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Survival Is for the Fittest

Export Survival Patterns in Georgia

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Abstract

This paper analyzes the determinants of export flow survival in Georgia. The paper uses a unique Georgian firm-level data set, in which firms' characteristics and output dynamics are matched with their customs' export transactions, for the period 2006–12. A discrete survival model is used to explore the role of firm level characteristics, diversification strategies, and network effects on the survival rates of export flows. Low survival rates at the product level are found to limit the ability of Georgian firms to consolidate new products in international markets. The analysis finds that it is production efficiency, rather than size, that boosts export survival chances, that firms' diversification strategies matter for the prospects of survival, and that there is strong evidence of network effects in export survival. The analysis also finds that ratified foreign trade agreements contribute to increase the survival of export flows by reducing policy-induced trading costs and increasing information about destination markets.

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Survival Is for the Fittest: Export Survival Patterns in Georgia

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1. Introduction

Understanding the main challenges to export diversification and survival is crucial from a policy perspective for many developing countries as an important part of their growth prospects is inevitably linked to their ability to competitively produce and market goods in the global marketplace.

Export growth results from different factors such as the expansion into new products and new markets (the extensive margin), the extension of existing export relationships (the intensive margin) and the survival of these relationships across time (the sustainability margin). A closer look at the sources of export growth reveals that exporting is a risky activity characterized by a high degree of uncertainty. Firms struggle to diversify their export portfolio both in terms of products and destination, but once they have reached new markets, they also struggle to keep their export flows active for long periods (Besedes and Prusa (2004, 2006), Brenton et al. (2010), Cadot et al. (2013)). Low survival rates entail welfare losses for the economy as a whole when sunk costs of entry and exit are high.

Besedes and Prusa (2007) have shown that the main difference between successful developing countries and less successful ones in terms of export performance lies in the ability to maintain export relationships for longer. Brenton et al. (2009) also have shown that poor export performance of some developing countries is attributable to low survival rates, with no substantial differences in the introduction of new trade flows. Thus, improving the survival rate of new export flows is important not only because the high mortality rate implies high inefficiencies but mostly because low survival limits the deepening of trade relationships and henceforth diversification, overall export growth and the resulting job creation.

In this paper we use a unique data set on Georgian firms matched with customs' export transactions for the period 2006-2012. This database allows us to explore the role of firm level characteristics among the factors affecting export survival. We also explore the role of both diversification strategies and network effects on the success of export flows.

The analysis yields five main results.

First, Georgian exporters failed to consolidate new products in international markets. We find that while Georgia experienced sustained export growth between 2006 and 2012, firms encountered difficulties in the introduction of new export products and particularly failed to keep these flows alive. This unsatisfactory record is mainly the result of low survival rates at the product level. There is substantial churning in export flows with firms adding and dropping products to their export mix continuously. Second, firms' diversification strategies matter for the prospects of survival. Looking at the relationship between diversification and export survival we find that it matters how firms diversify. Flows from multi-product firms show better chances of survival relative to those originating from firms that have a concentrated export bundle. However, export flows from multi-destination firms (those more diversified along the destination dimension) show lower survival rates than those from firms with export bundles concentrated in fewer destinations.

Third, survival is higher among the fittest, more productive firms. Indeed, it is production efficiency, rather than size, that boosts export survival chances. After taking into account efficiency differences, larger firms are no different than smaller firms in their survival patterns. Fourth, there is strong evidence of network effects in export survival. The chances of surviving active in export markets increase with the number of firms exporting the same product to the same destination. Fifth, foreign trade agreements (FTAs) contribute to increase export survival by reducing policy-related trading costs, and adding information about destination markets. These results have important implications for export promotion policy design.

The remainder of this paper is structured as follows. Section 2 presents a literature review. Section 3 describes the data set used and presents descriptive statistics. Section 4 presents the empirical strategy and discusses the main results. Finally, section 5 concludes and discusses policy implications.

2. Literature review

Several studies have looked into the duration of export flows either at the country or firm or, more recently, at the product level. Besedes and Prusa (2006) in their pioneering study on survival of export flows to the US showed that the duration of exports tends to be very short, between two to four years, and exhibit negative duration dependence meaning that the probability of failure decreases if flows survive the first few years. While Besedes and Prusa focused on country-product combinations, the literature that followed tried to explain the low export survival at the firm level. Bernard et al. (2010) contributed to the understanding of drivers of export survival at the firm-product level. These efforts generated some empirical and theoretical knowledge of what are the main determinants of export survival.

Bernard et al. (2010) have extended the firm heterogeneity literature to the product level showing that firms will modify their production and export mix according to the evolving characteristics of their own firm and those of the market in which they operate. The key parameters in their model are the firm's productivity level and the product specific consumer taste, which the firm can observe only after incurring a sunk cost. Optimization implies that firms will produce or export a product only if the consumer taste parameter given the firm's productivity is greater than a zero-profit consumer taste cut-off. This zero profit cut-off varies across firms and is negatively related to the firms' productivity. Both parameters are subject to random shocks, which prompt firms to drop and add products from their product mix. The main implication of this model is that lower productivity firms are more vulnerable to shocks that make a product unprofitable and thus are more likely to drop products from their production/export mix. Thus, firm level productivity is one of the main factors that can affect survival also at the firm-product level.

A further prediction coming from the Bernard et al. (2010) model is that the probability of dropping a product is negatively related to the duration of the product in the export mix (the model exhibits "negative duration dependence"). In fact, given that both productivity and consumer tastes are serially correlated, the longer the period a product is exported, the lower the probability of it being dropped.

Rauch and Watson (2003) also develop a model that implies negative duration dependence. In their model there is a search-and-match game between importers and exporters in presence of information asymmetries and moral hazard. Importers search a reliable supplier while exporters need to be sure of the duration of the relationship before making the relative investments to expand the production capacity. In such conditions export transactions are characterized by trial and error, or small experiments to "test" the partner. Once they survive these tests, the mortality decreases.

Both Bernard et al. (2010) and Rauch and Watson (2003) predict that product survival is positively related to the value of the export flow. In Rauch and Watson (2003) this derives from the fact that when importers are uncertain about the capacity of the exporter to comply with the order requirements, or the exporter faces uncertainty with regards to its production capacity, or about the importer's reliability, they may start with small orders, to update their information about each other through trial and error. In Bernard el al. (2010) a higher value of the export flow implies a high value of the consumer taste and thus a lower probability of dropping the product. The effect of the scale of the trade flow on survival has been documented in several empirical studies (Gorg et al. 2012; Cadot et al. 2013).

There is scarce literature on the links between diversification strategies and survival. One of the examples is Volpe and Carballo (2009). The authors look at the specific link between firms' diversification strategies and export survival in an empirical application for the Peruvian case, and find that market and product diversification increases the survival rate of Peruvian firms in export markets. They explain the results with a portfolio argument for which firms exporting different products or in different destinations can take advantage of the non-perfect covariance of sales of different products/markets to reduce the overall variability of sales and thus increase the likelihood of survival in export markets.

The literature has also explored the role of network effects in the success of export flows under the hypothesis that other exporters could facilitate entering and surviving into foreign markets for other firms of the same country. Cadot et al. (2013) find evidence of 'network effects' in determining export survival chances. The authors find that survival probabilities increase with the number of same-country firms exporting the same product to the same destination, suggesting the existence of cross-firm informational externalities.

