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Learning By Exporting: Evidence Based on Data of Knowledge Flows from Innovation Surveys in Estonia

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Learning by exporting: evidence based on data of knowledge flows from innovation surveys in Estonia

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Abstract

This paper studies learning-by-exporting, based on survey data of knowledge flow indicators. Most of the earlier related papers investigate the effects of exporting on productivity of firms, and often find little evidence of learning effects. This study looks more in detail into the mechanism of these effects. It investigates whether exporting is associated with increase in intensity of knowledge flows to the firm from the firm's clients, relative to other knowledge sources. I use measures of learning about the new technologies from two pooled innovation surveys and firm level exporting data of manufacturing firms in Estonia. Unlike the majority of earlier studies that use productivity data, I find evidence consistent with learning-by-exporting. Exporting in the past is associated with more learning from the firm's clients in next periods.

Keywords: exporting, learning, knowledge transfer, Central and Eastern Europe

JEL classification: F12, L1

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1. Introduction

By now there are many firm-level studies that try to find out whether there is evidence about learning-by-exporting. The majority of them find little evidence of it. See, for example studies by Wagner (2007), International Study Group on Exports and Productivity (ISGEP, 2008), Bernard and Jensen (1995, 2004) or Clerides *et al*. (1998). Also, most of the papers look at the effects on total factor productivity (TFP), but do not go in detail with analysis of the channels of the effects of exporting on TFP.[2]

Based on the existing literature it appears that exporters' performance premium (incl. higher productivity) can be mostly explained by the best performing firms self-selecting into exporting, as suggested by the new-new trade theory models (Helpman, Melitz and Yeaple 2004 and Melitz (2003)). Only a few papers find some evidence of effects of exporting on the productivity of firms, e.g. based on data from developing countries as in Blalock and Gertler (2004) and van Biesebrock (2005).

However, the shortage of findings of significant effects of exporting on productivity suggests that we should look more into the mechanism of the learning-by-exporting effects, especially the effects on direct measures of learning and knowledge flows. There is a clear shortage of papers based on firm level data that study the link between exporting and direct measures of knowledge transfer. An important exception is by Crespi *et al*. (2008) based on UK data, showing that exporting is significantly associated with subsequent learning from the clients of the firm.

[2] So far, the overwhelming share of firm-level evidence about the lack of learning-by-exporting effects is based on relatively noisy firm level measures of productivity, especially the TFP. The TFP is in these studies estimated often with the Levinsohn and Petrin (2003) or Olley and Pakes (1996) approaches that try to account for the simultaneity of inputs in the production function.

This paper adds to the literature by studying whether exporting is associated with direct measures of learning and knowledge transfer from the clients of the firm. The related earlier paper by Crespi *et al*. (2008) studies similar correlations, but they do not attempt to investigate whether their correlations might also imply effects. By using the instrumental variables approach, this paper endeavours to go somewhat beyond their analysis of correlations in investigating the effects of exporting. Of course, the chosen approach depends fully on the validity and strength of the instruments used. As in other studies using data of CIS surveys, one does not have some natural experiment at hand here. Therefore one cannot fully argue that the results, including these from the IV regressions, necessarily show the causal effects. However, it pays to investigate if the relationship between exporting and knowledge flows is robust to different estimation methods, and beyond the simple Probit or OLS models.

Whereas there is increasing number of papers that explore the exporting-innovation link (Damijan *et al*. 2008, Bratti and Felice 2009, Salomon and Shaver 2005, etc), there is, to the best of my knowledge, a dearth of empirical papers showing the relationship between exporting and indicators of knowledge flows or exporting and innovation-related co-operation.[3] My study of these issues covers firms in the manufacturing industry in Estonia during 1997-2004. The measures of learning about the new technologies stem from two pooled EU Community Innovation Surveys (CIS) of Estonia. The paper explores the exporting-learning link, based on pooled sample of CIS3 and CIS4 innovation surveys. In addition, it uses also firm level productivity and export status data of the population of firms from the Business Register of Estonia. The empirical analysis of firm level data relies here mostly on the instrumental

[3] A paper by Hanley (2004) based on UK data looks at a related question to innovation co-operation, the relation between exports and participation in information networks with other firms.

variables approach (2-stage least squares regressions), but also on standard ordered probit and bivariate probit models.

2. Literature Review

Empirical studies show that exporting firms have higher productivity than firms that sell their products only at their domestic market. It is also clear that the exporter premium is still found if a variety of other firm level determinants of productivity are taken into account (incl. firm size) (e.g. Bernard and Jensen 1999, 2004; Bernard *et al*. 2003; Clerides *et al*. 1998).

There is overwhelming econometric evidence suggesting that this correlation is largely due to the fact that only the relatively productive firms are able to start exporting (see Wagner *et al*. 2007 or Falvey and Yu 2005 for literature overview). This supports the predictions from recent new-new trade theory models (Helpman *et al*. 2004, Melitz 2003, Melitz and Ottaviano 2008), that emphasize the role of sunk costs of entry in determining the productivity threshold for successful entry into export markets. In these models only the relatively 'good' firms with high productivity are able to cover the sunk costs of exporting and enter the export markets. The relatively low-productivity firms will stay at their home market. The self-selection hypothesis is also quite plausible based on evidence from business press that stresses that firms often need to be successful at home before they can accumulate enough knowledge and experience to be successful in export markets.

Certainly, the causality can in fact run in the other direction as well, from exporting to subsequent increase in performance and productivity of the firms. This is the standard learning-by-exporting hypothesis: i.e. firms may learn as a result of exporting (Bernard and Jensen 2004). For example, exporters may benefit from the knowledge transfer from their buyers abroad, for example in the form of technical and other types of assistance. There may be increased need for quality upgrading to match the expectations and tastes of international clients. Hence, there is increased need for the product and process innovation and the innovation-related co-operation with the clients from abroad. Also a scale effect from simply having a larger market and therefore larger production volume may lower the average production costs of exporters compared to their domestic competitors (Falvey and Yu 2005).

