

SME's growth and the role of collaboration and internationalization

Author: Max Weber/ Supervisor: Joan-Lluís Capelleras - Segura

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Abstract

The growth of small and medium enterprises (SME's) is usually explained by their age, the industry they belong to and the firm size. This thesis argues that collaboration and internationalization strategies could be a further indicator to explain growth for small and medium – sized enterprises. Our main aim is to examine the impact of the interaction between collaboration and internationalization upon the sales and employment growth of SMEs. We make use of a longitudinal dataset of Spanish manufacturing firms. Results of a multivariate regression framework tend to confirm our hypotheses on the relationships between exports, collaboration and subsequent SME growth. We conclude with some implications derived from our findings.

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1. Introduction

The development of small and medium-sized enterprises (SMEs) has been seen as a key to economic growth, innovation and market competition in advanced economies (Acs & Audretsch, 1990). Equally, SMEs have been considered as a central source of job generation and wealth creation (Storey, 1994).

Accordingly, empirical research on the topic of SME growth is extensive (Davidsson et al, 2006; Gilbert et al, 2006). Empirical evidence has shown that growth is a necessity for firms to survive (Audretsch & Mahmood, 1995). Especially for SMEs this is an important finding to be considered if they want to succeed in the market (Buederal, Preisendoerfer & Ziegler; 1992). In contrast, large firms do not necessarily need a great growth rate to survive, because they are already established in their markets.

Further there is the need to decide which measure of growth to choose. Murphy, Trailer & Hill (1996) suggest several measures such as cash flow, net income, customer base, sales, employment and market share. However, the most commonly used indicators are sales growth and employment growth (Weinzimmer, Nystrom & Freeman, 1998; Gilbert et al, 2006). The employment growth rate implies organizational changes or a different strategy of the firm (Hanks, Watson, Jansen & Chandler, 1993) and the sales growth rate measures the companies' success in monetary terms (Robinson, 1998).

Different factors have been used to explain SME growth. Taking a behavioral perspective Baum et al. (2001) and Baum & Locke (2004) consider the entrepreneurial characteristics. The willingness to grow and the educational background of firm founders are the main drivers in these studies. Other researchers have linked access to financial capital (Cooper et al., 1994; Lee et al., 2001) and human capital (Cardon, 2003) to a company's growth success. In fact smaller firms need more specific expertise and highly skilled workers than larger firms. According to Cardon (2003), established companies need a less skilled workforce to meet production demands.

Moreover, the industry and their characteristics matter to understand the patterns of growth (Bamford et al. 2000 a; Eisenhardt & Schoonhoven, 1990). They figure out that in

different industries and sectors growth levels are different. Important factors that have also been the focus of much research are firm size and age (e.g. Geroski, 2005).

An additional factor mentioned in the recent literature is the firm's strategic decision. Strategic management literature emphasizes the role of strategy on the performance of SMEs and numerous studies have considered the importance of a firm's strategy for its growth performance (e.g. Davidsson et al, 2006; Gilbert et al, 2006).

Our interest here is on international and collaboration strategies. There is evidence that firms that cooperate in terms of R&D and marketing alliances achieve better performance (e.g. McGee, Dowling & Meggionson, 1995). Internationalization strategy can also have a great impact on growth (e.g. Mc Dougall, 1989). Especially the sales growth can greatly depend on the internationalization efforts. For the employment growth it depends on the internationalization strategy. If for instance a company expands through licensing, then it may not grow in terms of employment, but the effect on sales would be more important.

Our aim in this study is to examine the individual and joint effects of internationalization in terms of exports and technological cooperation upon the growth of SMEs. While there are several studies on the influence of export and R&D collaboration upon the growth of small firms, little research has been done explicitly on the growth implications of both exporting and collaborating. Hence, the main novelty of the study is to investigate the impact of their interaction on the sales and employment growth rates. We not only underline previous results (e.g. Mc Gee et al., 1995; Mc Dougall, 1989) but also close the gap of the interaction effect which is so far not mentioned in the literature.

