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**Working Paper**

## How do firms organize trade?: Evidence from Ghana

Kiel Advanced Studies Working Papers, No. 449

**Provided in Cooperation with:**

Kiel Institute for the World Economy – Leibniz Center for Research on Global Economic Challenges

*Suggested Citation:* Krüger, Jens (2009) : How do firms organize trade?: Evidence from Ghana, Kiel Advanced Studies Working Papers, No. 449, Kiel Institute for the World Economy (IfW), Kiel

This Version is available at:

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Working Paper No. 449

**How Do Firms Organize Trade?  
Evidence from Ghana**

by

Jens Krüger

February 2009

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# How do firms organize trade? Evidence from Ghana\*

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24.02.2009

## Abstract

The literature on firm heterogeneity in international trade posits that only the most productive firms become exporters (Melitz 2003). However, empirical findings suggest that also firms that are not highly productive export. This paper investigates empirically how firms organize their export trade. If selling directly, sunk costs of foreign market entry are arguably very high, so only productive firms can achieve this (Schroeder et al. 2003). Low productivity firms, by contrast, may prefer to export through trading companies, which involves lower sunk costs. Using a firm level panel data set of Ghanaian firms we investigate the relationship between firm productivity and the use of export intermediaries. Our estimation results take simultaneity problems into account and reveal that indeed low productivity firms tend to export through intermediaries.

*JEL Classification:* D21, F14, L22

*Keywords:* export intermediation, firm productivity

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\*The author would like to thank Holger Görg and Harmen Lehment for constructive comments.

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# 1 Introduction

The literature on firm heterogeneity in international trade posits that only the most productive firms become exporters (Melitz 2003)<sup>1</sup>. Empirically, it is, however, the case that also firms that are not highly productive export. This paper looks at how firms organize their export trade. If exporting directly, sunk costs that arise prior to entering a foreign market tend to be very high, so only productive firms may find it profitable to enter the export market (Schroeder et al. 2003). Hence, low productivity firms may prefer to export through trading intermediaries, which involves lower sunk costs but higher variable costs (i.e. due to fees for the trade intermediary). Using a Ghanaian firm-level panel data set of the years 1991–1997 we investigate the relation between firm productivity and export intermediary use. Thus, the main hypothesis that is tested in this paper is that less productive firms have a tendency to use trade intermediaries rather than exporting directly. Empirical evidence on how firms organize their trade will help to fill the knowledge gap on export intermediaries and represents a valuable piece of information for governments that wish to design their export promotion efforts more efficiently (Peng & Ilinitich 1998).

This paper is organized as follows. Section 2 reviews literature on trade intermediaries in general and export intermediaries in particular. Section 3 describes the data that is used and presents descriptive statistics. Section 4 presents the econometric analysis and Section 5 concludes.

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<sup>1</sup>See Hanson & Xiang (2008) for an empirical assessment of Melitz’s model.

## 2 The role of intermediaries

In standard trade theory it is assumed that trade occurs between producers and final users. However, it has to be noted that the way goods are actually traded is more complicated (Feenstra & Hanson 2004). One important feature that trade theory is mostly silent about is the use of trade intermediaries<sup>2</sup>. However, there are plenty examples in history of export intermediaries that would justify some research attention. See, for example, Greif (1993) for a study on 11th century Mediterranean traders. The East India Company that in 1600 received a royal charter in London to monopolize the trade with India and hence became an export intermediary is another example (Cho 1987). A more recent case of export intermediaries are the so called sogo shosha (general trading companies) – huge Japanese export intermediaries that played a major role in expanding the Japanese economy after the Second World War. As a result, about 40% of Japanese exports were handled by nine sogo sohas in the 1990's (Jones 1998, p. 1). Following the Japanese example other countries (such as South Korea, Taiwan, Thailand, Turkey, China and the United States) introduced export intermediaries<sup>3</sup>. So why did export intermediaries receive so little attention in research? Peng & Ilinitch (1998) describe three possible reasons for this lack of research on trade intermediaries.

First, most of the research on export development has been carried out by North American scholars that develop research questions based on their personal experience. The shift from intermediary use to foreign direct investment as the dominant mode of internationalization in North America can thus be seen as one reason why research changed its focus from intermediaries to management of multinational enterprises. The fact that Dunning (1992) devotes 3 out of 600 pages to trading companies can be seen as evidence for that.

