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Learning to export and learning by exporting

The case of Ethiopian manufacturing

Eyerusalem Siba[1] and Mulu Gebreeyesus[2]

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Abstract: In this study, we investigate the relationship between exporting and firm performance using a longer panel dataset of Ethiopian manufacturing firms for the period 1996–2009. We test two hypotheses regarding exporting: selection into exporting versus learning by exporting. According to the selection into exporting hypothesis, more productive firms self-select into exporting due to high entry costs. The learning by exporting hypothesis, on the other hand, emphasizes that firms learn after entering into the export market. We find evidence in support of both self-selection and learning by exporting.

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[1]University of Gothenburg; [2]UNU-MERIT; corresponding author: gebreeyesus@merit.unu.edu

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UNU-WIDER, Katajanokanlaituri 6 B, 00160 Helsinki, Finland, wider.unu.edu

1 Introduction

The development thinking on the relation between export-orientation and economic performance has long been optimistic. Exports are expected to promote economic growth through increased earnings of foreign exchange (thus relaxing balance of payments constraints), economies of scale, and access to new technologies and knowledge (Helpman and Krugman 1985; Melitz 2003). There is considerable cross-country empirical evidence of a positive association between growth in aggregate exports and real output growth (see Greenaway and Sapsford 1994 for a review). The miracle of industrialization in East Asia is also often explained by the export orientation of these countries (World Bank 1993).

Several micro-level studies have also documented a positive association between exporting and firm performance (e.g. Aw and Hwang 1995; Bernard and Jensen 1999; Bigsten et al. 2004; Clerides, Lach, and Tybout 1998; Roberts and Tybout 1997). The direction of causality, however, has been a point of debate between two competing (but not necessarily exclusive) hypotheses—self-selection versus learning by exporting. The self-selection hypothesis points out that exports do involve a large sunk cost that includes modifying domestic products for foreign consumption, searching markets and new distribution networks, and transportation. Firms that enter into the export market should have sufficient profits to cover the fixed costs, so it is the more productive firms that self-select into exporting (Roberts and Tybout 1997). The learning by exporting hypothesis, on the other hand, emphasizes the productivity improvement of firms following their entry into foreign markets. This is because entry into export markets improves access to information on the best managerial and marketing practices, new technologies and exposure to competition (Clerides, Lach, and Tybout 1998). Self-selection into exporting is well supported by most of the existing empirical studies for both developed and developing countries. However, the evidence for learning by exporting is mixed. For example, Bernard and Jensen (1999), Clerides, Lach, and Tybout (1998) and Delgado, Fariñas, and Ruano (2002) found evidence of self-selection but not of learning by exporting, while Fernandes and Isgut (2005), Girma, Greenway, and Kneller (2004), Hahn (2004) and Kraay (1999) found evidence for both self-selection to and learning from exporting.

Despite the continuing engagement of several Sub-Saharan Africa (SSA) countries in some type of export promotion activities, only a few studies explicitly investigate the relation between export and firm level productivity, partly due to lack of suitable data. Bigsten et al. (2004) find some evidence of learning by exporting using firm level data collected as part of the Regional Program on Enterprise Development in the early 1990s from four SSA countries. Van Biesebroeck (2005) found, based on the same data source but covering three more SSA countries, both self-selection and learning by exporting. Both of these studies rely on a dataset that covers a very short time period, a maximum of three years, which makes it hard to investigate any learning effect since learning requires a longer period of adjustment in technology and productivity. Rankin, Söderbom, and Teal (2006) use relatively longer panel data (although not collected annually), with a focus on the determinants of export participation. They found a strong and robust effect of size on export participation, while the evidence for self-selection was weak.

An annual ten-year (1996–2005) firm level panel dataset for the Ethiopian manufacturing firms Bigsten and Gebreeyesus (2009) provides evidence for both self-selection into exporting and learning by exporting. The current study extends their work in the following ways. First, it extends the study period

by four years. This will obviously improve the precision of the estimation results and enable us to identify any long-term effects of learning by exporting. More importantly, a closer look at the recent period is warranted given intensive government efforts to promote exports and the increased number of manufacturing firms entering into the international market, particularly in recent years. For example, in the period 2005/06–2008/09 alone the number of manufacturing firms with ten and more employees almost doubled and the number of exporting firms grew by about 40 per cent (see Table 1). Second, the focus of Bigsten and Gebreeyesus (2009) was on six export-oriented manufacturing sectors. The present study includes all the manufacturing sectors but also compares these with the six export-oriented sectors.

The remainder of the paper is organized as follows. The next section gives some background on the policy and export performance of Ethiopia. Section 3 sets the empirical framework. Section 4 describes the data and gives some descriptive statistics. Section 5 discusses the econometric results and Section 6 concludes.

2 Some background: Ethiopia's policy and export performance

Agricultural Development Led Industrialization (ADLI), which was formulated in the mid-1990s, is Ethiopia's broad development vision. The philosophy of ADLI is that agricultural development plays a leading role in industrialization, so it focuses on improving the productivity of smallholder agriculture and creating linkages with the industrial sector. Based on this broad development vision, the country formulated the Industrial Development Strategy (IDS) in 2002/03. One of the guiding principles of the industrial development strategy is that sustainable and fast industrial development can only be ensured if the sector is competitive in international markets. Thus, export sectors should lead the industrial development and be given preferential treatment. The strategy identifies priority sectors, including: textiles and garments; meat, leather, and leather products; agro-processing; construction; and micro and small-scale enterprises.