Despite these effects outlined in theory, the empirical evidence about the causal link from exporting to better performance (higher productivity) is very limited, at best. There are many case studies that document incidents of learning-by-exporting. For example Ree, Ross-Larson, and Pursell (1984) discuss cases of learning-by-exporting in East Asia. However, the majority of firm level econometric studies find no significant learning-by-exporting effect, i.e. effect of exporting on performance of firms (Wagner *et al*. 2007).

Some papers that indeed find significant learning effects of exporting are by Greenaway and Kneller (2003) for UK, Blalock and Gertler (2004) for Indonesia and van Biesebrock (2005) for sub-Saharan Africa. It has been suggested that these learning effects may be stronger in developing countries (Blalock and Gertler 2004), as there is more scope for learning from foreign export markets in the case of exporters from the developing countries. At the same time, based on reasoning from FDI literature (e.g. Glass and Saggi 1998), one can argue that firms may need larger own absorptive capacity to learn from others. So, one might even expect larger effects of exporting on the firms in advanced economies, that have more knowledge and other firm-specific assets than firms in developing countries. Unfortunately, direct data to study knowledge transfer through exporting is rarely available and therefore the standard approach is to use the productivity data instead.

There are fewer papers on links between exporting and innovation than on exporting and productivity. Recently the number of such studies has been increasing. Salomon and Shaver (2005) show learning-by-exporting effects using data of Spanish manufacturing firms. Their paper finds that exporting is associated with the increase in subsequent probability of the firms to innovate. Also Damijan *et al*. (2008) find, based on data from Slovenia, that exporting leads to productivity improvements, through process innovation. The causality can, similarly to the productivity case, run both ways between exporting and innovation. The effects can also work from innovation to subsequent export market entry, as innovation may make it easier to cover the sunk costs of entry to a foreign market. The link from innovation to export market entry has been studied by Cassiman and Martinez-Ros (2007) who find that engaging in product innovation increases the probability of starting to export. Similar effects are found by Becker and Egger (2007) based on German firm level data. Damijan *et al*. (2008) use Slovenia's firm level data and propensity score matching approach to try to account for endogeneity of the innovation activities, but find no evidence that innovation is a significant factor of export propensity.

There is a clear shortage of studies investigating effects of exporting on direct measures of knowledge flows. A significant exception is Crespi *et al*. (2008) who use UK firm level data from two CIS surveys. Their indicators of the intensity of knowledge flows include the knowledge flows from buyers, suppliers, competitors of the firm, consultants, conferences and trade fairs, universities and research institutes. Crespi *et al.* (2008) find that the firms that exported in past periods are more likely to report increased learning from their buyers, relative to other knowledge sources. In addition, they show that increased learning from buyers is associated with higher productivity growth. Their results provide some support for the learning-by-exporting hypotheses. However, their paper studies correlations, not the causal effects of exporting.

3. Data and Descriptive Statistics

For the analysis of effects of exporting status on the subsequent intensity of knowledge sourcing I employ a sample of Estonia's firms covered both by the CIS3 and CIS4 innovation surveys. Estonia's Community Innovation Surveys (CIS) are executed every couple of years. The survey framework is based on a common innovation survey performed in different EU countries.

The CIS3 covers period 1998-2000 and CIS4 period 2002-2004. In these surveys there are, respectively, 1205 and 762 domestic owned manufacturing firms. Importantly, there is a significant overlap between the two CIS surveys in terms of respondents.

The response rates in the Estonian CIS surveys are rather high, 74 per cent in CIS3 and 78 per cent in CIS4 (Terk *et al*. 2007). For the purposes of my econometric analysis the CIS3 and CIS4 data have been merged into a short two-period panel. This short panel has been previously used in Masso and Vahter (2008) and Vahter (2010).

My study combines the information from innovation surveys with yearly indicators of the firms' export status from the Statistical Office of Estonia, and the database of financial indicators of the firms from the Business Registry of Estonia. The export data stem from the database of firm level yearly indicators of exporting and importing from the Statistical Office of Estonia. The yearly data on exporting is available for all the manufacturing firms in Estonia during 1997-2002.

The descriptive statistics of key variables are provided in Table 1. Note, that I concentrate on domestic owned firms, in order not to mix up the effect of ownership changes with that of exporting (exporting and FDI are highly correlated). Based on Estonia's firm level data on productivity and innovation, one can see from Table 1 that exporters have higher performance indicators and higher innovation propensity than other local firms. This is the standard result in the literature. See e.g. Bernard and Jensen (1999) on productivity, Damijan *et al*. (2010) on innovation. Also, Estonia's exporters are larger, more capital intensive, more likely to have foreign owners and somewhat older than the rest of the firms. The share of exporters is rather high in Estonia, due to the small size of the home economy. During the studied period around 40 per cent of all firms in the manufacturing sector exported a share of their output. This number is much higher in Estonia than in the USA, where only 3.1 per cent of firms exported in year 2000 (Bernard and Jensen 2009). At the same time it is less than in Sweden, where about 70 per cent of firms in the manufacturing industry engage in exporting (Lööf 2009).

Table 1. Descriptive statistics, merged CIS3 and CIS4 dataset, domestic owned firms in the manufacturing industry

	Exporters		**Non-exporters**	
Variable	Mean	Std. Dev.	Mean	Std. Dev.
Ln(TFP)	9.876	1.843	9.038	1.799
Ln(Value added per employee)	11.328	0.766	10.987	0.827
Ln(Sales per employee)	12.214	0.928	11.809	0.903
Ln(Capital per employee)	10.222	1.492	9.584	1.486
Ln(Size)	3.462	1.098	2.648	0.968
Age (in years)	1.716	0.65	1.688	0.672
Product innovation (0/1)	0.276	0.447	0.146	0.352

Process innovation (0/1)	0.246	0.431	0.13	0.337
Learning from suppliers is of high importance (0/1)	0.118	0.323	0.067	0.25
Learning from clients is of high importance (0/1)	0.12	0.325	0.068	0.253
Learning from competitors is of high importance (0/1)	0.051	0.219	0.02	0.139
Learning from within the same corporation is of high importance (0/1)	0.165	0.371	0.102	0.303
Innovation-related co-operation with clients of the firm (0/1)	0.128	0.008	0.055	0.009
Innovation-related co-operation from any of the sources (within own corporation, from clients' suppliers, universities, etc.) (0/1)	0.179	0.009	0.102	0.0115
Learning from clients – average learning from all other knowledge sources* : ($L_{it}^{CLIENTS} - L_{it}^{AVERAGE}$)	0.379	0.778	0.178	0.636
Average learning $L_{it}^{AVERAGE}$	0.675	0.763	0.398	0.635
Learning from suppliers – average learning from all other knowledge sources (other than suppliers)	-0.071	0.775	-0.058	0.715

