due to the anticipation of high profits. It is posited that decision-makers would be less prone to spend money on R&D when the firm is already performing well or when success is predicted.

Summing up, the empirical evidence on the implications of expectations for innovative activity is mixed. This relatively unclear empirical evidence might be due to the fact that almost all studies used real fluctuations in market demand (seasonal fluctuations, business cycle), where it is difficult to determine the causality between innovations and economic growth (Devinney 1990).

Market Structure and Industry-Specific Variables as Determinants of Innovation

Apart from the influence of business expectations, several other variables of market structure will be analyzed. Determinants of product innovations that have been regarded as important in the earlier literature refer to the number of firms and concentration on the relevant markets. Furthermore, industry-specific characteristics such as the existing degree of product differentiation and the size of the market can be relevant within a cross-sectional analysis.

Conflicting views exist in the literature about the linkage between the degree of competition on markets and innovation. Standard IO theory in a Schumpeterian tradition posits that innovation declines with competition, since more competition reduces the monopoly rents that reward successful innovators, and monopolistic rather than polypolistic firms have the financial basis for successful innovations (Rottmann 1995; Aghion et al. 2002). In this sense, a declining number of firms as well as a lower market concentration should increase R&D incentives and innovations. Another part of the literature stresses companies' incentives to innovate in order to escape competition with rivals (Aghion et al. 2002). In contrast to Schumpeter, these models hypothesize a positive impact of concentration on innovation. It is argued that the difference between post-innovation and pre-innovation rents is higher in the case of competitive market structures, since a monopolist's market price already exceeds marginal cost (Arrow 1962; Aghion et al. 2001). Competition thus may increase the incremental profits from innovating and thereby encourage investment aimed as "escaping competition."

Most empirical approaches emphasize the importance of oligopolistic market structures and argue that the relationship between concentration and innovation has a non-linear inverted U-shape (Scherer 1967; Scott 1978; Levin, Cohen, and Mowery 1985; Aghion et al. 2002). Regarding the food industry, Roggenkamp's (2002) results in a study of "hit products" in Germany also confirm an inverted U-type influence of concentration on the success of product innovations. Aghion et al. (2002) show theoretically that at high initial competition the Schumpeterian effect does exist, whereas at low initial competition an escape-competition effect is dominant. In addition, dynamic models point to an inverted-U relationship (Kamien and Schwartz 1976).

However, several studies (e.g., Elßer 1993) indicate that only a small part of the variability of innovations across markets is due to differences in concentration or the number of firms in a market. There is evidence that industry-specific characteristics, such as technological or demand structures—e.g. market size, degree of product differentiation, and demand elasticities—have a more important explanatory power for the innovation activity.

Thus market size, measured in absolute terms, can be expected to influence innovation activity positively. Connor (1981) argues that a larger market segment raises the expected potential for a successful product innovation.

Economic theory suggests that product differentiation affects innovative activities positively. Thus markets with an increasing product differentiation have more market niches, and the potential for new product introductions is stimulated (Röder, Herrmann, and Connor 1999). Several studies confirm a positive relationship between product differentiation and innovation activity (Herrmann 1997).

Model Specification

In combining the previous arguments, the following basic model is estimated:

$$(1)\quad I = I\left(n, n^2, CONC, SIZE, EXPEC, DIFF\right),$$

where I is the number of new product introductions, n is the number of firms, n^2 is the squared number of firms to capture a possible non-linear influence on innovations, *CONC* stands for sales concentration, *SIZE* for the value of shipments, *EXPEC* for business expectations, and *DIFF* measures the degree of product differentiation in an industry. The hypotheses on the signs of first derivatives are $\partial I/SIZE > 0$ and $\partial I/\partial DIFF > 0$. All other signs are ambiguous, as there exist differential hypotheses on the influence of n, n^2, *CONC*, and *EXPEC*.

