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Serie Research Memoranda

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SPACE - TIME PATTERNS OF ENTREPRENEURIAL EXPECTATIONS AND PERFORMANCE

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Abstract

Economic research in the past decade has paid much attention to the motives of entrepreneurial behaviour in a Neo-Schumpeterian spirit. Entrepreneurial decisions are by definition characterized by uncertainty regarding future events. Rational expectations theories have become a major new line of thought in dealing with future uncertainty. In the literature we find mainly attempts to estimate indirectly relationships on observable behaviour and strategies, which are derived from postulated expectations of decision-makers. Normally, such expectations are not directly observed.

In our paper we have analyzed a set of empirical regional micro data on entrepreneurial expectations regarding their future decisions, whilst for the same period the observed and realized data are also available. This allows for a test between expectations and realizations.

The paper develops a model to test correspondence between facts and expectations and comes to the conclusion that in all regions and all time periods a structural under-estimation of performance has taken place. This leads to the question to which extent statistical data on expectations are coloured by strategic considerations.

1. Introduction

Economic research in the past decade has paid much attention to the motives of entrepreneurial behaviour. An important reason for this renewed interest has been the 'neo-Schumpeterian wave' for the explanation of economic dynamics, in which the 'animal spirits' of entrepreneurs were supposed to exert a critical influence on economic restructuring and technological innovation (see e.g. Davelaar 1991, Freeman et al. 1982, and Kleinknecht 1987). Another reason for the recognition of the importance of entrepreneurial decisions has been the observed close mutual relationship between spatial developments and macro-economic progress, as reflected amongst others in incubator theories and gateway concepts (see e.g. Cappellin and Nijkamp 1990, and Nijkamp 1990).

Entrepreneurial decisions are by definition characterized by uncertainty regarding future events, which may be both internal and external to the firm (cf. Kantor 1979; Theil 1964). In contrast to traditional accelerator and multiplier theories, recent research on entrepreneurial strategies is much more centred around the notion of rational expectations (Hansen and Sargent 1980; cf. Lucas and Sargent 1981). Such rational expectations form a common element in both Keynesian views on economics and supply side economics. However, the empirical validation of the significance of entrepreneurial expectations is relatively weak. Clearly, in the literature (cf. Spear 1989) we often find an intriguing analysis of both adaptive and rational expectations, but the formulation and specification of such models has hardly been tested. In most cases, only relationships on observable behaviour or strategies (derived from postulated expectations of decision-makers) are - usually indirectly - estimated (see for instance earlier studies by Cagan 1956 and Koyck 1954). Direct estimations are found in Brown and Maitel (1981), Figlewski and Wachtel (1981) and Frankel and Froot (1987).

The main cause of the unsatisfactory indirect approach is lack of empirical data on entrepreneurial expectations at a disaggregate level. Normally, such expectations are not directly observed, but only their consequences in terms of measurable and actual entrepreneurial behaviour. Thus in empirical research there has been a trend to

resort to reduced form equations which only implicitly incorporate entrepreneurial expectations. In consequence, it is difficult to arrive at a rigorous test on the existence and importance of rational expectations in entrepreneurial decision-making.

Our paper has a modest aim. It does not provide a comprehensive rigorous test on rational expectations behaviour of entrepreneurs, but it aims at investigating whether micro expectations at the entrepreneurial level are unbiased; the latter is a necessary condition for rational expectations behaviour. Besides, the spatial and sectoral component in such behaviour will be analyzed in more detail as it seems plausible that the formation of entrepreneurial expectations is co-determined by economic conditions in their home regions. Clearly, this research effort requires a detailed spatial data set on micro performance and expectations of entrepreneurs.

Fortunately, in the Netherlands the regional Chambers of Commerce conduct an extensive common survey among enterprises in their respective districts every year. This micro data set is a very rich source of information on sales, exports, investments and employment of the firms concerned. This survey, abbreviated as ERBO (Enquete Regionale Bedrijfs Ontwikkeling), is conducted in order to provide the regional Chambers with strategic insight into past and future trends regarding entrepreneurial activity in the area. In addition to actual data, the survey also contains questions on expected sales and investments for the next year. This data set provides a unique opportunity for a more direct test on the consistency of revealed entrepreneurial expectations vis-à-vis realized behaviour. It should be added that such regional economic research on entrepreneurial motives and decisions is fairly rare (see for some noteworthy exceptions Begg and McDowall 1987, and Meyer-Krahmer 1985).

In the next Section the main elements of the ERBO survey will concisely be described. In Section 3 an adaptive model for entrepreneurial expectations regarding sales, based on the specific features of the ERBO data set, will be presented and estimated for four selected Chambers of Commerce districts in the Netherlands. A more detailed sectoral analysis will be given in Section 4. Next, Section 5 will present alternative response behaviour formulations in relation

to entrepreneurial expectations, while the sensitivity of the results for an alternative statistical distribution (i.e., a Cauchy distribution) will be discussed in Section 6. Then in Section 7 the model will be re-estimated in terms of employment variables rather than sales. Finally, the paper will be concluded with a comparison of the predictive potential of the various model specifications used.

2. Description of the ERBO Survey

The ERBO survey is conducted by each Chamber of Commerce in the Netherlands on an annual basis in the months September to November. This means that most firms are already able to assess their performance in the year concerned as well as to reveal their realistic expectations for the next year. Apart from one free question which is at the discretion of each individual Chamber, all other questions are standardized and uniform all over the country.