Note: Period 1997-2004. Data sources: CIS3 and CIS4 innovation surveys (years 1998-2000 and 2002-2004), the Business Registry data of domestic-owned manufacturing firms in Estonia. TFP is calculated with the Levinsohn-Petrin (2003) method, allowing the coefficients of capital and labour in the production function to differ for each NACE 2-digit industry. *from suppliers, competitors, from within own corporation, conferences, universities and research institutes, academic publications, consultants. These ($L_{it}^{CLIENTS}$, $L_{it}^{AVERAGE}$, etc.) are all ordered variables that take value 0 for answer that the particular type of knowledge sourcing (i.e. learning) is 'not used', value 1 for answer that it is of 'low importance' for the firm, value 2 for 'medium importance' and value 3 for 'high importance'.

Table 2. Average yearly transitions matrix between export and non-export status (all manufacturing firms)

		Final state:	
		Exporter	Non-Exporter
	Exporter	86.3%	13.7%
Initial state:	Non-Exporter	11.8%	88.2%

Note: Period 1997-2002. Data source: data from the Statistical Office of Estonia, all manufacturing firms in Estonia.

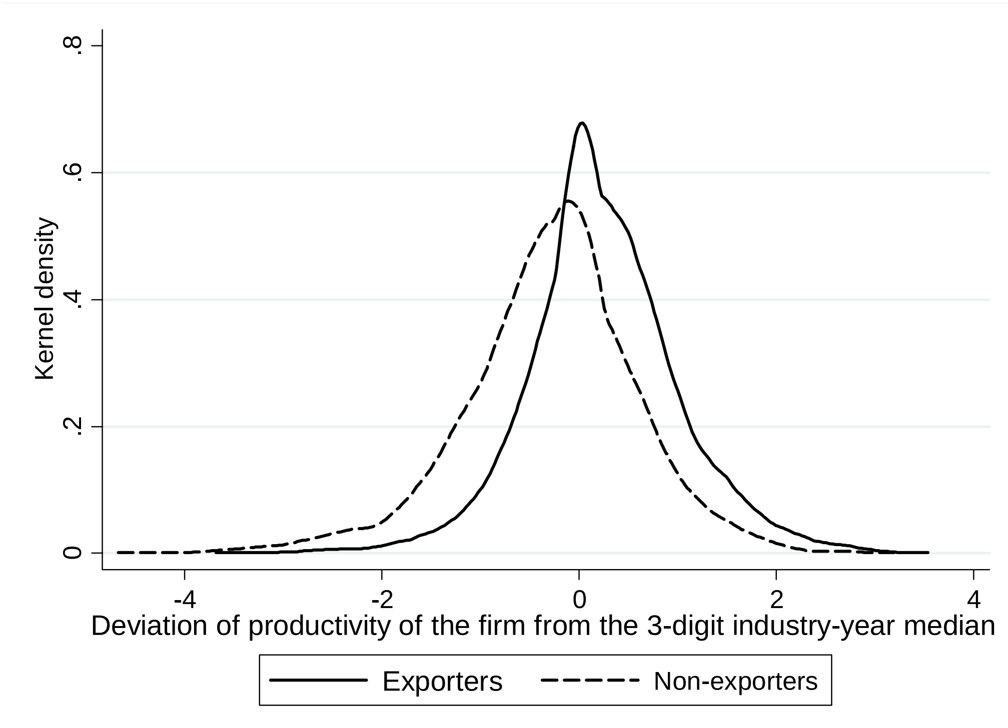

Figure 1. The distribution of log of value added per employee (deviation from the 3-digit industry-year median): exporters (solid line) vs non-exporters (dotted line), kernel density, period 1997-2002.

Source: merged data of exporting and firm productivity, respectively from the Statistical Office of Estonia and the Business Registry of Estonia.

Table 3. Productivity premium of exporters, all manufacturing firms during 1997-2002

	Log TFP	Log (sales per employee)	Log (value added per employee)
Coefficient of Export dummy in fixed effects (FE) regression	0.111*** (0.022)	0.275*** (0.015)	0.165*** (0.0185)
Coefficient of Export dummy in OLS regression	0.221*** (0.024)	0.576*** (0.017)	0.528*** (0.016)

* Both simple regression models include log of firm size and year dummies as additional controls. OLS includes also 2-digit industry dummies (note that these are absorbed by firm level fixed effects in the FE model). Source of data: firm level export database of the Statistical Office of Estonia; firm level database of Estonia's Business Registry. Years: 1997-2002. * significant at 10 per cent; ** significant at 5 per cent; *** significant at 1 per cent level.

As evident from the Table 2 above, exporting is highly persistent with 88 per cent of the firms that export in one year will continue this in the next year. Firms that do not export are most likely to stay non-exporters.

I have shown in previous tables of unconditional comparison of means that exporters have both higher labour productivity and also higher TFP than the rest. As can be seen from Figure 1 also the different quantiles of the productivity distribution of exporters lie to the right of the same quantiles of the productivity distribution of non-exporters.

A next step here is to investigate how large is the average exporter premium if one accounts for some other control variables, including 2-digit industry effects and the size of the firm. This conditional exporter premium, based on standard OLS regression models (with industry effects and size included as controls), is 22 per cent in the case of TFP, 58 per cent in the case of sales per employee and 53 per cent in the case of value added per employee. Once I account for firm-specific fixed effects, this exporter premium diminishes, for obvious reasons. Notably, the exporter premium is still large, even in international comparison (e.g. see Wagner *et al.* 2007 results). Based on standard fixed effects regression, starting to export is associated with 11 per cent higher TFP and 17 - 28 per cent higher labour productivity, depending on the indicator of productivity.