Panel-data models (Hsiao 1989; Baltagi 1995) are applied in this study because of the use of pooled cross-sectional and time-series data. Results from these models are compared to ordinary least-squares (OLS) estimates. In the OLS regression, the estimated model of Equation (1) is

$$(2)\quad I_{it} = \alpha + \beta x_{it} + u_{it}.$$

Product innovations, I, are now defined over time

($t = 1,\ldots,T$) and across branches ($i = 1,\ldots, N$). X is the vector of explanatory variables. A zero mean value and a constant variance are posited for the residuals u_{it}. Equation (2) implies that all regression coefficients are assumed to be constant over time and across sectors; all observations are used in the estimation. Panel-data models—as opposed to the plain OLS estimates—include sector-specific intercepts (α_i) in order to avoid biased estimates of coefficients:

(3) $I_{it} = \alpha_i + \beta x_{it} + u_{it}$.

Equation (3) is a general formulation that may be estimated as a fixed-effects or a random-effects model. In the fixed-effects estimate, all intercepts are estimated as dummy variables for the sectors. It is assumed in the random-effects model that the intercepts are randomly drawn from a statistical distribution with a given mean and variance. We estimate both types of panel-data models and decide on the basis of the Hausman test which type of model is preferred.

Data

The analysis is based on panel data from 14 branches of the German food industry for six years (1993–1998). Since annual data are utilized, there are 84 total observations. Table 1 shows definitions and descriptive statistics of dependent and independent variables. This study focuses on the influence of business expectations, so the expectation data utilized are crucial. An average indicator of revenue expectations, published annually in the journal *Lebensmittelpraxis* for certain commodity groups in the food industry, was used as *EXPEC*. These expectation data are part of an annual survey of leading representatives of the grocery-retailing sector who are involved in the marketing of different product groups. Retailers are asked whether they have positive or negative revenue expectations for the forthcoming year. The indicators for the different product groups are constructed by taking the balance between positive and negative revenue expectations. The published revenue expectations data for the commodity groups were then attributed to different branches of the food industry for this study. Table 1 shows that the yearly balance between positive and negative business expectations was about 14 across all branches, i.e. the number of retailers expecting a revenue increase exceeded the number of firms that expect a decrease by 14 percent. The standard deviation of 27.2 indicates a high variability in business expectations.

The other variables of the empirical analysis

Table 1. Definitions of Variables and Sample Statistics[a].

Variables	Variable description	Mean	Standard deviation
Dependent variable			
I/n	Yearly number of new product introductions per company in a branch	0.44	0.44
Independent variables			
EXPEC	Yearly balance between positive and negative business expectations for a branch	14.4	27.2
N	Yearly number of firms in a branch	193.2	357.6
SIZE	Yearly sales in a branch, million DM	8853.4	7177.5
CONC	Yearly sales concentration in a branch according to the Herfindahl-Hirschman coefficient times 1000	81.8	76.7
DIFF	Yearly average number of articles in a branch offered in supermarkets	219.1	186.4
GROWTH	Yearly percentage change of sales in a branch[b]	2.5	13.2

[a] The data basis includes 14 branches of the German food industry.

[b] Data on these variables are lagged by one year.

were measured as follows: *I* is the number of new product introductions in the period 1993–98 as shown in the weekly newspaper *Lebensmittelzeitung* and as counted and aggregated by Zahn (1995), Stühmeyer (1997), and by our own calculations. The introductions include both line extensions of already existing brands and new brands. The yearly number of new product introductions per company across all branches was on average 0.4, with a standard deviation of 0.4. The number of companies in the branches, *n*, is available from Statistisches Bundesamt (a) for the former West Germany. Table 1 shows that the average yearly number of firms in a branch was about 193. The high standard deviation of 357.6 is mainly due to high differences across branches. *SIZE* was measured with sales data from Statistisches Bundesamt (b) for the former West Germany. As the data basis covers a period prior to the introduction of the Euro, this variable is measured in millions of DM. Yearly sales were on average about DM8,853 million. *CONC* is quantified as the concentration of revenues in the respective food categories on the basis of the Herfindahl-Hirschman coefficient x 1000, following the statistical computation in Statistisches Bundesamt (c).

Product differentiation *DIFF* is measured by the average number of articles supplied for various food categories in supermarkets. Data from Euro-Handelsinstitut e.V. for individual years are attributed to the branches of the food industry. As reported in Table 1, across all branches, 219 articles were offered on average, with a standard deviation of 186.