A second obstacle for research on trade intermediaries is data availability. It is more difficult to obtain data on intermediaries than on manufacturing firms. This is because export intermediaries

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<sup>2</sup>Intermediaries are defined as "... an economic agent who helps buyers and sellers to meet and transact." (Spulber 1999, p.3).

<sup>3</sup>See Peng (1998) for a detailed description of the legislation of the respective trading firms.

may not be obliged to report information to neither the public nor the government <sup>4</sup> and thus published data is rare. The fact that information on export intermediaries is not regularly subject to articles in the business press could also play a role in explaining the data scarcity.

The third reason for the absence of research on export intermediaries that is pointed out by Peng & Ilinitich (1998) is the lack of a conceptual framework that would enable researchers to test the relevant research questions.

Nonetheless, there are some attempts to fill this research gap on intermediaries. The literature on trade intermediation in general starts with the work of Cosimano (1996). He introduces a parametric model that is able to explain why individuals choose to trade with an intermediary. In this model an individual will compare the gains from using an intermediary and a matching game where she can choose to be either a direct seller/buyer or a non-participant. It is shown that an intermediary is more efficient in matching buyers and sellers as the presence of such an intermediary increases the probability of successful trade.

Spulber (1999) provides an in-depth theoretical assessment of the role of trade intermediaries. He shows that intermediaries can only exist if market conditions involve moral hazard, information asymmetries or fixed transaction costs <sup>5</sup>.

Research that focuses on export intermediaries in particular starts with the pioneering work of Peng & Ilinitich (1998). Taking a theoretical analysis of the export intermediation process as a background the authors develop 5 testable hypotheses on the choice to export through an intermediary and the performance of export intermediaries. These hypotheses have been tested in two studies.

Peng & York (2001) test the resulting hypotheses concerning export intermediary performance using data from 195 U.S. export intermediaries. Two measures for export intermediary performance were used. These are the net export sales margin represented by export profits over export earnings, and per capita export sales. They find that export intermediary performance is positively correlated

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<sup>4</sup>For instance, the U.S. department of Commerce uses the so-called standard industrial identification code (SIC) for collecting data on trade and production. However, the amount of data that is collected is considerably smaller for service firms than for manufacturers.

<sup>5</sup>See also Casson (1998) for a more practically focused analysis of trading companies.

with export knowledge, the ability to take title of goods and the involvement with commodity products of the intermediary.

Trabold (2002) tests hypotheses of Peng & Ilinitch (1998) related to the questions whether a higher commodity content <sup>6</sup> or a higher distance to the export market influence the decision of manufacturers to export through an intermediary. The study uses firm related foreign trade data that was obtained from French customs authorities. The empirical findings only weakly support the hypothesis that distance matters for the use of an intermediary. However, the second proposition of Peng & Ilinitch (1998) that goods with a higher commodity content are more likely to be exported through export intermediaries is strongly supported.

Another recent study that looks at export intermediation is Feenstra & Hanson (2004). This paper discusses of Hong Kong's role in intermediating trade between China and the rest of the world. Since Hong Kong is a major distributor of Chinese exports the authors examine the determinants of the re-export markups and find that these markups are higher for more differentiated products, products with a higher export price variance and for products that have been sent to China for further processing.

Finally, Schroeder et al. (2003) investigate theoretically and empirically why export intermediaries are only used for certain destination markets. Their model is tested by using the same data set as Trabold (2002). The empirical findings reveal that the trade intermediary share is positively correlated with market entry costs and negatively with the size of the destination market. Moreover, it is found that the trade intermediary share is not correlated with distance-dependent export costs.

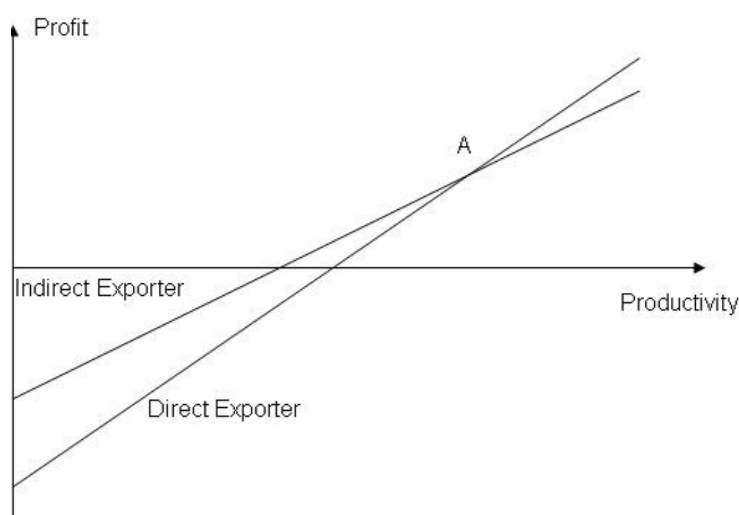
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<sup>6</sup>Two measures of commodity contents are applied. The first measure is a classification that divides products into high, medium or low commodity contents products. The second measure is the R&D share in value added (Trabold 2002, p. 332).