In the case of CIS3 and CIS4 data one could clearly see from previous Table 1 that exporting is associated with more innovation and more knowledge sourcing. Innovation indicators of exporters are about twice the ones of local firms. The same holds for several knowledge flow indicators, especially in the case of knowledge flows from clients of the firm. If one takes a look at innovation related co-operation indicators, then a similar pattern is evident: exporters co-operate more with other firms during their innovation process. What is most important in the context of this study is that exporters tend to learn on average more from their clients than from the rest of knowledge sources (see Table 1).

4. Methodology

My approach to find out the effects of exporting on the intensity of knowledge-sourcing relies on the use of instrumental variables. It extends the approach of Crespi *et al*. (2008) who studied the correlation between exporting and the subsequent intensity of knowledge sourcing from clients of the firm.

The empirical analysis employs the firms' answers in the EU CIS innovation survey to a question about the importance of different types of knowledge flows. In CIS surveys the firms are asked to: "*Indicate the sources of knowledge and information used in your technological innovation activities, and their importance.*" The answer choices for each type of source of knowledge are: "*importance of the source is* i) *high,* ii) *medium,* iii) *low,* iv) *not used*." Knowledge sources listed in the questionnaire are the following: *from within the enterprise, from* *suppliers, from customers, from competitors, (and a number of other sources have been listed as well*[4]*, but are seldom indicated as important by firms in Estonia).*

Based on the answers of the firms, an ordered variable is created for each knowledge source, as the four possible answer choices have a natural ordering. This ordered variable takes value 0 for answer that the particular knowledge source is 'not used', 1 for answer that it is of 'low importance' for the firm, 2 for 'medium importance' and 3 for 'high importance'.

In general I am interested in the relationship between learning from clients and exporting status of firms, as outlined in the equation below:

$$L_{it}^{CLIENTS} = f(EXP_{it-1}, X_{it-1}), \qquad (1)$$

where intensity of learning from clients ($L^{CLIENTS}$, that takes 4 values as above) is a function of firm's exporting status (*EXP*, that is equal to 1 for exporters and 0 for non-exporters) and other determinants of learning X (e.g. proximity to different knowledge sources, etc.). Here *i* denotes firm and *t* the time period.

However, as also pointed out by Crespi *et al*. (2008), there are two major econometric problems in estimating the relationship between exporting and learning in Equation (1). These are: a) endogeneity and b) unobserved factors. The causal relationship between learning and exporting can run also from increased learning to entry into exporting. Hence, one could in fact write the current exporting as a function of the past learning:

$$EXP_{it} = f(L_{it-1}^{CLIENTS}, L_{it-1}^{OTHER\_SOURCES}, M_{it-1}), \qquad (2)$$

[44] Also: knowledge sourcing from universities and research institutes, consultants, conferences, scientific publications.

where the export status of the firm depends on the intensity of knowledge sourcing (e.g. in previous periods) from firm's clients ($L^{CLIENTS}$), from other sources of knowledge ($L^{OTHER\_SOURCES}$), and other determinants of exporting *M*. Also there may be unobserved firm level variables *Z* that affect both the intensity of learning from various sources in general and the export status of the firm. These variables *Z* could include productivity and profitability of firms, managerial excellence of firm's managers, skills and education of firm's workforce (i.e. absorptive capacity of the firm).

Because of these standard problems of estimation, simply using an OLS regression with lagged exporter dummy as the key explanatory variable in estimating the Equation (1) would not enable us to identify the causal effects of exporting. One needs a source of exogenous variation in the exporting dummy (*EXP*) to be able to identify the causal effects. Natural experiments or instrumental variables may serve as the standard sources of exogenous variation. As I do not have natural experiments at hand here, I have to find a valid and strong instrumental variable for firm's export status. One needs to find an instrument that predicts exporting status of the firm but does not otherwise (directly) affect learning from clients.

My approach, apart from the attempt to identify the learning-by-exporting effect by choosing a suitable instrument, is largely similar to Crespi *et al*. (2008). One can account for the unobservable variables in the following way. I expect that exporting affects the learning from firm's (foreign) clients significantly more than the learning from other knowledge sources. In order to test this proposition one can, instead of Equation (1), look at the effect of exporting on the difference between the indicator of the learning from clients ($L^{CLIENTS}$) and the average of indicators of all other main types of learning ($L^{AVERAGE}$). $L^{AVERAGE}$ is the average of learning from suppliers, competitors, from within firm itself, and other sources of learning mentioned in the

CIS survey[5]. This allows one to investigate whether exporting is associated with the increase in learning from clients relative to all other sources of learning (i.e. sources available from the CIS dataset):

$$(L_{it}^{CLIENTS} - L_{it}^{AVERAGE}) = \beta_0 + \beta_1 EXP_{it-1} + \lambda_t + \gamma_j + \pi_R + \varepsilon_{it}, \qquad (3)$$

were *j* denotes sector, *R* region. The equation includes also time effects λ_t, 2-digit NACE sector effects γ_j and region effects π_R. In the empirical analysis I account for 5 different large regions within Estonia.

The transformation ($L_{it}^{CLIENTS} - L_{it}^{AVERAGE}$) should account for these unobservables that affect all kinds of learning in a similar way. Such variables could be the general skills and education of managers and employees of the firm. By additionally using instrumental variables I try to go beyond the standard analysis of correlations. In fact, the transformation of the dependent variable in Equation (3) helps us also to account for the endogeneity problem as it enables to use some instruments that would not be valid instruments if simply ($L^{CLIENTS}$) were used as dependent variable (as in Equation 1).

To identify the influence of exporting on learning from clients relative to average learning, one needs an instrument that predicts changes in exporting status, but is otherwise unrelated to changes in intensity of knowledge flows from clients relative to other knowledge sources. I employ the lagged TFP or firm's distance to local 3-digit industry's productivity frontier as instruments for its export status (exporter vs non-exporter). These instrumental variables would

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5 I include knowledge sourcing also from consultants, universities, trade fairs and conferences in calculating this average learning indicator. As a robustness check I have experimented with different ways of calculating the average learning indicator, by concentrating only on the 4 most important knowledge sources. I chose 4 main types of knowledge flows in the robustness exercise because other types of knowledge flows are only seldom indicated as important by Estonia's firms (esp. in the case of learning from universities). In the case only these 4 types of knowledge flows are incorporated into analysis, the results are rather similar to the results shown in the paper.

predict future export status of a firm in Estonia, as firms with higher productivity are able to cover the sunk costs related to exporting. At the same time, productivity of firms is not likely to directly affect the relative importance of knowledge sourcing from clients relative to all other knowledge sources.