The next section briefly reviews the literature and develops a number of hypotheses. We then present the data, variables and methods used in the empirical analysis. Hypotheses are tested by using a panel data set composed of Spanish manufacturing firms. We subsequently show the results of six longitudinal regression models. Our results give evidence for an existing relationship between our variables of interest. The findings are briefly summarized and discussed in the final section.

2. Theoretical background, literature review and hypotheses

There is no unique theory with which to explain firm growth. Prior work has shown that both firm and environmental factors figure in the prediction of SMEs growth (e.g. Davidsson et al, 2006; Gilbert et al, 2006; Capelleras et al, 2008).

Organizational characteristics such as firm age may explain growth. Firms may suffer from being “young” due to lack of reputation or experience, or they can suffer from being “old” due to the inability to adapt to changing environment conditions (Barron, West & Hannan, 1994). Researchers have also investigated the firm size and growth relationship extensively. Gibrat (1931) argued that growth is proportional to size and that the factor of proportionality is random. In other words, proportional growth rates are independent of size (Barron et al., 1994; Sutton, 1997). Numerous studies have tested this “Gibrat's Law” (e.g., Evans, 1987 a, b; Geroski, 2005) and the results have been mixed.

From an industrial organization perspective, firm growth is clearly dependent on the industry structure (Scherer 1980). Hence, a firm's growth primarily depends on industry characteristics and how the company positions itself vis-à-vis the industry structure. Researchers have primarily focused on competitive intensity in the industry as a predictor of growth. As the competition intensifies, firms find it challenging to achieve high sales growth rates.

While firm age and size, as well as industry structure, are relevant factors to explain growth, in this study we focus on strategies that firms make use in order to exploit environmental conditions (Romanelli, 1989). As stated before, we are interested in the individual and joint effects on SME growth of export and collaboration strategies. To our knowledge, these issues have not been the focus of much research.

Internationalization may be achieved through export and/or foreign direct investments (FDI). Compared with FDI, exporting is a relatively easy and fast way to enter foreign markets, because it involves comparatively low levels of commitment and risk (Golovko & Valentini, 2011). Export constitutes the initial preferred way of internationalization for SMEs because

does not usually involve a substantial resource commitment to a foreign market and does not necessarily imply establishing a foreign subsidiary (Lu & Beamish, 2006).

Export is likely to exert a positive impact on ventures' growth, as suggested by previous research (e.g. McDougall & Oviatt, 1996; Robson & Bennett, 2000; Becchetti & Trovato, 2002). Prior literature has also shown that export not only has a positive direct effect on sales, but also provides the firm with indirect gains from the diversification of revenues (Shaver, 2011) and the development of new capabilities, which enhance the firm's ability to pursue growth opportunities (Sapienza et al, 2006). It has also been suggested that exports may have a positive influence on employment growth (McDougall, 1989). Overall, therefore, we suggest the following hypotheses:

H1a: Exports will be positively related to sales growth.

H1b: Exports will be positively related to employment growth.

Collaboration strategies allow SMES to combine their own resources with those of their partners. Such cooperation may thus enable ventures to achieve fast and large-scale expansion. In particular, technological cooperation with customers, suppliers, competitors, research centers or other organizations offers learning opportunities for small and new ventures (Zou et al, 2010). The parties may share knowledge in technology know-how and market opportunities (Lee, Lee, & Johannes, 2001). This is very beneficial to enable new and small ventures to overcome their liability to inexperience. Moreover, the relationship with partners is an important means to obtain critical inputs such as good reputation and market access, especially for high-tech firms (Larson, 1991; Zhao & Aram, 1995). Accordingly, we offer the following hypotheses:

H2a: Technological collaboration will be positively related to sales growth.

H2b: Technological collaboration will be positively related to employment growth.

In addition to the individual effects of exports and collaboration upon growth, one would expect a positive interdependence between them (interaction effect) which in turn would impact positively the growth of the firm.

