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EXPORT CREDIT GUARANTEES AND DEMAND FOR INSURANCE

ANDREAS KLASEN¹

Introduction

Government financing instruments like state export credit guarantees have successfully strengthened international trade over the last ninety years. They play a significant role in promoting exports, both in highly industrialised and in developing economies (Klasen 2011). Together with private insurers, government export credit agencies (ECAs) accounted for a record 11 percent of global trade in 2013. ECAs give evidence of strong support for insuring exporters against losses due to buyers' insolvencies in export markets and political risks. This particularly applies to exports to emerging economies, where ECAs fill the gap left by private insurers or banks.

The willingness to pay for certainty is well documented in business and economic literature. Insurance is both a traditional and up-to-date instrument for risk-averse individuals, and risk aversion is considered as the main rationale for demand. Recognising that risk aversion as the sole motive does not adequately explain companies' decisions to purchase insurance, several scholars have provided a positive theory based on evidence that firms purchase substantial insurance amounts (Mayers and Smith 1987 and 1982; Main 1982). This theoretical framework has been extended and tested by a number of authors with empirical studies on corporate demand (e.g. Jia, Adams and Buckle 2012; Krummacker and Schulenburg 2008; Regan and Hur 2007; Hoyt and Khang 2000). Krummacker (2011) also provides a qualitative approach discussing motives influencing demand.

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In the export credit guarantee context, scholars have argued that insurance is an essential tool for exporters (see e.g. Felbermayr, Heiland and Yalcin 2011; Coppens 2009; Abraham and Dewit 2000). In addition to factors derived from individual export transactions, demand is driven by insurance services, liquidity and balance sheet protection. However, empirical research has never been undertaken into demand for state export credit guarantees associated with firm-specific factors.² No empirical study to date has connected existing theories on corporate insurance demand with export credit insurance.

This research aims to discover significant factors in export credit guarantee purchase following a quantitative methodology and an analytical survey research design. It examines factors such as risk aversion, the existence of bankruptcy costs, financing needs and risks related to foreign buyers and countries. This article provides empirical evidence from Germany to test microeconomic factors based on existing theory. It is organised as follows: firstly, theories regarding demand for corporate insurance and state export credit guarantee purchase are discussed, and hypotheses are developed. The section 'Empirical analysis' describes the data and development of variables. In the 'Results' section, empirical evidence from correlation as well as multivariate regression analyses is presented and summarised. The last section concludes and discusses limitations, as well as contributions to knowledge and practice.

Corporate insurance demand

Insurance demand has become a major research area over the last couple of decades. This includes the vital role played by firms' purchase of insurance as a substantial aspect of corporate risk management. Looking at influencing factors for corporate insurance demand, relevant determinants are discussed in the following sections.

² Several authors have investigated the role of ECAs during the last couple of years. Scholars have concentrated on the programmes in general or in terms of their economic, legal, regulatory or environmental aspects.

Risk aversion and shifting

Although there seems to be no rationale for risk neutral legal entities to purchase insurance (Modigliani and Miller 1958; Markowitz 1952), a number of authors describe risk aversion and shifting as significant for companies where the owner's risk aversion is a relevant motive (Doherty and Smith 1993; Meyer and Power 1983). This applies to smaller or privately-held companies for which the owners bear unlimited liability. As the owner tends to be the relevant decision-maker in closely held enterprises, s/he will bear the risk with private assets. By contrast, investors holding a broad and well-diversified portfolio are neutral with regard to firm-specific risks. As a result, one determinant affecting companies' insurance demand is the structure of ownership. It is hypothesised that companies with ownership structures affected by manager-owners or closely held purchase more state export credit guarantees than other firms.³

Bankruptcy costs

The existence of bankruptcy costs incentivises companies to mitigate risks. Like hedging, insurance can help to lower the probability of incurring transaction costs by reducing companies' financial up- and downturns (Smith and Stulz 1985). The direct and indirect costs of bankruptcy can induce companies to purchase insurance against risks (Hoyt and Khang 2000; Core 1997). Warner (1977) gave evidence that financial distress costs are, in general, not proportional to firm size. Mayers and Smith (1982) argue that expected bankruptcy costs are less than proportional to firm size due to the relatively higher direct costs of bankruptcy. The relevance of firm size has also been discussed with regard to state export credit guarantees (García-Alonso, Levine and Morga 2004). This is consistent with the objective of several ECAs, for example in Germany or the Netherlands, to support small and medium-sized enterprises. A number of studies also associated insurance demand and bankruptcy costs with financial ratios (e.g. Regan and Hur 2007). Smaller companies and firms with worse financial ratios such as lower liquidity are expected to have higher demand.