The IDS was implemented by the subsequent development plans, through setting targets specifically on export performance.[1] In order to meet the targets, the government has played an important role through improving the investment climate and providing direct support to the selected sectors. This support includes providing economic incentives and promoting export-oriented cluster developments and capacity building in terms of increasing the supply of skilled manpower for the sectors. As part of the economic incentives, exporters/investors were granted cheaper credit, easy access to land at lower lease prices and longer tenure periods, and duty and tax exemptions. The government has also increasingly engaged in developing industrial zones around major cities with the necessary infrastructures such as roads, power and telecommunications with special attention to export-oriented sectors. For instance, the Ministry of Trade and Industry allocated industrial zones for export sectors including garment and footwear industries in the vicinity of Addis Ababa and industrial zones for those local and foreign investors (e.g. China, India, Turkey, and Egypt) promising to engage in export sectors.

[1] The Plan of Action for Sustainable Development and Eradication of Poverty, which covers the period 2005/06–2009/10, and the recent five-year plan called Growth and Transformation Plan (2010/11–20014/15).

The Ethiopian economy has shown spectacular growth since 2003/04, registering an average annual growth of 10.6 per cent between then and 2010/11. This is about double the average growth rate (5.2 per cent) recorded for SSA over the same period. Ethiopian merchandize exports have almost quadrupled in this period (i.e. increased from less than US$0.5 billion in 2004 to above US$2 billion in 2011). Both the agriculture and manufacturing exports grew but the growth of the former is much higher than that of the latter. For example, between 2001 and 2011 agriculture exports grew about eightfold, while manufacturing exports grew threefold (Gebreeyesus 2013). However, these achievements have attained little in terms of structural transformation. The Ethiopian economy remains agrarian with the share of the industrial and manufacturing sectors value added not exceeding 14 per cent and 5 per cent, respectively in 2010 (World Bank, various years). Both merchandize exports per capita and manufacturing exports per capita have also remained far lower than the average for SSA (see Table 2).

Another recent trend in Ethiopia's manufacturing exports is a substantial increase in the share of exports destined for developing country markets. For example, in 2000, the developed and developing countries' market share was respectively 60 per cent and 40 per cent. In 2010, this was reversed and the developed and developing country markets respectively accounted for 42 per cent and 58 per cent (see Table 3). This shift might limit the scope for technological learning and spill-over of best practices.

3 Empirical framework

3.1 Self-selection into export markets

Roberts and Tybout (1997) developed a dynamic discrete choice model of export participation with sunk costs for a profit-maximizing firm.[2] They argue that exports involve a large sunk cost that includes modifying domestic products for foreign consumption, market searches, new distribution networks, and transportation. The existence of sunk costs in exporting has two interrelated implications. First, it creates a barrier to entry. Firms that enter into export markets should have sufficient profits to cover the fixed costs; it is therefore the more productive firms that self-select into export markets. Second, high sunk costs imply high exit costs when re-entry is possible. When firms stop exporting, knowledge about export markets diminishes rapidly and the expertise gained is lost. Hence, those who have already incurred start-up costs should be relatively likely to export in the current period. The combination of sunk costs and uncertainty should induce persistency (hysteresis) in exporting status. Roberts and Tybout (1997) provide the following econometric framework for modelling export decisions.

$$\Pr(y_{it} = 1) = \Phi(\sum_{j=1}^{J} \gamma A_{i,t-j} + \sum_{j=1}^{J} \beta y_{i,t-j} + \sum \alpha z_{it} + u_{it}) \quad (1)$$

where y_{it} is the export participation dummy equal to one if firm i has any export in year t and zero otherwise. y_{it-j} is the lagged export participation dummy. A_{it-j} is the lagged productivity, z_{it} a vector of other control variables and u_{it} is the normally distributed error term. A positive and significant coefficient of the lagged productivity, γ, indicates self-selection into the export market. A positive and significant coefficient of prior export status (β), on the other hand, shows hysteresis in export.

[2] The theory of sunk costs and exporting was developed by Baldwin (1989), Baldwin and Krugman (1989), and Dixit (1989).

We employ a simplified version of Equation (1) where only one lag period is considered. We use output per employee as measure of productivity where factor inputs per employee are used as additional control variables:

$$\Pr(y_{it} = 1) = \Phi[\gamma_1 \ln\left(\frac{Q}{L}\right)_{i,t-1} + \gamma_2 \ln\left(\frac{K}{L}\right)_{i,t-1} + \gamma_3 \ln\left(\frac{RM}{L}\right)_{i,t-1} + \gamma_4 \ln\left(\frac{EN}{L}\right)_{i,t-1} + \beta y_{i,t-1} + \alpha z_{it} + u_{it}] \quad (2)$$

where, Q/L denotes output per employee, K/L capital per employee, RM/L raw material per employee, and EN/L energy costs per employee, all of which are entered with a lag of one year.[3] y_{it-1} represents export status at time t-1 and the set of control variables (z_{it}) includes firm age, number of previous exporting years, ownership type, industry, and year-specific effects. In this specification, we infer self-selection from a positive and statistically significant γ_1 and persistence in exporting from $\beta > 0$.

3.2 Learning by exporting

Clerides et al. (1998) argue that firm productivity might be boosted after entering export markets due to reduction of x-inefficiency through increased competition, access to new technology, or economies of scale arising from larger markets. They extend the dynamic choice model of Roberts and Tybout (1997) on export decisions to allow for learning effects—that is, causality to run not only from productivity to export but also from export to productivity.

The empirical strategy adopted by Clerides et al. (1998) and subsequent studies on learning by exporting is to include export history in a regression of firm productivity. The rational is that if there is any learning effect then prior export experience should raise productivity (or reduce costs).

$$A_{it} = \rho A_{i,t-1} + \beta_1 y_{i,t-1} + \beta_2 z_{1it} + e_{1it} \quad (3)$$

where A_{it} denotes productivity of firm i at time t, y_{it} is the export participation dummy, and z_{it} and e_{it} respectively represent a set of control variables and residuals.