3. Data

The analysis is based on a unique data set from Georgian Customs' export transaction data merged with firm level data obtained from Georgia's National Statistics Office, Geostat. The firm level data consists of a panel of Georgian firms spanning the period 2006-2012. This is matched with Customs data recording all export transactions occurred in the same period using a common firm identifier. Large firms (those with more than 100 employees) are all included in the data set while small and medium enterprises have been randomly sampled. There are 13,816 firm-year observations with 6,745 firms surveyed at least once in the panel (Table 1). On average firms have been surveyed around twice from 2006 to 2012.

The number of exporting firms in the industrial survey ranges from 10 to 16% of all firms in the sample. The proportion of exporting firms increases slightly from 2006 to 2012 (Table 1).[1] Movements in and out of export markets are quite large. Table 1 shows the dynamics of entry and exit into the export market by tracking firms that exported the year before and ceased to export the following year and vice-versa (firms that exported but were not exporting the year before). Between 15% and 20% of exporters cease to export the following year while a slightly lower number of exporters starts exporting. These figures are likely to be underestimated because larger firms are overrepresented in the matched data set. Computing entry and exit rates for the entire universe of Georgian exporters from the full custom data gives rates close to 50%. This is high if compared with other countries as Albania (35%), Bulgaria (40%), Mexico (35%) and Peru (35%).[2] The data also show that number of HS 6-digit products exported increases substantially between 2006 and 2012 as does the number of destinations.

Table 1: Georgian Firms by Export Condition

Year	Firms	Exporting firms (%)	Exit from exporting	New exporters	Total Exported products (HS6)	Total Exporting destinations
2006	2,117	234 (11.1)	45		265	50
2007	1,581	166 (10.5)	29	30	286	55
2008	1,606	168 (10.5)	25	29	317	51
2009	2,415	237 (9.8)	46	28	397	70
2010	2,220	211 (9.5)	34	37	479	69
2011	1,848	292 (15.8)	46	36	665	76
2012	2,029	255 (12.6)		42	588	71

Source: Authors' Calculations based on Geostat – Industrial Survey

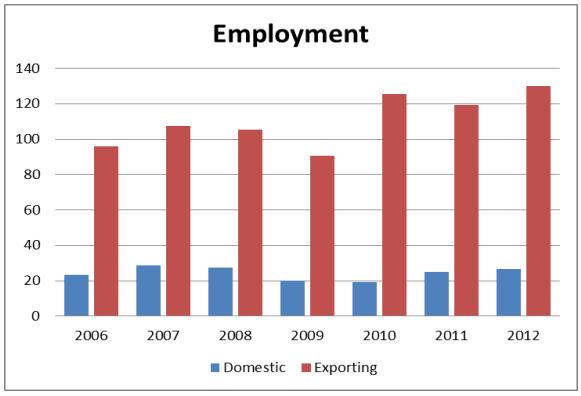
Exporters are larger both in terms of turnover and employment. In 2006, exporters' turnover and employment were four times bigger than those of non-exporters. The difference increases over the years with exporters having on average five times the turnover and employment of non-exporting firms in 2012. This shows that Georgian exporters grew faster than domestic oriented firms. Exporters are more capital intensive, more productive, and show a higher share of foreign ownership than firms oriented to the domestic market. Total factor productivity (TFP), an indicator of firms' efficiency that measures how much output a firm can produce with a given amount of inputs, is greater for exporters than for non-exporters (see the Appendix for a discussion of productivity dynamics in Georgia). In addition to this, exporters show higher capital intensive production processes, and this intensity is growing over time (the same trend holds for all firms,

[1] In 2012 the proportion of exporters fell with respect to 2011, this may be due to the recession in the Euro area which is the second most important destination for Georgian exports after the ECA region. In fact, cumulated exports towards Europe declined between 2011 and 2012 and it is likely that firms exporting toward Europe experienced problems in 2012.

[2] Entry and exit rates for comparator countries are obtained from the Exporter Dynamics Database (EDD).

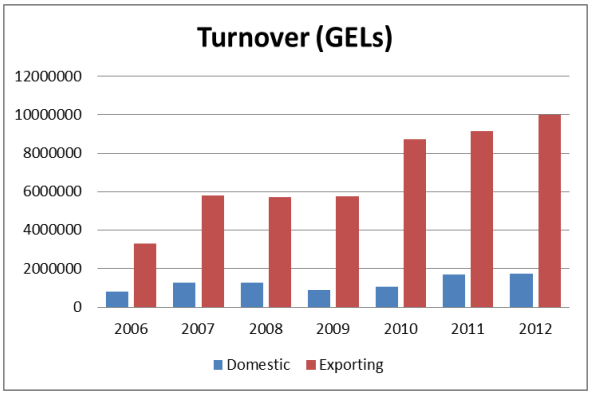
but it is more pronounced among exporters). Finally, the share of foreign ownership among exporters is substantially higher than among non-exporters, and for both groups it has grown over time (for non-exporters, from 1.8 in 2006 to 6.7% in 2012, for exporters from 14 to 32% over the same period (see Figure 3, Figure 4 and Figure 5).

Figure 1: Employment for Exporters and Non-Exporters (2006-2012)



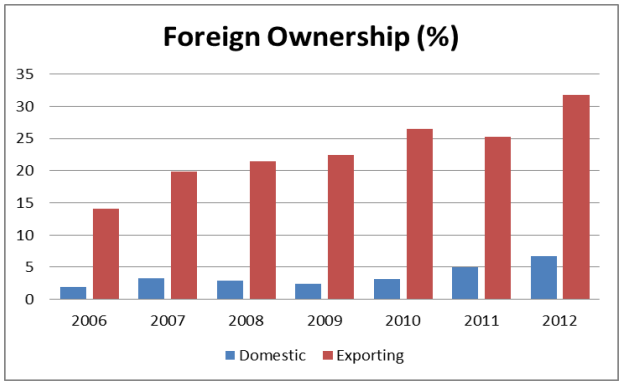
Source: Authors calculation based on GeoStat firm level data.

Figure 2: Turnover for Exporters and Non-Exporters (2006-2012)



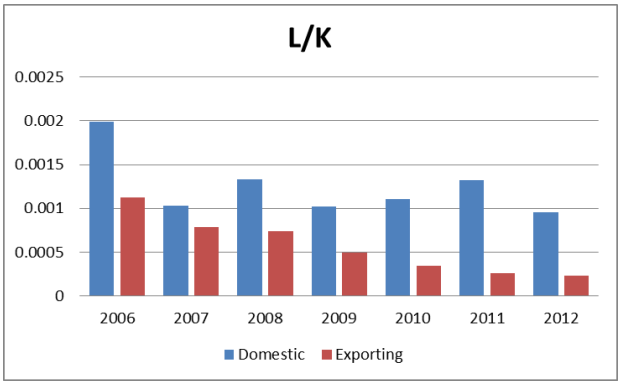
Source: Authors calculation based on GeoStat firm level data.

Figure 3: Share of Foreign Ownership by Exporter Status (2006-2012)



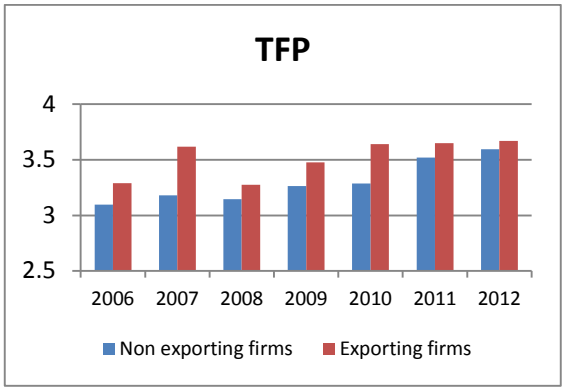
Source: Authors calculation based on GeoStat firm level data

Figure 4: Capital Intensity by Exporter Status (2006-2012)



Source: Authors calculation based on GeoStat firm level data

Figure 5: Total Factor Productivity (TFP) by Exporter Status (2006-2012)



Source: Authors calculation based on GeoStat firm level data

At the same time as firms increased their revenues from exporting, they also diversified their export mixes both in terms of products and markets. The average number of exported products per firm grows from 2.2 in 2006 to 3.9 in 2012 while the average number of destinations reached by Georgian firms goes from 2.4 in 2006 to 3.3 in 2012. This is relatively low when compared with a large, developed economy such as the US. In fact, for that country, Bernard et al. (2005) reports that in 2000 the average number of products exported by firms was 8.9 while the average destinations were 3.5 countries. The comparison with other developing countries, such as Peru, Bulgaria and Mexico for example, shows that Georgian firms are relatively more diversified across destinations than products (Table 2). In addition, export revenues increase by a factor of three in nominal terms (when looking at export volumes, rather than values, these double between 2006 and 2012).