One might expect that firm's productivity or distance from the best practice frontier affects firm's general ability to learn from many different kinds of knowledge sources. It affects ability to learn from clients, from suppliers, competitors, universities, etc. Note that there is no strong reason to believe that higher productivity of the firm would increase only learning from clients, but at the same time not learning from other knowledge sources. Therefore past productivity or firm's distance from the local productivity frontier at least seems to be potentially suitable instrumental variable in this case. Again, productivity in previous periods may affect the exporting decision of the firm, but does not necessarily directly affect the difference between learning intensity from clients and learning intensity from other types of knowledge sources.

The short summary of my empirical approach is the following. By using instrumental variables I try to account for the endogeneity bias in estimating the effects of exporting. By using the deviation of learning from clients from the average level of learning from all possible sources (suppliers, competitors, etc), I account for the unobservable fixed factors that affect learning from clients and from the rest of sources in a similar way.

5. Results

This section shows the results on the relationship between exporting and knowledge flows. At first some simple correlations based on innovation survey data are presented. It appears that exporting is associated with increased intensity of knowledge sourcing: with increased knowledge sourcing from clients, competitors and from within own corporation itself (Table A1 in Annex 1). However, exporting seems to be especially correlated with knowledge sourcing from clients. One can conclude this, as the marginal effects of exporting on the probability that the knowledge flows from firm's clients are of 'high importance' for the firm is about twice as high as in the case of the knowledge sourcing from competitors or from within own corporation. Similar positive relationship with previous exporting is present also in the case of innovation-related (formal) co-operation activities and innovation indicators (see Table A2 and A3 in Annex 1). In comparison to purely domestic firms, exporters tend to co-operate more with outside parties during their innovation process. Among the various co-operation partners they tend to co-operate more with the clients of the firm. Exporters are more likely to engage in product or process innovation than the rest of the firms.[6]

Table 4. Knowledge sourcing from clients: marginal effects for different answer choices

Panel of CIS3 and CIS4: Method: ordered probit	(1)	(2)	(3)	(4)
Answer choice:	Not used	Low importance	Medium importance	High importance
Export dummy$_{jt-1}$	-0.08*	0.007*	0.038*	0.035*
	(0.031)	(0.003)	(0.15)	(0.013)
Sector dummies	Yes	Yes	Yes	Yes
Region dummies	Yes	Yes	Yes	Yes
Survey wave dummy (CIS3 or CIS4)	Yes	Yes	Yes	Yes
Number of obs.	872			
Log likelihood	-1317			

Note: Estimation by ordered probit, marginal effects for each answer choice are reported. Two survey waves included (CIS3 and CIS4), i.e. panel of two time periods (1998-2000 and 2002-2004) is used. Exporting is associated with higher probability that the knowledge sourcing from clients is of high or medium importance for the firm and it lowers the probability that the knowledge sourcing from clients is not used at all by the firm. * significant at 10 per cent; ** significant at 5 per cent; *** significant at 1 per cent level. Period *t-1* indicates year 1997 in the case of CIS3 survey and 2001 in the case of CIS4.

[6] Table A2 in Annex 1 shows this based on a probit model. As the decisions to engage in the product or the process innovation are likely to be related, I have used a bivariate probit specification to investigate the link between exports and innovation. We see that firms that exported at time t-1 (1 year before the CIS survey) are at time t on average 9.4 per cent more likely to engage in product innovation and 7 per cent more likely to engage in process innovation than others.

So, far I have used binary indicators that take value 1 if a particular source of knowledge is of high importance for the firm. Table 4 shows the marginal effects of exporting on knowledge sourcing from clients if one uses the more detailed aspects of answers from the CIS. The respondents could choose among four different answer choices for each question on knowledge sourcing. As evident from Table 4, exporting is associated with increased probability that the respondent attaches either high or medium importance to the knowledge flows from the clients. Also, being an exporter lowers the probability that the knowledge sourcing from the clients is not used at all by the firm.

As a next step I endeavour to go beyond the simple correlation analysis and try to account for the potential endogeneity of the exporting status of the firm. The instrumental variables (2SLS in this case) framework is a standard and suitable framework for that purpose, as there are no clear natural experiments at hand. Obviously the identification of effects relies fully on the quality of theinstruments used.

The first stage of the estimated 2-stage least squares regression (2SLS) is given in Table 5. I use the firm's TFP or distance from the sector's productivity frontier at period *t-1* as main instrument for its exporting status at time *t*. It appears, as expected, that the firm's TFP and distance to productivity frontier are significantly correlated, at 1 per cent significance level, with export status of the firm in the next period (see Column 1, 2 and 3). The coefficient of lagged TFP is significant and positive in Table 5. Thus, higher TFP predicts exporting. Similarly, smaller distance to the local productivity frontier predicts exporting in next periods. It seems unlikely that the productivity instruments used would directly affect the difference between learning from clients and learning from other main knowledge sources. As an additional instrument I include also the size of the firm into one of the specifications in order to test the robustness of the results. (This variable turns also out to be a good predictor of the future export decision of the firm.) Note that I use the linear probability model (LPM) to estimate the first stage in Table 5, not a probit or logit model. As outlined by Angrist and Pischke (2009), one should not use a non-linear first stage in 2SLS approach. Only OLS estimation will yield first stage residuals that are not correlated with the fitted values of the key endogenous variable and covariates.