Different measures of plant level productivity are used in the empirical literature that include labour productivity, average variable costs, and total factor productivity (TFP) derived from a factor-share approach or econometric estimation of production function. In this study we prefer the econometric approach and estimate, the Cobb-Douglas production function.[4] The standard practice of linking productivity and export status is the two-step approach whereby at the first step TFP is derived from production function estimation and at the second step TFP becomes a dependent variable with export status as one of the main explanatory variables. Van Biesebroeck (2005) criticizes the two-step approach on the grounds that if export status is correlated with inputs, then omitting the export dummy from the production function regression could yield inconsistent input coefficients and productivity

[3] Alternatively, we used value added per employee as a measure of productivity, in which case we exclude intermediate inputs from the set of control variables. Results are largely similar and are not reported here for brevity.

[4] Recent studies (for example Syverson 2011 and Van Biesebroeck 2008) have shown that productivity estimates are relatively insensitive to the choice of method.

estimates. Following his suggestion, we use a one-step-approach whereby the export status is included in the production function.

$$Q_{it} = \rho Q_{i,t-1} + \sum \alpha X_{it} + \varphi y_{i,t-1} + \beta Z_{it} + \lambda_t + \omega_i + e_{it} \quad (4)$$

where Q_{it} and Q_{it-1} denote current and lagged output respectively, X_{it} is an array of inputs used in the production, and y_{it-1} is an indicator variable of the previous year's export status. Z_{it} denotes other control variables such as firm age, number of previous years exporting, and ownership type. λ_t and w_i represent year and sector-fixed effects and e_{it} is a pure random error term.

The variable of interest is prior export status. A positive and significant φ indicates a learning effect from export participation. The lagged dependent variable is introduced to control for high persistency in the productivity series (output). In light of the evidence that more productive firms self-select into exporting, the lagged export dummy can also pick up a previous productivity effect if the latter is not controlled for. Firm age and number of years in exporting are introduced to capture the firm's production and export experience, respectively (Fernandes and Isgut 2005).

There are some econometric issues surrounding the estimation of relationship between productivity and exports, including unobserved heterogeneity and endogeneity. Unobserved firm heterogeneity including product attributes or managerial ability might affect a firm's export decisions. As these are permanent attributes they might lead to persistency in export behaviour and hence to overestimation of the importance of entry costs (see Bernard and Wagner 1998). Under a strict exogeneity assumption, the fixed effect method eliminates the unobserved time-invariant firm-specific effects. However, the strict exogeneity assumption does not hold in the model with a lagged dependent variable (Wooldridge 2002). A popular approach to dealing with the problem of unobserved heterogeneity and endogeneity, which we follow in this study, is to adopt a dynamic panel model with instruments – the generalized method of moments (GMM). When individual series (inputs and outputs in our case) are persistent the differenced GMM (Arellano and Bond 1991) has poor finite sample properties, and it is downwards biased, especially when T is small. Blundell and Bond (1998) propose a system GMM (SYS-GMM) estimator which is derived from the estimation of a system of two simultaneous equations, one in levels (with lagged first differences as instruments) and the other in first differences (with lagged levels as instruments).

Selection bias is another source of concern in estimating the learning by exporting model. The estimate of the causal effect obtained by comparing the treatment group (exporters) with a non-experimental control group (non-exporters) might be biased. The reason is that it is impossible to exactly observe the effect of treatment (exporting in our case) since we do not know the outcome of the treated (exporters) when it is not under treatment (exporting) and the outcomes for the untreated (non-exporters) had they been under treatment (exporting). Thus, in non-experimental studies one needs to construct the counterfactual based on some observable variables that predict the probability of being under treatment (exporting). The matching method enables us to select from the non-treated pool a control group in which the distribution of observed variables is as similar as possible to the distribution in the treated group. We follow previous studies (e.g. Bigsten and Gebreeyesus 2009; Girma, Greenaway, and Kneller 2004; Wagner 2002) and apply the matching method, which involves pairing each treatment (exporter) and comparison (non-exporter) units that are similar in terms of their observable characteristics.

4 Data and descriptive statistics

A firm level dataset for the period 1996 2009 is used for this analysis. These unpublished data are collected by the Ethiopian Central Statistical Agency (CSA) on an annual and census basis. They contain relevant information on firms' outputs, export status, capital, labour, raw material, energy inputs, and investment as well as other industrial costs for establishments employing at least ten employees. This means that the dataset covers large- and medium-scale formal manufacturing firms, providing a representative sample of exporters of manufactured goods in Ethiopia. Table 1 shows the number of exporting firms in the Ethiopian manufacturing sector (both in absolute terms and and in terms of share in total number of firms) as well as share of exports in total sales. The number of firms in the sector more than tripled in the sample period (1996–2009), amounting to an average annual growth rate of 15 per cent. The number of exporters has also increased over this period from 24 to 78 with an average annual growth of about 16 per cent. But the share of exporters has remained small due to equivalent growth in the total number of firms in the sector. For example, in 2008/09 only 4 per cent of the firms sold their products on the international market, which is equal to the share of exporters at the beginning of the study period, i.e. 1995/1996. Exports are a significant source of income for the firms engaged in exports, accounting on average for about 43 per cent of their annual sales. But the share of exports in total sales of the manufacturing sector at large never exceeded 10 per cent and has in fact exhibited a declining trend over the sample period.

Table 4 reports the sectoral distribution of exporters. Exporting is concentrated on a few sectors such as food, beverages, textiles, apparel, leather, and footwear, accounting for about 90 per cent of the number of exporters in the manufacturing sector. About 31 per cent of exporting firms are in the leather sector followed by the textile (17 per cent), food (16.8 per cent), beverage (10 per cent), apparel (7.75 per cent), and footwear (6 per cent) sectors. Similarly, there is a skewed distribution among the sectors when it comes to the share of exports in total sales and production. The empirical analysis will distinguish between these six major exporting sectors and the remaining sectors.

