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Exports and firm profitability: Quality matters!

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Abstract

This paper uses a tailor-made newly available data set to investigate for the first time the links between profitability and the quality of exports in enterprises from manufacturing industries in Germany, one of the leading actors on the world market for goods. The paper demonstrates that exporters of high-quality goods tend to be more profitable.

1. Motivation

Over the past twenty years a huge literature emerged that investigates the links between various forms of international firm activities and various dimensions of firm performance (see Wagner (2012a) for a recent survey). From this micro-econometric literature two conclusions emerge than can be regarded as uncontroversial. First, exporters are more productive than firms that do not trade internationally. Second, firms engaged in exports have to bear extra costs. Exporting firms have to pay for, among others, market research in foreign countries, adaptation of products to local regulations there, or transport costs. Furthermore, exporting firms tend to pay higher wages than non-exporting firms. These extra costs are the reason for self-selection of more productive firms on international markets – only firms with a productivity that is high enough can be profitable when extra costs have to be covered.

A question that has been investigated in the literature on the micro-econometrics of international trade only recently is whether the productivity advantage of exporting firms does lead to a profitability advantage of firms that engage in exports compared to otherwise identical non-trading firms even when exporters are facing extra costs. This apparent gap in the literature on the micro-econometrics of international trade comes as a surprise because maximization of profits (and not of productivity) is usually considered as a central goal for firms. Furthermore, looking at profitability instead of productivity is more appropriate from a theoretical point of view, too. Even if productivity and profitability are positively correlated (which tends to be the case) productivity is, as was recently pointed out by Foster, Haltiwanger and Syverson (2008, p. 395), only one of several possible idiosyncratic factors that determine profits. Success of firms in general, and especially survival, depends on profitability. Often profitability is viewed both in theoretical models of market selection and in empirical studies on firm entry and exit as a positive monotonic function of productivity, and selection on profits then is equivalent to selection on productivity.

In empirical studies the use of productivity instead of profitability is usually due to the fact that productivity is easily observed in the data sets at hand while profitability is not. Fortunately, there are data sets that are rich enough to allow to measure profitability. The number of studies on trade and profits, however, is still small and the number of countries covered (all of which are member states of the EU) is even smaller. Wagner (2012b) surveys the evidence for five countries from six studies. Results differ widely across the studies – from positive to no to negative profitability differences between exporters and non-exporters; from evidence for self-selection of more or less profitable firms into exporting to no evidence for self-selection at all; from no positive effects of exports on profits to positive effects.

One reason for the absence of a clear-cut result for the link of exports and profits at the firm level might be due to the fact that in all of these studies exports of goods from an industry[1] are treated as homogeneous in the sense that exports of, say, low-budget cars and Porsches are treated alike as exports of cars. Although one should expect that the link between exports and profitability should be (more) positive for high-quality exports than for standardized low-quality products, none of these studies looks at the link between the quality of exports and firm profitability.

This paper intends to fill this gap. It uses a tailor-made newly available data set (described in detail in section 2) to investigate for the first time the links between profitability and the quality of exports in enterprises from manufacturing industries in Germany, one of the leading actors on the world market for goods. To anticipate the most important finding, the

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[1] The empirical models used to investigate the link between exports and profitability usually include a full set of industry dummies to control for the industry affiliation of the firms.

paper demonstrates that in German manufacturing industries exporters of high-quality goods tend to be more profitable.

2. Data and measurement issues

The lack of empirical studies on the link between profitability and quality of exported goods is due to the fact that until most recently suitable data at the level of the firm that could be used in an econometric investigation were not available. The empirical investigation here uses a tailor-made data set that combines for the first time high quality firm-level data from three official sources.

The first source is the regular survey of establishments from manufacturing industries by the Statistical Offices of the German federal states. The survey covers all establishments from manufacturing industries that employ at least twenty persons in the local production unit or in the company that owns the unit. Participation of firms in the survey is mandated in official statistics (see Malchin and Voshage (2009) for details). For this study establishment data were aggregated to the enterprise level to match the unit of observation in the other data sources (described below). From this survey information is used on the number of employees in the firm, the sum of wages paid, and detailed industry affiliation.