Data for all these variables were available for 14 branches of the German food industry. The food branches included in the econometric analysis are manufacture of macaroni, noodles, couscous, and similar farinaceous products; manufacture of condiments and seasonings, homogenized food preparations, and dietetic food; manufacture of bread, fresh pastry goods, and cakes; manufacture of rusks, pastry goods, and cakes; processing and preserving of fruit and vegetables; manufacture of cocoa, chocolate, and sugar confectionery; operations of dairy and cheese making; manufacture of margarine and similar edible fats; production, processing, and preserving of meat and meat products; production, processing, and preserving of fish and fish products; processing of tea and coffee; manufacture of beer and malt; manufacture of distilled potable alcoholic beverages; manufacture of wines, fruit wines, and other nondistilled fermented beverages; and production of mineral water and soft drinks. Standard deviations indicate a high variability in key explanatory variables. The data are promising for developing a reliable model on how innovation will change in response to changes in explanatory variables.

Empirical Results

Table 2 shows selected empirical results. The number of new product introductions per company is explained across branches of the food industry and over time. Additionally, models with the *EXPEC* variable are compared with models where the *EXPEC* variable is substituted by a proxy for the future business outlook. The variable *GROWTH* captures past growth in sales in the individual branches and serves as such an approximation.

The explanatory power of the selected models is rather high. When the expectation variable is included, the corrected coefficients of determination are 0.73. Due to the limited number of panel data, most results are rather similar to plain OLS and random-effects models. However, statistically significant F-tests could reject at the 95-percent level or more the null hypothesis of an equivalence of the OLS and fixed-effects models. Random-effects models were generally outperformed by the fixed-effects models. Thus, according to the Hausman test we can reject the null that random effects are appropriate for the estimated model. In addition, all fixed-effects models yielded a significantly higher R^2 coefficient than did the corresponding random-effects models.

The findings are very interesting with regard to the influence of business expectations. There is a statistically significant and negative influence of business expectations on the number of new product introductions per company. In addition, the comparison between Models (3) and (4) shows that the fixed-effects model improves clearly when the growth variable is substituted by the expectation variable. The estimated coefficients of the fixed-effects models indicate that an improvement in business expectations by one percentage point lowers product introductions per company by 0.003 units. This translates into an elasticity of −0.1, which is not a trivial impact (Table 3). The sign of the coefficient suggests that branches with a less favorable business outlook innovate more than do those branches with

Table 2. The Influence of Business Expectations and Market Structure on New Product Introductions per Company, German Food Industry 1993–98 (n=84)[a].

				Independent variables					Test statistics	
Method/ Equations[b]	Constant	n	n^2	SIZE/n	DIFF	GROWTH	EXPEC	CONC	R^2	F-Test
Dependent variable: New product introductions per company										
OLS (1)	0.310*** (3.89)	$-0.163\cdot10^{-2}$*** (−5.16)	$0.702\cdot10^{-6}$*** (3.98)	$0.478\cdot10^{-3}$ (1.19)	$0.133\cdot10^{-2}$*** (6.50)	$-0.909\cdot10^{-4}$ (-0.03)			0.35	
OLS (2)	0.048 (0.42)	$-0.111\cdot10^{-2}$*** (-3.10)	$0.493\cdot10^{-6}$*** (3.85)	$0.179\cdot10^{-2}$** (2.11)	$0.130\cdot10^{-2}$*** (4.72)		$-0.256\cdot10^{-2}$* (-1.82)	$0.264\cdot10^{-2}$*** (2.72)	0.57	
Fixed-effects (3)		$-0.155\cdot10^{-2}$*** (-5.57)	$0.694\cdot10^{-6}$*** (4.48)	$0.192\cdot10^{-2}$*** (4.46)	$0.167\cdot10^{-2}$*** (9.22)	$0.173\cdot10^{-2}$ (0.73)			0.55	10.24***
Fixed-effects (4)		$-0.146\cdot10^{-2}$*** (-4.63)	$0.621\cdot10^{-6}$*** (3.94)	$0.144\cdot10^{-2}$* (1.88)	$0.134\cdot10^{-2}$*** (4.93)		$-0.303\cdot10^{-2}$** (-2.14)	$0.196\cdot10^{-2}$** (2.06)	0.73	9.65***

[a] For the definitions of the variables, see Table 1. t-values in parentheses.