Table 5 compares the average performance of exporters and non-exporters over the sample period. Output is measured as gross value of production whereas value added is measured as a difference between gross value of production and industrial costs such as raw material and energy expenditures. Labour is measured as the number of workers including permanent and seasonal or temporary workers (year equivalent when available), and capital stock is measured as the average of capital stock at the beginning and end of the year. All financial values are expressed in constant terms using a GDP deflator due to the absence of a sectoral deflator. Exporters produce more outputs and use more inputs (i.e. employ a larger number of workers, are more capital-intensive and use larger raw material and energy inputs). They also have higher labour productivity as measured by value added per labour and output per labour. The differences in output, input usage, and labour productivity between exporters and non-exporters are statistically significant at 1 per cent.

5 Econometric results

5.1 Self-selection into the export market

We start our analysis by investigating firm characteristics associated with firm exporting status by estimating Equation (2) using a probit regression model. The dependent variable is a dummy equal to

one if a firm has any exports at year *t* and zero otherwise. Here we are mainly interested in analysing the effect of previous productivity levels and export status on the likelihood of current exporting. One-period lagged capital per employee and intermediate inputs per employee, along with current ownership type, firm size, year, and sector dummies are used as control variables.[5]

Table 6 reports the selection into exporting estimation results. Lagged export status is positive and highly significant, indicating that firms with previous exporting experience are more likely to export. This is consistent with high entry and exit costs in the export market as argued by Roberts and Tybout (1997). Output per employee, conditional on inputs, is used as a measure of productivity.[6] The one-period lag output per employee gives positive and significant coefficients, implying that more productive firms self-select into exporting. In column 2 we introduce the cumulative number of previous years of exporting instead of a one-period lag in export status. We find stronger evidence both for selection into exporting and export persistence. According to this estimate, a 1 per cent increase in labour productivity increases the likelihood of exporting by 0.22 percentage points, all other things remaining constant. A one-year increase in previous export experience also raises the probability of staying in export by about 0.43 percentage points.

Columns 3–4 report separate regression results, focusing on firms operating in the six export-oriented sectors. The main difference with the whole sample results is that the coefficient of previous year productivity has substantially improved both in terms of magnitude and level of significance. The six export-oriented sectors estimates show that a 1 per cent increase in productivity increases the likelihood of exporting by 0.26–0.40 percentage points, which is higher than that found from the whole sample estimation (i.e. 0.14–0.22 percentage points).

Other firm characteristics such as age, size and type of ownership are also found to affect the probability of exporting in the Ethiopian manufacturing sector. In all specifications we find that larger firms, those that are capital-intensive, and those owned by the state are more likely than their counterparts to engage in exporting. Firm age is also associated positively with the likelihood of exporting but not robust when controlling for the number of years in exporting.

5.2. Learning by exporting

The second objective of this study is to examine whether firms improve their productivity subsequent to their entry into export markets. In doing so we estimated Equation (4); that is, current output as a function of previous export status, with one-year lagged output, current factor inputs and other firm attributes such as firm age, ownership, and number of years in export as control variables. A positive and statistically significant coefficient of the lagged export status is considered as evidence of learning by exporting.

Table 7 reports the estimation results for all sectors. The ordinary least square (OLS) and SYS-GMM results are reported under each specification, the former serving as a benchmark. In all estimations,

[5] Firm size, measured in number of employees, is included as a categorical variable to avoid high correlation with other inputs expressed as a ratio of labour input. Size4, a dummy variable equal to one for firms employing at least 100 workers, is used as a base category.

[6] A similar pattern exists when using value added per employee as a measure of productivity.

including the OLS, year- and sector-fixed effects are controlled for and standard errors are clustered at firm level. In the SYS-GMM estimation we use the first and earlier lags of all the inputs and the second and earlier lags of the dependent variable and other controls such as production and exporting experience as instruments for the first difference equation, and the lagged first difference of all explanatory variables as instruments for the equation in levels. The Hansen tests of validity of the instruments were not rejected and no evidence of second-order serial correlation was found.[7]

The first two columns in Table 7 give the benchmark estimation results. Both the OLS and SYS-GMM estimations provide a positive and statistically significant coefficient for the one-year lag export dummy, suggesting previous exporting boosts' current productivity. The magnitude of the coefficient of the previous export status in the SYS-GMM is a bit larger than the OLS. According to these estimations, engaging in exporting increases the productivity of the firm by about 8–12 per cent (depending on the model), other things remaining constant.

In columns 3 and 4 we added a post-2005 dummy interacted with previous export status to examine whether there is any change in the relation between export status and productivity in recent years in light of the substantial increase in share of exports destined for the developing country markets starting in 2005. The previous export status remained positive and significant, while the coefficient of the interaction of previous export status with the post-2005 period is wholly insignificant. This suggests the post-2005 period is no different from the previous periods with regard to the learning effect of exports. However, based on this result we cannot claim that different market destinations have no differential impact on learning. This is because the inclusion of interaction of previous exports with the post-2005 period is not an ideal way to capture the differential learning effect arising from different types of market destinations had it not been for the absence of firm level data on export destinations.

Next we apply the matching method in light of addressing the potential problem of selection bias discussed in the methodology section. We selected the counterfactual control group from the pool of non-exporters in which the distribution of observed variables is as similar as possible to that for exporters. Using psmatch2 in Stata (Leuven and Sianesi 2003) we first estimated the export participation equation, whereby the export status dummy is regressed on a one-year lag of size (in term of employment), capital intensity (K/L), firm age at first level and squared term, ownership type, and industry and year dummies. The propensity score was estimated with a logistic model based on the full sample. All but 85 of the exporting observations were matched with similar non-exporters, observations providing 1,289 firms/year observations of which 416 are exporters.[8] We then formally tested the learning by exporting hypothesis for the matched sample using OLS and system GMM. The results are respectively reported in columns 5 and 6 in Table 7. Both the OLS and SYS-GMM estimations give a positive and statistically significant (at 5 per cent or better) coefficient of the previous export status dummy. The magnitude of the effect in the matched sample is higher (11.8–19.3 per cent) than those

[7] The Hansen test of the over-identifying restriction is a minimized value of the two-step GMM criterion function and robust to heteroskedasticity or autocorrelation and the null is that the instruments are valid.

