Learning-by-Exporting: Continuous Productivity Improvements or Capacity Utilization Effects? Evidence from Slovenian Firms

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Abstract: Following along the lines of a growing literature on the causal link between exporting and productivity, this paper analyzes the existence of "learning-by-exporting" using firm-level data for Slovenian manufacturing enterprises between 1994 and 2002. We fail to find conclusive evidence of learning-by-exporting. By matching new exporting firms to "sufficiently" similar non-exporters and using the difference-in-differences method on the matched pairs it is revealed that productivity improvements, although present, are far from permanent and tend to dissipate shortly after initial entry. Confronting the data on factor accumulation with TFP measures indicates that the perceived learning effects may in fact only be a consequence of increased capacity utilization brought about by the opening of an additional market. JEL no. D24, F12, F14
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1 Introduction

In recent years we have witnessed a substantial increase in the availability (and quality) of firm- and plant-level data on a broad selection of variables. This has enabled a shift in the focus of trade analysis from countries and industries to individual firms. Along with the introduction of a variety of microeconometric tools, the increased access afforded to researchers to

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a growing number of large-scale, firm-level data sets has driven an expansion in empirical literature on the causal linkages between firm characteristics and their involvement in foreign markets.

The prevailing questions in this strain of literature seem to be whether more productive firms self-select into exporting and whether exporting serves to ensure ongoing productivity benefits compared with firms producing solely for the local/national markets. This paper contributes to that literature. We focus on the exporting behavior of Slovenian manufacturing firms. This choice is driven in part by the availability of a comprehensive firm-level data set and partly by the possibly greater scope for the learning-by-exporting effects due to the greater efficiency gap existing between a transition economy (such as Slovenia) and the markets of Western Europe. In addition to searching for the existence of learning effects stemming from involvement in a foreign market, the paper attempts to answer the question of whether foreign market competition can serve as a determinant of firm productivity growth or whether other factors are driving productivity improvements.

We find evidence of the existence of learning-by-exporting and the effects of foreign market competition to be less than conclusive. Matching and difference-in-differences techniques reveal significantly higher productivity growth only in the initial period of exporting, but the effect diminishes in subsequent years. As it turns out, the more credible explanation for this occurrence may be a simple utilization of excess capacity caused by the sudden availability of a larger product market.

The rest of the paper is organized as follows. In Section 2, a short literature survey is presented. Section 3 contains a description of the database, while the methodology and the empirical approach used in the estimation are discussed in Section 4. The results and their implications are discussed in Section 5, while Section 6 concludes.

2 Literature Review

The literature on the causality between firm characteristics and exporting status can be quite clearly divided into two groups. On one hand, there is mounting evidence in support of the self-selection hypothesis stating that more productive firms self-select into exporting (and multinational production). On the other hand, evidence of learning-by-exporting has proven harder to come by.

In the former group, the seminal work of Bernard and Jensen (1995) represents one of the earliest attempts at reconciling populist rhetoric about exports (and exporters) with actual empirical facts. They offer conclusive evidence backing the hypothesis of self-selection in US manufacturing industries between 1976 and 1987. More importantly, their work serves as a starting point for a prolific expansion of the field. The self-selection hypothesis was subsequently confirmed by Aw and Hwang (1995) on Taiwanese data, Clerides et al. (1998) on data for Colombia, Morocco and Mexico, Bernard and Jensen (1999) on US data, Roberts and Tybout (1997) on a sample of Colombian enterprises, Bernard and Wagner (1997) on German data, Girma et al. (2005) on UK firms, Damijan et al. (2004) on Slovenian data, and Alvarez and Lopez (2005) on data for Chilean plants.[1] In contrast to the seemingly abundant evidence of self-selection, none of the aforementioned analyses finds conclusive evidence of learning-by-exporting.