While collaboration with other firms is no guarantee to an SME's successful entry into international markets (Lu & Beamish, 2001), the combination of export with collaboration with customers, suppliers, research centers or other organizations may enhance SME growth. Exporting firms that also collaborate with other organizations can increase their sales growth selling better products in export markets and, at the same time, they can also witness positive spillovers for the products sold in domestic markets, which will be of improved quality (Golovko & Valentini, 2011).

Moreover, firms' learning abilities may increase through the combination of export and collaboration. Recent studies suggest that exports might serve as a vehicle to get access to novel information and technological knowledge not available in the home market, and which can further be used in the collaboration process (Golovko & Valentini, 2011).

Our approach to investigate the effect of both export and collaboration on SME growth is based on the comparison of single strategies with a combined strategy. Thus, we distinguish the following cases:

- (0) firms that neither export nor collaborate
- (1) firms that only export
- (2) firms that only collaborate
- (3) firms that both export and collaborate

After the creation of the categorical interaction effect, we go on to investigate their effects on the sales and employment growth. According to the Hypothesis 1 and Hypothesis 2 the categories 1 – 3 should have a positive impact on the sales and employment growth. When exports or collaboration do have this effect the third category which represents exporting and cooperating firms should have the greatest coefficient with the highest significance level. Our expectations are formulated in the following hypotheses:

H3a: Category 1 (exports and no collaboration) has a higher impact on sales and employment growth than the reference category (no exports and no collaboration).

H3b: Category 2 (no exports and collaboration) has a higher impact on sales and employment growth than the reference category (no exports and no collaboration).

H3c: Category 3 (exports and collaboration) has a higher impact on sales and employment growth than the reference category (no exports and no collaboration).

The same should hold for the binary interaction effect. If the categorical interaction has a positive influence on the two growth variables the binary interaction should underline and proof the results again. This is reflected in the following hypothesis:

H4a: The binary interaction is positively correlated with the sales growth.

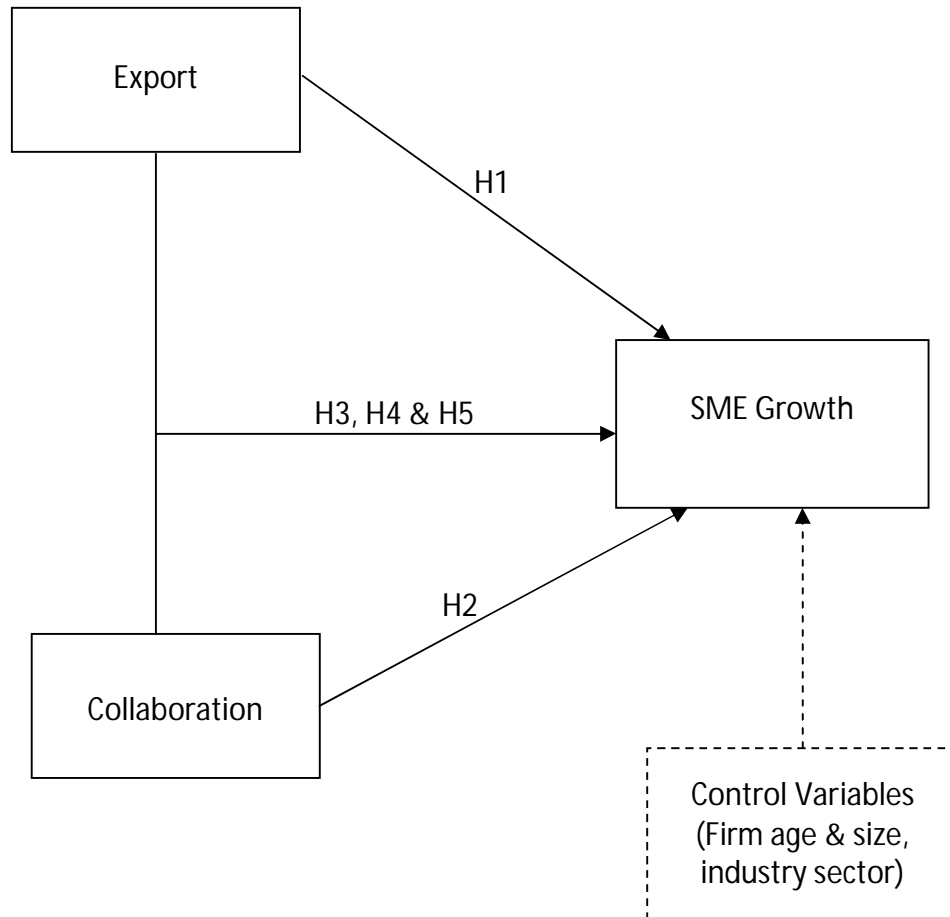
H4b: The binary interaction is positively correlated with the employment growth.