Insurance services

Insurance companies have specific knowledge and are well-versed in risk analysis. Providing real services for

their customers, they have a comparative advantage concerning both the development and the application of risk management, and have mechanisms to control adverse outcomes (Hoyt and Khang 2000).⁴ Insurance companies are able to realise an increase in efficiency, which also applies to the processing of lawsuits, as well as to the enforcement or settlement of claims (Mayers and Smith 1982). In addition, insurance providers such as export credit agencies regularly adopt a systematic and state-of-the-art approach to the assessment and monitoring of risks. This includes the assessment of country risks and foreign buyers' financial ratios. Insurance services therefore provide additional arguments for corporate insurance demand. It has been hypothesised that smaller firms are not able to realise these comparative advantages. Furthermore, Regan and Hur (2007) argue that firms that have experienced an insured or insurable loss have a higher incentive to insure. Companies with higher claims are expected to purchase more state export credit guarantees than other firms.

Agency conflicts

Scholars have also linked agency conflicts to corporate insurance demand. Firstly, these conflicts are caused by a non-linearity of rights or claims for payment (MacMinn 1987). This is because risk positions with regard to expenses are shifted between shareholders and outside creditors.⁵ Corporate insurance or hedging is able to solve the underinvestment and the asset substitution problems (e.g. Smith 1986). Secondly, agency conflicts can arise from the different interests of shareholders and managers (Han and MacMinn 2006). In contrast to shareholders' risk neutral behaviour, managers are risk-averse and tend to operate self-interestedly at the cost of shareholders. Furthermore, managers will try to maximize expected revenues in a specific financial year and will neglect companies' long-term perspective to increase firm value. Although it is difficult to measure this effect, several authors have discussed that financial ratios and growth rate are possible factors (see e.g. Zou and Adams 2006; Yamori 1999). This research hypothesises that the EBIT-to-equity ratio is related to the amount of export credit purchase. The same applies to the exporter's growth rate.

⁴ This is one of the main differences to other risk mitigation instruments such as hedging.

⁵ Firms would not even carry out an investment project with a positive net present value if the return is not sufficient for uncertain debt redemption due to the underinvestment problem. While outside creditors would benefit from a return on the investment project, shareholders would have to bear the investment costs.

³ Furthermore, firm size has been connected to risk aversion and shifting. Compared to larger corporations, fairly small companies have only a limited number of shareholders. This leads to a relatively lower level of diversification regarding equity structure and can also lead to a risk-averse attitude on the part of the company.

Tax treatment

Prior research demonstrated that tax effects are of particular importance to demand for corporate insurance. Mayers and Smith (1982) and Main (1983) mention the insurance-related provisions of the tax code or the relationship between interest rates and tax liabilities. It has also been shown that a convexity implies that companies' expected tax liabilities are higher than the tax liabilities connected with the expected pre-tax income resulting from statutory progressivity.⁶ Yamori (1999) argues that highly profitable corporations purchase insurance to reduce the current tax burden, even with a linear tax rate. This is also discussed in a German context with an incentive to insure if a company's pre-tax income is falling in a convex portion due to negative profits. It is hypothesised that companies with higher tax payments purchase more export credit guarantees than other exporters.