To sum up, there is a growing body of literature on trade intermediation in general. However, research on export intermediaries is still limited and the relationship between intermediary use and productivity has only scarcely been investigated. Therefore, this paper aims to shed additional light on the relationship between intermediary use and productivity of manufacturing firms. The main hypothesis that is tested by using a panel data set of Ghanaian firms of the years 1991-1997 is that less productive firms tend to use export intermediaries whereas high productivity firms prefer to export directly. The argumentation can be seen as an analogy to Helpman et al. (2004) and goes as follows. The costs of entering the export market can be divided into fixed and variable costs. In comparison to indirect exporters direct exporters face higher fixed (market entry costs) and lower variable costs. This is because of the costs that arise since a direct exporter has to establish a distribution network and gather information on potential buyers. Indirect exporters, however, do not have such high fixed costs but have to pay an amount per unit to the export intermediary which leads to higher variable costs. Thus, using the theoretical framework of Helpman et al. (2004), one can visualize the profit functions of direct and indirect as follows:

Figure 1: Relation between productivity and profits for direct and indirect exporters



Source: Author based on Helpman et al. (2004)

The profit function of indirect exporters is steeper than for indirect exporters due to intermediary charges. As shown in Figure 1 it is more profitable for low-productivity firms to export indirectly. However, having reached a certain productivity level (point A) the profits from directly exporting are higher than those from exporting through an intermediary. Taking this as a background we will test the hypothesis that low productivity firms tend to export through export intermediaries.

### 3 The Data

The data that is used in this paper is available from the Centre for the Study of African Economies at Oxford University. It is a firm level data set of Ghanaian manufacturing firms covering the time period of 1991 to 1997. The fact that Ghana has by far the longest experience of trade liberalization in Africa makes this data set particularly interesting. Indications for the years 1991 to 1993 were collected as part of the Regional Program on Enterprise Development (RPED) which was organized by the World Bank. Data for the years 1994 to 1997 was collected in separate surveys. All the surveys contain firm level information on investment, capital, inputs, output and workers of the respective firm (Teal 2002) <sup>7</sup>.

During the surveys 278 firms have been interviewed. A sub-sample of 253 firms provided sufficient information so that it was possible to compute the capital stock and employment of the firm. Continuous data for seven years is available for 191 firms. The data covers several locations and manufacturing sectors. The sectors that are covered are: foods, bakery, wood products, furniture, textiles, metal products and the machinery sector. Relatively large firms can be found in the wood and textiles sector whereas garments and furniture are dominated by smaller firms. Information if a firm is located in the following locations is available: Accra, Kumasi, Takoradi, Cape Coast.

Table 1 summarizes the export shares of different intermediaries. The sample is constraint to only exporting firms. Since the surveys carried out in 1998 and 1996 only contain information on intermediary use for 1997 and 1995 and the questionnaire of 1992 does not ask about intermediaries, data on export intermediary use is only available for 4 years. The numbers in Table 1 represent the average percentage of exports that was either exported directly or through a government or private trading agency (export intermediary). For the year 1997 two cases of 'miscellaneous' export intermediaries were reported. In the first case the firm exported to a rolling mill in Togo on behalf of the owner. In the second case inter-firm sales were reported as miscellaneous exports.

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<sup>7</sup>The sampling is based on the Census of Manufacturing Activities, Ghana. See Steel & Webster (1991) and Teal (2002) for details on the sampling methodology and possible explanation for the differences in between the Population Census and the Manufacturing Census.

Table 1: Average shares of different export channels of exporting firms

	1997	1995	1993	1992
Direct exports	48.49 (7.78)	60.87 (10.41)	45.00 (11.55)	58.33 (14.86)
Exports through government trading agencies	0.00 (0.00)	4.35 (4.35)	5.56 (5.56)	0.00 (0.00)
Exports through private trading agencies	45.94 (8.00)	34.78 (10.15)	49.44 (11.62)	41.67 (14.86)
Other	5.57 (3.40)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Observations	35	23	18	12

Standard errors in parentheses

Table 1 reveals three major findings on intermediary use in this data set. First, direct exporting and exporting through private trading agencies are the major ways of exporting for Ghanaian manufacturers. Government trading companies play a minor role in export intermediation. Second, the shares of the major export channels do not vary substantially over time. Third, a substantial amount of exports (around 50%) is exported through export intermediaries.