Table 5. First stage of the 2SLS approach: relationship between export status and previous period's productivity of firms

	(1)	(2)	(3)	(4)
Dep. var.:	Export dummy	Export dummy	Export dummy	Reduced form regression: $L_{it}^{CLIENTS} - L_{it}^{AVERAGE}$
Log TFP_{t-2}			0.132***	0.05*
			(0.02)	(0.027)
Log $Size_{t-2}$		0.123***		
		(0.015)		
Log Distance to productivity frontier $_{t-2}$	-0.102***	-0.12***		
	(0.021)	(0.023)		
Year dummies	Yes	Yes	Yes	Yes
Industry and location fixed effects	Yes	Yes	Yes	Yes
Period (CIS4) dummy	Yes	Yes	Yes	Yes
Number of observations	891	891	891	891
F-test of instrumental variables	23.86	53.18	42.4	-
	(p=0.00)	(p=0.00)	(p=0.00)	
Weak identification test critical values (from Stock and Yogo 2005):				
Maximal 10 % allowed IV bias	16.38	19.93	16.38	-
Maximal 20 % allowed IV bias	6.66	8.75	6.66	-
Shea partial R2	0.066	0.116	0.066	-
Sargan overidentification test (and p-value)		0.257	-	-
		(0.612)		

Note: Merged CIS3 and CIS4 surveys. Method: first stage of 2SLS, LPM. Domestic-owned manufacturing firms. Labour productivity frontier has been calculated for each 3-digit NACE industry. Distance to productivity frontier is calculated for each firm based on their labour productivity (value added per employee) data, as a difference between ln(local frontier productivity in a 3-digit sector) and ln(firm's own productivity). * significant at 10 per cent; ** significant at 5 per cent; *** significant at 1 per cent level. Period *t-2* indicates year 1996 in the case of the CIS3 and 2000 in the case of the CIS4.

A standard issue in the case of the IV approach might be weak identification (Murray 2006). It occurs if instruments are only weakly correlated with the endogenous regressor, this would cause the estimators to perform poorly. A standard test diagnostic of weak instruments is the F-statistic of significance of instruments in the first stage of the 2SLS (Angrist and Pischke 2009). Stock, Wright and Yogo (2002) suggest a rule of thumb that this F-statistic should be at least as large as 10. Then one can often conclude that the instruments are not weak. As evident from Table 5, the F-statistic of the significance of instruments lies between 24 and 53, thus significantly above 10 and also significantly larger than the critical values calculated in Stock and Yogo (2005).

The last column of Table 5 shows the reduced-form relationship between difference of the learning from clients from the average learning from all different sources ($L_{it}^{CLIENTS} - L_{it}^{AVERAGE}$) and lagged TFP. The lagged TFP of the firm is positively associated with ($L_{it}^{CLIENTS} - L_{it}^{AVERAGE}$). Given the strong assumption that the exclusion of TFP from the relative learning equation (in Table 6) is valid, the combination of positive first-stage coefficient on TFP and a positive reduced-form coefficient implies that the IV estimate of the effect of exporting on relative learning from clients will be positive (see also e.g. Angrist and Pischke 2009, Murray 2006 for discussion on the 2SLS approach).

The results from the second stage of the 2SLS that describes the effect of exporting on relative intensity of learning from clients are shown in Table 6. The estimates of the standard OLS are provided for comparison as well. Columns 1-3 endeavour to address the endogeneity of exporting (to an extent) and report the 2SLS results. Column 4 shows the estimates from the standard OLS model for comparison.

Table 6. Effects of exporting on knowledge flows from clients (relative to other knowledge sources), OLS and 2-SLS results

	(1)	(2)	(3)	(4)	(5)	(6)
Method:	2-SLS	2-SLS	2-SLS	OLS	OLS	2-SLS, IV
Dep. var:	$L_{it}^{CLIENTS} - L_{it}^{AVERAGE}$	$L_{it}^{CLIENTS} - L_{it}^{AVERAGE}$	$L_{it}^{CLIENTS} - L_{it}^{AVERAGE}$	$L_{it}^{CLIENTS} - L_{it}^{AVERAGE}$	Log TFP_{ijt}	$L_{it}^{SUPPLIERS} - L_{it}^{AVERAGE}$
$Exporting_{it-1}$(E)	0.538*	0.392*	0.432	0.184***	0.224***	0.08
	(0.284)	(0.182)	(0.281)	(0.036)	(0.047)	(0.259)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Instrumented terms	Yes	Yes	Yes	No	No	Yes
Industry and location effects	Yes	Yes	Yes	Yes	Yes	Yes
Period (CIS4) dummy	Yes	Yes	Yes	Yes	Yes	Yes
Type of instruments (lagged by 2 years)	Distance to 3-digit productivity frontier	Distance to 3-digit productivity frontier , log Size	Log TFP	-	-	Log TFP
Additional lagged controls in productivity equation					Log Size, Age, Herfindahl index (at 3-digit NACE sector level)	
Number of obs.	891	891	891	1151	1610	870
R^2	0.194	0.252	0.242	0.05	0.89	0.13
Sargan overidentification test (and p-value)		0.257 (0.612)	-	-	-	-

Note: merged CIS3 and CIS4 surveys, domestic owned manufacturing firms. Heteroscedasticity robust standard errors are in parentheses. Period t-1 is year 1997 in the case of CIS3 (CIS 3 covers period 1998-2000) and year 2001 in the case of CIS4 (CIS4 covers period 2002-2004). * significant at 10 per cent; ** significant at 5 per cent; *** significant at 1 per cent level. Period *t-1* indicates year 1997 in the case of CIS3 survey and 2001 in the case of CIS4.

Once we try to account for endogeneity of exporting, the coefficient of exporting dummy becomes much larger compared to the standard OLS (compare Columns 1, 2 and 3 with Column 4). The OLS coefficient of exporting dummy is 0.184. The same coefficient in the IV model is, depending on the choice of instruments, between 0.392 and 0.538. However, note that the IV models have, as expected, also higher standard errors. Therefore, the effect of exporting on relative importance of the knowledge flows from clients is statistically significant only at 10 per cent level.

The effect is statistically significant only if: i) firm's distance from the productivity frontier (at time t-2), or ii) the firm's distance from the productivity frontier and the size of the firm are used as instruments. If only log TFP is used, then the effect is positive, but not statistically significant. Based on the Sargan test statistics and their p-values, the IV model with more than one instrument does not seem to be over-identified. Hence, we can conclude that there seems to be some evidence (but not very strong) based on Estonia's innovation survey data that exporting may be indeed associated with knowledge transfer, i.e. learning-by-exporting.