Each firm with 50 employees and over is requested to fill out the ERBO-survey every year. Smaller firms are approached on the basis of a sample which is stratified in the sense that in the category of firms with less than 50 employees the larger firms have a higher probability of being drawn from the total population. In practice, firms with more than 10 employees have still a probability of 90 percent of being selected. In general, the response rate is fairly high (an average higher than 70%).

In our analysis of entrepreneurial expectations we have restricted ourselves to 4 selected Chamber of Commerce areas in the Netherlands, viz. Amsterdam, Zaanstad, Utrecht and 's Hertogenbosch. This set contains 2 large cities (Amsterdam and Utrecht) and two smaller areas with a clear urban core (Zaanstad and 's Hertogenbosch). The two larger cities are more centrally located in the Netherlands, while the two remaining areas are positioned at the edge of the Dutch Randstad. This allows us to identify the existence of regionally discriminating factors, although in a small country like the Netherlands such factors are likely not very significant.

The time period for which the ERBO data were analyzed covered the years 1986-1989. This period was deliberately chosen, as it is a period in which - after the economic recession in the beginning of the

eighties - the Dutch economy showed a stable growth pattern accompanied by an extremely low inflation rate (cf. Verhoeven and Wennekers 1990).

Table 1 provides some global insight into the nature of replies of entrepreneurs in the areas considered regarding the variable 'sales rise'. The table enables a confrontation of the actual sales rise in

Table 1 about here

the current (but almost finished) year with the expected sales rise reported in the previous year. These data which are recorded in nominal quantities immediately reveal some interesting information. First, a large majority of the firms appear to be able and prepared to reveal the expectations regarding sales in a subsequent year; the number of non-respondents on the expectations question is extremely low. Second, a relatively large proportion of the firms appear to be on the conservative side regarding their revealed expectations: approximately 50 percent appear to expect a more or less equal sales level in the next year (equal means a growth ranging from 0 % to 2 %, an amount sufficient to compensate for the low inflation rate in that period). Third, the percentage of firms expecting a decline c.q. a rise in sales is lower than of those actually experiencing a decline, respectively a rise in the year concerned. And fourth, there is no specific regionally discriminating sales expectation. Thus, the expectations seem to support a conservative estimate compared to the realisations, with a concentration around zero.

3. A General Adaptive Model for the Formation of Firms' Expectations

In order to test whether revealed expectations are (un)biased, a simple model - to start with - has been designed. This model is based on the specific data included in the ERBO survey. In this survey firms were asked to indicate whether they expected a given firm-specific strategic variable (viz., sales rise in our case) to increase, to decrease or to remain approximately equal in the next year. Information on the same variable for the current (almost finished) year (i.e., the actual performance) is also collected. Both the expected and the realized values of the sales variable are measured in percen-

tage rise. Now it is plausible to conjecture that the revealed expectations on sales rise for the year to come (denoted by Ex) are influenced by the actual realisation of this variable in the current year and by other (non-observed) factors. Assuming a simple linear expectations model for firm n we get:

$$Ex_n(t+1) = \alpha_0 + \alpha_1 x_n(t) + \epsilon_n(t) \quad , \quad (1)$$

where α_0 and α_1 are parameters to be estimated and ϵ_n an error term. Parameter α_1 reflects the influence of period t upon the expectation in period $t + 1$, while the parameter α_0 is the intercept accounting for omitted variables (provided the linear model is a correct specification). The error term ϵ is assumed to be independently normally distributed with mean 0 and standard deviation σ .

In our approach we will estimate the coefficients α_0 and α_1 and the standard deviation σ separately for each Chamber of Commerce district and for each year in order to allow for region-specific and time-specific influences. Therefore, the model is ultimately less rigid than it looks at first glance, as it allows for space-time differences in entrepreneurial performance and expectations.

However, before the simple model (1) can be estimated, a cumbersome statistical problem has to be solved. A problem inherent in estimating model (1) is the fact that the variable $Ex_n(t+1)$ is only observed in a categorical manner; each entrepreneur n had to indicate in his questionnaire whether he expected a percentage decline ($Ex_n < 0$), an approximately equal level ($0 \leq Ex_n < 2$) or a percentage rise ($Ex_n \geq 2$) for the sales of his firm. Consequently, instead of Ex_n we are essentially dealing with a categorical variable y_n defined as follows:

$$y_n = \begin{cases} -1, & \text{if } Ex_n < 0 \\ 0, & \text{if } 0 \leq Ex_n < 2 \\ +1, & \text{if } Ex_n \geq 2 \end{cases} \quad (2)$$

This implies that our model is an ordered multi-response probit model with normalization of the threshold values (see Amemiya 1981; Example 3.2). It should be added that of course the observed value x_n is non-categorical in nature.

Now the probability that y_n assumes certain values can be speci-

fied in the following way:

$$\begin{aligned} \text{Prob}[y_n(t+1)=-1] &= \text{Prob}[\epsilon_n(t) < -\alpha_0 - \alpha_1 \cdot x_n(t)] \\ \text{Prob}[y_n(t+1)=0] &= \text{Prob}[-\alpha_0 - \alpha_1 \cdot x_n(t) \leq \epsilon_n(t) < 2 - \alpha_0 - \alpha_1 \cdot x_n(t)] \\ \text{Prob}[y_n(t+1)=1] &= \text{Prob}[2 - \alpha_0 - \alpha_1 \cdot x_n(t) \leq \epsilon_n(t)] \end{aligned} \quad (3)$$

Given the assumption of independent normality of the ϵ_n 's, we may compute the likelihood that the sample used here is actually observed on the basis of our statistical model. Maximization of this likelihood gives unique estimates for the parameters α_0 and α_1 , as well as for the standard deviation σ of the error terms¹.