Some evidence of learning-by-exporting is found by Greenaway and Kneller (2003) on a large sample of UK manufacturing firms, but the learning effects are only found to be significant in the initial couple of periods after entry and are by no means persistent. In an interesting twist, Van Biesbroeck (2005) and Blalock and Gertler (2004) find evidence that exporter's productivity benefits from its engagement in the export markets for less developed countries (sub-Saharan Africa and Indonesia, respectively). Based on the evidence, Blalock and Gertler explain the presence of learning effects by suggesting that the scope for learning through exports is far greater for firms from less developed countries (through trade with developed countries) than for firms from developed countries.[2] For a comprehensive survey of the field, see Wagner (2006).

3 Data, Sample Characteristics and Methodology

The data employed in the empirical analysis is firm-level data on Slovenian manufacturing firms active in the period between 1994 and 2002. The data

[1] Greenaway et al. (2005) do not find evidence of either self-selection nor learning-by-exporting in a sample of Swedish firms, which they attribute to the very high export participation rates.

[2] Evidence of learning-by-exporting is also found by Baldwin and Gu (2003) on Canadian data, and by Fernandes and Isgut (2005) for Colombia.

set contains detailed accounting information as well as a fairly complete set of data on external trade and capital flows of individual firms (such as exports, imports, outward and inward direct investments etc.). The original accounting data for the period between 1994 and 2002 was provided by AJPES (Agency of the Republic of Slovenia for Public Legal Records and Related Services) and has been enriched with the addition of trade and FDI data from the Statistical Office of the Republic of Slovenia (1994–2002). All data are in Slovenian tolars and have been deflated using the consumer price index (for data relating to capital stock) and a producer price index (at the 2-digit NACE industry level) for data relating to sales and added value. Data on the foreign-market (European Union, Eastern and Central Europe as well as former Yugoslav republics) characteristics (sales, number of firms, ...) stem from the UNIDO INDSTAT 4 (2003) database.

For the purposes of this analysis we restrict the sample to manufacturing establishments (NACE rev.1 industries 15 to 37) with at least 10 employees in all years of observable data. The reason for the restriction lies in the fact that accounting data for very small firms is highly unreliable and noisy.[3] The database used in the estimations hence includes information on 903 firms (in 1994) up to 1,379 firms (in 2002).[4] Slovenian manufacturing is characterized by very high export participation rates as these remain at around 80 to 85 percent throughout the period. In addition, the vast majority of exporters exported to the EU market, the market of the former Yugoslav republics or both. Other salient features of the sample data, such as the evolution of the value added per employee, firm size in terms of employment and the number of firms according to the market servicing mode (firms with domestic sales only, exporting firms and firms with outward foreign direct investment, OFDI) are reported in Table 1.

The two prevailing features of Table 1 are the pronounced differences in terms of the value added per employee as well as firm size between firms solely serving the domestic market, exporting firms and firms that, in addition to exporting, also engage in outward foreign direct investment (OFDI). It is also worth noting that the average firm size in all three groups

[3] As it turns out, results on the complete sample (including firms with less than 10 employees) do not differ substantially from those presented below. For the sake of brevity these results are not presented.

[4] Given the substantial entry and exit dynamics, we are dealing with an unbalanced sample of firms.

Table 1: *Structure of Firms in the Sample with Respect to Firm Type by Average Productivity, Size and the Number of Enterprises*

	Domestic sales only				Exporters w/o OFDI				Exporters w/OFDI			
	y^a	ry^b	l^c	N	y^a	ry^b	l^c	N	y^a	ry^b	l^c	N
1994	2,156	0.97	50	158	1,849	1.03	142	713	2,300	1.11	654	115
1995	2,558	0.99	39	195	2,032	1.03	126	813	2,570	1.08	657	120
1996	2,820	0.98	37	239	2,496	1.04	115	850	3,052	1.10	564	137
1997	2,910	0.93	38	283	2,943	1.03	103	917	3,710	1.14	542	142
1998	3,220	0.96	36	285	3,197	1.03	99	973	3,914	1.12	470	162
1999	3,518	0.96	34	286	3,672	1.02	95	1,025	4,805	1.15	432	169
2000	3,852	0.94	33	266	4,048	1.03	91	1,035	4,584	1.07	406	183
2001	3,852	0.90	33	255	4,394	1.04	90	988	5,083	1.10	360	213
2002	3,967	0.88	31	257	4,950	1.05	84	1,007	5,575	1.11	368	212

[a] Value added per employee, in thousands of Slovenian tolars. — [b] Relative value added (with respect to the 3-digit NACE industry average). — [c] Average number of employees.