[b] Equivalent random-effects models were also estimated, but are not shown here since Hausman's test statistic was significant at the 90-percent level or more and the fixed-effects models reported a higher R^2. The null hypothesis of an equivalence of the random-effects and fixed-effects model was rejected for both models. Statistically significant F-tests had shown at the 99-percent level that the null hypothesis of an equivalence of the OLS and fixed-effects models was rejected. Sector-specific constants matter.

***, **, * statistically significant at the 99-percent, 95-percent, and 90-percent level, respectively.

Table 3. Estimated Elasticities of Innovation Activity with Regard to Expectations and Other Determinants[a].

Exogenous variables	Elasticities
EXPEC	-0.10
N	-0.54
SIZE/n	0.15
CONC	0.36
DIFF	0.67

[a] Computed with equation (4) in Table 2 and evaluated at the means of the variables.

a more favorable business outlook. In an intertemporal interpretation, this means that under shrinking demand, the effect of lower opportunity costs of innovation, and/or increasing competitive pressure on firms is stronger than the negative effect on liquidity and profits. In other words, companies innovate in response to an expected downturn rather than in anticipation of profits from an expected upturn of the economy.

We find a number of examples from our data set which are consistent with this finding. The manufacture of distilled potable alcoholic beverages had negative business expectations over the period under consideration and ranked well above average in product innovations per company. Moreover, the highest number of new product introductions per company occurred in the manufacture of condiments and seasonings, homogenized food preparations, and dietetic food. Their business expectations, however, were very unfavorable in the period 1993–98. On the other hand, the manufacture of margarine and similar edible fats experienced very high business expectations and ranked very low in terms of product introductions per company. There are counterexamples with a positive relationship between expectations and innovations. Processing of tea and coffee ranked high in terms of business expectations and in product introductions per company. However, the coefficient of the expectation variable indicates that the negative influence of expectations on new product introductions dominates.

Apart from the influence of expectations, several other findings are remarkable. The number of firms affects product introductions per company in a nonlinear manner. The sign of the coefficient of the unsquared term is significantly negative and the sign of the coefficient of the squared term is significantly positive. This result is consistent with a U-shaped relationship. However, as illustrated in Figure 1, the linear effect clearly dominates, i.e., the U-curve is fairly flat, although a rising number of firms lowers the number of product introductions per company with declining marginal change, it requires a very large number of firms until the number of new product introductions per company increases again. Consequently, the econometric results practically match the Schumpeter hypothesis, which is consistent with a negative coefficient of the unsquared n variable alone. This result is very interesting and complies with the results of Herrmann, Röder, and Connor (2000), where only a negative influence of n on I/n was measured and n^2 was insignificant. The point elasticity of −0.54, calculated at the mean number of firms in a branch, shows that the number of firms strongly influences innovation activity.

Apart from the influence of the number of firms, the existing product differentiation on the market is very important. With a higher degree of product differentiation, the number of product introductions per company rises. In all models, the coefficient is statistically different from zero at the 99-percent level. As shown in Table 3, the elasticity associated with differentiation, 0.67, has the largest impact of all independent variables. This result is in line with the hypotheses that consumers' demand for variety and competitors' innovations in branches with high product heterogeneity puts pressure on the individual firms to increase their innovative activities as well.

In addition, the variable *SIZE/n* has a significantly positive effect on the innovation rate, as shown in Table 2. Thus the number of product introductions per company increases with market growth which is available per company. This finding is consistent with economic theory that a larger market potential improves the potential for successful product innovation (Connor 1981). However, the estimated impact of market size on innovative activity, an elasticity of 0.15, is comparatively low.

