Export Superstars*

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Summary: We show that the top one percent of exporters critically shape trade patterns, using firm-level data from 32 countries. The top one percent of firms account for more than half of a country's total exports, export growth and diversification—and export concentration is increasing in stage of development. Export superstars are also important in determining the sectoral distribution of exports. In particular, variation in exports from the top one percent of firms in a country explains over 80 percent of the variation in sectoral exports across countries, and superstars create revealed comparative advantage (RCA) in 20 percent of industries with RCA. We also find that current superstars typically entered the export market relatively large, often through foreign investment, and reached the top one percent after less than three years of exporting. Overall, the results imply that individual firms matter for trade volumes and sectoral trade patterns.

JEL codes: D22, L11, L25, F14
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1. Introduction

Large firms define exports. There are well known examples, such as Nokia in Finland, Samsung in Korea, and Intel in Costa Rica, each of which accounts for around 20 percent of the country's total exports. But patterns are not that different elsewhere. On average, the top firm alone holds almost 15 percent of total (non-oil) exports across 32 countries between 2006 and 2008. The top 10 firms account for nearly 40 percent of exports in the same group. The top one percent of exporters accounts for 53 percent of exports on average during the same period. The remaining volume of trade is mainly concentrated in the next tier of large firms. Specifically, the top five percent of firms accounts for almost 80 percent of exports on average and the top ten percent accounts for almost 90 percent. Using a novel firm-level panel, based on highly disaggregated customs data across all regions of the world, we demonstrate the importance of these "superstars" in defining trade patterns and uncover their origins.

The first contribution is to show the importance of superstars (the top one percent) for exports, export growth and diversification in a large number of countries across varying income levels. Over the latest period available of three consecutive years, superstars account for over half of total export growth and of the growth driven by product-markets new to the country (the extensive margin) during that period. We further show that export concentration in the top one percent is increasing in stage of development, suggesting that richer countries allocate relatively more resources to their larger (and more productive) exporters.

The second contribution of this paper is revealing the importance of export superstars in defining sectoral trade patterns (or revealed comparative advantage) across countries. We examine the role of large firms in determining trade patterns in two ways. We begin by

exploring their contribution to the variation observed in sectoral exports across countries. We find that over 80 percent of this variation is due to the presence of superstars—significantly more than their share in total exports. This implies that the sectoral export structure of other firms is more similar across countries.

The fact that superstars are responsible for such a large share of the variation could be because they magnify differences that are also there in the rest of the firms or because their presence and size in a given sector is unique – in this case, superstars are responsible for a revealed comparative advantage that otherwise would not exist. For example, a country that is relatively strong in the exports of chemicals may have a relatively large number of small firms exporting chemicals, a couple of superstars, or both. To explore this further, we estimate revealed comparative advantage (RCA) in 15 industries in two ways and assess the contribution of export superstars. First, we calculate the Balassa index of RCA and determine the share of country industries that would lose RCA in the absence of superstars. Next, we follow Costinot, Donaldson, and Komunjer (2012) and estimate a revealed measure of productivity (RMP) using exporter-industry fixed effects from a regression on bilateral trade data by industry, controlling for exporter-importer fixed effects and importer-industry fixed effect. We estimate RMP on the full data and in the absence of superstars. Finally, we calculate the share of the variation in RMP that is attributable to the superstars.

Both the Balassa and Costinot et al. method suggest that 20 percent of comparative advantage is created by the superstars. Some clear patterns emerge, with industries estimated to benefit from increasing returns to scale, such as chemicals, machinery, metals, paper and transport, driven to a large extent by superstars; while superstars are not important for other industries, such as, animals, apparel, foodstuffs, glass, leather and wood. With respect to

countries, middle income countries, such as Mexico and South Africa, exhibit a greater reliance on superstars than poor countries, such as Uganda or Yemen.

One concern with our methodology is whether the top one percent is too broad to interpret the results with respect to individual firms. We prefer using a measure which controls for country size, but we also want to highlight the importance of specific firms. For robustness, we show similar and economically meaningful patterns for the top 10 firms in a country, and where applicable also for the top firm.

Our third and final contribution is to explore the origin of new superstars. New superstars are defined as firms that entered the export sector during the period for which we have data and grew to be superstars by the end of period. Using the most recent period of three consecutive years for which we have available data in 18 countries, we find that over 80 percent of the new superstars entered the export sector very large—in the top five percent of exporters. For three countries where the time series allow analysis over a decade (Costa Rica, Peru and Morocco), we also find that superstars are born relatively large and they grow quickly into the top one percent. In particular, over half of the new exporters that became superstars during the decade, entered the export sector in the top five percent of exporters and on average they grew into superstars within three years of entry. In addition, the incumbent superstars were nearly all large one decade ago—so the cases of exporters that transitioned slowly from the bottom to the top of the size-distribution are extremely rare. These results reveal that superstars tend to start as large exporters and grow fast—implying that the majority is already highly productive upon entering the export sector and there is not a long period of learning before becoming a superstar.