Source: AJPES (Agency of the Republic of Slovenia for Public Legal Records and Related Services) and authors' own calculations.

has been decreasing which is in line with expectations given that the observed period largely coincides with the period of transition in the Slovenian manufacturing sector.[5]

As expected, exporting firms (and firms with OFDI) are more productive and larger than domestic firms, raising the issue of the cause of these productivity differences (self-selection or learning-by-exporting). In spite of the wealth of research on the topic of the direction of causality between productivity levels and engagement in foreign markets, there is no conclusive evidence on its true nature.

In the remainder of the paper we direct our attention to finding evidence of learning-by-exporting in the Slovenian manufacturing sector.

4 Empirical Model and Econometric Issues

In order to explore the possible effects of learning-by-exporting we employ both static and dynamic specifications of productivity. The latter approach is often utilized in the literature (Clerides et al. 1998; Damijan et al. 2004)

[5] See Šušteršič (2004) for details on the effects of the transition process on Slovenian manufacturing enterprises.

and finds its theoretical basis in the proposition commonly applied to models of firm activity and market interaction that productivity follows an exogenous Markov process[6] (Hopenhayn and Rogerson 1993; Olley and Pakes 1996; Amiti and Konings 2005). In addition to the above justification, the inclusion of the lagged dependent variable is also merited by the fact that its introduction can serve as a proxy for the unobserved serially-correlated state variables (those, in turn, serve as determinants of omitted idiosyncratic firm characteristics).

In terms of productivity measures, we opt to use two parallel measures which affords us an additional test of the robustness of the outcomes obtained. We base our primary productivity proxy on the Griliches and Mairesse (1995) approach, where "approximate total factor productivity" is estimated as $ATFP = \ln Y/L - s \ln K/L$ or $ATFP = \ln y - s \ln k$. The residual of the regression of labor productivity (y) on capital intensity (k) could be interpreted as a measure of total factor productivity.[7] In addition, we use total factor productivity, as obtained from the Olley–Pakes (1996) estimation algorithm, as an alternative measure of productivity.

There are several contentious issues in estimating the production function, the most crucial of which are the questions of input endogeneity and (in a dynamic specification) the endogeneity of the lagged dependent variable. The inclusion of the offending variables in both cases confines ordinary least squares estimates to be biased as well as seriously altering the structural interpretation of the obtained coefficents. To see this (in case of the dynamic productivity specification) one need only decompose the error term into a permanent firm-specific effect (μ_i) and an iid term (ε_{it}). Clearly the time-invariant part of the error term will be correlated with both the dependent variable as well as the lagged dependent variable used as a regressor. This violates even the least restrictive of the exogeneity assumptions (contemporaneous non-correlation) placed on the regressors and ensures that regressions failing to account for this factor would be inconsistent and the coefficients on the lagged dependent variable would be upwardly biased (OLS). If the remaining unobserved firm-specific effects were time-invariant, then a fixed-effects estimator could be used to solve the endogeneity problem at hand. As it turns out, though, fixed-effects estimates produce downward biased and inconsistent estimates of the lagged

[6] This functional form reflects the empirical finding of the high serial correlation of productivity measures.