Financing

Financing of the specific export transaction is a further determinant influencing companies' decision to purchase export credit insurance. Zou, Adams and Buckle (2003) argue that insurance enables companies to realise financial advantages such as more consistent cash flows. This especially applies in the export credit guarantee context. ECAs help companies to secure cash flows and find adequate financing for exports. This particularly holds true for supplier credit cover, a facility often extended to the exporter. Insurance increases the likelihood that exporters will receive financing from commercial banks and can mobilise additional funds otherwise not available (Bischoff and Klasen 2012). Several scholars have discussed the idea that supplier credit cover and the necessity of safeguarding liquidity by means of state export credit guarantees offers a relevant advantage. Cash flow is expected to be negatively related to the amount of export credit insurance purchased. However, it must be stated that previous analyses of the impact of hedging or insurance purchase on liquidity and cash flow yield mixed results.

Foreign trading partner

Regan and Hur (2007) describe the export share of a company as relevant to its purchase of insurance. They add export as a further determinant in existing

⁶ Regan and Hur (2007) give several arguments, including the fact that premiums reduce current tax burdens. They state that depreciation is a further motive to purchase insurance.

corporate insurance demand theory. This argument is in line with research into export credit agencies. The mitigation of risks linked to foreign buyers and countries is a main rationale for exporters' demand. Companies purchase export credit cover to protect themselves against a potential loss due to payment risks associated with the foreign trading partner (Ross and Pike 1977). Although there is a close relationship between the specific export transaction and the decision to purchase export credit guarantees, demand can also be connected with the company's export share. Felbermayr, Heiland and Yalcin (2011) give evidence that there is a relationship between the export quota and export credit guarantee utilisation. This research hypothesises that companies with a higher export share will purchase more export credit guarantees than other exporters.

Empirical analysis

Data

The data used in this research are drawn from several sources. The *Dafne* database and the *eBundesanzeiger* database were used for the majority of company-based data. In addition, figures were supplemented with data from companies' websites or received by using questionnaires distributed by telephone. Other data were collected from the German export credit agency. Due to several data restrictions, the data to be used in this research are the financial figures from 2010. These limitations again reinforce the importance of this research. The sample population comprises German exporters from the manufacturing industry using the official export credit guarantee scheme with premiums paid in 2010. The final sample size for correlation and multivariate regression analyses consists of 258 companies. All variables are measured as of the end of the calendar year with values reported in euros as in the respective annual reports.

Measurement of variables

The dependent variable in this research is export credit guarantee demand (*INSDEM*). The amount of export credit insurance purchased by an exporter is represented by the ratio of export credit insurance premiums to insurable revenues. With this approach, the research follows prior studies by Regan and Hur (2007), Zou and Adams (2006), and Hoyt and Khang (2000). Export credit guarantee premiums in Germany are

Table 1

Descriptive results

Variable	Mean	St. Dev.	Skewness	Kurtosis	Min	Median	Max
<i>INSDEM</i>	0.448	1.236	6.593	53.226	0.002	0.095	12.709
<i>SIZE</i>	126.155	239.322	5.219	37.667	0.202	45.459	2371.499
<i>EMPLO</i>	567.480	1024.819	4.823	28.765	4.000	258.000	8553.000
<i>LIQUI</i>	2.824	2.195	2.573	9.057	0.620	2.200	15.270
<i>CLAIM</i>	0.021	0.114	7.825	70.888	0.000	0.000	1.266
<i>LEVER</i>	35.076	20.255	0.135	0.033	- 29.970	35.116	93.380
<i>MONIT</i>	27.762	79.829	4.460	42.884	- 287.090	23.740	811.600
<i>GROWT</i>	18.391	25.678	2.306	11.829	- 48.358	18.391	194.009
<i>TAX</i>	3.135	7.327	5.093	30.964	- 5.125	1.161	58.931
<i>CASHF</i>	5.843	7.825	5.365	57.937	- 16.050	4.835	92.260
<i>EXPOR</i>	58.320	24.998	- 0.254	-1.055	5.000	60.000	100.000
N	258						

Source: Own calculation.

calculated on an annual basis and contain administrative fees such as application fees and issuing fees. Premiums are either based on a percentage of the amount to be insured or on a specific risk horizon where the maximum exposure limit in combination with risk-related factors is also taken into account.⁷ Insured revenues are represented by the profit and loss statement figure for total revenues multiplied by the export quota. Like some independent variables, the variable for export credit guarantee demand (*INSDEM*) is positively skewed (Table 1). In addition, the frequency distribution has a larger peak value than a normal distribution because of a high kurtosis. Natural logarithms are applied to remove a positive skew with regard to the dependent variable.