If one constrains the sample further to large firms <sup>8</sup> one can conclude that on average large firms prefer to export directly. Taking into account that firm size and productivity tend to be positively correlated (Teal 2002, p. 15) the descriptive statistics of Table 5 (Appendix) can be seen as a first hint that high productivity firms may rather choose to export directly.

Statistics on the proportion of output that is exported (export intensity) are reported in Table 6 in the Appendix. These are in line with the results of other studies which look at Cameroon, Ghana, Kenya, and Zimbabwe and find an average export intensity of 26% for the years 1991-1995 (Bigsten et al. 1999, p. 55). It is shown that large firms on average export 23.91% of their output and that the export intensity rises over time but still in 1997 is on a very low level <sup>9</sup>.

<sup>8</sup>Large refers to firms which have more than 100 employees. This measure was also used in Teal (1999). The results are shown in Table 5 in the Appendix.

<sup>9</sup>See Bigsten et al. (1999) for a discussion on this lack of specialization in exporting.

## 4 Econometric analysis

This section investigates empirically the relationship between firm productivity and the choice of exporting directly or through an intermediary.

The production function here is assumed to be a standard Cobb-Douglas production function:

$$Y = A K^{\alpha_1} L^{\alpha_2} M^{\alpha_3} MISC^{\alpha_4} HCAP^{\alpha_5} \quad (1)$$

Where  $Y$ ,  $A$ ,  $K$  and  $L$  stand for output, total factor productivity (TFP), capital and labor respectively.  $M$ ,  $MISC$  and  $HCAP$  represent material inputs, miscellaneous inputs and human capital. Taking logs<sup>10</sup> and adding time (wave 1 to 7), location, sector<sup>11</sup>, export and ownership (state or foreign) dummies leads to the following specification:

$$\begin{aligned} y_{it} = & \alpha_0 + \alpha_1 k_{it} + \alpha_2 l_{it} + \alpha_3 m_{it} + \alpha_4 misc_{it} + \alpha_5 hcap_{it} + \alpha_6 UNION_{it} \\ & + \alpha_7 EXPORT_{it} + \alpha_8 FMAGE_{it} + Time\ Dummies + Location\ Dummies \\ & + Sector\ Dummies + Ownership\ Dummies + error\ term \end{aligned} \quad (2)$$

In (2)  $y$  stands for the log of real output of firm  $i$  in period  $t$ . Price deflators for inputs and outputs were calculated based on indications from a supplementary survey of the RPED project (Teal 2002, p. 7)<sup>12</sup>. Labor is measured by the employment level of the respective year. Human capital is represented by firm level weighted average of tenure and education multiplied by the number of employees.  $UNION$  and  $EXPORT$  are dummy variables that have the value one if the labor force of the firm is unionized or if the firm is an exporter.  $FMAGE$  stands for the firm age. Finally, two ownership dummies are included. These dummies control for effects if a firm is owned by the state

<sup>10</sup>Small letters represent variables that are in logs.

<sup>11</sup>See Section 3 for details on which sectors and locations are included in the data set.

<sup>12</sup>See Teal (2002) for details on the computation of the capital stock.

or foreign shareholders.

Table 2 shows the results of estimating (2) using OLS and Fixed effects estimation methods. The results are generally in line with other studies such as Görg et al. (2008) and show significant positive coefficients for materials, intermediate inputs, labor and capital in the OLS estimates. The time dummies indicate that there were changes in productivity over time. However, this can be owed to measurement errors in the deflators due to real exchange rate changes. Taking this into account, one can conclude that there is little evidence for changes in productivity over time (Teal 2002, p. 14). The sector dummies show some evidence that the food sector is more productive than other sectors.

Table 2 also shows that the productivity of a firm is positively related to firm age, the fact that the labor force is unionized and being an exporter. Tests for the assumption of constant returns to scale were also carried out. The p-values of a Wald test in Table 2 indicate that the assumptions of constant returns to scale are met by the specification.