The estimation results of equation (1), referred to as the Basic Model, for each individual Chamber of Commerce district and each relevant year are contained in Table 2.

Table 2 about here

The estimated values of α_0 , α_1 and σ (denoted by the symbol $\hat{\cdot}$) appear to be statistically significant at a 95% confidence interval (with one exception, viz. the coefficient $\hat{\alpha}_1$ for Zaandam in 1986). The parameter estimate of α_0 appears to fall in between 0 and 2, which means that on average entrepreneurs expect a more or less stable sales level. The parameter value $\hat{\alpha}_1$ is relatively small, suggesting that the impact of sales changes in the current year on the expected sales for the subsequent year is small (but nevertheless statistically significant). Thus a better performance in a given year appears to generate a more favourable expectation pattern for the next year. The results show that a sales rise of 1% in the current year would lead to an average expected sales rise in the next year of .026%. This suggests a risk-avoiding and conservative estimate of the future by these entrepreneurs, irrespective of the region where they are located. Apparently, a region-specific structural component is not present.

The previous results lead to the conclusion that on average entrepreneurs expect a modest rise in sales, irrespective of their perfor-

¹ The relevant mathematical derivations can be found in Rouwendal et al. (1991).

mance in the current year (mirrored by a positive value of $\hat{\alpha}_0$), while the influence of the latest sales developments are only marginally relevant (mirrored by a positive, but small value of $\hat{\alpha}_1$). Thus the formation of expectations is relatively independent of the actual development and is probably more determined by structural generic factors. This is a fairly uniform pattern for all entrepreneurs, as also the estimated standard deviations $\hat{\sigma}$ are relatively small.

Besides, it is noteworthy that in the period considered the estimated parameter values $\hat{\sigma}$ in all regions are first slightly declining, followed by a rise in later years. The estimated coefficients $\hat{\alpha}_1$ and $\hat{\sigma}$ show a similar pattern (except for 's Hertogenbosch). Although it is difficult to provide a convincing explanation, this time pattern suggests some delayed perception and response of entrepreneurs to the economic recession in the beginning of the eighties, followed by the recovery in later years. However, in principle there might also be a statistical cause for this pattern, viz. heterogeneity in expectations per size category of firms (a factor which may have been relevant, as the economic recovery has had different impacts on different size classes of firms; see Verhoeven and Wennekers, 1990).

An important question is now whether the revealed expectations of entrepreneurs are reflected in actual outcomes; in other words, whether such expectations provide a meaningful basis for predictions. In order to shed some light on this issue we have computed the average expected growth of sales in each of the years 1987, 1988 and 1989 on the basis of model (1). In doing so, we made use of the remarkable fact that our estimates of the α 's allow us to make numerical predictions of expectations that were revealed to us by the data only in categorical form. We denote the average expected sales growth for year t as μ_t and estimate it next as:

$$\hat{\mu}_t = \hat{\alpha}_0 + \hat{\alpha}_1 \cdot x_{t-1} \quad (4)$$

with x_{t-1} the average realized sales growth in the preceding year. The standard error of $\hat{\mu}_t$ around μ_t is $\hat{\sigma}$ divided by the number of observations. If entrepreneurs are good predictors, we expect the values of $\hat{\mu}_t$

to be close to those of x_t . The results are also contained in Table 2.

This table does not give the impression that entrepreneurs are reliable predictors of their own future. For example, in the period 1987 - 1989 the average actual sales growth of entrepreneurs in Utrecht was 7.12%, whereas the average expected sales growth, revealed during the period 1986-1988, amounted to 1.65%! In the other Chamber districts this difference was less dramatic, but nevertheless in all cases higher than 2%.

It is also interesting to observe that the estimated average rise in sales expectations over the period concerned exhibits a pattern similar to $\hat{\alpha}_0$: an initial decline is followed by a rise in later years. The ultimate level is higher than that in 1986. Besides, in the large cities of Amsterdam and Utrecht the 'average' entrepreneur expected for 1990 a higher sales rise than the one in Zaandam or 's Hertogenbosch. Here we find some region-specific elements in our analysis; the entrepreneurs in the core area of the Netherlands (the Randstad) apparently share a higher degree of optimism than their colleagues elsewhere.

The statistical analysis of our Basic Model leads to the conclusion that an unambiguous relationship between aggregate expectations and realizations of sales rise is missing. If we compare - by means of linear regression (including an intercept) - the average realized sales rise to the average expected sales rise for the same year, then only 3% of the variance in the first mentioned variable is explained, while the estimated coefficients do not differ significantly from zero. Furthermore, neither a decline nor a rise at the aggregate level appears to be explained in a satisfactory way: a decline in expected sales growth is five times accompanied by a rise in realized sales growth, whereas inversely a rise in expected sales is once accompanied by a rise in actual sales and once with a decline. In general, there appears to be a structural underestimation of the future growth in sales. Although some regional variation occurs, the overall space-time pattern leads to similar results.

It seems to be a plausible proposition now that the formation of entrepreneurial expectations is determined either by strategic behaviour (i.e., underestimation of expected performance) or by general

economic growth factors. The validity of these propositions will be further examined in subsequent Sections.