However, these figures mask the fact that some firms produce very little of a given product. We also look at the number of "significant" products per firm. A product is considered "significant", if it explains more than 1% of total revenues of the firm. When we consider significant products only, then, the average number of products firms export is almost halved and remains quite stable across years. Thus, the observed increase in the number of products firms export is mainly due to small transactions while the bulk of firms' export remains concentrated on few products.

Table 2: Cross-country comparisons on products and destinations per exporter

Country	Avg. num. of products per exporter	Avg. num. destination per exporter
Albania	3.5	1.5
Bulgaria	6.2	2.4
Mexico	7.2	2.2
Peru	7.5	2.6
US	8.9	3.5

Source: Exporter Dynamics Database (EDD); Bernard et al (2005) for the US; Volpe and Carballo (2009) for Peru.

Moreover, despite the fact that firms have been diversifying in terms of products and destinations, most export growth is still accounted for by more exports of the same products to the same destinations. An export growth decomposition into the intensive and extensive margins shows

that about 80% of the export growth is due to the intensive margin and 20% is due to the extensive margin – to the addition of new products to the export mix. Using Customs export transaction data we can have a closer look at the relative contribution of the intensive and the extensive margins to export growth and at the issue of product diversification in Georgian exports between 2006 and 2012.

Diversification happens because existing firms add new products to their export mix and because new firms export products that were not exported before. We can decompose the extensive margin into a "within-firm" component, which represents the contribution of products exported by continuing firms (firms exporting both in 2006 and 2012) and an "entry/exit" component, which represents the net effect of new products exported by entrant firms minus the products dropped by exiting exporters. Between 2006 and 2012 25% of the export growth due to product diversification happens within existing firms while 75% is due to new firms.

There is substantial experimentation with new products that happen at small scale. These products, however, struggle to contribute substantially to export growth probably because of low survival rates, which impedes their consolidation. The number of export products increased from 1,497 in 2006 to 2,024 in 2012. In 2012 the product mix is equally split between continuing products (products already exported in 2006) and new products. However, new products only account for 16% of total exports in terms of value.

The entry of new exporters into the market is an important driver of product diversification in Georgia. Thirty percent of the growth in the number of product exported is due to within firm diversification while 70% is due to the entry of new firms.

From the perspective of destinations, export growth is obtained almost entirely from increased exports to the same destinations. The extensive margin accounts for a mere 2.8% of total export growth in the period. This implies that at the firm level destination diversification has been minimal and much lower than product diversification. Contrary to what it is seen for product diversification the major part of the destination diversification happens within continuing firms (62.2%) while new destinations introduced by entrants account for 37.8% of the extensive margin.

Table 3: Decomposition of Export Growth

Trade 2006 (Ths US$)	**Trade 2012 (Ths US$)**	**Continuing prod. Trade (Ths US$)**	**New prod. Trade (Ths US$)**	**Δ trade (Ths US$)**	**Intensive margin**	**Extensive Margin**	
						New products	*Dropped products*
						312594.3	89818.45
910471.3	2032984	1720389	312594.3	1122512.5	899736.6	222775.9	
		(84.6%)	(15.4%)	(123.3%)	(80.1%)	(19.9%)	
						Within firms	*Entry/exit*
						54609	168116.9
						(24.5%)	(75.5%)

Nr. Products 2006	**Nr. Products 2012**	**Continuing products**	**New products**	**Δ Nr. Products**	**Extensive Margin**	
					New products	*Dropped products*
1497	2024	1005	1019	527	1019	492
		(49.6%)	(50.4%)		527	
					Within firms	*Entry/exit*
					159	368
					(30.2%)	(69.8%)

Trade 2006 (Ths US$)	**Trade 2012 (Ths US$)**	**Continuing dest. Trade (Ths US$)**	**New dest. Trade (Ths US$)**	**Δ trade (Ths US$)**	**Intensive margin**	**Extensive Margin**	
						New destinations	*Dropped destinations*
						49925.5	18053.63
910471.3	2032984	1983058	49925.5	1122512.5	1090641	31871.87	
		(97.5%)	(2.5%)	(123.3%)	(97.16%)	(2.84%)	
						Within firms	*Entry/exit*
						19831.5	12040.4
						(62.2%)	(37.8%)

Nr. destinations 2006	**Nr. destinations 2012**	**Continuing destinations**	**New destinations**	**Δ Nr. destinations**	**Extensive Margin**	
					New destinations	*Dropped destinations*
98	112	84	28	14	28	14
		(75%)	(25%)		14	
					Within firms	*Entry/exit*
					10	4
					(71.4%)	(28.6%)

Source: Authors' calculations based on Geostat export transaction data.

This trend in product and market diversification can be due to firms' inability to sustain efforts to export new products and enter new markets over time. For countries to achieve fast export growth and diversification, both successful entry into export markets and survival of export flows are crucial.

Previous studies conducted in Georgia that look at export survival at the product-level have shown that the survival rate of Georgian export is low compared to peer countries (Reyes and Varela 2013). The mean spell length over which an export flow (a particular product being exported to a particular destination) is active for Georgia is on average slightly more than two years, while for Lithuania it is 2.84 years, for Slovakia 3.35 years, and for Czech Republic 3.5 years (Table 4).

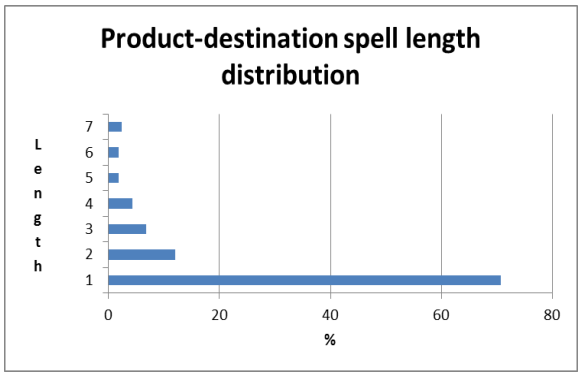
Table 4: Export Survival– Descriptive Statistics (1999-2011)

Country	Mean Spell Length	Standard Deviation
Armenia	2.05	2.09
Georgia	2.15	2.22
Lithuania	2.84	2.79
FYR Macedonia	2.90	2.79
Slovakia	3.35	3.22
Czech Republic	3.50	3.40

Source: Reyes and Varela (2013), "Georgia Trade Competitiveness Diagnostics".