Exporting increases the relative intensity of learning from firm's customers, relative to other sources of learning. This result confirms the correlations found previously based on UK innovation data in Crespi *et al*. (2008). Provided the validity of the instruments used here, we can argue that our evidence might show not only correlations, but possibly also the effects of exporting. Also, the magnitude of the effect is large. The sample average of the indicator $L_{it}^{CLIENTS} - L_{it}^{AVERAGE}$ is 0.318. The coefficient of the exporting dummy in regressions with $L_{it}^{CLIENTS} - L_{it}^{AVERAGE}$ as a dependent variable took values between 0.392 and 0.538.

Columns 5 and 6 of Table 6 check whether the results found here may be spurious. I estimate a simple OLS regression where next period's TFP is regressed on previous period's dummy of export status. There is a positive correlation between these two variables. Column 6 shows the effect of exporting on relative learning from suppliers. Note that in this case we do not find similar effect of exporting as we did in the case of relative learning from clients. This supports the idea that exporting may indeed particularly enhance the learning from the clients of the firm.

6. Conclusions

Estimating the effects of exporting is difficult. Therefore, no study to date (including this one) provides definitive econometric proof of the causal effects of exporting on direct measures of the knowledge flows. However, this paper has endeavoured to go beyond simple analysis of correlations and to provide some evidence that, given the quality of instrumental variables, might show us the effects of exporting on the learning from firm's clients. Using firm level data from Estonia, and in some specifications also the IV estimates, I find a significant association between exporting and learning from clients relative to other knowledge sources. At the same time, this result is statistically significant only at 10 per cent level.

Longer time series than the two-period panel of CIS3 and CIS4 surveys that are used here, would be particularly useful for study of the causal effects. Also, it would be useful to have a significantly clearer identification of the effects of exporting than in this paper, e.g. by using some natural experiment that causes exogenous variation in firms' export status. Unfortunately, such clear natural experiments are only rarely available.

References

Angrist, J. and Pischke, J. (2009), Mostly Harmless Econometrics. An Empiricist's Companion. Princeton University Press, 373 p.

Aw, B.Y., M.J. Roberts, T. Winston (2005). The Complementary Role of Exports and R&D Investments as Sources of Productivity Growth. NBER Working Paper No. W11774.

Becker, S. and P. Egger (2007). Endogenous Product Versus Process Innovation and a Firm's Propensity to Export. CESIFO Working Paper No. 1ef906

Bernard, A. B. and Jensen, J. B. (1999). "Exceptional Exporter Performance: Cause, Effect, or Both?", *Journal of International Economics*, 47, 1-25

Bernard, A. B., Eaton, J., Jensen, J. B. and Kortum, S. (2003), "Plants and Productivity in International Trade", *American Economic Review*, Vol.93, No 4.

Bernard, A. B. and Jensen, J. B. (2004), "Exporting and Productivity in the USA", *Oxford Review of Economic Policy*, 20, 343-357.

Blalock, G. and Gertler, P. J. (2004). "Learning from exporting revisited in a less developed setting," *Journal of Development Economics*, 75(2), 397-416,

Bratti , M., Felice, G. (2009). Exporting and Product Innovation at the Firm Level. Mimeo.

Clerides, S. K.; Lach, S. and Tybout, J. R. (1998). "Is Learning by Exporting Important? Micro-Dynamic Evidence from Colombia, Mexico, and Morocco," *The Quarterly Journal of Economics*, MIT Press, vol. 113(3), pages 903-947,

Cassiman B. and E. Martinez-Ros (2007). Product Innovation and Exports. Evidence from Spanish Manufacturing. IESE Business School, mimeo.

Crespi, G., Criscuolo, C., Haskel, J. (2008). "Productivity, Exporting and the Learning-by-Exporting Hypothesis: direct Evidence from UK firms." *Canadian Journal of Economics*, 41(2), 619-638

Damijan, J. P., Kostevc, Č. and Polanec, S. (2008). From Innovation to Exporting or Vice Versa? Causal Link between Innovation Activity and Exporting in Slovenian Microdata (2008). Available at SSRN: http://ssrn.com/abstract=1131156

Falvey, R. and Yu, Z. (2005). Exporting and Productivity Growth: theory. In Görg, Greenaway, Kneller (eds.) Globalisation and Productivity Growth. Pp 117-135.

Glass, A. and Saggi, K. (1998). "International Technology Transfer and the Technology Gap." *Journal of Development Economics* 55, 369–398.

Hanley, E. (2004). "Exports, Linkages and Innovation", University of Nottingham Occasional Paper 2004-8.

Helpman, E., Melitz, M. and Yeaple, S. (2004). "Export Versus FDI with Heterogeneous Firms," *American Economic Review*, Vol. 94(1), pp. 300-316.

International Study Group on Exports and Productivity (ISGEP), 2008. "Understanding Cross-Country Differences in Exporter Premia: Comparable Evidence for 14 Countries," *Review of World Economics*, 144(4), 596-635.

Keller, W. (2004). "International Technology Diffusion, "*Journal of Economic Literature* Vol. 42, No. 3 (Sep., 2004), pp. 752-782

Levinsohn, J. and Petrin, A. (2003). "Estimating Production Functions Using Inputs to Control for Unobservables." *Review of Economic Studies* 70 (2), 317–341.

Lööf, H. (2009). Are Services Different Exporters. Mimeo.

Masso, J., Vahter, P. (2008). "Technological Innovation and Productivity in Post-Transition Estonia: Econometric Evidence from Innovation Surveys", European Journal of Development Research, 20 (2), 240–261.

Melitz, M. J. (2003). “The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity.” *Econometrica*, 71(6): 1695–1725.

Melitz, M. and G. Ottaviano (2008). "Market Size, Trade, and Productivity." *Review of Economic Studies*, 75(1): 295–316.

Murray, M., (2006). "Avoiding Invalid Instruments and Coping with Weak Instruments." *Journal of Economic Perspectives* 20(4), 111–132.