Additionally, we expect a higher interaction influence on the sales growth than on the employment growth. This is due to the fact that the internationalization strategy could be different. A firm could for instance expand through a licensing strategy. This is supposed to cause an effect in the sales growth but do not necessarily involve hiring new employees (McKelvie and Wiklund, 2010). We thus formulate our final hypothesis:

H5: The coefficients and the significance levels for the binary interaction are always higher for the sales growth than for the employment growth.

To summarize our approach, figure 1 shows the conceptual model of the study. The figure indicates that SME growth will separately depend on export and collaboration strategies. Secondly, we suggest that the interaction of these two strategies will have a positive impact of growth. The model also includes a number of control variables that may have an influence on the growth of firms, such as their age, initial size and industry sector.

Figure 1: Conceptual Model



3. Methodology

3.1. Data

In order to examine the expected relationships between exports, collaboration and firm growth, we draw on data obtained from the ESEE (*Encuesta Sobre Estrategias Empresariales*). It is a firm-level panel of data compiled by the Spanish Ministry of Science and Technology. The ESEE covers a wide sample of Spanish manufacturing firms operating in

all industry sectors. The sample is representative of the population of Spanish manufacturing firms with 10 to 200 employees. In this study, the figure of 200 employees is taken as the upper limit for definition as an SME.

One of the main advantages of the ESEE is that we can work with panel data. That makes our results more reliable than the usual cross-sectional studies on SME growth (see Davidsson et al, 2006). The ESEE started to gather in 1990 and we have data from 1998 to 2006 to work with. The reason for taking just the 8 years from the data is that the collaboration variables are not recorded in the early sample.

Information is available for an incomplete panel data with 15,520 observations. According to our classification, 10,758 of these observations pertain to SMEs.

3.2. Variables and measures

To create the dependent growth variables in terms of sales and employment we followed Evans (1987 a, b):

$$\textbf{Sales Growth} = \log S_{t+1} - \log S_t$$

$$\textbf{Employment Growth} = \log E_{t+1} - \log E_t$$

Where S_{t+1} and E_{t+1} are the absolute values for sales and employment in the future period and S_t and E_t are the absolute values for sales and employment in the actual period.

For our analysis we also need to rearrange the collaboration, internationalization and interaction variables. In order to do so we create a binary variable for collaboration whenever the manufacturers are cooperating at least with one partner or if they do not have any cooperation at all. The same procedure we apply for the exports variable which is related to the internationalization. In both cases the new independent variable takes the value of 1 if there is collaboration or internationalization and the value of 0 if there is none.

For the interaction effect we create two different variables in order to run separate models to investigate the complementarities between exports and collaboration for SME growth. The first idea is to create a binary variable which takes the value of 1 if the company is collaborating and exporting. If it takes a value of 0 there is either no collaboration or no exports or both. The second idea is to create a categorical variable which distinguish between companies which are exporting and collaboration just exporting or collaborating and companies which are not exporting and collaborating.

We control for a number of relevant variables. We include the logarithm of sales and the logarithm of workers to account for the link between firm size and growth (e.g. Evans, 1987 a, b; Lu & Bearnish, 2006; Golovko & Valentini, 2011). We also control for the years the firm has been operating (Age). Furthermore we create a categorical variable for five different industry sectors by following the suggestion of Castellacci (2008). The order of this variable is like the following. It takes the value of 1 if it is a supplier dominated industry, the value of 2 if it is related to a science based industry, the value of 3 if it is a scale intense industry. If it is a supplier specialized industry the value is 4 and for the other companies it takes the value of 5.