4. Disaggregation into Sectors

The previous remarkable and intriguing results are not immediately convincing, as it does not seem plausible that entrepreneurs who have to react rapidly and flexibly to new developments underestimate their sales growth. Therefore, before we accept the hypothesis of entrepreneurial strategic behaviour or of generic economic impacts on expected performance, the question has to be raised whether these outcomes may be due to a misspecified model. The transformation of categorical survey data into a linear regression model is not likely the main problem, as it is based on a well established statistical method. Therefore it may be meaningful to investigate whether - as a result of heterogeneity in firm responses - a sectoral disaggregation may generate better results. Therefore, the estimation procedure was repeated for a subdivision into 17 standard economic sectors over all 4 Chamber of Commerce districts (with each sector containing at least 143 observations in each year) (see Annex A). Although clearly some variation takes place, the results are for almost all sectors consistent with the overall estimation results. The pattern of the estimated coefficient values is more or less similar. The predicted versus realized sales growth figures correspond to a large extent also to the previous findings; in most sectors the sales growth is underestimated, although a few sectors (food, retail and hotels/restaurants) appear to exhibit an overestimation of sales growth for a couple of years. The Table in Annex B gives the frequency distribution of the average prediction errors; these results indicate that a sectoral subdivision does not lead to a significant improvement in results, as from the 51 cases there are 25 for which the underestimation amounts to at least 3% of the sales in the previous year.

In light of these test results, in the sequel a sectoral disaggregation will no longer be made and the models will only be based on distinct Chamber of Commerce districts.

5. Strategic Response Behaviour

Clearly, the sector-specific statistical analysis did not improve our results. Therefore, the hypothesis of strategic response behaviour will be tested in the present Section. This hypothesis implies that firms reveal their future expectations in a conservative manner, in order to avoid optimistic growth expectations which might lead to additional wage rise claims, reduction in public subsidies and the like. Thus the strategic response hypothesis assumes that such firms will normally express modest or stable growth expectations which are fairly invariant against actual growth patterns.

On the basis of the previous ideas we will now formulate a model incorporating two types of choice behaviour, viz. of entrepreneurs who reveal their actual real expectations and of entrepreneurs who provide a strategic underestimation (or conservative estimate) of their change expectations. The share of the latter class of entrepreneurs is supposed to be equal to an unknown proportion γ , to be estimated simultaneously with all other model parameters. This assumption means for our model that the probabilities from equation (3) are only relevant for the proportion $(1-\gamma)$ of the responding entrepreneurs who reveal their real expectations. For the remaining proportion of strategic-response entrepreneurs we assume a probability of one that an approximately zero expected sales growth is recorded. The model used here is based on Kiefer's (1978) switching model, which is specified for our purposes as follows:

$$\begin{aligned} & (a) \quad \mu_t = \alpha_0 + \alpha_1 x_t + \varepsilon_t \quad \text{with probability } (1-\gamma) \\ & \text{and} \\ & (b) \quad 0 < \mu_t < 2 \quad \text{with probability } \gamma \end{aligned} \tag{5}$$

Since in our case μ_t is of a discrete (categorical) nature, we will use our original model (3) as the basis for regression and multiply the right hand elements with $(1-\gamma)$ and add γ to the second equation of (3), in order to guarantee the additivity conditions for the probabilities. In Kiefer's switching model, the occurrence of 'regime' (a) or (b) in (5) for a given actor is dependent on 'nature' (whether or not the actor concerned responds fairly). It can also easily be demon-

strated that for γ , α_0 , α_1 and σ maximum likelihood estimators do exist.

Table 3 about here

The results are presented in Table 3. These results show that the estimated values of $\hat{\alpha}_0$ and $\hat{\alpha}_1$ are higher than in the basic model. Furthermore, the estimated parameter values of γ are in most cases significantly different from zero, although their values are relatively low. Thus strategic-response behaviour is not a wide-spread phenomenon among entrepreneurs. It is noteworthy that the estimation results inhibit more variation than in previous cases. Furthermore, it is interesting to observe that the estimated value of γ for the years 1986 and 1989 is smaller than 10% of all respondents, whereas for the intermediate years in most cases γ appeared to be higher than 10% (except for 's Hertogenbosch in 1987). A possible explanation might be the perturbation on the stock exchange markets in October 1987, which might have increased the uncertainty of entrepreneurs regarding the future of the economy. This effect might then have lasted until the end of 1988. This is confirmed by the low value of $\hat{\gamma}$ for 's Hertogenbosch in 1987, where most firms had already responded before the perturbation on the stock exchange market in October 1987.

A comparison of the estimated values in Tables 3 and 2 shows that α_0 and α_1 are clearly higher in our reformulated model, so that the model performance is now somewhat better. Nevertheless there is still a pronounced underestimation of the sales growth, so that - despite a clear improvement in results - the strategic-response hypothesis does not seem to be unambiguously valid, so that the search for a better model specification should be continued. This will be dealt with in the next Section.

6. Distribution of Error Terms

The results of the linear regression analysis presented in the previous Sections are still somewhat puzzling. Therefore, an attempt has been made to improve the results by assuming a different distribution. We will assume here a Cauchy distribution which allows for a

larger share of the sample to take on values at a larger distance from the mean. This distribution is characterized by two parameters, one for the median value, m , and another one representing the scale factor, β . The Cauchy distribution function $c(x)$ of a stochastic x is now defined as $0.5 + \arctan((x-m)/\beta)$. Analogous to the previous estimation procedure, we assume here that the median is a linear function of the sales growth. Of course, the t -values are not t -distributed anymore.

Since we do not add any new coefficient to our model, we cannot judge the model performance by means of t -values. Instead, we have to check whether the transition from a normal distribution to a Cauchy distribution resulted in an increase in the value of the likelihood.