Olley, S. G. and A. Pakes (1996). “The Dynamics of Productivity in the Telecommunications Equipment Industry.” *Econometrica* 64 (6): 1263–1297.

Salomon R.M. and J.M. Shaver (2005). Learning by Exporting: New Insights from Examining Firm Innovation. *Journal of Economics and Management Strategy*, 14 (2): 431-460.

Stock, J., Wright, J. and Yogo, M. (2002). “A Survey of Weak Instruments and Weak Identification in Generalized Method of Moments.” *Journal of Business and Economic Statistics* 20(4), 518–529

Stock, J. H. and Yogo, M. (2005). Testing for Weak Instruments in Linear IV Regression. **In D.W.K. Andrews and J.H. Stock, eds.** Identification and Inference for Econometric Models: Essays in Honor of Thomas Rothenberg. Cambridge: Cambridge University Press, 2005, 80–108.

Van Beveren, H., Vandenbussche, H. (2009). Exports, innovation and productivity: firm-level evidence for Belgium. kuleuven.be 2009, mimeo.

van Biesebroeck J. (2005). “Exporting raises productivity in sub-Saharan African manufacturing firms.” Journal of International Economics, 67(2), 373 - 391.

Máñez-Castillejo, J. A., Rochina, M. E. (2009). Self-Selection into Exports: Productivity and/or Innovation? *Applied Economics*.

Vahter, P. (2010). Does FDI spur Innovation, Productivity and Knowledge Sourcing by Incumbent Firms? Evidence from Manufacturing Industry in Estonia. U. Of Nottingham, GEP centre research paper No. 2010/09.

Wagner, J. (2007). "Exports and Productivity: A Survey of the Evidence from Firm-level Data," The World Economy, vol. 30(1), pages 60-82,

Rhee, Y., Ross-Larson, B., Pursell, G. (1984). *Korea's Competitive Edge: Managing Entry into World Markets.* Baltimore: John Hopkins U. Press for World Bank.

Annex. The relationship between exporting, innovation and innovation-related co-operation

Table A1. Correlation between exporting and direct indicators of knowledge flows to the domestic firms

Panel of CIS3 and CIS4:	(1)	(2)	(3)	(4)
Method:	Probit	Probit	Probit	Probit
Dep.var.:	Knowledge sourcing from Competitors	Knowledge sourcing from Suppliers	Knowledge sourcing from Clients	Knowledge sourcing from within own corporation
Export dummy$_{jt-1}$	0.021***	0.019	0.041**	0.02*
	(0.007)	(0.015)	(0.015)	(0.01)
Sector dummies	Yes	Yes	Yes	Yes
Region dummies	Yes	Yes	Yes	Yes
Survey wave dummy (CIS3 or CIS4)	Yes	Yes	Yes	Yes
Number of obs.	1210	1210	1210	1210
Log likelihood	-270	-546	-550	-322.4

Note: domestic owned firms in the manufacturing industry. Estimation by probit, marginal effects reported (at sample means). All specifications include also lagged size of the firm, lagged import intensity of each 3-digit sector and Herfindahl index. Two innovation surveys are included (CIS3 and CIS4), i.e. panel of two time periods (1998-2000 and 2002-2004) is used in this estimation. The dependent variable is equal to 1, if the corresponding type of knowledge sourcing is of medium or high importance for the firm. Sector dummies are at 2-digit NACE level. Regions: 5 regions in Estonia. * significant at 10 per cent; ** significant at 5 per cent; *** significant at 1 per cent level. Period *t-1* indicates year 1997 in the case of CIS3 survey and 2001 in the case of CIS4.

Table A2. Correlation between exporting and innovation, manufacturing firms in CIS3 and CIS4

Panel of CIS3 and CIS4:	(1)	(2)
Method:	Bivariate probit	Bivariate probit
Dep. var.:	Pr(product innovation$_{ijt}$=1)	Pr(process innovation$_{ijt}$=1)
Export dummy$_{jt-1}$	0.094***	0.07***
	(0.025)	(0.024)
Other controls	Yes	Yes
Sector dummies	Yes	Yes
Region dummies	Yes	Yes
Survey wave dummy	Yes	Yes
Number of obs.	1360	1360
Log likelihood	-1938	-1938

Note: domestic owned firms in the manufacturing industry. Estimation by bivariate probit, marginal effects estimated and reported (at sample means). All specifications include lagged size of the firm, lagged import intensity of each 3-digit sector and Herfindahl index as other control variables. Two innovation surveys (CIS3 and CIS4) are included, i.e. panel of two time periods (1998-2000 and 2002-2004) is used in this estimation. Dependent variable is equal to 1 if the firm engages in i) product or ii) process innovation. Sector dummies are at 2-digit NACE level. Regions: 5 regions in Estonia. * significant at 10 per cent; ** significant at 5 per cent; *** significant at 1 per cent level. Period *t-1* indicates year 1997 in the case of CIS3 survey and 2001 in the case of CIS4.

Table A3. Correlation between exporting and indicators of innovation related co-operation with competitors and suppliers

Panel of CIS3 and CIS4:	(1)	(2)	(3)
Method:	Probit	Probit	Probit
Dep.var.:	Innovation related co-operation with Competitors	Innovation related co-operation with Suppliers	Innovation related co-operation with Clients
Export dummy$_{jt-1}$	0.014	0.03*	0.036**
	(0.012)	(0.015)	(0.016)
Sector dummies	Yes	Yes	Yes
Region dummies	Yes	Yes	Yes
Survey wave dummy (CIS3 or CIS4)	Yes	Yes	Yes
Number of obs.	1118	1118	1118
Log likelihood	-352	-516	-513

Note: all coefficients denote marginal effects. Domestic owned firms in the manufacturing industry. The dependent variable is equal to 1, if the corresponding type of innovation-related co-operation is of medium or high importance for the firm. Sector dummies are at 2-digit NACE level. Regions: 5 regions in Estonia. * significant at 10 per cent; ** significant at cent; *** significant at 1 per cent level. Period *t-1* indicates year 1997 in the case of CIS3 survey and 2001 in the case of CIS4.

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