To summarize, the descriptive statistics and frequency tables contain information about the variables which are used in the later empirical analysis.

Table 1: Descriptive statistics

Variable	Observations	Mean	Std. Dev.	Min	Max
Employment growth	17591	-0.0047178	0.2401077	-5.17615	3.135494
Sales growth	17529	0.0417415	0.296666	-6.493986	7.864032
Binary exports	21151	0.4513262	0.497637	0	1
Binary collaboration	10774	0.1846111	0.3879998	0	1
Binary interaction	17066	0.0900621	0.2862791	0	1
Age	21093	18.69848	17.83154	0	172
% graduates	21101	3.282987	6.247625	0	88.2
Log of sales	21091	0.7586834	1.390247	-5.173978	5.885208
Log of workers	21151	3.389209	0.9098848	0	5.298317
Workers	21151	45.71056	47.35762	1	200

Table 2: Frequency table for the interaction categories

Interaction categories	Frequency	Percent
No collaboration and no exports (0)	4,861	45.12
No collaboration but exports (1)	3,924	36.42
No exports but collaboration (2)	452	4.20
Exports and collaboration (3)	1,537	14.27
Total	10,774	100.00

Table 3: Frequency table for the industry categories

Industry categories	Frequency	Percent
Supplier – dominated (1)	10,110	47.80
Science – based (2)	2,313	10.94
Scale – intensive (3)	6,333	29.94
Specialized suppliers (4)	1,843	8.71
Other manufacturing (5)	552	2.61
Total	21,151	100.00

The tables presented above give us a short overview about the variables which have to be considered in our analytical part. From the constructed sales and employment growth rates we can see that the sample contains growing and shrinking companies. The employment growth mean is close to zero and the including standard deviation shows that the companies shrink in terms of employment growth and grow in terms of the sales growth. For the binary exports we can obtain that almost half of the companies have an international business. Further we observe that 18.46% of the companies cooperate with one or more partners. The categorical interaction variable is spited into four parts. 4861 companies do not export or have a single cooperation. 3924 firms sell their products to other countries but negate cooperation. 452 observations do not export but collaborate with at least one partner. Finally we obtain 1537 firms which export and cooperate. For the binary interaction variable we can observe that 9.00% companies in the sample do export and collaborate.

From the categorical industry variable we can see that the majority of the manufacturers belong to a supplier dominated industry. 2313 observations are related to the science based industry and 6333 belong to a scale intense industry. Further we obtain 1843 companies operating in a supplier specialized industry and 552 to other industries. Although the range of manufacturers' age is quite large we obtain a mean of 19 years. The conclusion is that most of the small and medium enterprises are relatively young companies which fit into the context of the theory. In the average companies in the sample employ a 3% graduated workforce. Interesting to see is that the maximum value is with 88.2% extremely high. In fact the four companies with the highest proportion of graduates are in the average only 4.7 years old and have a graduate proportion of 82.6%.

The following table presents the correlation matrix:

Table 4: Correlation Matrix

	Employment growth	Sales growth	Binary exports	Binary collaboration	age	% graduates	Log of sales
Employment growth	1						
Sales Growth	0.299***	1					
Binary exports	0.003	0.002	1				
Binary collaboration	0.036***	0.017	0.253***	1			
Age	-0.043***	-0.051***	0.195***	0.115***	1		
% graduates	0.033***	0.021***	0.156***	0.215***	0.114***	1	
Log of sales	0.024***	-0.042***	0.475***	0.324***	0.315***	0.276***	1

The table gives us first insights about the connections between the variables. Not surprisingly, our two measures for growth (sales and employment) are positively correlated. We also find that export and collaboration decisions are correlated, which is line with our idea on the positive interdependence of these two activities. Further we can observe a high correlation between firm size and the internationalization variable. Thus companies which are exporting are more likely to be larger.