[7] Any additional right-hand-side regressors will hence serve to explain total factor productivity.

dependent variable coefficients (see Nickell 1981) but, as Griliches and Mairesse (1995) note, there is also a related problem of the possible simultaneity between the lagged dependent variable and the unobserved firm heterogeneity. In order to mitigate the issue of endogeneity we rely on two parallel approaches. We utilize the Olley–Pakes (1996) algorithm[8] to tackle the issue of input endogeneity (simultaneity) as well as control for the possible sample-selection bias resulting from less productive plants exiting the market (and the sample). The relatively long period of observation allows us an additional robustness check by employing the system Generalized Method of Moments (sys-GMM) (Blundell and Bond 1998, 1999).[9] Finally, we also apply matching (Heckman et al. 1997, 1998) and difference-in-differences (Blundell and Costa Dias 2000) techniques in order to obtain more detailed evidence of the existence of learning-by-exporting. In our approach non-exporters are matched with first-time exporters according to their propensity scores[10] using the nearest neighbor with caliper[11] method. On these matched pairs we apply the usual marginal production function estimation, written in difference-in-differences terms.

We estimate the following equation

$$ry_{jt} = \beta_1 + \beta_2 ry_{jt-1} + \beta_3 rk_{jt-1} + \sum_{s=0}^{4} \beta_4 D_{t+s}^{EXP} + \sum_{s=0}^{4} \beta_5 D_{t+s}^{EXP} Mkt_{it_0} + \sum \beta_6 X_{jt} + \beta_7 D_t + \varepsilon_{jt}, \quad (1)$$

where the dependent variable ry_{jt} represents the productivity growth differential of the firms' pair j, i.e., the difference between the productivity

[8] We opted not to employ the Levinsohn and Petrin (2003) approach as only firm-aggregated data on material costs were made available to us. Additionally, we also estimated an augmented version of the Olley–Pakes approach following Van Biesebroeck (2005) and De Loecker (2004) who include exporting status as an additional state variable entering the investment function.

[9] Arellano and Bover (1995) showed that the commonly applied difference GMM estimator can perform poorly when instrumented variables display near unit root behavior.

[10] The propensity score is obtained by estimating the probability of becoming a first-time exporter

$$P_{i\tau}(EXP_{i\tau} = 1) = F(ry_{i\tau-1}, rl_{i\tau-1}, rk_{i\tau-1}, IFDI_{i\tau-1}, \textit{ sectoral, time dummies})$$

Following Greenaway and Kneller (2003) matching is done on a cross-section by cross-section basis, but in contrast to their work we performed matching within individual sectors as well.

[11] Caliper is a pre-specified scalar that causes some possible matches that do not have sufficiently similar controls to be left unmatched.

growth rate of an exporter ($ry^1_{it} - ry^1_{it-1}$) and a non-exporter ($ry^0_{it} - ry^0_{it-1}$). Note that r denotes relative firm-to-sector figures, as all firms characteristics, such as productivity y and capital-to-labor ratio k, are recalculated according to individual firm pair's 3-digit NACE sector. The model includes the effects of usual explanatory variables, such as the lagged relative productivity level (ry_{jt-1}) and lagged relative capital intensity (rk_{jt-1}) in terms of the difference between treatment and control groups. The vector of coefficients β_4 captures the impact on the growth rate only for those firms that entered the export market at time $t + s$. It is these coefficients that will reveal whether or not learning-by-exporting is present (and important). β_5 reveals whether additional learning effects are being driven by different initial market conditions in individual exporting markets. We measure the importance of different foreign market conditions Mkt_{t_0} with an export share weighted average of the number of firms present in the firm's foreign markets (within the same 3-digit NACE industry), i.e., $Mkt_{t_0} = r\sum_{m=1}^{M} ExSh_{imt} \times N_{mt_0}$. We expect that firms which export predominantly to very competitive markets may be additionally motivated to improve their productivity (compared with firms exporting to less challenging marketplaces). The vector of coefficients β_6 include the share of revenue from exports ($ExSh_{TOT}$), share of material costs in imports ($ImSh_{TOT}$), an indicator variable for firms with outward foreign direct investment to EU countries ($OFDI_{EU}$), and changes in relative market conditions ($\Delta r\sum_{m=1}^{M} ExSh_{imt} \times N_{mt}$). The vector β_7 captures the time (year) effects that are common to all firms.