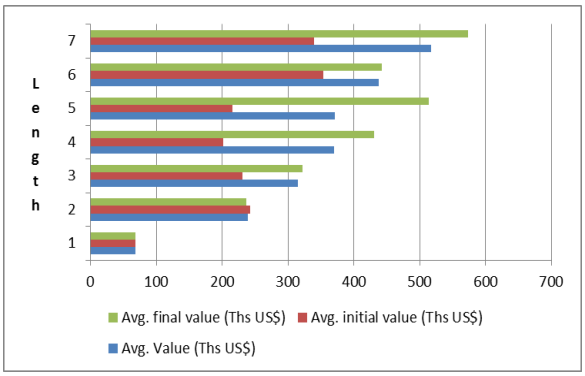
To look at survival patterns, we start by analyzing the distribution of export spells' length. A firm-product-destination export spell is defined as a period in which a firm continuously exports a particular product (HS 6 digits) to a given destination. A high percentage of spells have short duration. Around 70% of product spells lasts just one year. About 18% of spells lasts more than two years. Spells with longer duration represent a low share of export spells (Figure 6).

Figure 6: Distribution of the Average Spell Length of a "Product-Destination" combination



Source: Authors' calculations.

Figure 7: Average export value at each spell length



Source: Authors' calculations.

These figures show that low survival of export relationships is indeed a challenge for Georgian firms and that the shortness of the relationship impedes export growth.

4. What determines Georgian firms' survival in export markets?

With imperfect information firms face a high degree of uncertainty when making their decisions about entering export markets. They need to obtain information about export costs, the demand profile of potential markets, the requirements to enter these markets, etc. They also need to judge in advance, their own ability to survive in the export markets given all the exogenous conditions prevailing in these markets. This implies that firms may enter the export market but later realize they are unable to make profits resulting in short-lived export relationships. Along this process, some firms will succeed while some other will fail. Here we identify what are the factors that determine that success in export markets.

While survival affects diversification and the consolidation of export flows also a reverse effect could be in place: does it matter how firms diversify for export flows survival? We take this question from Carballo and Volpe (2009), and pose it in the Georgian context. Volpe and Carballo (2009) find that market and product diversification increased the survival rate of Peruvian firms in export markets. Strictly, their analysis differs from ours in that we look at the firm-product and firm-product-destination levels while theirs looks at the firm level survival.

To the best of our knowledge, there are no studies on the impact of firms' diversification strategies on product survival rates and ultimately the direction of impact, if any, is an empirical question. On the one hand, more diversified firms are supposed to be bigger, more productive and with a better production capacity and thus more likely to be able to withstand potential shocks without having to drop products from their export mix. On the other hand, more diversified firms are also the ones that can experiment more with the export of new products because they can more easily incur the cost of adding new products in their export mix, and because their cash flow may be less volatile.

We also examine the role that information and spillover effects have on export survival. Informational failures have been identified as important obstacles to good export performance. Hausmann and Rodrik (2003) argue that learning what one is good at producing is a key challenge countries face in their development path and that in order to do so they need to go through a tough process of self-discovery based on trial and error. This argument can be extended to the firm level. Exporters need to learn about foreign tastes, costs of production, foreign regulations and trading partners' trade policies, etc.. In the absence of information, firms learn through trial and error, typically leading high export market entry and exit, or put differently, to low export survival rates. Firms are likely to survive longer in export markets when they have readily available information about the specificities of exporting a particular product, or exporting to a particular market, which is likely related to the number of other firms in the market exporting a given product or to a given destination.

4.1 Econometric analysis

We explore the determinants of export survival for a panel of Georgian firms between 2006 and 2012. The data set contains detailed information on firms' balance sheets matched with Customs data on exports disaggregated at the six-digit HS level. The key feature of our matched firm-export data is that we can look at the role of product and sector characteristics while simultaneously control for firm heterogeneity, by incorporating important elements such as total factor productivity, size and ownership. We analyze how different firm, product, sectors and country characteristics influence export survival.

We analyze survival at the firm-product-destination level. A product-destination export spell is defined as a period when a firm continuously exports a given product to a particular destination country. Products are defined at the HS six-digit level. An important choice relates to the exact period of time used to classify an export spell. In this paper we use a three-year period, following Gorg et al. (2012). A spell is considered completed only if the firm did not export that product for three consecutive years before starting again. An alternative option would have been to use a one year definition, considering a spell as completed if the firm stops exporting the product for at least one year. However, short breaks of one year in the export flow can be caused by different factors not necessarily indicating the end of the trade relationship. Moreover, our firm-level data set is characterized by a high degree of firms' entry and exit implying that a less restrictive spell definition is desirable.

For spells starting in 2006 we do not know the exact starting year of the transaction, they are left-censored. Left-censoring can potentially bias the results so we exclude left-censored spells from the estimation. A second form of censoring concerns spells that in 2010 are still active. These spells are right-censored as we cannot determine when they will eventually end. Right censoring does not represent a problem for the estimation and such spells can be included in the analysis.

The problem of censoring is amplified by the unbalanced nature of the panel in which firms enter and exit at different times and sometimes have gaps between the first and last appearance in the panel. In cases where gaps in the panel for a given firm are exactly the year before (after) the beginning (end) of a spell we are again unable to observe the exact duration of the spell. We treat these spells as either left or right censored dropping from the analysis only the left censored.

We use a discrete survival model for the main estimation. Discrete survival models have been indicated as the best solution available to analyze trade dynamics given the nature of trade data (Brenton et al. 2010; Hess and Persson 2010). In particular, trade data is recorded at yearly intervals and this violates one of the main assumptions of continuous time survival models. They also partly relax the quite stringent assumption of proportional hazard, which characterizes continuous time survival models.

Discrete survival models describe the probability that an export spell terminates given that it has not terminated before as a function of time and other covariates. If T is the discrete random variable indicating the time period j when the export spell terminates for a randomly selected firm we can define the discrete time hazard as the conditional probability that the firm stops exporting

that specific product (or product-destination combination) in time *j* given that she did export it before *j* as:

$$h_{ij} = \Pr[T_i = j \mid T_i \geq j] = F(x_{ij}^{'}\beta + \gamma_j)$$

where x_{ij} is a vector of covariates and γ_j is a duration indicator that allows the hazard to vary across periods. *F* is a suitable distribution function ensuring that the hazard is bounded between zero and one. Defining the binary variable y_{ij} taking the value one if the spell terminates in the j^{th} interval and zero otherwise the log-likelihood is given by:

$$\ln L = \sum_{i=1}^{n}\sum_{j=1}^{T_i}[y_{ij}\ln(h_{ij}) + (1-y_{ij})\ln(1-h_{ij})]$$

The choice of the functional form for the hazard determines the model used. Common choices are the normal (probit), logistic (logit) and extreme value (cloglog). In what follows we assume a normal distribution and estimate the model as a probit. However, results are qualitatively unchanged estimating a logit.

Among the firm level characteristics we look at the role of the firm total factor productivity, firm size proxied by the total number of employees and the ownership status (a dummy for whether the firm is foreign owned). A firm is considered as foreign owned if the share of foreign capital is more than 10%. This definition follows the standard international benchmark to identify a direct investment relationship.

Our measure of firm level productivity is based on Levinsohn and Petrin's (2003) approach to the estimation of production functions, which uses intermediate inputs as proxies for the unobservable productivity shocks whose correlation with input levels biases standard estimation methods (see Appendix).

We control for product characteristics with the value of the export as a proxy for the scale of the export flow. Firm diversification strategies are captured by the total number of products exported by the firm and the total number of destination where the firm exports.

We look at the potential effect of network and information spillovers controlling for the number of firms exporting the same product to the same destination in a given year. To isolate the network effect from possible comparative advantage factors, we control for sectoral fixed effects, as well as for indicators of revealed comparative advantage.

Finally, all estimations control for the duration of the export flow (tenure dummies), industry fixed effect where industry is defined at the two digit HS level, years fixed effects and destination fixed effects.