However, there is at least one major issue with the point estimates. The problem of simultaneity may arise. This can be because the firm (the manager in charge) will observe total factor productivity early enough (or will even know TFP of his plant from past experience) so that knowledge on TFP will influence the factor input decisions. If this is the case inputs would be correlated with the error term which makes OLS estimates biased.

Table 2: Production Function

	OLS	Fixed Effects
Log Material	0.663*** (0.011)	0.599*** (0.013)
Log Intermediate Inputs	0.150*** (0.011)	0.118*** (0.012)
Log Labour	0.102** (0.041)	0.077 (0.055)
Log Capital	0.035*** (0.008)	0.061 (0.058)
Log Human Capital	0.049 (0.038)	0.079* (0.045)
Wave 2	0.078* (0.045)	0.107*** (0.039)
Wave 3	0.013 (0.045)	0.089** (0.039)
Wave 4	0.099** (0.043)	0.166*** (0.039)
Wave 5	0.068 (0.043)	0.132*** (0.039)
Wave 6	-0.059 (0.044)	0.022 (0.040)
Wave 7	-0.111** (0.044)	-0.027 (0.040)
Accra	-0.004 (0.048)	
Kumasi	0.001 (0.048)	
Cape Coast	-0.118 (0.077)	
Foods	0.195** (0.098)	
Bakery	0.133 (0.100)	
Wood	0.068 (0.108)	
Furniture	0.126 (0.097)	
Metal	0.084 (0.096)	
Machines	0.142 (0.110)	
Textile	0.048 (0.117)	
Garment	0.140 (0.098)	
Any Foreign Ownership	0.011 (0.036)	
Any State Ownership	0.017 (0.063)	
Firm Age	0.002* (0.001)	
Union	0.082* (0.044)	
Exporter	0.090** (0.039)	
Constant	2.798*** (0.199)	3.918*** (0.961)
Number of observations	1154	1182
R-Squared	0.9684	0.7677
Adj. R-Squared	0.9676	0.7028
Number of groups		248
Average obs. per group		4.766
Test for constant returns to scale	0.889	0.314

Standard errors in parantheses

\*, \*\* and \*\*\* denote a 10, 5 and 1 percent significance level

There are different ways of dealing with this simultaneity problem and we will apply some in this paper. For instance, one could simply assume that the part of the error term that is correlated with the input choice is firm specific and time invariant. In that case using a fixed effects estimator (using a dummy for each firm) would solve the problem (Greene 2003, p. 695).

The results of a fixed effects estimator are reported in the second column of Table 2. In comparison to the point estimates the coefficients on material inputs do not change in terms of their sign or significance but labor and capital are not significant any more whereas the human capital variable

becomes significant when using a fixed effect estimator. When comparing the size of the coefficients it has to be noted that the coefficients of labor and capital vary. This is what one would expect if unobservables (productivity shocks) are correlated with the error term.

However, there are at least two issues with the fixed effects estimator. First, this estimator only uses across time variation. Second, assuming that the part of the error term that is correlated with the inputs is fixed over time does not appear to be reasonable (Arnold 2005).

To address these issues we now use a two-step approach. First, we estimate a production function following the approach of Levinsohn & Petrin (2003) and a fixed a effects estimator. Second, we use the log of residuals from these estimations as dependent variables to investigate the relationship between productivity and export intermediary use.

The approach by Levinsohn & Petrin (2003) suggests to solve the simultaneity problem by using inputs (i.e. fuel or electricity) as a proxy for the unobserved productivity component <sup>13</sup>. We here use the real value of all miscellaneous inputs factors as a proxy for the unobserved productivity component and real-value added as dependent variable. Table 3 shows the results <sup>14</sup>. Again the hypothesis of constant returns to scale is not rejected.

Table 3: Production Function after Levinsohn and Petrin (2003)

	(1) LP
Log Material	0.391*** (0.030)
Log Labour	0.324*** (0.046)
Log Capital	0.374 (0.231)
Number of observations	1174
Test for constant returns to scale	0.707

Standard errors in parantheses

\*,\*\* and \*\*\* denote a 10, 5 and 1 percent significance level

The log of residuals from the estimations displayed in Table 3 and from a similar regression using the fixed effects estimator as dependent variables for the regressions in Table 4. Using OLS estimates

<sup>13</sup>See Levinsohn & Petrin (2003) and Petrin et al. (2004) for details on the methodology.

<sup>14</sup>Due to a violation of the constant returns to scale assumption human capital was not included.



we find after controlling for sector and time effects the following four major results.