5 Learning-by-Exporting or Capacity Utilization Effects

We present estimates of the difference-in-differences matching estimation (Table 2) which enables the analysis of the pairwise differences in growth rates between exporting and non-exporting firms. The reason for using this specification is to capture the temporal features (or lack thereof) of the learning-by-exporting phenomenon. In order to ascertain the duration of the perceived benefits from exporting, we capture the productivity dynamics by using a series of dummy variables. In estimating the dynamic specification system Generalized Method of Moments was employed to control for the endogeneity issues.

The time line of the model is rescaled so that at time $s = 0$ a first-time exporter starts to export. Dummy variable D^{EXP} ($s = 0$) therefore equals 1 in

Table 2: *Productivity Improvements of New Exporters Relative to Domestic Firms (Firm-Level Analysis with Difference-in-Differences Matching)*

Model	Static w/ bs[a]		Sys-GMM w/o bs	
ry_{jt-1}			−0.950***	(−9.6)
rk_{jt-1}	−0.103	(−1.6)	0.119**	(0.1)
D^{EXP} $(s=0)$	0.336*	(1.9)	0.611**	(2.0)
D^{EXP} $(s=1)$	−0.165	(−0.9)	0.294	(1.0)
D^{EXP} $(s=2)$	0.081	(0.5)	0.350	(1.2)
D^{EXP} $(s=3)$	0.025	(0.1)	−0.218	(−0.6)
D^{EXP} $(s=4)$	0.312**	(2.1)	−0.054	(−0.2)
$D^{EXP}_{s=0} \times Mkt_{t_0}$	−0.073	(−1.4)	−0.217**	(−2.6)
$D^{EXP}_{s=1} \times Mkt_{t_0}$	0.087*	(1.8)	−0.078	(−1.0)
$D^{EXP}_{s=2} \times Mkt_{t_0}$	0.001	(0.0)	−0.086	(−1.1)
$D^{EXP}_{s=3} \times Mkt_{t_0}$	0.019	(0.4)	−0.008	(−0.1)
$ExSh_{TOT}$	0.469	(0.6)	−0.140	(−0.4)
$ImSh_{TOT}$	−0.566	(−1.5)	−0.256	(−0.6)
$OFDI_{EU}$	−0.269	(−0.9)	−0.292	(−0.5)
$\Delta r \sum_{j=1}^{m} ExSh_{imt} \times N_{mt}$	0.002	(0.0)	0.008	(0.1)
Sec. dummies	no		no	
Time dummies	yes		yes	
N	484		488	
Adjusted R^2	0.07			
Hansen $\chi^2[p]$			87.9 [0.537]	
$AR(1)$			−2.12**	
$AR(2)$			0.52	

***, **, * indicate statistical significance at 1, 5, and 10 percent, respectively. Dependent variable is $\Delta ry_{it}^{Treatment} - \Delta ry_{jt}^{Control}$. t-statistic in parentheses.
[a] *w/bs* with bootstrapped standard errors.

the year the exporter starts exporting (D^{EXP} $(s=4)$ equals 1 four years after it started exporting). On the other hand, the interaction terms with foreign market conditions should help answer the question of whether exporters that export to more demanding markets reap additional productivity gains compared to domestic firms. Given the small size of the samples[12], we used bootstrapped standard errors (1000 repetitions) in the first estimation. We first estimate a static model. The results are quite telling as learning-by-exporting effects are only present in the period when a firm first starts to

[12] This was caused by the restrictions of the matching process and the requirements (for the length of the observation period) of the estimated model.