[8] The estimation results of the export participation equation are reported in Appendix Table A1. They show that firms with larger size, higher capital-intensity and those owned by the state are more likely to participate in exporting. Firm age is also important but has an inverted-U relationship with export status; that is, the probability of exporting increases with firm age only up to a certain point. This is generally consistent with our earlier finding in Section 4.1. The propensity score results indicate that the exporters are more productive than non-exporters in both the unmatched and matched samples.

found in the unmatched estimations (8.3–11.9 per cent), providing stronger evidence of a learning by exporting effect. So far, the results for learning by exporting have been based on all the manufacturing sectors. However, as indicated in the descriptive section, a large number of the sectors are not meaningfully participating in export markets. Hence, comparison of the performance of the exporters and non-exporters by lumping the heterogoneous sectors together might give biased results. In light of this and similar to Bigsten and Gebreeyesus (2009) we estimated Equation (4) focusing on the six export-oriented sectors. The results are reported in Table 8.

The estimation results of the unmatched sample (columns 1 and 2 respectively using OLS and the SYS-GMM) give a positive coefficient of the previous year export status but it is only significant in the OLS estimation. We then run similar regressions for the matched sample in the six export sectors (see columns 3 and 4). Unlike the unmatched results, we now find positive and significant (at 5 per cent) previous export status not only for the OLS but also for the SYS-GMM estimation. This shows that addressing the selection bias through matching improves the effect of export engagement on productivity. The magnitude of the previous export experience coefficient in the six sectors matched sample (0.168) is slightly lower when compared not only with the matching results of all the sectors in Table 7 (0.193) but also with the six sectors matching result (0.255) reported by Bigsten and Gebreeyesus (2009) based on data covering only 1996–2005. Despite the magnitude difference, all these results support the presence of a learning by exporting effect in the Ethiopian manufacturing sector.

Lastly, we turn to the effect of other explanatory variables in the model. Lagged output is positive and highly significant in all cases, suggesting persistency in productivity. The number of years in exporting gives mostly statistically insignificant coefficients. Moreover, neither firm age nor public ownership is significant in any of the estimations.

6 Conclusions

The positive association between exporting and productivity is well documented in the literature. However, inferring causality from a positive association between exporting and firm performance has been a subject of debate. The self-selection hypothesis emphasizes that more productive firms self-select into exporting due to high entry costs in international markets. The learning by exporting hypothesis, on the other hand, states that firms learn after entering into the export market. Using a unique and relatively longer panel dataset over the period 1996 to 2009 from the Ethiopian manufacturing sector, this study specifically tested these two hypotheses. The econometric results show that more productive firms self-select into exporting and this effect is stronger when focusing on the six export-oriented sectors. Firms with previous exporting experience are also more likely to export subsequently, providing evidence for export hysteresis.

The analysis also shows that not only that productive firms self-select into exporting but also that they improve their productivity further following their entry. The learning by exporting effect is stronger when estimation is based on the matched sample that corrects for heterogeneity. Depending on the specification, previous year exporting improves firm productivity by about 8–19 percentage points. Our results are largely consistent with the emerging evidence from other developing countries reviewed above and give support to the view that export promotion efforts might have long-term effects in terms of sustaining exports and industrial competitiveness.

Market destination of exports may affect learning as the scope for learning might be limited if exporting is made between countries with a similar level of technological advancement. In our analysis we find no significant change in the relation between export status and productivity post-2005—the period when export destination has increasingly shifted from developed to developing countries. However, examining the differential impact of export destination (developed versus developing countries) on learning requires firm level export destination information, which we do not have in our dataset. Hence, future research needs to take account of this limitation.

References

Arellano, M., and S. Bond (1991). 'Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations'. *Review of Economic Studies*, 58: 277–97.

Aw, B.Y., and A.R. Hwang (1995). 'Productivity and the Export Market: A Firm Level Analysis'. *Journal of Development Economics*, 47(2): 313–32.

Baldwin, R.E. (1989). 'Sunk Cost Hysteresis'. Working Paper 2911. Cambridge, MA: National Bureau of Economic Research.

Baldwin, R.E, and P.R. Krugman (1989). 'Persistent Trade Effects of Large Exchange Rate Shocks'. *Quarterly Journal of Economics*, 104(4): 635–54.

Bernard, A.B., and J.B. Jensen (1999). 'Exporting and Productivity'. Working Paper 7135. Cambridge, MA: National Bureau of Economic Research.

Bernard, A.B., and J. Wagner (1997). 'Exports and Success in German Manufacturing', *Weltwirtschaftliches Archiv*, 133(1): 134–57.

Bigsten, A., and M. Gebreeysus (2009). 'Firm Productivity and Exports: Evidence from Ethiopian Manufacturing'. *Journal of Development Studies*, 45(10): 1594–614.

Bigsten, A., P. Collier, S. Dercon, M. Fafchamps, B. Gauthier, J. Gunning, A. Oduro, R. Oostendorp, C. Pattillo, M. Söderbom, F. Teal, and A. Zeufack (2004). 'Do African Manufacturing Firms Learn from Exporting?' *Journal of Development Studies*, 40(3): 115–41.

Blundell, S., and S. Bond (1998). 'Initial Conditions and Moment Restrictions in Dynamic Panel Data Models'. *Journal of Econometrics*, 87(1): 29–52.

Clerides, S., S. Lach, and J. Tybout (1998). 'Is Learning-by-Exporting Important? Micro-Dynamic Evidence from Colombia, Mexico, and Morocco'. *Quarterly Journal of Economics*, 113(3): 903–47.