The independent variables are ownership, firm size, number of employees, liquidity, paid claims, leverage, monitoring, growth, tax payments, financing and export quota. The definition for ownership (*OWNER*) in this research follows a distinction between joint-stock companies (*Aktiengesellschaften*) and other companies using a dummy variable.⁸ Firm size is measured by the sum of all assets of the company defined as any items of ownership convertible into cash. This approach is consistent with prior research (Regan and Hur 2007; Mayers and Smith 1990). The measurement of firm size (*SIZE*) is the natural log of total assets. As studies have shown that other stakeholders like employees are relevant for the insurance decision, the number of employees is a possible measurement

for the stakeholders' fraction of claims (Mayers and Smith 1982). The variable representing the number of employees (*EMPLO*) is measured as the natural log of the number of year-work-units. With regard to bankruptcy probability, the measurement for liquidity (*LIQUI*) is the natural log of the current ratio. This is traditionally used in balance sheet analyses to examine a firm's ability to comply with its obligations and resources to pay its debts over the following year. Consistent with Krummaker and Schulenburg (2008), claims frequency is regarded as a significant factor in terms of insurance services. Claims ratio (*CLAIM*) is represented by annual indemnifications from the German ECA and the annual export turnover. Due to agency theory and underinvestment, leverage, monitoring and growth are expected to play an important role in the insurance purchase decision. The debt-to-equity ratio is a well-established financial parameter indicating financial leverage (*LEVER*). Monitoring (*MONIT*) is measured by the quotient of earnings before interest and taxes and shareholder equity. Following Hoyt and Khang (2000), growth is included as a third measurement. In this study, growth is calculated as the percentage of growth in turnover based on the figures in 2009 and 2010 (*GROWT*). As mentioned above, tax consideration is a further motivation for the purchase of insurance. The presence of tax preference items such as tax-loss-carry-forwards and investment tax credits described by Zou and Adams (2006) is relevant for German exporters. In addition, they might have a convex tax function *de facto* due to a pre-tax income in the expected value of a convex partition. As specific loss probability was not available, this research follows Yamori (1999) to a large extent by calculating tax measurements as taxes on income in relation to turnover (*TAX*). As it is impossible to include specific financial figures for individual

⁷ Insurance for single transactions is payable upfront in the year where the cover is granted, and monthly payments for revolving cover were transformed into annual payment figures.

⁸ Non-incorporated firms (*Personengesellschaften*) and limited liability companies (*Gesellschaft mit beschränkter Haftung*) are typically held by few shareholders who are mostly owner-managers, meaning that the owner assumes the risk personally and with his personal wealth.

export transactions in this research due to the specification of the conceptual model, the firm's cash flow is expected to influence export credit guarantee demand. For measurement, the financial ratio of the cash flow deriving from net revenues is calculated representing financing (*CASHF*). As there is an indication for size-related and distortive effects, score alteration has been applied for cash flow, as well as monitoring and tax payments. No other violations of the OLS assumptions are detected. Finally, export turnover in relation to the turnover is used in this research (*EXPOR*). Table 1 reports the descriptive results of the dependent variable and the predictors before logarithmic transformations and score alteration.

Results

Correlation

Simple correlation coefficients were applied for export credit insurance and all predictors using Pearson correlation.⁹ The relationship between the dependent variable and ownership (*OWNER*) can be tested by a point biserial correlation analysis. The relationship between export credit insurance demand and the other significant variables was also analysed by using the Pearson product-moment correlation coefficient. The results in Table 2 show significant correlations at the $p < 0.05$ level or below with regard to export credit insurance demand (*logINSDEM*) and six predictors.