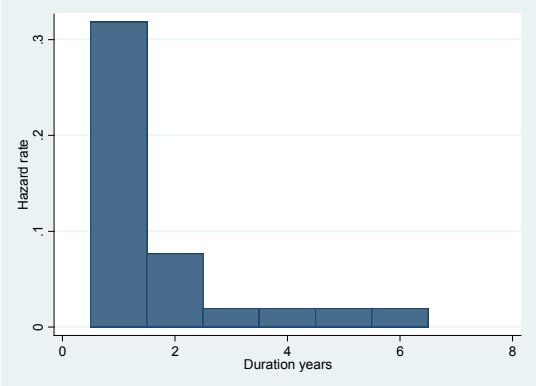
In allowing short gaps between spells we need to address the problem of variables that are unobserved during these years. When the gap is caused by a pause in the export of the product we have all firm level variables and we replace trade variables with their last observed value.

When the gap is caused by the firm not being surveyed that year we replace both firm level and trade variables with their last observed values. The interpretation of the coefficients is that a positive sign on a given covariate implies an increase in the probability of death, meaning a higher hazard of terminating the trade transaction conditional on the duration of the transaction. We present full results of the estimations in the appendix.

4.2 Results

The baseline regression results are shown in the first column of Table 5. Before discussing the results in detail we discuss the role of spells' duration. The regression analysis confirms that there is negative duration dependence. The longer the spell is in place the lower is the probability that it will end. The key feature of the discrete survival model is the ability to control for the duration of the trade transaction including tenure dummies. These dummies define a baseline hazard rate in function of the duration of the relationship. Figure 8 shows how the baseline hazard varies with the duration of the trade relationship. There is a big drop in the hazard of ending the relationship after the first year. Spells that survive the first year tend to have a higher probability of surviving in the future.

Figure 8: Export Mortality Rates Across Length of Export Spell



Source: Authors calculation based on GeoStat firm level data

The value of the export transaction reduces the hazard of terminating the transaction meaning export spells of higher value tend to last longer. The initial value of the export flow is positively associated with its survival. Taking the average initial value as a benchmark (of about 158 thousand dollars), firms that start exporting with an initial value of double that average, are 0.45 percentage points more likely to survive than firms starting with an average size export.

Table 5: Product-destination spells. Discrete time survival model

Dependent variable: Ongoing spell =0 Completed spell =1	(1)	(2)	(3)	(4)	(5)	(6)
Init. Value (log)	-0.0548***	-0.0596***	-0.0568***	-0.0548***	-0.0569***	-0.0548***
	(0.0129)	(0.0106)	(0.0125)	(0.0129)	(0.0134)	(0.0136)
Dest. x firm count (log)	0.146***	0.0846**	0.191***	0.146***	0.153***	0.156***
	(0.0480)	(0.0397)	(0.0430)	(0.0480)	(0.0520)	(0.0521)
Prod. x firm count (log)	-0.130***	-0.122***	-0.164***	-0.130***	-0.131***	-0.146***
	(0.0409)	(0.0337)	(0.0331)	(0.0409)	(0.0436)	(0.0442)
Firms x prod x dest. count (log)	-0.177***	-0.199***	-0.126***	-0.177***	-0.169***	-0.169***
	(0.0477)	(0.0439)	(0.0433)	(0.0477)	(0.0496)	(0.0495)
Employment (log)	0.0168	0.0529	-0.00615	0.0168	0.0324	0.0299
	(0.0377)	(0.0332)	(0.0361)	(0.0377)	(0.0412)	(0.0415)
TFP (log)	-0.128***	-0.0850***	-0.133***	-0.128***	-0.133***	-0.130***
	(0.0377)	(0.0325)	(0.0345)	(0.0377)	(0.0397)	(0.0400)
Foreign owned	-0.233***	-0.184**	-0.240***	-0.233***	-0.209**	-0.225**
	(0.0780)	(0.0725)	(0.0749)	(0.0780)	(0.0866)	(0.0875)
RCA		-0.00284				
		(0.00599)				
FTA			-0.271***	0.120		
			(0.0633)	(0.642)		
K/L (log)					-0.0365	-0.0297
					(0.0295)	(0.0295)
Real Ex. Rate (log)					-0.0269	
					(0.0239)	
Rauch referenced					0.0655	0.0764
					(0.122)	(0.124)
Rauch homogeneous					-0.101	-0.107
					(0.213)	(0.216)
Real Ex. Rate (growth)						-0.0303
						(0.0280)
Duration dummies	Yes	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	No	Yes	Yes	Yes	Yes
Destination FE	Yes	Yes	No	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,349	4,349	4,349	4,349	4,108	4,024

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

This result confirms the theoretical expectations that higher value transactions signal a lower degree of uncertainty about the trading partner or the demand conditions in the export market and thus have higher survival probabilities. This finding suggests that there is substantial trial and error in exporting. With high costs of learning about foreign demand conditions, tastes, and product specification requirements, many firms opt for directly engaging in international transactions without having a thorough understanding of foreign market conditions, which makes them more vulnerable to failure. The fact that firms with higher initial values survive longer in export markets seems to support this interpretation. Firms that start exporting at a greater scale

are more likely to have undertaken prior thorough market research, and be more confident about the survival of its market relationship with foreign buyers.

The coefficient on Total Factor Productivity (TFP) indicates that the 'fittest', that is, the more productive firms have less chances of failing at keeping the export flow active, and thus tend to have longer trade relationships. The estimated effect suggests that doubling the average firm total factor productivity would increase the survival probability by 1.05 percentage points. Instead, firms' size (with size measured in term of number of employees) has no statistically significant impact on the probability of ending the transaction. Thus, better performing firms survive longer in export markets, and this result is robust across alternative measures of productivity (see Appendix). This is likely related to the fact that better performers have higher profit margins, and thus are less vulnerable to market shocks.

Foreign owned firms have a lower probability of dropping an export flow. The effect is substantial: products exported by foreign owned firms have an average survival probability of 2.8 percentage points higher than domestic owned firms. This result is in line with the theoretical expectations that see information and network barriers as important obstacles to export success. Foreign firms are in fact supposed to have more established links with foreign partners and better knowledge of foreign markets that can help in identifying successful export products. Furthermore, firms with foreign participation typically have intangible assets associated with improved management techniques, closer-to-the-frontier technologies, etc., that help them surviving for longer in export markets.

Results show that both the product and destination scope of exporting firms are important for survival. While geographical diversification decreases the chances of survival, product diversification increases them**.** Firms with higher product scope tend to have spells of longer duration and are less likely to drop a product from their export mix. Adding one product to the firms export mix from the average of 3.3 products per firm increases the probability of survival by 0.41 percentage points. The number of export destinations instead increases the hazard of ending the transaction. Firms reaching a larger number of markets tend to have a higher probability of dropping products form their export mix. The average number of destinations for firms in the sample is three. Adding one destination would increase the likelihood of dropping a product by 0.5 percentage points.

A very important result of our analysis is that the higher is the number of firms exporting the same product to the same destination, the higher is the survival rate of export flows. We interpret this variable as a network and information spillover effect. In order to do so we need to control for sectoral comparative advantages through sector fixed effects. In fact, having many firms producing and exporting a given product may be the result of the country's competitiveness in that sector which is also likely to affect survival. Omitting to control for comparative advantage would thus bias the network coefficient. This variable is statistically significant and reduces the hazard of ending a spell showing that there is an important network effect in place. Doubling the number of firms exporting the same product from the average of 1.8 would increase the survival probability

by 1.46 percentage points. Although the effect is not very large, it is not negligible either: considering that around 30% of product spells survive the first year this would account for a proportional increase of 5% (from 30% to 31.5%).