Delgado, M., J. Fariñas, and S. Ruano (2002). 'Firm Productivity and Export Markets: A Non-Parametric Approach'. *Journal of International Economics*, 57(2): 397–422.

Dixit, A. (1989). 'Entry and Exit Decisions under Uncertainty'. *Journal of Political Economy*, 97(3): 620–38.

Fernandes, A.M., and A.E. Isgut (2005). 'Learning-by-Doing, Learning-by-Exporting, and Productivity: Evidence from Colombia'. Working Paper 3544. Washington, DC: World Bank.

Gebreeyesus, M. (2013). 'Industrial Policy and Development in Ethiopia: Evolution and Present Experimentation'. Working Paper 2013/125. Helsinki: UNU-WIDER.

Girma, S., D. Greenaway, and R. Kneller (2004). 'Does Exporting Increase Productivity? A Microeconometric Analysis of Matched Firms'. *Review of International Economics*, 12(5): 855–66.

Greenaway, D., and D. Sapsford (1994). 'What does Trade Liberalization do for Exports and Growth?' *Weltwirtschaftliches Archiv*, 131: 152–74.

Hahn, C. (2004). 'Exporting and Performance of Plants: Evidence from Korean Manufacturing'. Working Paper 10208. Cambridge, MA: National Bureau of Economic Research.

Helpman, E., and P. Krugman (1985). *Market Structure and International Trade*. Cambridge, MA: MIT Press.

Kraay, A. (1999). 'Exportations et Performances Economiques: Etude d'un Panel d'Entreprises Chinoises'. *Revue d'Economie du Developpement*, 0(1–2): 183–207.

Leuven, E., and B. Sianesi (2003). 'PSMATCH2: Stata Module to Perform Full Mahalanobis and Propensity Score Matching, Common Support Graphing, and Covariate Imbalance Testing'. Boston College Department of Economics, Statistical Software Components. Available at: http://ideas.repec.org/c/boc/bocode/s432001.html (accessed 23 June 2014).

Melitz, M.J. (2003). 'The Impact of Trade on Intra-industry Reallocations and Aggregate Industry Productivity'. *Econometrica*, 71(6): 1695–725.

Rankin, N., M. Söderbom, and F. Teal (2006). 'Exporting from Manufacturing Firms in Sub-Saharan Africa'. *Journal of African Economies*, 14(4): 671–87.

Roberts, M., and J. Tybout (1997). 'The Decision to Export in Colombia: An Empirical Model of Entry with Sunk Costs'. *American Economic Review*, 87(4): 545–64.

Syverson, C. (2011). 'What Determines Productivity?' *Journal of Economic Literature*, 49(2): 326–65.

UNCTADstat (United Nations Conference on Trade and Development). Available at: http://unctadstat.unctad.org/ReportFolders/reportFolders.aspx?sRF_ActivePath=p,15912&sRF_Expanded=,p,15912 (accessed 23 June 2014)

Van Biesebroeck, J. (2005). 'Exporting Raises Productivity in Sub-Saharan African Manufacturing Plants'. *Journal of International Economics*, 67(2): 373–91.

Van Biesebroeck, J. (2008). 'The Sensitivity of Productivity Estimates: Revisiting Three Important Debates'. *Journal of Business and Economics Statistics*, 26(3): 311–28.

Wagner, J. (2002). 'The Causal Effect of Exports on Firm Size and Labor Productivity: First Evidence from a Matching Approach'. *Economics Letters*, 77(2): 287–92.

Windmeijer, F. (2000). 'A Finite Sample Correction for the Variance of Linear Two-Step GMM Estimators. Working Papers W00/19. London: Institute for Fiscal Studies.

Wooldridge, J. (2002). *Econometric Analysis of Cross Section and Panel Data*. Cambridge, MA: MIT Press.

World Bank (1993). *The East Asian Miracle: Economic Growth and Public Policy*. New York: Oxford University Press.

World Bank (various years). 'World Development Indicators'. Washington DC: World Bank. Available at: http://databank.worldbank.org/ddp/home.do (accessed 10 July 2013).

Table 1: Trends in exporting in Ethiopian manufacturing, 1996–2009

Year	Number of firms	Number of exporters	Share of exporters (%)	Average export share of total sales (%)	
				All firms	Only exporters
1995/96	622	24	3.86	7.34	41.28
1996/97	695	27	3.88	7.84	53.36
1997/98	725	28	3.86	8.92	53.12
1998/99	722	37	5.12	5.20	45.84
1999/00	738	40	5.42	4.68	43.40
2000/01	722	38	5.26	8.45	40.16
2001/02	882	32	3.63	8.59	52.78
2002/03	939	41	4.37	9.94	50.90
2003/04	988	47	4.76	7.06	44.07
2004/05	762	51	6.69	8.03	38.55
2005/06	1140	56	4.91	9.08	41.08
2006/07	1339	58	4.33	5.10	43.04
2007/08	1734	62	3.58	6.06	41.35
2008/09	1948	78	4.00	4.14	35.36

Source: own calculations from Central Statistical Agency (CSA) (1996–2009).

Table 2: Comparison of export performance – Ethiopia and average SSA country

Year	Merchandise exports per capita		Manufacturing exports per capita	
	Ethiopia	SSA	Ethiopia	SSA
1995	7.40	130.72	0.83	
1996	7.09	143.09		39.55
1997	9.71	140.83	0.94	42.11
1998	9.02	114.72	0.61	33.35
1999	7.32	121.03	0.49	35.71
2000	7.41	140.26	0.72	43.01
2001	6.76	129.01	0.91	39.29
2002	6.96	133.67	1.00	48.81
2003	7.01	159.32	0.80	53.65
2004	9.35	209.21	0.36	
2005	12.16	254.51	0.56	
2006	13.72	292.60	0.74	88.45
2007	16.43	337.26	2.26	110.43
2008	20.16	410.32	1.82	133.86
2009	19.66	291.28	1.70	89.39

Source: World Bank, World Development Indicators.