The correlation analysis indicates that there is a significant and negative relationship between export credit insurance demand and the exporter's ownership structure (*OWNER*) as well as the exporter's firm size (*logSIZE*), number of employees (*logEMPLO*) and cash flow (*CASHF*). In addition, there is a positive relationship between the dependent variable and tax payments (*TAX*), as well as export quota (*EXPOR*).¹⁰ Furthermore, there is only one relationship between the independent variables indicating the problem of multicollinearity. Due to a significant and high correlation coefficient and because (*logINSDEM*) and firm size have a stronger correlation, the third independent variable (*logEMPLO*) will be excluded in the regression

⁹ In order to ensure no violation of the assumptions of normality, linearity as well as homoscedasticity, preliminary analyses were undertaken.

¹⁰ In addition, there are several non-significant correlations at the $p < 0.05$ level or below with regard to export credit insurance demand (*logINSDEM*) and the remaining predictors. The results also reveal that the majority of the independent variables are not correlated with each other.

model. The tolerance indicates that there is no high correlation with other independent variables and therefore no high possibility of further multicollinearity.

Multiple regression

A multiple linear regression model is used to investigate the association of the dependent variable with ownership, firm size, tax payments, financing and export quota. The standard multiple regression model used in this research is an ordinary least squares (OLS)

Table 2

Correlation coefficients												
	logINSDEM	OWNER	logSIZE	logEMPLO	logLIQUI	CLAIM	LEVER	MONIT	GROWT	TAX	CASHF	EXPOR
logINSDEM	1.000											
OWNER	-.274**	1.000										
logSIZE	-.487**	.332**	1.000									
logEMPLO	-.484**	.285**	.842**	1.000								
logLIQUI	.020	.087	-.000	.026	1.000							
CLAIM	.057	.044	.032	.054	-.048	1.000						
LEVER	-.051	.146*	-.014	-.043	.585**	-.082	1.000					
MONIT	.031	-.059	-.074	-.015	.051	-.199**	.018	1.000				
GROWT	.050	-.101	-.119	-.143*	-.080	.006	-.020	.145*	1.000			
TAX	.347**	-.102	-.357**	-.347**	.212**	.064	.186**	.136*	-.089	1.000		
CASHF	-.296**	.110	.133*	.151*	.259**	-.143*	.260**	.312**	-.017	.053	1.000	
EXPOR	.340**	.049	-.216**	-.194**	.056	.097	.045	.010	.026	.219**	-.112	1.000
N	258											

* $p < 0.05$, correlation significant at the 0.05 level (2-tailed).

** $p < 0.01$, correlation significant at the 0.01 level (2-tailed).

Source: Own calculation.

Table 3

OLS multivariate regression results

Variable	R	B	β	t-ratio	sr^2
Ownership	-0.274**	-0.754**	-0.142	-2.689	-0.167
Firm size	-0.487***	-0.350***	-0.295	-5.180	-0.310
Tax	0.347***	0.117***	0.192	3.573	0.220
Cash flow	-0.296***	-0.072***	-0.227	-4.505	-0.273
Export	0.340***	0.014***	0.216	4.173	0.254
N = 258					
$R^2 = 0.390$					
Adj.- $R^2 = 0.378$					
$F(5, 258) = 32.191***$					
Significance (1-tailed) **p<0.01, ***p<0.001					

Source: Own calculation.

model testing the significant factors with regard to the relationship between export credit insurance and the company's firm-specific characteristics. This is shown in the following model:

$$(1) \log INSDEM = \beta_0 + \beta_1 (OWNER) + \beta_2 (\log SIZE) + \beta_3 (TAX) + \beta_4 (CASHF) + \beta_5 (EXPOR) + e$$

The findings described in Table 3 indicate that all five independent variables significantly contribute to export credit insurance. It also indicates that ownership has the weakest influence over export credit insurance demand having a β -value of -0.142. Firm size is also found to be negative and statistically significant. For the size of the exporter being represented by total assets of the company, the standardised regression coefficient accounts for -0.295. Showing the highest standardised coefficient, firm size seems to have the strongest influence in the model. The coefficient on the variable for tax payments is positive and significant with a value of 0.192. The influence of cash flow and export quota reveal that companies with lower cash flow have a higher demand, and the export quota has a positive influence on export credit insurance demand.

Specification tests and regression diagnostics ensured that there was no violation of the assumptions of best linear unbiased estimators.¹¹ Multicollinearity was also not indicated, as all variance inflation factor values are below two. In addition, the validity of the model was proven with the cross-validation method by using the adjusted R^2 and by randomly splitting the data set.