The estimation results can be found in Table 4, including the results for the strategic - response behaviour. The values of $\hat{\alpha}_0$ appear

Table 4 about here

to be more or less equal to those in the normal distribution. The value of $\hat{\alpha}_1$ appears to be larger, whereas the value of $\hat{\beta}$ is smaller than the estimated scale factor $\hat{\sigma}$ from the model based on the normal distribution; the value of $\hat{\gamma}$ appears to be larger. Finally, in almost all cases the improvement in the value of the likelihood indicates a better performance in terms of model specification. In all 12 cases we observe a reduction in the underestimation of the sales growth. Thus our Cauchy approach is apparently more satisfactory, although also in this case this improvement is still modest.

Therefore, it may finally be meaningful to look for a different performance indicator of enterprises. This is the subject of the next Section.

7. Employment as Performance Indicator

Instead of sales growth, we will use in this Section full-time labour equivalents as an indicator for the (expected and actual) performance of firms. The results are presented in Table 5. It turns

Table 5 about here

out that all estimated coefficients - with the exception of $\hat{\alpha}_1$ for Zaandam in 1986 - are statistically significant. Besides, Amsterdam and Zaandam appear to have larger values of $\hat{\alpha}_0$ and smaller values of $\hat{\alpha}$ than 's Hertogenbosch and Utrecht, while $\hat{\alpha}_0$ is in 1988 and 1989 larger than in 1986 and 1987. Finally, the parameter estimates $\hat{\alpha}_0$, $\hat{\alpha}_1$ and $\hat{\alpha}$ appear to be smaller for employment growth than for sales growth. Thus here we have a clear case of more regional differentiation in our results.

It is of course interesting to compare the expectations with the realisations of employment growth. Table 5 confirms the previous findings: the growth in employment is structurally underestimated. The average prediction errors for Amsterdam, Zaandam, 's Hertogenbosch and Utrecht are 2.43%, 3.79%, 5.64% and 5.52% of the full-time labour equivalents, respectively. Thus there is a clear region-specific prediction error here. Apparently, the employment growth in each Chamber of Commerce district is even more poorly predicted than the sales growth. Thus there is at least a consistent underestimation of both realized sales growth and employment growth. The relatively large estimation errors suggest that entrepreneurs are either unreliable predictors of their own future or strategic underestimators of their future. Alternatively, it seems plausible to conjecture that entrepreneurial expectations are largely determined by general economic prospects and growth factors.

As a final step in our analysis we have also experimented with investment and export data. Such variables however appear to exhibit drastic fluctuations over time and hence the outcomes are less reliable. Nevertheless, the results for these variables were in conformity with the previous findings.

8. Conclusion

The previous modelling efforts focused on the reliability of revealed expectations vis-à-vis realized outcomes of strategic variables of individual firms, viz. sales growth and employment growth. It turned out that for all variables examined a structural under-estima-

tion of realisations took place. Thus the choice of indicators appeared to have hardly any influence on the final results.

The model results for sales growth are concisely summarized in Table 6 where the original model, the strategic-response model and the Cauchy-distributed error term model are mutually compared. The results

Table 6 about here

are apparently not dramatically different. Since the model incorporating strategic-response behaviour did not perform significantly better than other models, the hypothesis of strategic underestimation cannot be regarded as plausible. The possibility of a mis-specified model (e.g., lack of sectoral subdivision, spatial heterogeneity etc.) cannot be ruled out, but the various tests on indicators, probability distribution of error terms, the year-by-year estimation procedure, and the level of disaggregation do not lead to unambiguous results.

The hypothesis of rational expectations - in the sense of unbiased predictions of future performance of entrepreneurs - is not supported by our results. All our model specifications - despite refinements and amendments - point to systematic prediction errors in entrepreneurial expectations. Despite some heterogeneity in sectors, regions or size classes the results are fairly uniform.

The only plausible explanation left at the end is that entrepreneurs were in the period concerned (a period with an economic 'upswing' after the recession in the first part of the 1980's) - pleasantly - surprised by the relatively high sales growth. In this situation of structural uncertainty the relatively better results of the Cauchy distribution are plausible. Thus in conclusion the uncertain economic prospects may be regarded as the main source for the conservative estimations of the future performance of entrepreneurs in the Netherlands. Apparently, generic economic factors and prospects are more decisive for expectation formation of firms than sectoral or regional growth performance indicators. Our results warrant also the conclusion that further empirical research into the formation of entrepreneurial expectations needs to be focussed on determinants at the micro level of individual firms, located in different areas.

Table 1. Expected and actual sales growths in percentages of the number of reporting firms per district per year

	Δ Sales Reported in Current, but Expected for Next Year				Actual Δ Sales in Current Year				Δ Sales Reported in Current, but Expected for Next Year				Actual Δ Sales in Current Year		
	-	0	+	?	-	0	+		-	0	+	?	-	0	+
A'DAM								Z'DAM							
1986	12	49	39	0	26	28	46		13	52	35	0	26	30	44
1987	11	53	36	0	27	32	41		12	56	32	0	30	30	40
1988	8	54	38	0	18	46	36		8	59	33	0	15	50	35
1989	6	50	44	0	14	46	40		6	52	42	0	13	46	41
D'BOSCH								UTRECHT							
1986	9	47	41	3	21	30	49		9	49	38	4	21	32	47
1987	10	49	39	2	23	32	45		9	54	35	2	24	32	44
1988	9	51	37	3	14	46	40		6	52	39	3	14	46	40
1989	6	50	41	3	12	46	42		6	49	42	3	11	46	43

Legend: -: decline; 0: no change; +: rise; ?: no report
 Δ Sales: a change in sales level

Table 2. Estimated Parameters of the Basic Model, Actual Average Sales Rises and Estimated Parameters of the Distributions of the Expectations