export, but this effect dissipates in the years to come. Whereas the initial effect of exporting is seemingly fairly robust, the static estimates also reveal significant positive effects in the fourth year after the firm started to export (this effect is not significant in the dynamic model). The static estimation also confirms that firms exporting to more competitive markets experienced a very small (but significant) improvement a year after they commenced exporting. Quantitatively, the effects of the first year dominate the other factors in the static specification, while the dynamic specification is dominated by the effects of the lagged relative productivity on the difference in the relative growth between the matched exporter and domestic firms. Surprisingly, in the dynamic specification the effects of the initial productivity surge are actually smaller for firms engaging in exports to very competitive markets. In summary, the effects of learning-by-exporting exist and are fairly significant in either a dynamic or static specification of the model, but they are only observable in the year the firm commences exporting[13] (this finding is in line with Damijan et al. (2004), while De Loecker (2004) finds support for a somewhat longer duration of learning effects[14]).

The fact that the learning effects of productivity are far from being permanent or even long lasting seriously weakens the credibility of the learning-by-exporting argument as an explanation for these effects. Had the learning effects been significant, then one would have expected to observe them in latter periods (allowing time for the effects to be absorbed and implemented) and last for a longer period of time. A different explanation of these one-time, short-lasting productivity improvements may be needed in order to fully explain the observed hike in productivity in the initial year of exporting. It may be that the initial productivity hike is solely a consequence of a scale effect whereby the firm takes advantage of a larger market to place its additional output. In essence, the hike in productivity therefore only reflects the fact that firms can take advantage of their spare capacity (the fixed costs that are already sunk) in the new markets. To explore the topic further we present Table 3 in which levels (and growth) of relative sales rq (Δrq) of new exporters are compared with the levels (and growth) of relative productivity in terms of value added per

[13] These results are confirmed using relative total factor productivity (rtfp) in place of the relative value added per employee (see Table A1 in the Appendix).

[14] It should be noted that neither Damijan et al. (2004) nor De Loecker (2004) use similar estimation procedures in attaining their results.

Table 3: *Changes in Relative Value Added, Growth of Relative Value Added, Relative Size, Relative Capital Intensity and Relative Sales with Respect to the Start of Exporting* (t)

	rq	Δrq	ry	Δry	$rtfp$	$\Delta rtfp$	rk	rl
				Firms exporting to the EU				
$t-2$	0.573	−0.011	0.961	−0.052	0.996	−0.013	0.657	0.630
$t-1$	0.562	0.025	0.909	0.010	0.983	0.006	0.599	0.620
t	0.587	0.099	0.919	0.126	0.989	0.010	0.576	0.614
$t+1$	0.686	0.100	1.045	0.005	0.999	0.001	0.627	0.639
$t+2$	0.786	0.040	1.050	0.016	1.000	0.001	0.725	0.734
$t+3$	0.826	0.019	1.066	−0.001	1.001	0.004	0.774	0.781
$t+4$	0.845	–	1.065	–	1.005	–	0.772	0.792
				Firms exporting to ex-Yugoslav markets				
$t-2$	0.568	−0.018	1.006	−0.102	0.998	−0.019	0.646	0.616
$t-1$	0.550	0.005	0.904	0.071	0.979	0.013	0.586	0.606
t	0.555	0.089	0.975	0.084	0.992	0.005	0.539	0.554
$t+1$	0.646	0.095	1.059	0.001	0.997	0.001	0.586	0.591
$t+2$	0.741	0.052	1.060	0.012	0.998	0.001	0.691	0.682
$t+3$	0.793	0.018	1.072	−0.019	1.000	0.002	0.736	0.749
$t+4$	0.811	–	1.053	–	1.002	–	0.740	0.762

Source: Authors' own calculations.