Table 4: Regression results for TFP

	(1)	(2)
	logTFP(FE)	logTFP(LP)
Firm Age	0.006*** (0.002)	0.008*** (0.002)
Union	0.606*** (0.061)	0.218*** (0.066)
Exporter	0.418*** (0.098)	0.312*** (0.099)
Indirect Exporter	-0.106 (0.115)	-0.211* (0.127)
Number of observations	990	990
R-Squared	0.349	0.147

Robust standard errors in parantheses

\*, \*\* and \*\*\* denote a 10, 5 and 1 percent significance level

Constant term and full set of sector and time dummies included

First, all specifications show that older firms are more productive. Even though the coefficients are small there is evidence for learning effects when firms become older. Second, the results uniformly show that the fact that some or all workers are unionized is positively correlated with firm level productivity. Third, exporting firms are found to be more productive. Whether firms self-select themselves into the export market or if exporting causes productivity (learning by exporting) is not captured by our analysis. However, this question is addressed in Bigsten et al. (2004) who provide evidence for the 'learning by exporting' hypothesis using this data set. As we shall see the direction of causality between exporting and productivity is relevant when deriving policy implications of our findings.

Fourth, a dummy variable that has the value one if a firm exports through an intermediary is found to be negatively correlated with productivity. When total factor productivity measures that were obtained using the methodology of Levinsohn and Petrin (2003) are used as the dependent variable (column 2), this dummy shows a significant and negative coefficient. Since the exporter dummy covers all exporters (indirect and direct exporters) and the indirect dummy only indirect exporters the productivity premium for indirect exporters is the sum of both dummies. As can

be seen from Table 4 this premium is smaller for indirect exporters than for direct exporters but still positive. Hence, the hypothesis that low productivity firms tend to export indirectly through intermediaries is confirmed by our econometric analysis.

## 5 Summary and policy relevance

This paper investigates the relationship between export intermediary use and productivity. Following studies such as Das et al. (2007) one can argue that high market entry costs exist so that only high productivity firms will find it profitable to enter the export market. Hence, low productivity firms may prefer to export indirectly through export intermediaries that can be associated with lower market entry costs. We used a panel data set on Ghanaian firm of the years 1991 to 1997 that is available from the Center for the Study of African Economies at Oxford University to test the hypothesis that low productivity firms export indirectly through intermediaries. Preliminary descriptive statistics revealed that around 50% of the exports are indeed exported through intermediaries.

To investigate the relation between export intermediary use and productivity we used a two-step approach. First, we estimated a production function that takes simultaneity problems into account. We then computed the residuals from the estimations in Table 3 and used them as the dependent variable to investigate the relationship between export intermediary use and total factor productivity. Our econometric analysis confirmed the hypothesis that low productivity firms tend to export through intermediaries.

To highlight the complexity of the results and the role of 'learning by exporting' effects let us consider the following policy action. Knowing that low productivity firms export through intermediaries a government decides to introduce a subsidy for export intermediaries. As a consequence, less profitable firms can enter the export market. If there is a 'learning by exporting' effect there is no problem as the firms that recently entered the export market will become more profitable. However, if this is not the case it could happen that these firms which export indirectly crowd out the more efficient firms. This shows that policy implications of this paper are strongly dependent on assumptions such as the 'learning by exporting' effects.

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# Appendix

## Descriptive Statistics

Table 5: Mean export share for different trade intermediaries of *large* firms (>100 employees)

	1997	1995	1993	1992
Direct exports	44.87 (9.82)	71.43 (12.53)	57.14 (20.20)	66.67 (33.33)
Exports through government trading agencies	0.00 (0.00)	7.14 (7.14)	14.29 (14.29)	0.00 (0.00)
Exports through private trading agencies	48.17 (10.11)	21.43 (11.38)	28.57 (18.44)	33.33 (33.33)
Other	6.96 (4.97)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Observations	23	14	7	3

Standard errors in parentheses

Table 6: Average proportion of output that was exported (Export Intensity) by firm size

	1997	1996	1995	1994	1993	1992	1991
Export Intensity Large firms	32.68 (6.49)	27.84 (6.07)	33.58 (6.91)	31.92 (6.84)	16.67 (6.64)	10.33 (6.36)	14.35 (5.98)
Export Intensity All firms	11.13 (1.98)	10.21 (1.91)	11.36 (2.07)	11.36 (2.07)	6.08 (1.58)	3.43 (1.22)	2.69 (0.97)

Standard errors in parentheses