	$\hat{\alpha}_0$	$\hat{\alpha}_1$	$\hat{\sigma}$	$\hat{\mu}$	$\hat{\sigma}/\sqrt{N}$	x
AMSTERDAM						
1986	1.54 (48.5)	.029 (12.3)	1.30 (35.3)	1.67	.031	4.64
1987	1.50 (52.1)	.023 (12.8)	1.22 (42.8)	1.58	.025	3.54
1988	1.58 (57.3)	.019 (10.9)	1.15 (42.8)	1.66	.023	4.21
1989	1.71 (61.0)	.029 (14.1)	1.11 (38.0)	1.83	.023	4.21
ZAANDAM						
1986	1.48 (19.1)	.039 (1.4)	1.32 (17.5)	1.74	.067	6.54
1987	1.37 (29.4)	.028 (8.3)	1.18 (25.0)	1.46	.042	3.38
1988	1.48 (32.7)	.013 (5.4)	1.05 (25.3)	1.54	.038	4.94
1989	1.68 (35.1)	.020 (6.1)	1.15 (24.4)	1.77	.040	4.62
DEN BOSCH						
1986	1.60 (42.0)	.018 (9.4)	1.38 (34.8)	1.70	.033	5.48
1987	1.52 (49.5)	.030 (12.2)	1.31 (37.0)	1.67	.030	5.07
1988	1.44 (42.6)	.024 (11.1)	1.26 (37.8)	1.58	.029	5.73
1989	1.57 (48.5)	.036 (13.7)	1.20 (37.1)	1.79	.028	6.52
UTRECHT						
1986	1.46 (44.3)	.035 (13.9)	1.30 (38.2)	1.72	.030	7.30
1987	1.46 (54.8)	.016 (12.4)	1.19 (46.1)	1.53	.023	4.61
1988	1.57 (56.3)	.016 (11.7)	1.22 (45.6)	1.69	.023	7.69
1989	1.61 (59.1)	.027 (15.0)	1.23 (45.0)	1.85	.023	9.06

Legend: x = average actual sales rise in current year;
 $\hat{\mu}$ and $\hat{\sigma}/\sqrt{N}$ are, respectively, the estimated mean and standard deviation of expected sales rise for the next year;

Table 3. Parameter Estimates of Model with Strategic Response Behaviour and the Normal Distribution (t-values in brackets)

	$\hat{\alpha}_0$	$\hat{\alpha}_1$	$\hat{\sigma}$	$\hat{\gamma}$
AMSTERDAM				
1986	1.63 (26.6)	.039 (9.3)	1.44 (17.0)	.091 (2.6)
1987	1.72 (18.8)	.051 (7.5)	1.54 (11.8)	.205 (4.6)
1988	1.89 (16.1)	.040 (6.8)	1.55 (11.5)	.240 (5.2)
1989	1.78 (36.2)	.037 (10.8)	1.19 (23.8)	.075 (2.5)
ZAANDAM				
1986	1.48 (18.8)	.039 (1.4)	1.32 (16.7)	0*
1987	1.49 (15.2)	.040 (4.9)	1.40 (8.1)	.164 (2.0)
1988	1.68 (13.2)	.065 (5.1)	1.35 (8.2)	.285 (4.3)
1989	1.72 (24.0)	.025 (5.7)	1.20 (15.1)	.046 (0.9)
DEN BOSCH				
1986	1.65 (25.7)	.029 (8.1)	1.49 (16.6)	.067 (1.8)
1987	1.57 (29.5)	.035 (8.2)	1.39 (18.1)	.051 (1.3)
1988	1.60 (18.4)	.040 (6.1)	1.55 (11.5)	.173 (3.3)
1989	1.61 (36.2)	.041 (10.7)	1.26 (24.6)	.048 (1.8)
UTRECHT				
1986	1.54 (24.9)	.048 (7.6)	1.46 (14.1)	.103 (2.3)
1987	1.57 (27.8)	.053 (10.0)	1.40 (16.6)	.182 (5.0)
1988	1.75 (23.2)	.042 (7.6)	1.51 (14.7)	.186 (4.9)
1989	1.68 (6.2)	.041 (3.1)	1.35 (4.1)	.087 (0.6)

* The values of $\hat{\alpha}_0$, $\hat{\alpha}_1$ and $\hat{\sigma}$ for Zaandam 1986 are the same as in Table 2 (the t-value of a zero estimate is by definition zero).

Table 4. Parameter Estimates of Model with Strategic Response Behaviour and Cauchy Distribution (t-values in brackets)

	$\hat{\alpha}_0$	$\hat{\alpha}_1$	$\hat{\beta}$	$\hat{\gamma}$
AMSTERDAM				
1986	1.57 (30.1)	.092 (6.9)	.75 (11.5)	.184 (5.7)
1987	1.67 (37.0)	.076 (9.2)	.78 (13.4)	.226 (8.2)
1988	1.77 (40.6)	.082 (8.3)	.69 (13.0)	.258 (10.4)
1989	1.80 (69.1)	.064 (10.2)	.44 (13.5)	.146 (6.2)
ZAANDAM				
1986	1.56 (11.6)	.064 (2.5)	.93 (4.8)	.211 (2.5)
1987	1.59 (17.2)	.114 (4.6)	.85 (7.0)	.310 (6.3)
1988	1.71 (24.4)	.092 (4.1)	.59 (6.7)	.312 (6.9)
1989	1.78 (41.8)	.030 (4.4)	.42 (7.6)	.437 (0.9)
DEN BOSCH				
1986	1.68 (36.8)	.053 (5.6)	.77 (11.4)	.122 (3.4)
1987	1.68 (32.3)	.077 (8.1)	.80 (12.2)	.184 (5.7)
1988	1.64 (24.9)	.105 (5.9)	.94 (10.8)	.277 (9.8)
1989	1.70 (47.9)	.070 (7.9)	.55 (13.4)	.135 (5.3)
UTRECHT				
1986	1.49 (25.2)	.110 (6.6)	.86 (10.8)	.221 (7.4)
1987	1.57 (34.3)	.113 (7.4)	.79 (13.4)	.294 (11.5)
1988	1.73 (41.6)	.084 (8.6)	.75 (13.8)	.246 (10.9)
1989	1.66 (53.0)	.096 (9.6)	.56 (16.1)	.159 (8.5)