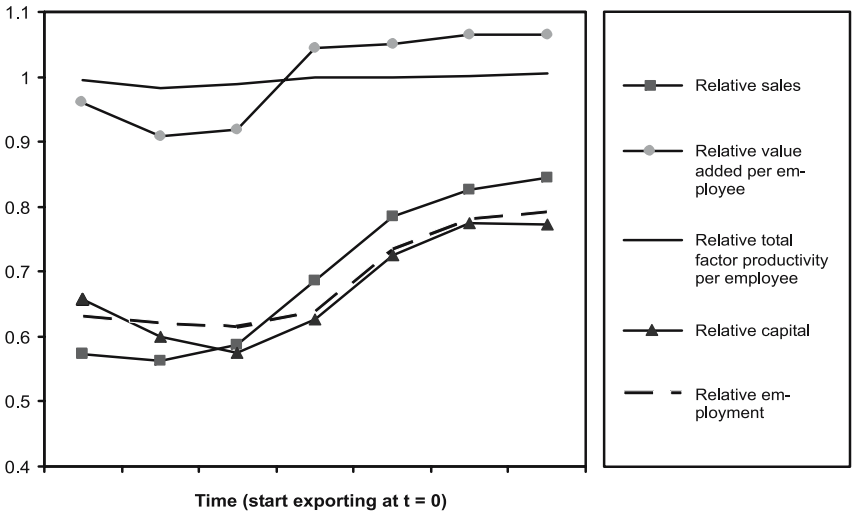
employee ry (Δry) and TFP $rtfp$ ($\Delta rtfp$), as well as with relative capital intensity rk and relative size rl in years before and after entering export markets.

Table 3 reveals the correlation between productivity growth and the relative sales of the firm. As can be seen, both firms exporting to EU markets as well as those exporting to former Yugoslav countries experience only a one-time increase in their productivity the year after they start exporting, which is accompanied (and preceded) by a substantial increase in sales. This point is compounded by data on the relative total factor productivity, which is more or less stagnant over the observed time interval.[15] Interestingly, the start of exporting also triggers an increase in relative firm size (increase in employment) and an increase in relative capital intensity.

Based on the evidence presented in Table 3, it can be concluded that the majority of productivity growth can in fact be attributed to the initial utilization of excess capacity (conclusive evidence on this proposition, though,

[15] Table A2 in the Appendix reveals that the majority of the initial period increase in the value added per employee can in fact be explained by the growth in capital intensity.

Figure 1: *Changes in Relative Values of Sales, Value Added, TFP, Capital and Labor Inputs for New Exporters with Respect to the Moment They Start Exporting*



would rely on the availability of capacity utilization data[16]). The effect of the productivity hike diminishes quickly as firms proceed to increase their size to accommodate the increased sales (Figure 1). The observed productivity improvements are hence primarily a reflection of the growth in inputs.

6 Conclusions

This paper contributes to the recent theoretical and empirical literature on firm heterogeneity, foreign trade and the firm performance. Taking advantage of a very complete data set for Slovenia in the period between 1994 and 2002, we employ matching and difference-in-differences techniques in order to explore the possibility of learning-by-exporting by Slovenian manufacturing enterprises. Our analysis, though, does not provide conclusive evidence that exporting causes permanent productivity improvements. Indeed, by matching new exporting firms to "sufficiently" similar non-

[16] Data on stocks (of intermediate and final goods), although illustrative, does not help in resolving the issue. Namely, excess capacity would have been internalized soon after it occurred (it therefore would not be reflected in stock levels).

exporters and using the difference-in-differences method on the matched pairs it is revealed that productivity improvements, although present, are far from permanent and tend to dissipate shortly after initial entry. Also, the observed effects are at least one order of magnitude smaller than the impact of traditional production function variables. These findings, which are in line with Damijan et al. (2004) and Greenaway and Kneller (2003) on UK data, along with the evolution of relative sales growth by new exporters, lead us to conclude that the initially experienced productivity hike may be explained by something other than learning-by-exporting (such as capacity utilization caused by the firm's market expansion allowing firms to utilize excess capacity). One possible reason for the lack of evidence of learning effects may be that there has to be a greater gap in development between the importing country and the exporter's home country for there to be effective learning, as suggested by Blalock and Gertler (2004).