The second source of data is the cost structure survey for enterprises in the manufacturing sector. This survey is carried out annually as a representative random sample survey. The sample is stratified according to the number of employees and the industries; all firms with 500 and more employees are covered by the cost structure survey (see Fritsch et al. 2004). This survey is the source for information on the profitability of a firm.

Information on the goods traded internationally is available from the statistic on foreign trade (*Außenhandelsstatistik*). This statistic is based on two sources. One source is the reports by German firms on transactions with firms from countries that are members of the European Union (EU); these reports are used to compile the so-called *Intrahandelsstatistik* on intra-EU trade. The other source is transaction-level data collected by the customs on trade with countries outside the EU (the so-called *Extrahandelsstatistik*).[2] Data in the statistic of foreign trade are transaction-level data, i.e. they relate to one transaction of a German firm with a firm located outside Germany at a time.

For the reporting years 2009 and 2010 these transaction-level data have been aggregated at the level of the exporting firm for the first time. Using the firms' registration number for turnover tax statistics these data were matched with the enterprise register system (*Unternehmensregister-System*) and with the enterprise level data from the two other sources discussed above. For each exporting or importing firm that reported either to the statistic on intra-EU trade, or to the statistic on trade with countries outside the EU, we know from the data the value and the volume of exports and imports for the ten most important exported goods. This information is used to compute an index for the quality of exports.

With these data it is possible to investigate the relationship between the quality of goods exported and the profitability of the firm.

The <u>rate of profit of a firm</u> is computed as a rate of return, defined as gross firm surplus (computed in line with the definition of the European Commission (1998) as gross

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[2] Note that firms with a value of exports to EU-countries that does not exceed 400,000 Euro in 2009 do not have to report to the statistic on intra-EU trade. For trade with firms from non-member countries all transactions that exceed 1,000 Euro are registered. For details see Statistisches Bundesamt, Qualitätsbericht Außenhandel, Januar 2011.

value added at factor costs minus gross wages and salaries minus costs for social insurance paid by the firm) divided by total sales (net of VAT) minus net change of inventories:[3]

$$(1) \quad rate\,of\,profit = \frac{gross\,value\,added - gross\,wages - costs\,for\,social\,insurance}{total\,sales - net\,change\,of\,inventories}$$

This profit measure is a measure for the price-cost margin which, under competitive conditions, should on average equal the required rental on assets employed per money unit of sales (see Schmalensee 1989, p. 960f.). Differences in profitability between firms, therefore, can follow from productivity differences, but also from different mark-ups of prices over costs and from differences in the capital intensity.[4]

The quality of exported goods is defined as the unit value of exports and computed as value of exports (measured in Euro) over quantity of exports (measured in tons). In the data set used here we have information on the value of exports and the quantity of exports for the ten most important products (measured by the value of exports) exported by a firm. For firms that exported more than one good the unit value of exports is the weighted sum of the unit values of the (up to ten) different goods exported, and the weights are the shares of the value of exports of a good in the total exports of the firm of these (up to ten) goods. The unit value of exports is expressed in percentage of the mean value of unit values in the 4digit industry to take care of differences across industries due to the nature of the products (e.g., mobile phones and cement).

The empirical model includes a number of control variables. The number of employees (also included in squares to take care of non-linearity) is included to control for any relationship between firm size and firm profitability. The sum of wages per employee is used as a proxy variable for human capital intensity which might be expected to be positively correlated with the profitability of an exporting firm from one of the most highly developed industrial countries of the world.[5] Furthermore, a complete set of 4-digit level industry dummy variables is included to control for the role of industry-specific factors related to the link between profitability and quality of exported goods.

Given that the East German economy still differs in many respects from the West German economy, especially with regard to exporting (see Wagner (2008)), and that the number of exporting firms is small in East Germany this study looks at West German manufacturing enterprises only.