Table 5. Estimated Parameters for Full-Time Labour, Actual Average Sales Rises
and Estimated Parameters of the Distributions of the Expectations

	$\hat{\alpha}_0$	$\hat{\alpha}_1$	$\hat{\sigma}$	$\hat{\mu}$	$\hat{\sigma}/\sqrt{N}$	x
AMSTERDAM						
1986	1.24 (51.1)	.007 (6.6)	0.78 (43.2)	1.26	.019	3.44
1987	1.21 (59.7)	.007 (7.4)	0.78 (52.6)	1.23	.016	3.26
1988	1.24 (59.6)	.005 (5.7)	0.81 (52.3)	1.26	.016	3.93
1989	1.34 (64.2)	.005 (5.5)	0.79 (49.0)	1.36	.016	3.84
ZAANDAM						
1986	1.19 (21.8)	.002 (0.6)	0.80 (21.3)	1.20	.040	3.58
1987	1.15 (33.8)	.005 (3.3)	0.69 (30.3)	1.17	.024	3.56
1988	1.20 (33.5)	.005 (3.4)	0.72 (29.3)	1.23	.026	6.26
1989	1.33 (39.3)	.004 (3.4)	0.71 (29.1)	1.24	.025	5.15
DEN BOSCH						
1986	0.96 (34.8)	.005 (5.1)	0.94 (44.3)	1.00	.022	7.64
1987	1.05 (38.9)	.002 (2.2)	0.97 (45.3)	1.06	.022	6.96
1988	1.20 (44.7)	.005 (5.1)	0.92 (44.7)	1.23	.021	6.25
1989	1.22 (43.8)	.003 (4.6)	1.03 (42.7)	1.24	.024	6.99
UTRECHT						
1986	0.93 (33.0)	.007 (5.1)	1.05 (44.5)	0.96	.024	4.73
1987	0.97 (42.2)	.005 (5.7)	1.00 (55.0)	1.00	.019	5.91
1988	1.19 (56.0)	.003 (5.5)	0.92 (54.5)	1.21	.017	7.26
1989	1.18 (53.8)	.005 (6.5)	0.95 (54.5)	1.21	.018	6.56

Table 6. Average Prediction Errors for the Three Model Specifications

	Model 1	Model 2	Model 3
AMSTERDAM	2.35	2.06	1.97
ZAANDAM	2.73	2.60	2.27
DEN BOSCH	4.12	3.98	3.68
UTRECHT	5.47	5.20	4.87

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Annex A. Results of the Sectoral Basic Model (t-values in brackets)

	$\hat{\alpha}_0$	$\hat{\alpha}_1$	$\hat{\sigma}$	$\hat{\mu}$	$\hat{\sigma}/\sqrt{N}$	x
Agriculture						
1986	1.27 (15.0)	.046 (5.3)	1.26 (13.9)	1.35	.077	1.64
1987	1.23 (16.0)	.036 (4.7)	1.16 (15.6)	1.32	.068	2.41
1988	1.33 (17.4)	.029 (5.1)	1.08 (16.1)	1.41	.062	2.85
1989	1.28 (18.7)	.035 (5.2)	0.96 (16.5)	1.40	.055	3.36
Food Industry						
1986	1.61 (14.2)	.040 (4.2)	1.57 (11.0)	1.66	.114	1.35
1987	1.49 (15.8)	.046 (5.7)	1.27 (12.4)	1.47	.088	-.46
1988	1.74 (16.6)	.027 (3.0)	1.49 (11.6)	1.78	.106	1.37
1989	1.65 (17.0)	.058 (5.8)	1.09 (10.8)	2.02	.078	6.31
Textile, Leather						
1986	1.56 (15.5)	.018 (3.7)	1.27 (12.5)	1.63	.088	4.14
1987	1.35 (15.5)	.027 (5.1)	1.17 (13.8)	1.49	.074	5.26
1988	1.38 (16.3)	.031 (5.5)	1.12 (14.3)	1.52	.071	4.40
1989	1.53 (18.3)	.035 (5.7)	1.07 (13.6)	1.70	.067	4.89
Wood and Building Materials						
1986	1.39 (17.2)	.026 (4.3)	1.24 (15.9)	1.49	.070	3.92
1987	1.32 (19.1)	.023 (5.5)	1.16 (17.4)	1.37	.060	2.37
1988	1.51 (21.0)	.007 (2.2)	1.12 (16.0)	1.56	.060	7.27
1989	1.63 (24.9)	.032 (6.3)	1.01 (15.8)	1.81	.053	5.73
Paper and Graphics Industry						
1986	1.81 (17.5)	.055 (6.1)	1.55 (12.9)	2.07	.086	4.70
1987	1.82 (24.5)	.034 (5.9)	1.22 (16.3)	2.04	.060	6.46
1988	1.89 (23.9)	.024 (5.1)	1.23 (15.1)	2.10	.060	8.89
1989	2.00 (23.9)	.031 (5.0)	1.25 (14.6)	2.23	.061	7.39
Chemical Industry						
1986	1.55 (12.3)	.029 (3.1)	1.42 (10.0)	1.69	.119	4.94
1987	1.76 (12.2)	.006 (1.5)	1.49 (9.6)	1.79	.119	5.60
1988	1.93 (13.2)	.031 (3.7)	1.40 (8.7)	2.10	.116	5.56
1989	1.96 (15.5)	.032 (4.1)	1.16 (9.0)	2.24	.091	8.80
Metal Industry						
1986	1.63 (31.6)	.007 (3.7)	1.27 (24.7)	1.68	.043	6.49
1987	1.45 (30.7)	.011 (5.8)	1.32 (28.5)	1.50	.041	4.39
1988	1.56 (35.6)	.019 (7.8)	1.18 (27.7)	1.65	.037	4.90
1989	1.67 (37.0)	.018 (8.4)	1.26 (26.4)	1.81	.039	8.02
Building Industry						
1986	1.22 (18.3)	.014 (4.3)	1.22 (19.3)	1.28	.057	4.58
1987	1.19 (23.8)	.011 (5.4)	1.04 (25.2)	1.24	.041	3.02
1988	1.29 (29.2)	.003 (1.4)	0.91 (26.1)	1.31	.034	7.27
1989	1.42 (29.6)	.013 (4.3)	1.09 (24.2)	1.46	.042	5.73
Wholesale Trade						
1986	2.14 (19.6)	.033 (6.1)	1.29 (11.2)	2.31	.059	5.17
1987	1.95 (29.7)	.048 (8.9)	1.40 (20.4)	2.16	.053	4.33
1988	1.97 (25.5)	.020 (4.9)	1.51 (19.9)	2.13	.058	7.94
1989	2.22 (22.4)	.032 (5.3)	1.56 (14.0)	2.49	.061	8.31
Retail Food						
1986	0.92 (12.5)	.097 (7.9)	1.07 (16.0)	0.90	.063	-.22
1987	1.24 (20.7)	.067 (8.8)	1.15 (19.6)	1.25	.053	0.16
1988	1.34 (21.8)	.086 (8.9)	1.13 (18.6)	1.53	.052	2.25
1989	1.38 (23.6)	.084 (8.0)	1.02 (19.6)	1.60	.047	2.59