Appendix

Table A1: *Matching with Olley–Pakes Total Factor Productivity*

Model	Dynamic		Model[a]	Dynamic	
$rtfp_{jt-1}$	−0.198***	(−13.2)	$rtfp_{jt-1}$	−0.0429***	(−5.7)
rl_{jt_0} [b]	−0.0025	(−1.3)	rl_{jt_0} [b]	0.0003	(0.9)
D^{EXP} $(s=0)$	0.0174***	(3.4)	D^{EXP} $(s=0)$	0.0589***	(11.3)
D^{EXP} $(s=1)$	−0.0046	(−1.2)	D^{EXP} $(s=1)$	−0.0049	(−1.6)
D^{EXP} $(s=2)$	−0.0065	(−1.6)	D^{EXP} $(s=2)$	0.0042	(1.5)
D^{EXP} $(s=3)$	−0.0005	(−0.1)	D^{EXP} $(s=3)$	0.0037	(1.2)
D^{EXP} $(s=4)$	0.0017	(0.3)	D^{EXP} $(s=4)$	0.0008	(0.2)
Sec. dummies	yes		Sec. dummies	yes	
Time dummies	no		Time dummies	no	
N	5,088		N	4,842	

***, **, * indicate significance of coefficients at 1, 5, and 10 percent, respectively. Dependent variable is $\Delta rtfp_{it}^{Treatment} - \Delta rtfp_{jt}^{Control}$. t-statistic in parentheses.

[a] With exporting status as an additional state variable. — [b] Initial relative size in terms of employment.

Table A2: *Productivity Improvements of New Exporters Relative to Domestic Firms for all Enterprises*[a] *with Difference-in-Differences Matching*

Model	FE		Dynamic w/ sys-GMM	
ry_{jt-1}			−0.115	(−0.8)
rl_{jt_0} [b]	0.0003	(0.3)		
D^{EXP} $(s=0)$	−0.0076	(−1.0)	1.32	(0.7)
D^{EXP} $(s=1)$	0.0067	(1.2)	1.07	(0.3)
D^{EXP} $(s=2)$	0.0045	(0.7)	0.693	(0.1)
D^{EXP} $(s=3)$	0.0057	(0.9)	−0.233	(−0.1)
D^{EXP} $(s=4)$	−0.0011	(−0.1)	0.760	(0.4)
$D^{EXP}_{s=0} \times rk_{jt}$	0.0004***	(3.0)	0.004	(0.3)
$D^{EXP}_{s=1} \times rk_{jt}$	−0.0001	(−0.4)	−0.244	(−0.2)
$D^{EXP}_{s=2} \times rk_{jt}$	0.0001	(0.3)	−0.001	(−0.3)
$D^{EXP}_{s=3} \times rk_{jt}$	0.000002	(0.02)	0.052	(0.2)
$D^{EXP}_{s=4} \times rk_{jt}$	−0.002***	(−7.7)	0.143	(0.5)
$OFDI_{t-1}$ [c]	−0.088	(−3.7)	−2.419	(−0.1)
$IFDI_{t-1}$ [d]	0.154	(1.2)	−2.494	(−0.6)
Sec. dummies	yes		yes	
Time dummies	yes		yes	
N	28,968		2,181	
Adjusted R^2	0.004			
Hansen $\chi^2[p]$			6.58 [0.923]	
$AR(1)$			0.87	
$AR(2)$			0.10	

***, **, * indicate significance of coefficients at 1, 5, and 10 percent, respectively. Dependent variable is $\Delta rtfp_{it}^{Treatment} - \Delta rtfp_{jt}^{Control}$. t-statistic in parentheses.

[a] Including firms with less than 10 employees. — [b] Initial relative size in terms of employment. — [c] Outward FDI indicator variable (lagged). — [d] Inward FDI indicator variable (lagged).

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