3.3. Statistical approach

In order to deal with data over more than one time period we decide to work with a panel data model with which we can differentiate between fixed and random effects. In the end we are able to use the hausman test to check whether the random or the fixed effects model gives better estimates.

We use a regression model which is applicable for panel data:

$$Y_{it} = \alpha + x\beta + u_i + e_{it}$$

Where $i=1, \dots, n$ are the units measured at times $t=1, \dots, T_i$.

The models explained in the following tables are based on fixed effects. Generally the random effects model should be preferred if the characteristics of the population are deduced from some individuals. The fixed effects model on the opposite should be used if predictions should be related to the used sample in the database. In fact that is what we consider to explain. Therefore the fixed effects model will be much more useful for our analysis.

In order to check if the fixed effects model is really the better one we run the hausman test, which tells us that this model is better in every case. The test is supporting the fixed effects model on a $p<0.01$ confidence level. So that the Null – Hypothesis which claims that the random effects model is a better estimation can be rejected.

Further robust standard errors are included into the longitudinal data analysis in order to control for heteroskedasticity and interpersonal/intragroup correlations.

4. Results

The results of the regression models for sales growth are summarized in tables 5 and 6. Following prior research in this area (e.g. Golovko & Valentini, 2011), we run separate models to account for the influence of export and collaboration upon SME growth and for the impact of the complementarity between export and collaboration on growth.

4.1. Sales growth regression

Table 5: Sales growth regression

	Sales growth	Sales growth	Sales growth
Binary Exports	0.0373795**	-	-
Binary collaboration	0.0116042	-	-
Categorical interaction 0	-	Reference	-
Categorical interaction 1	-	0.0389461**	-
Categorical interaction 2	-	0.0288099	-
Categorical interaction 3	-	0.0443598**	-
Binary interaction	-	-	0.0505836***
Industry 1	Reference	Reference	Reference
Industry 2	0.0699569	0.0729017	0.0693201
Industry 3	0.0320857	0.0308965	0.0709012**
Industry 4	0.0426951	0.0401853	0.0697382
Industry 5	0.2375144***	0.2348481***	0.1927948**
Age	0.0016126**	0.0016867**	0.0033886***
Graduates	0.0003905	0.0002819	0.0041253***
Log of sales	-0.5297732***	-0.5227563***	-0.3559635***
F-Test	14.11***	17.29***	32.53***

First Model

In the first model we leave out the interaction effect. We use the binary internationalization, collaboration and the control variables.

From the F-Test we obtain a highly significant value for the whole model. It gives us evidence for a useful model.

Hypothesis 1a claims that we expect a positive correlation between sales growth and exports. The regression model supports this idea on a $p < 0.05$ confidence level. This is a further empirical evidence for the positive impact of exports on the growth rate of sales.

Hypothesis 2a has to be rejected. Despite the fact that there is a positive effect of collaboration on sales growth this coefficient is not significant. Therefore we conclude that collaboration by itself do no explain an increase or decrease in the growth rate.

Further we have three significant control variables. The industry category related to the companies which do not belong to the defined ones is significant on a $p < 0.01$ confidence level. Further we obtain a significant positive coefficient for the age variable on a $p < 0.05$ confidence level. Surprisingly older companies are able to grow faster than younger companies. This could be due to the lack of experience the young small and medium enterprises have. Finally, firm size (measured as log of sales) has a negative and significant impact on growth, which is consistent with prior research. However, the fact that the dependent variable and the size variable are created by the same base variable can be a reason for the high correlation.

Second model

The second model does not contain the binary variables for the internationalization and collaboration. Instead we added the categorical interaction variable in order to check for their effect on sales growth separately.

The F-Test confirms that the model is valid and useful to interpret. It is highly significant on a $p < 0.01$ confidence level.