Retail Non-Food							
1986	1.51	(26.7)	.041	(8.7)	1.23	(20.9)	1.65 .050 3.45
1987	1.33	(30.2)	.040	(9.3)	1.14	(26.1)	1.42 .038 2.13
1988	1.47	(32.3)	.033	(8.2)	1.18	(26.8)	1.47 .039 0.11
1989	1.47	(30.5)	.044	(8.5)	1.25	(25.6)	1.60 .043 2.97
Restaurants and Hotels							
1986	1.39	(19.1)	.052	(5.9)	1.08	(15.6)	1.45 .060 1.11
1987	1.52	(27.0)	.009	(2.6)	1.01	(19.3)	1.55 .048 3.43
1988	1.39	(25.1)	.043	(6.8)	0.93	(19.0)	1.46 .044 1.71
1989	1.53	(28.2)	.019	(4.5)	0.95	(19.4)	1.63 .044 5.34
Repair Industry							
1986	1.19	(15.7)	.047	(6.8)	1.11	(15.9)	1.30 .064 2.44
1987	1.32	(22.5)	.027	(5.3)	1.01	(18.1)	1.39 .050 2.61
1988	1.34	(22.3)	.033	(5.8)	1.05	(19.3)	1.38 .051 1.34
1989	1.38	(24.7)	.068	(8.4)	0.95	(17.5)	1.46 .060 1.46
Transport							
1986	1.54	(19.1)	.015	(3.2)	1.26	(15.6)	1.59 .070 3.66
1987	1.49	(23.1)	.025	(6.1)	1.17	(18.5)	1.57 .055 3.14
1988	1.40	(22.5)	.028	(6.5)	1.10	(19.5)	1.53 .051 4.78
1989	1.62	(26.5)	.027	(6.0)	1.08	(18.6)	1.73 .050 4.02
Real Estate							
1986	1.57	(13.1)	.010	(2.0)	1.44	(12.2)	1.66 .103 9.32
1987	1.22	(12.4)	.008	(3.1)	1.26	(13.6)	1.29 .083 8.26
1988	1.35	(16.1)	.016	(3.5)	1.07	(14.2)	1.42 .071 4.18
1989	1.54	(17.4)	.014	(3.3)	1.20	(14.0)	1.59 .075 3.47
Business Services							
1986	2.11	(16.8)	.015	(3.7)	1.60	(11.9)	2.29 .090 12.26
1987	1.92	(24.2)	.042	(9.2)	1.40	(17.4)	2.36 .064 10.49
1988	2.00	(24.9)	.031	(7.3)	1.53	(16.4)	2.32 .063 10.28
1989	2.23	(23.4)	.040	(7.6)	1.52	(15.4)	2.64 .064 10.28
Remaining Services							
1986	2.72	(15.6)	.026	(5.5)	1.55	(11.9)	1.94 .099 8.61
1987	1.51	(22.2)	.028	(5.8)	1.13	(16.4)	1.62 .059 4.09
1988	1.55	(20.3)	.010	(3.7)	1.24	(16.3)	1.66 .064 10.92
1989	1.68	(22.3)	.020	(4.9)	1.23	(16.4)	1.85 .063 8.44

Annex B. Frequency Distribution of Average Prediction Error (in Annex A.)

Average Prediction Error	0%	1%	2%	3%	4%	5%	15%
Empirical Quantile Point	.098	.196	.373	.510	.647	.725	1

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