There are two channels through which network or spillover effects may improve export survival. Both are related to informational spillovers. First, the more firms exporting one product to the same destination, the more information available there is about the specificities of exporting that product or exporting to that destination. That information may spillover to new entrants or to diversifying firms, which may benefit from it, since it reduces the risk of entering in a completely new market. Second, increased information also spills over to, for example, the financial sector, which may now find it less risky to finance innovative activities of firms trying to diversify.[3] To properly identify the network effects, however, we need to tackle the 'comparative advantage' confounding factor. There are more firms operating in sectors in which Georgia has a comparative advantage, and it is likely that in these sectors firms have higher chances of survival independently of any network effect in place. This is why in column two we control for the revealed comparative advantage at the HS 2-digits level. The sector RCA increases the survival probability but is not statistically significant. However, the network effects remain unchanged.

Free trade agreements are another channel through which the survival of exporters could be improved; as they reduce policy related trading costs, thus providing firms with an additional buffer to negative profit shocks, and with additional information about trading partners. Currently, Georgia has seven FTAs signed and ratified, mostly with other countries in the region (Armenia, Azerbaijan, Commonwealth of Independent States, and Turkey) To test for this effect, in column 3 we introduce a dummy variable for countries with which Georgia has a free trade agreement (FTA), and at the same time remove destination fixed effects – as they sweep out the FTA-related cross-country variation that is time-invariant. Results show that survival is higher in markets with which Georgia has a free trade agreement, since the FTA dummy identifying destinations with which Georgia has free trade agreements carries the expected sign and is statistically significantly different from zero. When we include the FTA dummy and the destination fixed effects, the effect disappears, for the reasons explained above (column 4).

In column 5 we add some additional controls. Firms with more capital-intensive production technologies have higher survival probability for their export products. We use the capital to labor ratio to control for firms' capital intensity. This variable is positively related to export survival but not statistically significant. Looking at the sectoral patterns of labor intensity we see that there is no sector, which is predominantly more labor intensive. Instead labor intensity seems to depend more on firms' characteristics within sectors as shown above i.e. domestic vs. exporting firms.

Positive relative price shocks increase the chances of survival for export products but are not statistically significant. Increases in relative prices increase the profit margins of exporters and could in this way reduce their vulnerabilities associated with export activities. Relative prices, akin to a product level real exchange rates, are computed as the average unit value in US$ at the HS 6-

[3] Cadot et al (2013) provide an interpretation along these lines for a similar result among African exporters.

digits level deflated by the consumer price index. The product real exchange rate is however not statistically significant. We also compute these relative prices as the growth rate of the average unit value at the HS 4-digits level deflated by the CPI. Also this variable is not statistically significant (column 6).

Finally we introduce dummies for the product differentiation defines using Rauch product differentiation classification (Rauch 1999), which classifies products into differentiated products, products with reference price and homogenous products traded on organized exchanges. The dummies are not significant, showing that export survival is not affected by the product's degree of differentiation.

5. Conclusions and Policy Implications

Since the turn of the century, export growth in Georgia has been high, suggesting that firms have taken advantage of available opportunities. However, most of the export growth experienced seems to be explained by more exports of the same products, to the same destinations. The contributions of diversification to export growth, either along the market or the product dimension, have been modest. What is more, the survival of exporters in the global marketplace has been low, both in absolute terms and comparatively, when looking at the performance of other firms in the region.

Low diversification increases the vulnerability of Georgia's firms to product-specific or country-specific shocks. On the other hand, low export survival depresses export growth, and may even be indicative of important welfare losses given the high fixed costs of entering export markets, and that are wasted when firms do not manage to survive in global markets.

Using detailed firm-level data matched with export transactions for Georgian firms in agriculture, industry and manufacturing over the period 2006-2012, this paper explored the survival of export flows, shedding light on the factors that affect the probability of surviving in export markets.

Georgian exporters are no exception in terms of being larger and more productive than domestic oriented firms. They grow faster than non-exporters in terms of employment and output, and more importantly, they are more productive. They also represent about 9-16% of the total number of firms in the economy (excluding services), which is in line with exporters' proportions in other countries in the region.

Georgian exporters became more diversified, but new products or new destinations reached did not contribute substantially to export growth. Between 2006 and 2012, the number of export destinations per firm increased from 2.4 to 3.3, while the number of exported products increased from 2.2 to 3.9. Product diversification, however, has been mainly explained by the entry of new firms into the market. In fact, additions of new products by entrants explain three-quarters of the product diversification component in export growth, while diversification among continuing firms explained the rest. Destination diversification instead happens mostly within continuing firms (almost two-thirds) while new destinations introduced by new firms account for one-third of the extensive margin.

There is substantial small-scale experimentation among exporters, when introducing new export products. When attempting to diversify, firms in Georgia experiment by exporting at small scale. New products are 50.4% of the total number of exported products in 2012 but they account only for about 16% of total exports in terms of value.

Almost three-quarters of export flows will not survive past one year. Once they survive the first year, the probability of surviving a further year in the market increases dramatically. This finding suggests that there is substantial trial and error in exporting.

Our econometric analysis of the survival of export flows delivers some key results. First, our analysis reveals that productive efficiency (measured as total factor productivity) for firms matters for survival. The role of size is instead not crucial once controlled for productivity differences. Thus, survival is for the fittest, not for the largest.

Second, the way Georgian firms diversify matters for survival. In fact, diversification and survival are related in a complex way. Firms with greater product scope exhibit greater chances of survival in the global marketplace. This may be due to the fact that diversification at the product level implies a better production capacity able to withstand potential shocks. Destination diversification, however, is associated with lower survival probability at the product level.

Third, there is strong evidence of network effects in export survival. The chances of surviving active in export markets increase with the number of firms exporting the same product to the same destination.

These results are important from a policy perspective. In fact, diversifying, both at the product and destination dimensions are costly and risky activities for firms. Given that diversification at the firm level reduces the economy's vulnerability to global market shocks, there may be space for public policies to facilitate the process. The process requires access to finance for entrepreneurs. The banking system has been typically reluctant to finance risky innovative activities such as those that diversification processes entail. This stresses the importance of developing strong financial markets, and ensuring it operates competitively, in which private firms can issue short and medium term debt at reasonable rates.

In addition to access to finance, innovative activities such as diversification at destination or product levels require the efficient operation of a national system of innovation in the economy that facilitates the dissemination of basic knowledge from the academia to the productive sectors of the economy, as well as the feedback from firms to universities.

Our results identify informational spillovers that contribute to improved export survival. Thus, strengthening the capacity of the Export Promotion Agency to address informational failures that may be preventing firms from keeping their export flows active is of foremost importance. Provision of information about foreign consumers' preferences, help with the identification of potential buyers, or assistance in tackling the regulatory complexities associated with serving foreign markets are useful roles that the Export Promotion Agency could be playing and that will likely impact positively on the survival of firms in export markets, as well as on their diversification

performance. Given that the record of public intervention in this area is patchy, it is recommended that efforts towards the improvement of the institutional design the Export Promotion Agency take into consideration the international best practices. Here again, any reform process in this area would benefit from a transparent system of monitoring and evaluation, to ensure that the scarce public funds are at their best use.

Foreign firms in Georgia are more productive and last longer in export markets. Georgia has managed to secure substantial inflows of foreign investment, but over the last years, these flows have been targeting services sectors such as construction and banking. Investment promotion activities that address the needs of potential investors in tradable sectors may be conducive to overall increased productivity in the economy, and faster export growth, particularly, if interaction of foreign and domestic firms is encouraged.