All computations are performed for two years, 2009 and 2010. In 2009, the value of German exports of goods declined by 18.4 percent compared to 2008. This was followed by an increase in exports by 18.5 percent in 2010 (Statistisches Bundesamt 2012, p. 414).

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[3] Note that the data set does not have any information on the capital stock, or the sum of assets or equity, of the firm, so that it is not possible to construct profit indicators based thereon like return on assets or return on equity.

[4] Given that the data set does not have information on the capital stock employed by the firms in the econometric investigations in the following sections differences in the capital intensity are controlled for by including detailed industry dummy variables at the 4-digit level.

[5] Unfortunately, there is no information on the qualification of the employees (e.g., the share of employees with a university degree, or the share of employees that successfully passed the exams following an apprenticeship) of the firm in the data used. However, Wagner (2012c) uses a unique different data set to demonstrate that in German manufacturing firms the average wage is a useful proxy variable for the qualification of the employees.

Therefore, a look at these two very different years can be considered as a robustness check to make sure that the results reported are not specific for a crises or recovery period.

3. Empirical findings

Descriptive statistics for the enterprise characteristics considered in this study are reported in Table I[6]. Note that firms are rather heterogeneous with regard to all characteristics looked at here. Both the rate of profitability and the quality of exported goods vary widely among the firms in the sample. Note further that profitability improved to a large degree from the export crisis in 2009 to the export boom in 2010.

How is the profitability of an exporting firm linked to the quality of goods exported? Are exporters of high-quality goods really more profitable than exporters of goods with a lower quality? To investigate this question empirical models are estimated with the rate of profit of a firm as the dependent variable and index of the quality of exports as the independent variable, controlling for firm size, human capital intensity and a full set of detailed industry dummy variables measured at the 4-digit industry level. Results are reported in Table II.

Three variants of the empirical model with different independent variables are estimated – the first includes only the index of export quality (plus the detailed industry controls), the second adds firm size (measured by the number of employees that is also included in squares to take care of a non-linear relationship) and the third adds the wage per employee, too.

The point estimates and the level of statistical significance of the quality of exported goods are stable over the estimated variants of the empirical model. Results reveal that the quality of exported goods is positively related to the rate of profit in a firm. This link is statistically significant at an error level of three percent for 2009, while the level of statistical significance is somewhat smaller in 2010.[7]

The discussion of the results from the empirical models so far only considered the statistical significance of the links between input and output quality. Evidently, statistically highly significant links can be irrelevant from an economic point of view if a ceteris paribus change of considerable size in export quality leads to a tiny change in the (estimated) rate of profit only. To see whether the statistically significant links are relevant from an economic point of view, too, the estimated change in profits that is caused by a ceteris paribus increase by one standard deviation of the quality of exports is computed based on the estimated regression coefficients from Model 3. For 2009, an increase by one standard deviation is linked to an increase in the rate of profit by 0.37 percentage points. For 2010, the respective figure is 0.28 percentage points. Given the mean value for the rate of profit of 4.8 percent in 2009 and 7.6 percent in 2010 these estimated changes are non-negligible from an economic point of view. Export quality does matter for profitability.

Interestingly, the link between profitability and export quality is stronger (both statistically and economically) during the export crisis of 2009 than during the export boom in 2010. However, evidence for more years is needed before any relation between macroeconomic conditions and the profitability – export quality link can be investigated in more detail.

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[6] Note that minimum and maximum values cannot be reported because they refer to a single enterprise and, therefore, are confidential.

[7] Given that the inclusion of control variables for firm size and human capital intensity does not change the results for the link between profits and export quality we do not discuss the estimation results for these variables in detail here.

4. Discussion

The bottom line, then, is that according to the empirical results presented in this study the quality of exported goods in German manufacturing industries is positively related to the rate of profit of the exporting firms.