Hypothesis 3a can not be rejected. The coefficient is positive and significant on a $p < 0.05$ confidence level. Therefore it supports the results from the first model. Firms which export and do not collaborate with a single partner have a higher sales growth than firms which do not export and do not collaborate at all. Consistent with Hypothesis 2a the coefficient for firms which do not export but collaborate is not statistically significant. Thus we reject Hypothesis 3b. For the last category we claimed that there should be a positive correlation between the sales growth and a company which exports and collaborates. In fact the coefficient has as expected the major influence from the three categories. Also we can observe statistical significance on a $p < 0.05$ confidence level. Therefore we do not reject Hypothesis 3c.

For the control variables the findings suggest similar results than for the first model.

Third model

The third model again does not contain the binary variables for the internationalization and collaboration. Instead of the categorical interaction variable we use the binary interaction variable in order to double check the results from the second model.

The F-test once again supports the validity of the model. We observe a highly significant model on a $p < 0.01$ confidence level.

Hypothesis 4a which claims that binary interaction is positively correlated with the sales growth can not be rejected. The coefficient is highly statistically significant on a $p < 0.01$ confidence level. Thus we can conclude on more time that a company which exports and collaborates growth faster in terms of sales than companies with just exports, just collaboration or without exports and collaboration.

The difference to the other two models is that we can observe two additional significant control variables. The third category of industries and the proportion of graduates in the company explain parts of the sales growth. The significance is confirmed on a $p < 0.05$ confidence level. The third industry category is related to a scale-intensive industry. Furthermore the proportion of graduates matter. An increase in the percentage of highly educated workers causes higher sales growth.

4.2. Employment growth regression

Table 6: Employment growth regression

	Employment growth	Employment growth	Employment growth
Binary Exports	0.004335	-	-
Binary collaboration	0.0258783***	-	-
Categorical interaction 0	Reference	Reference	Reference
Categorical interaction 1	-	0.0032565	-
Categorical interaction 2	-	0.0202366	-
Categorical interaction 3	-	0.0312127**	-
Binary interaction	-	-	0.0480657***
Industry 1	Reference	Reference	Reference
Industry 2	0.0611261	0.0609382	0.0806866*
Industry 3	0.0504518	0.050178	0.0732779*
Industry 4	0.041464	0.0411311	0.0582952*
Industry 5	0.0805755	0.0809149	0.0530812
Age	-0.0014301**	-0.0014302**	0.0002997
Graduates	0.001127	0.0011291	0.0020618**
Log of workers	-0.387042***	-0.3869502***	-0.337632***
F-Test	26.17***	23.65***	46.27***

First model

In the first model we leave out the interaction effect. We use the binary internationalization, collaboration and the control variables.

From the F-Test we obtain a highly significant value for the whole model. It gives us evidence for a useful model.

Hypothesis 1b claims that we expect a positive correlation between employment growth and exports. The regression model does not support this idea. The coefficient is not significant. This could be due to the fact that the internationalization is related to licensing strategies. Companies which export through for instance franchising models do not increase their level of employees but their level of sales could be as shown before significant.

Hypothesis 2b is supported by the first regression. We obtain a significant positive coefficient on the $p < 0.01$ confidence level. The increase of the employment growth caused by collaboration can be explained by the better performance caused by cooperation strategies. Further this success leads to more hires by the companies.

Moreover we have two significant control variables. The industry categories do not have a statistically significant impact on the employment growth anymore. We obtain a significant negative coefficient for the age variable on a $p < 0.05$ confidence level. Apparently younger companies are able to grow faster than older companies. The reason for the opposed effect is that younger companies are generally small and medium sized enterprises which can increase their employment level more easily in relative terms. Finally the logarithmic variable of the employment is evidently highly significant on a confidence level of $p < 0.01$. The high correlation and the fact that the dependent variable and the logarithm of employment are created by the same base variable are the reasons for the high correlation.

Second model

The second model does not contain the binary variables for the internationalization and collaboration. Instead we added the categorical interaction variable in order to check for their effect on employment growth separately.

The F-Test confirms that the model is valid and useful to interpret. It is highly significant on a $p < 0.01$ confidence level.