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Appendix

Productivity Dynamics in Georgia - Estimation and Results

A firm's productivity level is defined as the amount of output produced for a given level of inputs used. Despite the concept being intuitive, its empirical estimation is plagued with difficulties. Among them, there is the bias arising from the endogeneity of the choice of inputs. In essence, there exist shocks to productivity that are observable to the manager, but not to the data analyst, which makes the choice of inputs endogenous. In other words, managers will hire more workers when they anticipate positive productivity shocks. Because the data analyst is not aware of this, she will tend to attribute a greater marginal productivity to this additional labor, than it actually has. Therefore, the Ordinary Least Squares (OLS) estimation of a simple production function in which the level of output is explained with the level of raw materials used, the stock of capital of the firm and the number of workers, will yield inconsistent estimators of firm's productivity – estimators that on average do not approximate to the true values. According to Van Beveren (2012) failing to correct for the endogeneity of input choices (simultaneity bias), as it is the case for the OLS estimator, leads to a downward bias in the capital coefficient and an upward bias in the labor coefficient. Thus, the labor coefficient should be lower and the capital coefficient higher than OLS when using LP. We do find as expected that the OLS labor coefficient is higher and the capital coefficient lower.

The solution

In this note, we tackle this methodological problem by using the Levinsohn and Petrin (2003) approach (LP). This method uses intermediate inputs as proxies for the unobservable productivity shocks whose correlation with input level choices biases standard estimation methods. As output proxy we use firm's sales as reported in the survey, labor is measured as total employees, capital as the book value of assets at the start of the period and the use of intermediates is measured with the use of fuel and energy. Firms' output is deflated using the producer price index for each different NACE sectors of activity obtained from Geostat. Capital is deflated using the machinery and equipment producer price and intermediate inputs using the electricity, gas and water supply producer price index.

In order to check if the estimates are reliable we conduct two exercises. We first compare estimates obtained using the LP approach with estimates obtained using the OLS and Fixed Effect estimators. The Fixed Effect estimator corrects only for the portion of the simultaneity bias that is time-invariant. Moreover, it has been shown not to perform well in practice because it often produces unreasonably low estimates of the capital coefficient (Van Beveren 2012).

Table 6: Production function estimates

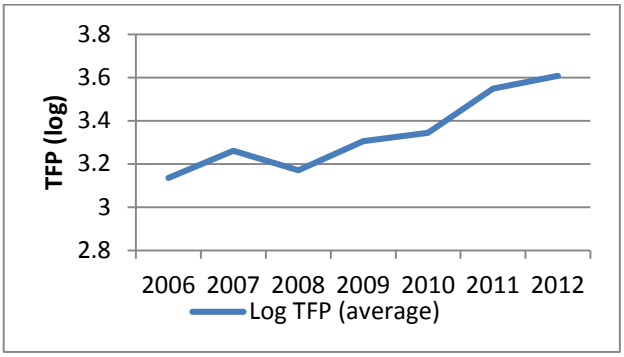
	(LP)	(OLS)	(FE)
VARIABLES	lny	lny	Lny
Log Employment	0.858***	0.853***	0.791***
	(0.0356)	(0.0191)	(0.0247)
Log Capital stock	0.191***	0.113***	0.0512***
	(0.0730)	(0.00969)	(0.0125)
Log Energy	0.165	0.258***	0.192***
	(0.116)	(0.0105)	(0.0116)
Constant		3.455***	4.353***
		(0.0431)	(0.0994)
Observations	6,209	6,209	6,209
R-squared		0.724	0.359
Waldcrs	3.849		
Standard errors in parentheses			
*** p<0.01, ** p<0.05, * p<0.1			

Results of the OLS and Fixed Effects estimations are reported in Table 6. As predicted, the Fixed Effects estimator produces a capital coefficient, which is even lower than the OLS estimates. As an additional robustness check, we correlated the obtained TFP indicator with the LP method with labor productivity (output/employment) and the Fixed Effects and OLS measures, which we expect to be positive and significant (Table 7).

Table 7: Correlation matrix of TFP estimates

	FE	OLS	LP	Labor prod.
FE	1			
OLS	0.8883	1		
LP	0.8779	0.9934	1	
Labor prod.	0.9016	0.8652	0.865	1

Figure 9: Productivity in Georgia has increased systematically since 2006.
(Average Log TFP 2006-2012).



Source: Authors' calculations.

The efficiency of firms in Georgia has been increasing since 2006.

Productive efficiency of firms, that is the amount of output produced with a given amount of inputs, measured by the (log) total factor productivity, has been increasing since 2006 in Georgia. While TFP was relatively stagnant during 2006-2009, TFP increased almost exponentially since 2009.

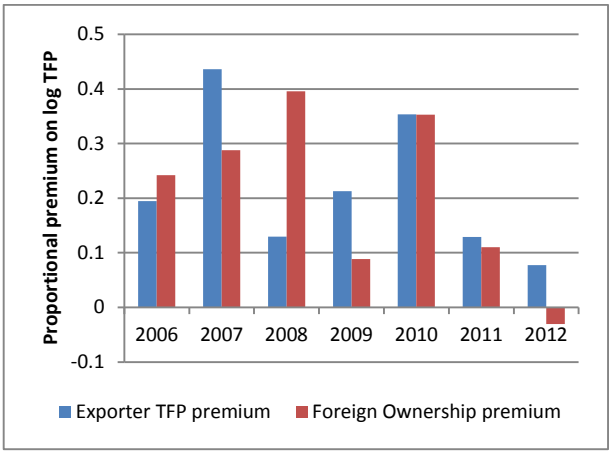
Two additional main results that can be typically found in the literature are also found in Georgia:

Internationalized firms are more productive than those without international links. In line with international evidence, exporting firms displayed a productivity premium of 17%, on average, above non-exporters. Similarly, foreign owned firms display a 15% productivity premium, on average, above domestically owned firms (see **Error! Reference source not found.**).

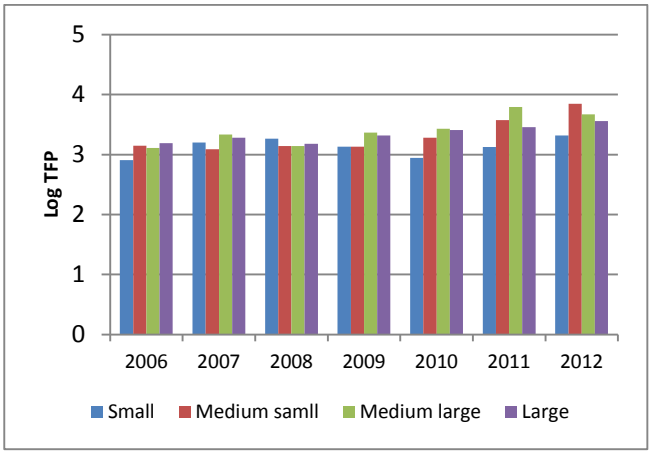
Larger firms are more productive than smaller firms. Error! Reference source not found. shows the productivity level for different quartiles of the employment distribution. Firms in the first quartiles, which are very small firms with one or two employees, have the lowest productivity and productivity tend to increase at higher quartiles but not always monotonically.

Figure 10: Internationalized firms are more productive in Georgia too, but their TFP premium has fallen over time.
(Exporters and foreign owned log TFP premium over non-exporters and domestic owned firms 2006-2012).

Figure 11: Larger firms are more productive in Georgia too.
(Log TFP 2006-2012 by quartiles of employment).



Source: Authors' calculations.



Source: Authors' calculations.

