Export Market Risk and the Role of State Credit Guarantees

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Public export credit guarantees in Germany

"Hermes coverage"

Policy instrument aimed at mitigating financing constraints of exporters

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Declared objectives

- support export and employment

$\Rightarrow$ Existing literature suggests positive effects exists

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  $\Rightarrow$ cost advantage
- bargaining power in debt renegotiations
- coordination cost

  $\Rightarrow$ comparative advantage in asserting claims

Aim of this paper

Try to understand *why* the instruments works

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How we approach this question:

- write down a small theoretical model of heterogeneous exporters and financial market imperfections (Manova,2013)
- derive predictions on how and what kind of firms would benefit from public guarantees given the hypothesized cost advantage exists
- confront the predictions with data on firm level

Preview of results

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Note: these conclusions rely on the assumption that long-run profits of the public agency are really non-negative

Related literature

Banks as providers of (costly) liquidity

- bank runs (Diamond and Dybvig, 1983)
- diversification cost, buffer stocks, cash (Kashyap et al., 2002), cost of equity

Role for government in financial markets

- Diamond and Dybvig (1983): lender of last resort
- Holmström and Tirole (1998): auditing and enforcement

Public export credit guarantees

- Moser et al. (2008), Felbermayr and Yalcin (2011), Felbermayr et al. (2012) (Germany); Egger and Url (2006), Badinger and Url (2013) (Austria); Janda et al. (2012) (Czech Republic); Auboin and Engemann (2012)
- Abraham and Dewit (2000); Dewit (2001)

Credit constraints and exports, trade finance ...

The theoretical model: Assumptions

One sector Melitz (2003)-type open economy:

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Firms can purchase credit guarantees to mitigate credit default risk

The financial sector

Banks:

- perfect competition, risk neutrality
- banks are obliged to neutralize risk in their balance sheet: cost $c^B \in [0, (\bar{R}-1)/\bar{R}]$ per unit of value at risk
- gross refinancing rate $\bar{R} \geq 1$

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$\Rightarrow$ project-specific insurance premium from no-arbitrage condition:

$$\gamma := \gamma[\lambda, \bar{R}, b^G, c^G]$$

Firms' export decision

Optimal sales for financing mode $i \in (B, G)$:

$$r^*[a]^{\boldsymbol{i}} = \left(\frac{\theta}{a R^{\boldsymbol{i}}}\right)^{-(\mathbf{1}-\varepsilon)} A \quad \text{with}$$

$$R^{\boldsymbol{B}} := R^{\boldsymbol{B}}[\lambda, \mathcal{B}] = \frac{\bar{R}}{\rho^{\boldsymbol{B}}} \qquad \text{with} \quad \rho^{\boldsymbol{B}} = \lambda + (1-\lambda) b^{\boldsymbol{B}} - \bar{R} c^{\boldsymbol{B}} (1-\lambda)(1-b^{\boldsymbol{B}})$$

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$$\pi^*[a] = \frac{\lambda}{\varepsilon} r^*[a] - \lambda R^{\boldsymbol{i}}(f-k) - \bar{R}k = 0$$

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If $b^B = b^G$, $c^B = c^G$, then $R^B = R^G$, and sales and the productivity threshold are identical under both schemes

Theoretical results and testable hypotheses

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Testable hypotheses: The use of credit guarantees provided by a public agency that faces lower diversification cost c or a higher recovery rate b

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The effect should be more pronounced

-for small firms

-for large contracts and firms with little working capital

-if refinancing conditions are tight

Data

▸ summary statistics

Data:

- Euler-Hermes transaction level data 2000-2010 (size, duration, risk category of importer, destination country)
- Ifo Business survey data (monthly assessment of stock of foreign orders, production constraint, employment, demand, export expectation)
- Amadeus yearly balance sheet data
- Thompson/Reuters interbanking rate

Observations	210370
Firms	3964
Guarantees	872

Empirical strategy: Logit model

Dependent variable:

- stock of foreign orders $y_{it} \in \begin{cases} 1 & \text{“}\textit{larger than usual}\text{”} \\ 0 & \text{“}\textit{as usual}\text{” or “}\textit{too small}\text{”} \end{cases}$

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Logit model:

$$\Pr(y_{it} = 1) = \Lambda(\beta_{1k} FinCon_{it}^{k} + \beta_2 Hermes_{it} + \beta_2^{k} Hermes_{it} \times FinCon_{it}^{k} \\ + \boldsymbol{\beta_3}' \mathbf{X}_{it} + \gamma_t + \gamma_i + \varepsilon_{it})$$