This link between export quality and profitability documents a correlation and should not be interpreted as a causal link from export quality to profitability. The huge and emerging literature on the links between international activities of heterogeneous firms and firm performance[8] has demonstrated that one can observe both self-selection of "better" firms on international markets and improvement of firms due to international activities. With the cross-section data at hand it is impossible to investigate whether the exporters of high-quality goods made higher profits on the national market already from selling high-quality goods before they started to export, or whether the higher challenges on the export markets induced improvement in the products of the firm that eventually lead to higher profits (or whether both is the case).

Another open question that has not been dealt with in this paper is the potential role played by unobserved inputs like management quality for the profitability of firms. If these unobserved firm characteristics are correlated with the observed characteristics that are included in the empirical model used to investigate the links between export quality and profitability, the estimated regression coefficients are biased and any conclusions based on the estimates have to take this potentially large bias into account. A standard solution to take at least those unobserved factors into account that do not change over the period under investigation is the addition of fixed firm effect to an empirical model that is estimated for panel data that cover all years from these period. This, however, is no feasible strategy here. As of today, the data used to construct the index of the quality of export goods are available for the years 2009 and 2010 only. Furthermore, both the export quality and the control variables include tend to be highly persistent at the level of the enterprise. Estimates from fixed effects panel data models that are based on the variation of variables over time inside a firm only, therefore, are no panacea here.

That said, the reported statistically significant and economically important correlation between the profitability of a firm and the quality of its exported goods should be regarded as an interesting new fact that might motivate further investigations of the causes and consequences of quality differences of internationally traded goods.

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[8] For surveys of this literature see Bernard et al. (2012), Melitz and Redding (2014) and Wagner (2012a).

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Table I: Descriptive statistics – Enterprise characteristics, West Germany

Entrerprise characteristic	Mean	sd	p1	p50	p99
2009					
No. of enterprises: 5,993					
Profitability (percent)	4.79	11.48	-31.87	5.29	29.48
Quality of exported goods (index)	100.00	234.03	0.353	47.40	992.82
Number of employees	343.26	2,683.88	22	110.33	2,699.3
Wage / employee (Euro)	35,343	10,447	14,915	34,577	64,128
2010					
No. of enterprises: 6,072					
Profitability (percent)	7,61	10.11	-19.11	7.42	31.04
Quality of exported goods (index)	100.00	237.15	0.65	47.72	833.16
Number of employees	319.49	2,313.16	23	106.54	2,626.33
Wage / employee (Euro)	36,563	10,618	15,132	35,966	65,492

Note: For a detailed definition of the enterprise characteristics see text. p1, p50 and p99 refer to the 1st, 50th and 99th percentile of the distribution of the characteristic (minima and maxima cannot be reported due to violation of privacy).

Table II: Profitability and quality of exported goods: West Germany

Enterprise characteristic		1	2	3
2009				
Quality of exported goods (index)	ß	0.0016	0.0016	0.0016
	p	0.032	0.030	0.030
Number of employees	ß		-0.00035	-0.00035
	p		0.045	0.048
Number of Employees (squared)	ß		2.54e-9	2.55e-9
	p		0.120	0.123
Wage per employee (Euro)	ß			7.00e-8
	p			0.997
Constant	ß	4.63	4.73	4.73
	p	0.000	0.000	0.000
4-digit industry controls		yes	yes	yes
No. of enterprises		5, 993	5,993	5,933
2010				
Quality of exported goods (index)	ß	0.0012	0.0012	0.0012
	p	0.081	0.079	0.072
Number of employees	ß		-0.00020	-0.00017
	p		0.240	0.322
Number of Employees (squared)	ß		1.75e-9	1.52e-9
	p		0.254	0.331
Wage per employee (Euro)	ß			-0.000014
	p			0.448
Constant	ß	7.49	7.55	8.06
	p	0.000	0.000	0.000
4-digit industry controls		yes	yes	yes
No. of enterprises		6,072	6,072	6,072

<u>Note</u>: OLS regressions; dependent variable: Profitability (percent). ß is the estimated regression coefficient, p is the prob-value (based on heteroscedasticity-consistent standard errors).For a detailed definition of the variables see text.