Table 3: Export destinations of Ethiopia's manufacturing goods (millions of dollars)

Year	World	Share of exports to developing economies (%)	Share of exports to developed economies (%)
1995	47.13	17.04	78.71
1996	40.22	13.33	54.01
1997	53.43	13.40	83.50
1998	37.40	20.35	79.37
1999	29.91	30.05	70.03
2000	44.42	39.92	60.07
2001	53.51	32.55	67.41
2002	58.93	22.83	77.08
2003	58.41	25.13	74.53
2004	20.85	27.60	70.41
2005	47.23	32.22	67.60
2006	62.24	26.05	73.62
2007	170.68	28.00	71.27
2008	143.28	40.28	59.42
2009	160.23	47.71	52.01
2010	253.88	57.97	41.93

Source: UNCTADstat.

Table 4: Sectoral composition of exports

Sector	Sectoral distribution of exporters (%)	Share of export in annual sales	Share of export in production
Food	16.80	36.05	27.75
Beverages	10.50	3.99	3.91
Textiles	16.96	23.98	22.13
Apparel	7.75	28.98	25.82
Leather	31.18	80.94	68.82
Footwear	6.14	33.11	30.67
Wood	032	50.00	0.00
Paper and printing	0.65	34.69	51.26
Chemicals	1.45	32.66	18.47
Rubber and plastic	0.65	1.37	0.93
Non-metal	3.39	18.84	22.55
Metal	1.29	7.78	19.44
Machinery and equipment	0.16	51.62	51.62
Furniture	0.66	60.85	45.93
Other	2.26	20.45	22.92
Total		43.35	34.83

Source: own calculations using CSA (1996–2009).

Table 5: Firm performance of exporters and non-exporters

	Exporters	Non-exporters	diff	*t*
ln labour$_t$	5.54	3.47	2.07 ***	42.63
ln capital$_t$	16.01	12.64	3.37***	32.17
ln (capital/labour)$_t$	10.47	9.19	1.29***	15.69
ln energy$_t$	12.53	9.57	2.96***	31.54
ln raw materials$_t$	15.93	12.76	3.17***	35.89
ln gross output	16.66	13.50	3.17***	37.68
ln value added per labour$_t$	10.15	9.21	0.94***	17.15
ln output per labour$_t$	11.13	10.03	1.10***	20.57
ln value added per labour$_{t-1}$	10.20	9.33	0.88***	14.65
ln output per labour$_{t-1}$	11.21	10.14	1.07***	18.65

Notes: *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Source: own calculations using CSA (1996–2009).

Table 6: Selection into exporting using size category, Probit regressions

VARIABLES	Whole sample		Only export-oriented sectors	
	(1)	(2)	(3)	(4)
Exporter (t-1)	2.336***		2.323***	
	(0.125)		(0.143)	
Log (output/labour)$_{t-1}$	0.135*	0.221***	0.255**	0.397***
	(0.0818)	(0.0828)	(0.103)	(0.106)
Exporting years$_{t-1}$		0.427***		0.410***
		(0.0420)		(0.0431)
ln(firm age)$_{t-1}$	0.406**	0.00782	0.346*	-0.0883
	(0.173)	(0.167)	(0.196)	(0.200)
ln(firm age)$_{t-1}^2$	-0.0673*	-0.00871	-0.0575	0.00375
	(0.0349)	(0.0359)	(0.0392)	(0.0426)
ln(capital/labour)$_{t-1}$	0.136***	0.152***	0.105***	0.125***
	(0.0292)	(0.0336)	(0.0336)	(0.0405)
ln(raw materials/labour)$_{t-1}$	-0.0488	-0.0834	-0.110	-0.184**
	(0.0679)	(0.0719)	(0.0862)	(0.0932)
ln(energy/labour)$_{t-1}$	-0.0413	-0.0653**	-0.0158	-0.0523
	(0.0306)	(0.0329)	(0.0448)	(0.0455)
Size1 (10–19 workers)$_{t-1}$	-0.927***	-0.910***	-1.071***	-1.122***
	(0.153)	(0.159)	(0.203)	(0.225)
Size2 (20–49 workers)$_{t-1}$	-0.665***	-0.701***	-0.680***	-0.797***
	(0.119)	(0.123)	(0.151)	(0.160)
Size3 (50–99 workers)$_{t-1}$	-0.523***	-0.536***	-0.601***	-0.637***
	(0.136)	(0.144)	(0.164)	(0.174)
Public ownership$_t$	0.205*	0.314***	0.285**	0.379***
	(0.106)	(0.117)	(0.114)	(0.140)
Year	Yes	Yes	Yes	Yes
Sector	Yes	Yes	Yes	Yes
Observations	9081	9081	3890	3890
Pseudo R^2	0.6752	0.6238	0.6769	0.6218

Notes: Dependent variable is export dummy equal to one if firm has any export in year t and zero otherwise.*Size4*, a dummy variable equal to one for firms with at least 100 workers, is used as a base category. Clustered standard errors at firm level in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Source: own calculations using CSA (1996–2009).