Table 8: Regressions of TFP premiums

VARIABLES	(1) TFP (log)	(2) TFP (log)	(3) TFP (log)
Exporter	0.238***		
	(0.0380)		
Foreign owned		0.178***	
		(0.0492)	
Employment 2nd quartile			0.231***
			(0.0576)
Employment 3rd quartile			0.330***
			(0.0527)
Employment 4th quartile			0.290***
			(0.0513)
Constant	2.537***	2.597***	2.291***
	(0.391)	(0.392)	(0.394)
Observations	6,209	6,207	6,209

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 9: Exporters, multi-product and multi-destination premiums

	(1) Turnover (log)	(2) Employment (log)	(3) TFP (log)	(4) Foreign owned (dummy)	(5) Labor intensity (log)
Exporter	2.935***	1.743***	0.238***	0.184***	-0.991***
	(0.0597)	(0.0353)	(0.0380)	(0.00611)	(0.0499)
Single product exporter	2.382***	1.348***	0.193***	0.118***	-0.671***
	(0.0822)	(0.0486)	(0.0533)	(0.00840)	(0.0691)
Multi-product exporter	3.437***	2.104***	0.272***	0.244***	-1.261***
	(0.0786)	(0.0466)	(0.0475)	(0.00806)	(0.0641)
Single product exporter (excluding <1%)	2.568***	1.476***	0.206***	0.147***	-0.793***
	(0.0773)	(0.0458)	(0.0496)	(0.00792)	(0.0647)
Multi-product exporter (excluding <1%)	3.375***	2.065***	0.272***	0.228***	-1.217***
	(0.0839)	(0.0497)	(0.0505)	(0.00861)	(0.0684)
Single destination exporter	2.336***	1.402***	0.122**	0.151***	-0.915***
	(0.0809)	(0.0479)	(0.0514)	(0.00831)	(0.0675)
Multi destination exporter	3.517***	2.077***	0.341***	0.215***	-1.063***
	(0.0798)	(0.0474)	(0.0489)	(0.00822)	(0.0658)

Note: OLS regressions. Standard errors in parentheses.

Industry (Nace 2 digits) fixed effects are included in all estimations.

Table 10: Distribution of product spells

Product spell length	Freq.	Percent	Cum.	Avg. Value (Ths US$)	Avg. initial value (Ths US$)	Avg. final value (Ths US$)

1	2,219	69.85	69.85	56.6	56.6	56.6
2	395	12.43	82.28	314.5	294.6	334.3
3	217	6.83	89.11	496.7	407.3	424.1
4	144	4.53	93.64	616.8	411.1	741.7
5	69	2.17	95.81	609.9	316.7	707.2
6	47	1.48	97.29	281.2	175.1	325.4
7	86	2.71	100	1401.7	976.4	1583.4
Total	3,177	100				

Source: Authors calculation based on GeoStat firm level data

Table 11: Distribution of product-destination spells

Product-destination spell length	**Freq.**	**Percent**	**Cum.**	**Avg. Value (Ths US$)**	**Avg. initial value (Ths US$)**	**Avg. final value (Ths US$)**
1	3,831	70.73	70.73	68.1	68.1	68.1
2	649	11.98	82.72	239.5	242.9	236.1
3	371	6.85	89.57	314.7	230.8	321.5
4	232	4.28	93.85	369.9	201.7	430.2
5	102	1.88	95.73	371.2	215.5	513.6
6	102	1.88	97.62	437.9	353.7	442.4
7	129	2.38	100	517.3	339.9	573.6
Total	5,416	100				

Source: Authors calculation based on GeoStat firm level data

Table 12: Distribution of product spells excluding products less 1% export revenues

Product spell Length excluding products less 1% of export revenues	**Freq.**	**Percent**	**Cum.**	**Avg. Value (Ths US$)**	**Avg. initial value (Ths US$)**	**Avg. final value (Ths US$)**
1	1,125	63.99	63.99	113.9	113.9	113.9
2	257	14.62	78.61	490.3	460.3	520.3
3	127	7.22	85.84	837.2	698.1	725.0
4	107	6.09	91.92	883.0	567.3	1020.4
5	41	2.33	94.25	994.0	491.2	1150.1
6	34	1.93	96.19	384.5	228.2	418.3
7	67	3.81	100	1759.7	1218.2	2008.9
Total	1,758	100				

Source: Authors calculation based on GeoStat firm level data

TFP sensitivity analysis

Table 13: Sensitivity to Alternative TFP Measures - Product destination spells

Dependent variable: Ongoing=0 Completed=1	(1)	(2)	(3)	(4)	(5)
Init. Value (log)	-0.0548***	-0.0561***	-0.0542***	-0.0695***	-0.0557***
	(0.0129)	(0.0129)	(0.0130)	(0.0140)	(0.0129)
Dest. x firm count (log)	0.146***	0.140***	0.156***	0.0777	0.146***
	(0.0480)	(0.0488)	(0.0480)	(0.0521)	(0.0491)
Prod. x firm count (log)	-0.130***	-0.138***	-0.123***	-0.0453	-0.144***
	(0.0409)	(0.0417)	(0.0409)	(0.0470)	(0.0410)
Firms x prod x dest. count (log)	-0.177***	-0.176***	-0.177***	-0.133***	-0.178***
	(0.0477)	(0.0478)	(0.0478)	(0.0510)	(0.0478)
Employment (log)	0.0168	0.0555	0.00324	-0.00900	0.0593*
	(0.0377)	(0.0340)	(0.0378)	(0.0409)	(0.0336)
Foreign owned	-0.233***	-0.238***	-0.226***	-0.192**	-0.224***
	(0.0780)	(0.0778)	(0.0783)	(0.0828)	(0.0792)
TFP (log) LP	-0.128***				
	(0.0377)				
TFP (log) FE		-0.0821**			
		(0.0384)			
TFP (log) OLS			-0.163***		
			(0.0384)		
TFP (log) Index (Arnold & Javorcik)				-0.133**	
				(0.0622)	
Labor Productivity (log)					-0.0769**
					(0.0348)
Duration dummies	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes
Destination FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Observations	4,349	4,349	4,349	3,788	4,349

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Export growth decomposition

Denoting exports of product k in the starting and final year as x_{k_0} and x_{k_1} total exports in both years are given by:

$$X_0 = \sum_{k_0} x_{k_0} \quad X_1 = \sum_{k_1} x_{k_1}$$

Export growth can then be decomposed into the increase in value of products exported in both periods (the intensive margin) and the addition of new products to the export mix net of dropped products (the extensive margin)

$$\Delta X = \underbrace{\sum_{k_0 \cap k_1} \Delta x}_{\text{Intensive margin}} + \underbrace{\sum_{k_1/k_0} x_k}_{\text{New products}} - \underbrace{\sum_{k_0/k_1} x_k}_{\text{Dead products}}$$

Identifying continuing, entrant and exiting firms as EF, NF and DF respectively we can further decompose the extensive margin into a within continuing firms component and an entry/exit component:

$$\Delta X = \underbrace{\sum_{k_0 \cap k_1} \Delta x}_{\text{Intensive margin}} + \underbrace{\left(\sum_{i=EF} \sum_{k_1/k_0} x_k - \sum_{i=EF} \sum_{k_0/k_1} x_k \right)}_{\text{Within firms component}} + \underbrace{\left(\sum_{i=NF} \sum_{k_1/k_0} x_k - \sum_{i=NF \cap EF} \sum_{k_1/k_0} x_k - \sum_{i=DF} \sum_{k_0/k_1} x_k + \sum_{i=DF \cap EF} \sum_{k_0/k_1} x_k \right)}_{\text{Entry/Exit component}}$$