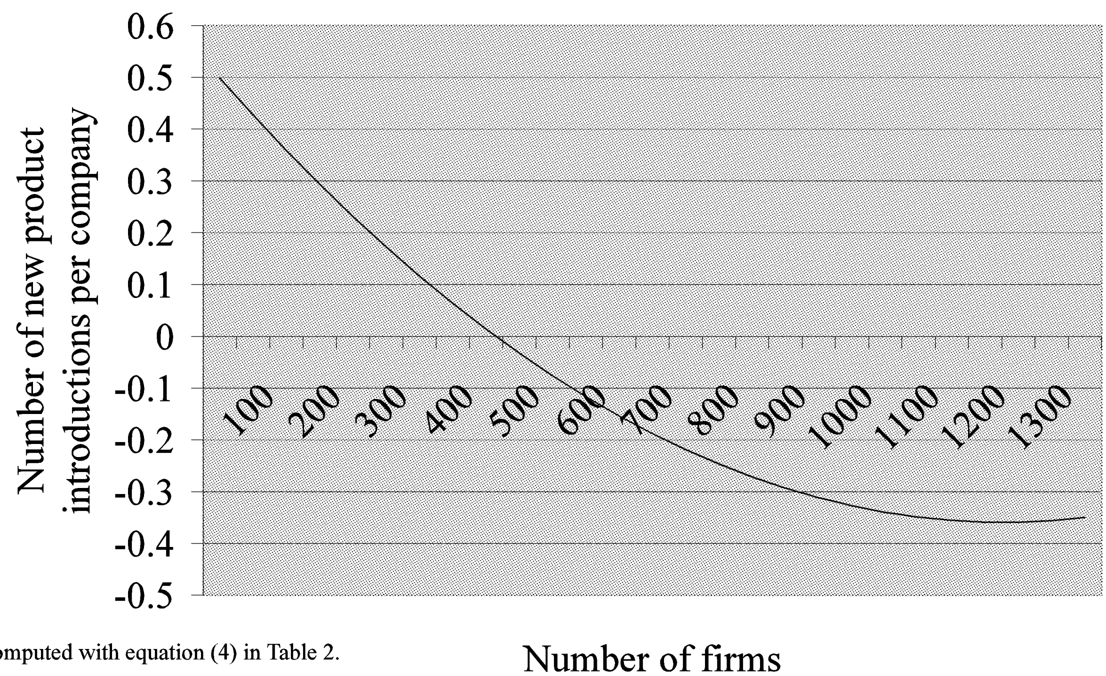
Table 2 shows that the variable *CONC* has a significant effect apart from the number of firms. Thus the number of product innovations per company is significantly lowered by a declining Herfindahl/Hirschman coefficient, i.e., falling sales concentration. The elasticity of new product introductions with respect to the sales concentration equals 0.36 (Table 3). The influence of *CONC* is consistent with the Schumpeterian hypothesis that innovation activities are more prevalent in highly concentrated markets.

Summary and Conclusions

This paper studies the impact of business expectations on new product introductions. A panel-model approach for the German food industry was utilized. One might expect that improving business expectations raise the willingness to invest in R&D and, thus, the number of product introductions per company. As far as this effect exists, it can be concluded that it does not dominate. The impact of business expectations on product introductions per company is negative. The elasticity is −0.10: a deterioration in the business-expectations variable of 1% raises new product introductions by 0.1%. An unfavorable business environment seems to put a strong pressure on firms to react by differentiating products and by increasing product innovations and/or seems to lower the opportunity costs of innovation.

This main result may be linked to the characteristics of product innovations in the food industry, where new products are often modifications and improvements or existing products or "me-too" products. Truly novel products from the industry's perspective are rare. As we have measured product innovations as the counted number of new products, we have included the bulk of product proliferations occurring in the food industry. It remains a question for future research whether deteriorating business expectations not only increase the number of new products but also lead to better economic performance in the medium run.

Apart from this effect of expectations, we iden-



[a] Computed with equation (4) in Table 2.

Figure 1. New Product Introductions per Company as a Function of Number of Firms[a].

tify a number of determinants of innovation which characterize market structure, such as the number of firms, concentration of sales, the existing degree of product differentiation, or the size of the market. Two of these relationships are striking. First, there is a strong and positive influence of the existing degree of product differentiation in an industry on product introductions per firm. This result is in line with earlier studies of innovations in the food sector. Second, the empirical results suggest a U-shaped relationship between the number of firms in an industry and product innovations per company. However, the U-curve is fairly flat, and almost all observations are on the declining part. This result therefore tends to support the Schumpeter hypothesis. More research is needed here to elaborate stable results on the impact of the number of firms on innovations and, additionally, on the success of innovations.

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