Table 7: Estimation results of the learning by exporting for all sectors

	Unmatched sample			Matched sample		
	OLS	SYS-GMM	OLS	SYS-GMM	OLS	SYS-GMM
	(1)	(2)	(3)	(4)	(5)	(6)
log output (*t*-1)	0.175***	0.073***	0.175***	0.074***	0.298***	0.0506
	(0.014)	(0.014)	(0.014)	(0.015)	(0.045)	(0.032)
Exporter (*t*-1)	0.083**	0.119**	0.078*	0.137*	0.118***	0.193**
	(0.042)	(0.059)	(0.043)	(0.070)	(0.043)	(0.089)
Exporter(*t*-1)*post-2005			0.038	-0.131		
			(0.043)	(0.159)		
years of previous exporting (*t*-1)	0.000	0.006	-0.002	0.018	-0.016	0.079***
	(0.008)	(0.012)	(0.009)	(0.025)	(0.021)	(0.028)
lnfirm_age (*t*-1)	0.007	0.000	0.007	-0.005	-0.002	-0.009
	(0.007)	(0.023)	(0.007)	(0.024)	(0.008)	(0.072)
public ownership	0.041	0.033	0.042	0.009	0.002	-0.118
	(0.027)	(0.097)	(0.026)	(0.116)	(0.042)	(0.099)
log capital	0.029***	0.012	0.029***	0.010	0.021	-0.004
	(0.005)	(0.022)	(0.005)	(0.022)	(0.016)	(0.035)
log labour	0.128***	0.125***	0.128***	0.131***	0.126***	-0.007
	(0.014)	(0.040)	(0.014)	(0.040)	(0.028)	(0.064)
log raw material	0.626***	0.758***	0.626***	0.761***	0.509***	0.722***
	(0.019)	(0.026)	(0.019)	(0.027)	(0.047)	(0.068)
log energy	0.086***	0.041***	0.086***	0.043***	0.093***	0.0229
	(0.009)	(0.012)	(0.009)	(0.013)	(0.016)	(0.027)
Year-controlled	Yes	Yes	Yes	Yes	Yes	Yes
Sector-controlled	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9187	9187	9187	9187	1289	1289
Number of firms	2187	2187	2187	2187	423	423
AR(2) in 1st diff		0.851		0.878		0.270
No. instruments		119		119		118
Hansen test chi-square (*p*-value)		77.06 (0.691)		77.21 (0.629)		60.89 (0.961)

Notes: Dependent variable is log of real value of output. The instruments for the differenced equation in the GMM estimations are first lag and earlier for the inputs and second lag and earlier for output, firm age and export history. On the other hand, only lagged first differences are used as instruments for the level equations. The standard errors are of the GMM results and are also a robust finite sample corrected on two-step estimates derived from Windmeijer (2000). The standard errors in the OLS estimations are also clustered at firm level, which makes them robust not only to within-panel (serial) correlation but also to cross-sectional heteroskedasticity. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Source: own calculations using CSA (1996–2009).

Table 8: Estimation results of the learning by exporting for the six export-oriented sectors

	The six export-oriented sectors			
	Unmatched sample		Matched sample	
	OLS	SYS-GMM	OLS	SYS-GMM
	(1)	(2)	(3)	(4)
log output (*t*-1)	0.166***	0.066***	0.290***	0.042
	(0.028)	(0.019)	(0.0513)	(0.033)
Exporter (*t*-1)	0.104**	0.098	0.107**	0.168 **
	(0.047)	(0.069)	(0.046)	(0.085)
years of previous exporting (*t*-1)	0.005	0.007	0.007	0.036*
	(0.008)	(0.014)	(0.008)	(0.020)
lnfirm_age (*t*-1)	-0.003	0.005	-0.029	0.025
	(0.010)	(0.029)	(0.023)	(0.055)
public ownership	0.052	-0.002	-0.021	0.030
	(0.035)	(0.139)	(0.046)	(0.149)
log capital	0.026***	0.003	-0.007	-0.028
	(0.007)	(0.013)	(0.016)	(0.025)
log labour	0.111***	0.041	0.148***	0.101
	(0.020)	(0.044)	(0.029)	(0.080)
log raw material	0.675***	0.802***	0.542***	0.684***
	(0.033)	(0.033)	(0.056)	(0.058)
log energy	0.054***	0.041**	0.069 ***	0.0417
	(0.011)	(0.016)	(0.019)	(0.028)
Year-controlled	Yes	Yes	Yes	Yes
Sector-controlled	Yes	Yes	Yes	Yes
Observations	3922	3922	1054	1054
Number of firms			283	283
AR(2) in 1st diff		0.747		0.928
No. instruments		119		116
Hansen test chi-square		90.67		68.22
(*p*-value)		(0.520)		(0.950)

Notes: See Table 7.

Source: own calculations using CSA (1996–2009).

.

Appendix

Table A1: Propensity to export, logistic regression

VARIABLES	(1) Whole sample	(2) Export-oriented sectors
$Ln(K/L)_{t-1}$	0.407***	0.455***
	(0.0573)	(0.0670)
$Ln(L)_{t-1}$	0.944***	0.995***
	(0.0631)	(0.0717)
$Ln(\text{firm age})_{t-1}$	0.931***	0.932***
	(0.328)	(0.3604)
$Ln(\text{firm age})^2_{t-1}$	-0.1806***	-0.1880***
	(0.0621)	(0.0677)
$Public_t$	0.420**	0.6551***
	(0.1663)	(0.184)
Year	Yes	Yes
Sector	Yes	Yes
Observations	9287	3942
Pseudo R^2	0.5170	0.4959

Note: dependent variable is export dummy equal to one if firm has any export in year *t* and zero otherwise. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Source: own calculation using CSA (1996–2009).

Table A2: Productivity difference between exporters and non-exporters after psmatch2 matching

A. Whole sample

Variable	Sample	Treated	Controls	Difference	S.E.	*T*-stat
Log (Q/L)	Unmatched	11.234	10.194	1.040	0.0580	17.93
	ATT	11.166	10.743	0.4231	0.1426	2.97

B. Focusing on export-oriented sectors

Variable	Sample	Treated	Controls	Difference	S.E.	*T*-stat
Log (Q/L)	Unmatched	11.283	10.346	0.9373	0.0629	14.90
	ATT	11.261	10.761	0.4999	0.1768	2.83

Source: own calculation using CSA (1996–2009).