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where

- $\mathbf{X}_{it} = \left\{ Demand_{it}, Constraint_i, \overline{\ln Employment_i} \right\}$
- $FinCon^k \in \left\{ \begin{array}{c} FirmSize_{it}, IBrate_t, \ln Working\ cap._{it}, \ln Cash\ flow_{it}, \\ \ln Tangibles, \ln Contract\ size_{it}, Guarantor_{it} \end{array} \right\}$
- $Hermes_{it} \in \{ Hermes_{it}(0,1); \ln EZD_{it} \}$

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$$\alpha_i = \begin{cases} \text{fixed effect (conditional logit)} \\ \bar{X}_i{}' \omega \quad \text{(Mundlak random effects)} \end{cases}$$

Baseline estimations

Dep. variable: *Stock of foreign orders*									
Model:	Mundlak-Chamberlain Probit					OProbit	Clogit	LPM	APE
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Hermes	0.300***	0.293***	0.318***	0.0866**		0.100*	0.259***	0.0270	0.0122**
	(.0269)	(.0302)	(.0324)	(.0405)		(.055)	(.0811)	(.0205)	(.00571)
ExpectExp (–)	-0.290***	-0.138***	-0.131***	-0.138***	-0.138***	-0.721***	-0.371***	-0.00549**	-0.0171***
	(.0174)	(.0233)	(.0265)	(.0234)	(.0234)	(.0209)	(.0556)	(.00225)	(.0027)
ExpectExp (+)	0.615***	0.306***	0.283***	0.309***	0.309***	0.280***	0.656***	0.0666***	0.0487***
	(.00787)	(.0123)	(.0142)	(.0125)	(.0125)	(.0156)	(.0252)	(.00367)	(.00217)
Demand (–)	-0.355***	-0.263***	-0.267***	-0.247***	-0.247***	-0.527***	-0.689***	-0.0251***	-0.0296***
	(.0119)	(.0147)	(.0167)	(.0147)	(.0147)	(.0139)	(.0349)	(.0018)	(.00162)
Demand (+)	0.417***	0.299***	0.296***	0.278***	0.278***	0.422***	0.655***	0.0527***	0.0444***
	(.00798)	(.0107)	(.0123)	(.0108)	(.0108)	(.0133)	(.0231)	(.00282)	(.00185)
avg. *Unconstrained*	0.0701***	-0.00109	-0.0278	-0.0283*	-0.0290*	1.182***			-0.00399*
	(.0124)	(.0155)	(.0178)	(.0156)	(.0156)	(.0177)			(.0022)
avg. $\ln Emp$	0.0470***	0.0396***	0.0285***	0.0366***	0.0364***	0.135***			0.00516***
	(.00225)	(.00274)	(.00309)	(.00277)	(.00277)	(.00315)			(.00039)
avg. *ExpectExp*				-0.124***	-0.124***	-0.271***			-0.0174***
				(.0263)	(.0263)	(.0303)			(.00371)
avg. *Demand*				0.492***	0.491***	0.837***			0.0693***
				(.0307)	(.0307)	(.0349)			(.00432)
avg. *Hermes*				0.524***		0.298***			0.0739***
				(.0639)		(.0899)			(.00901)
$\ln ContractSize$					0.00688**				
					(.00299)				
avg. $\ln ContractSize$					0.0384***				
					(.00462)				
# lags	0	6	12	6	6	6	6	6	6
N	290113	210258	168076	210258	210258	210244	137940	211063	210258
(Pseudo) R^2	.20	.45	.57	.45	.45	.19	.21	.13	