Hypothesis 3a has to be rejected. The positive coefficient is not statistically significant. Also Hypothesis 3b has to be rejected. Thus we can conclude that a company which just exports or just collaborates does not improve its employment growth rate. Consistent with

Hypothesis 2b the coefficient for firms which do not export but collaborate is not statistically significant. Thus we reject Hypothesis 3b and 3a.

For the last category we claimed that there should be a positive correlation between the employment growth and a company which exports and collaborates. In fact the coefficient has as expected the major influence from the three categories. Also we can observe statistical significance on a $p < 0.05$ confidence level. Therefore we do not reject Hypothesis 3c. The interaction effect of collaboration and internationalization is positive and statistically significant.

For the control variables the findings suggest similar results than for the first model.

Third model

The third model again does not contain the binary variables for the internationalization and collaboration. Instead of the categorical interaction variable we use the binary interaction variable in order to double check the results from the second model.

The F-test once again supports the validity of the model. We observe a highly significant model on a $p < 0.01$ confidence level.

Hypothesis 4a which claims that binary interaction is positively correlated with the employment growth can not be rejected. The coefficient is highly statistically significant on a $p < 0.01$ confidence level. Thus we can conclude one more time that a company which exports and collaborates growth faster in terms of employment than companies with just exports, just collaboration or without exports and collaboration.

The difference to the other two models is that we can observe five additional significant control variables. The categories of industries (without the fifth) and the proportion of graduates in the company explain parts of the employment growth. The significance is confirmed on a $p < 0.05$ confidence level for the proportion of graduates and on a $p < 0.1$ confidence level for the four industry categories. Apparently causes an increase in the percentage of high educated workers a higher employment growth.

4.3. Comparison between the sales and the employment growth

The assumption taken in the fifth Hypothesis that the coefficient of the binary interaction effects for sales growth is always above the coefficient for the employment growth is supported by the models' results.

Table 7: Comparison of the regression results

	Third interaction category	Binary interaction
Employment growth	0.0312127	0.0480657
Sales growth	0.0443598	0.0505836

The table shows that the coefficient of the binary interaction variable and the third categorical interaction variable (exports and collaboration) are higher in the case for sales growth than for the employment growth.

5. Conclusions

Rather than explaining the growth of small and medium sized enterprises in terms of entrepreneurial characteristics (Baum et al., 2001; Baum & Locke, 2004) or access to financial resources (Cooper et al., 1994; Lee et al., 2001), the present study is focused on the impact of collaboration and internationalization on sales and employment growth. We have controlled for variables such as firm size, age and industry sector.

Our results are in line with prior research on the impact of collaboration on growth (e.g. McGee et al, 1995). In particular, the findings show that technological collaboration with universities, suppliers, customers and competitors lead to better growth outcomes. Further our results are consistent with previous studies that found a positive impact of internationalization in terms of exports on SME growth.

Importantly, we created interaction variables between export and collaboration and found that they have a positive and significant impact on the two growth measures (sales and employment). Both exports and collaboration can thus be considered complementary activities that may become a means of overcoming resource deficiencies of SMEs and enhance their growth and development.

These findings also bring interesting implications. The fact that we found a positive and significant impact of internationalization, an insignificant positive impact of collaboration and the highest positive significant impact of the interaction variable implies that exporting together with collaboration leads to a better performance in terms of sales than just collaboration or internationalization separately. A similar result has been found for the employment growth. The highest significant impact is also observed for the interaction.

Overall, therefore, we can conclude that firms which collaborate and export are more likely to grow faster in terms of sales and employment. The consistent results for the different growth measures support the robustness of our models and their predictive power.

In the end we found that the interaction coefficient is always higher for the sales growth than for the employment growth. This can be explained by different expansion strategies like for instance licensing, which do not necessarily involve a greater number of employees in the company.

Of course the paper is limited in sense of the explanatory variables. In order to figure out if the predictive power of the collaboration, internationalization and interaction variables is permanent we could control for instance for the entrepreneurial characteristics and the financial equipment. For future research, it would be interesting to see if there are changes by introducing these or other variables in the model which were proofed in earlier studies to have a significant impact on SME growth.

6. References

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