¹¹ This included further robustness checks and an assessment of the assumptions of best linear unbiased estimators. These assumptions include a normal distribution of the residuals, homoscedasticity, an expected mean value of the residuals equal to zero and a lack of autocorrelation.

Conclusion

Several important findings emerge from this research. As an overall result, there is evidence that five firm-related factors significantly influence state export credit guarantee demand. The findings of the empirical estimation of the multiple linear regression model indicate that export credit insurance is valued by German exporters in the manufacturing industry. Insurance is regarded as an important component of risk-averse behaviour and of transferring potential bankruptcy costs. In addition, there are indications that it is a source of real services and reduces the tax burden. Furthermore, the purchase of export credit insurance demand is relevant for financing transactions and for risks related to foreign buyers in risky countries. Export credit agencies, policy makers and exporters can use the results reflecting the correlation and the multiple regression outcomes from this research. This model is based on the existing theory and reflects the empirical evidence regarding the impact of significant firm-based factors. Being cross-validated, the model can be generalised for the wider population.

Limitations

There are a number of limitations to this study: firstly, the research is based on data for the German manufacturing industry with time-specific data from 2010 only. This might have an impact on demand as state export credit guarantees play a crucial role in strengthening a recovery from economic crises.¹² A second limitation is a certain overlap between supplier credit and buyer credit cover. In addition, factors mainly associated with the specific export transaction were not available because of the firm-based model approach. Finally, the interdependencies between the different

¹² This applied, for example, during and after the 2008-09 global financial and economic crisis with impacts in 2010.

factors influencing export credit insurance demand have not been analysed.

Contributions

In several important ways, the results of this research extend findings from prior studies. Firstly, this research offers the first empirical analysis of export credit insurance demand. It furthers our understanding of the different factors driving demand by providing a comprehensive insight into the relevant determinants indicated having an impact. Secondly, it conceptualises the determinants revealed to be key drivers for insurance demand. This confirms existing evidence from authors such as Regan and Hur (2007), Zou and Adams (2006), Hoyt and Khang (2000) and Meyers and Smith (1990). Thirdly, there was previously no clear evidence on the theoretical discussions and results arising from a different context with regard to financing and risk related to foreign trading partners. This research now adds empirical evidence for both factors in the export credit insurance context.

This research has also implications for a number of parties involved in state export credit guarantees. This specifically includes ECAs, as well as policy makers and authorities. They might consider evaluating whether their strategic aims and policies are in accordance with relevant factors for exporters to apply for insurance cover. This includes the question of whether there should be a stronger focus on closely held corporations. It is worth assessing whether insurance products, cover policies and conditions are adequate to accommodate demand from companies that might not have highly professional and large corporate finance departments. This is in line with the question of whether small firms' needs are fulfilled. As there is empirical evidence that smaller companies purchase more export credit insurance than larger exporters, cover policies should be customised to meet the demand. Further considerations to simplify products and offer specific cover solutions for small and medium-sized companies might be necessary. As firm size is also relevant to the transaction costs of bankruptcy and insurance services, it might be necessary to further investigate the potential consequences for export credit agencies. This applies, in particular, with regard to real services. Export credit agencies should evaluate whether an additional allocation of resources to claims administration, loss control and other functions can be expanded in order to better support

exporters. From an export credit agency's perspective, tax motives might not be pivotal. However, the results with regard to financing are relevant concerning cover policies and product offerings. This study provides empirical evidence that financing is a relevant factor for the purchase of insurance. As export credit insurance provided by governments supports the company in securing financial resources from commercial lenders, the product has to be appropriate in order to meet demand for financing and refinancing purposes. Finally, the results for the risk related to foreign buyers also reveal that it is essential to concentrate on support for protection from losses with challenging buyers in risky markets. It might be worth exploring whether companies with a higher export quota and more transactions have different needs to other companies. Although the German products of the whole-turnover cover and whole-turnover cover light seem to be an ideal insurance service for export-focused companies, there might be additional stimuli to use these results.

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