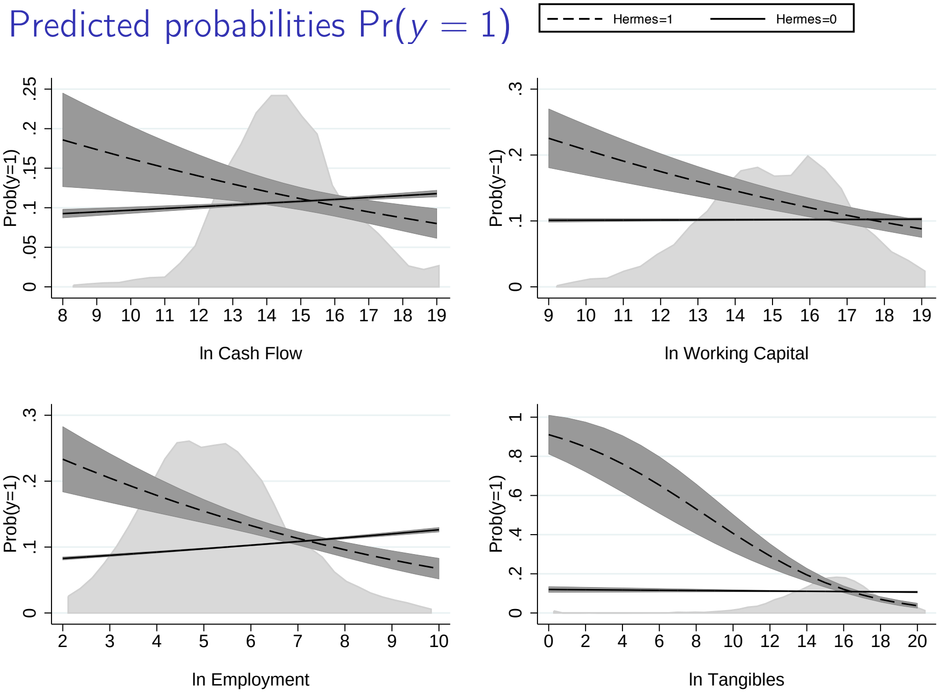
Interaction effects

Table: Interaction Terms, Coefficient Estimates

Dependent variable: *Stock of foreign orders*						
	Model: Mundlak-Chamberlain Probit					
	(1)	(2)	(3)	(4)	(5)	(6)
Hermes	1.102***	-0.491***	1.204***	1.131***	3.106***	
	(0.167)	(.0946)	(0.228)	(0.336)	(0.456)	
× ln *Emp*	-0.152***					
	(0.0244)					
× *Ibrate*		0.184***				
		(.026)				
× avg. ln *WorkingCap*			-0.0683***			
			(0.0133)			
× avg. ln *CashFlow*				-0.0739***		
				(.0215)		
× ln *Tangibles*					-0.189***	
					(0.0276)	
ln *ContractSize*						-0.0761***
						(.0192)
× ln *ContractSize*						0.00596***
						(.00135)
N	210258	210258	114209	92989	65352	210258
Pseudo R^2	.45	.45	.70	.75	.82	.45

Estimations are based on the specification in previous table, Column 4. Robust standard errors in parenthesis. *,**,*** indicate significance on the 10,5, and 1% significance level. Coefficients of lagged variables, firm averages (except for direct effects of interacted variables), time and sector FE not shown.

Predicted probabilities $\Pr(y = 1)$



Type of importer's guarantor

Table: Type of the Importer's Guarantor

	$\widehat{\Pr}(y = 1 \mid X)$	90% CI	# obs
Hermes = 0	**.102**	[.101;.103]	207712
Hermes = 1			
State	**.079**	[.045;.112]	59
Bank	**.121**	[.095;.148]	199
Private	**.164**	[.138;.191]	361
None	**.105**	[.095;.116]	2695

Predicted probabilities. 90% confidence bounds in parenthesis.

Robustness and open issues

We find qualitatively similar results

- using a continuous measure of *Hermes*
- using different number of lags of our covariates
- including qualitative covariates as indicator variables and medians instead of means
- for ordered logit

Summary and conclusion

We find a positive effect of Hermes guarantees on exports

- that is stronger for financially vulnerable firms
- for smaller firms
- for larger contracts
- in times where refinancing cost of banks are high

We read this as evidence for the hypothesis that the government has a cost advantage in financing very risky projects, in particular so if financing conditions on private markets are tight

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Interaction of the Hermes effect

Interpretation of and inference on interaction terms in non-linear models is not straightforward (Ai and Norton, 2003; Greene, 2010)

⇒ the sign of $\hat{\beta}_{1k}$ is not indicative for the sign of the change in the marginal effect of Hermes

⇒ $\beta_k = \beta_{1k} = 0$ is sufficient but not necessary for the effect to be zero, various combinations of estimated parameters and the data can equate $\frac{\partial DC_{j,D_{it}}}{\partial x_{kit}} = 0$, irrespective of β_k, β_{1k}.

To interpret interaction terms and assess significance, Greene and Henscher (2010) suggest to look at predicted probabilities at different values of the covariates.

Marginal effects and interaction terms

Marginal effect (discrete change in probability of $y = j$) of Hermes:

$$\begin{aligned} DC_{j,D_{it}} = {} & \Lambda(\tau_j - \delta' Z_{it} | D_{it} = 1) - \Lambda(\tau_{j-1} - \delta' Z_{it} | D_{it} = 1) \\ & - \Lambda(\tau_j - \delta' Z_{it} | D_{it} = 0) + \Lambda(\tau_{j-1} - \delta' Z_{it} | D_{it} = 0) \end{aligned}$$

The change in the marginal effect of Hermes when a continuous variables x_{kit} changes is

$$\begin{aligned} \frac{\partial DC_{j,D_{it}}}{\partial x_{kit}} = {} & (\beta_k + \beta_{1k}) \left[f(\tau_{j-1} - \delta' Z_{it} | D_{it} = 1) - f(\tau_j - \delta' Z_{it} | D_{it} = 1) \right] \\ & - \beta_k \left[f(\tau_{j-1} - \delta' Z_{it} | D_{it} = 0) + f(\tau_j - \delta' Z_{it} | D_{it} = 0) \right] \end{aligned}$$