Unfortunately, the data do not allow us to systematically examine superstars *before* they began exporting to learn about their potential previous experience in domestic markets. However, for three countries where we can identify the superstars by name (Jordan, Peru and Tanzania), we research their origins in order to understand how they start as exporters. Specifically, this allows us to determine whether they grew slowly in the domestic market before becoming exporters, whether they are domestic or foreign owned, and it also alleviates potential concerns about traders (non-producers) in the sample. We find that the majority of superstars are foreign owned, began operations as exporters, and a very small fraction are traders exclusively. This further supports the argument that superstars are unique—they are born as large exporters, they did not learn from domestic production or exporting to become superstars. Coupled with the large foreign share in ownership of superstars, this also highlights the role of multinationals in exports.

Our results have implications for trade theory. In particular, our contribution on the importance of superstars in creating revealed comparative advantage suggests that in these sectors there are some high-productivity firms, which are large, while the average productivity of other firms would not yield comparative advantage in the sector. This could be achieved in a heterogeneous firm framework with firms having a small probability of getting a very high productivity draw. However, while superstars exist in all sectors, the importance of superstars to revealed comparative advantage in increasing returns to scale industries suggests that entry costs play a critical role. In industries with high entry costs, getting a firm with a good productivity draw can make all the difference in export volumes. Overall, the results on the importance of superstars in trade volumes and trade patterns suggest that models that treat individual firms as insignificant are not consistent with the evidence.

Three related theoretical papers that explore these issues are Neary (2010), di Giovanni and Levchenko (2010), and Eaton, Kortum and Sotelo (2012). Eaton, Kortum and Sotelo (2012) is the most closely related, as it develops a model where shocks to individual firms can have aggregate effects. They further show that this model performs well in explaining both the extreme skewness in trade volumes and zeros in international trade. In contrast, Di Giovanni and Levchenko (2010) use a more standard heterogeneous model framework with a continuum of firms. They show that if productivities follow a Zipf's law—a fat-tailed distribution—there are important welfare consequences. In particular, entry costs are relatively less important than variable trade costs, because inframarginal firms make up the bulk of exports. Neary (2010) shows that the importance of large firms in trade can be explained by various forms of oligopoly. This leads to the implication that generating exports is not about promoting domestic entrepreneurship, but rather, about attracting large multinationals.

On an empirical front, this paper also relates to the large and growing body of work on exporting firms, which finds that exporters are larger and more productive firms than their domestic counterparts (Bernard et. al. 2007). While much of this literature focuses on the distinction between exporters and non-exporters, in terms of productivity, size, and wages—the evidence presented here shows an additional pronounced split *within* exporters between the handful of large firms that drive trade volumes, trade growth, trade patterns, and diversification, and the rest.

Evidence of the skewed distribution of exporters has been highlighted in a few studies of industrial countries. For instance, in the United States the top one percent of trading firms (exporters and importers) account for over 80 percent of the value of total trade (Bernard et. al. 2007) and in seven western European countries this share is just over 50 percent on average

(Mayer and Ottaviano 2008). While until now, most of these studies focused on developed countries,[1] the evidence in this paper shows that the skeweness in the size distribution of exporters also characterizes developing countries, and offers more detail on how superstars influence trade patterns and trade growth and also on how they are born.

This paper is organized as follows. In Section 2 we introduce the data. Section 3 calculates the contribution of superstars to export growth and diversification, and examines how export concentration is related to stage of development. Section 4 highlights the role of superstars in revealed comparative advantage. Section 5 delves into the origin of superstars. Finally Section 6 concludes.

2. Data on Firm Exports in 32 Countries

The data used for this paper are exporter-level information on non-oil exports from 32 countries in different regions of the world, mostly for the period 2004-2008.[2] This information has been gathered as part of the World Bank Exporter Dynamics Database.[3] In most cases, the data have been collected directly from Customs Authorities, Ministries of Finance or Commerce and National Statistics Institutes. In other instances, the data have been collected indirectly through

[1] One exception to this was the work of Eaton et. al. (2007) who using exporter-level transaction data find a similar pattern of concentration in Colombia.

[2] Although exporter-level data is available for years before and after this period we focus on these years for two main reasons. First, this period is covered in all countries in our sample (whether fully or partially). Data for years before 2004 are scarce across countries and for years after 2008 they include the trade collapse in 2009. Second, for consistency purposes in our cross-country comparisons, it is important to have a similar period across all countries. However, in the analysis of the origin of superstars, which requires a longer period, we also use data from 2000 to 2010 for three countries with available data.

[3] See Cebeci et. al. (2012) for a detailed description of the data and the cleaning process. A "consolidated" product classification that takes into account the transformations made to product codes according to the HS classification throughout the years was employed. In addition, in order to mitigate the risk of including transactions that correspond to the shipping of samples or personal belongings, we dropped the observations corresponding to exporters that, in a given year, had total sales below $1,000. We also dropped all the observations belonging to Chapter 27 according to the HS classification –Mineral fuels, oils and product of their distillation; etc.

think tank institutions (Egypt) or purchased from a private company based on inputs from customs authorities (Chile, Colombia and Ecuador).

To assess the quality of the data, we compare the total values obtained from aggregating the customs data at the country level with the total values obtained at the country level from Comtrade. We dropped the years in which the total values obtained from the customs data represented less than 70 percent or more than 130 percent of the total values obtained from Comtrade aggregates. Table 1 has the full list of countries and periods available and the complete list of countries and years for which data are excluded for quality concerns can be found in Table A1 in the Appendix.

Table 1 also reports summary statistics on number of firms and firm size, using annual averages for the years available from 2004 to 2008. There is significant variation in the number and size of exporters across countries and also within countries. For example, Cambodia has a relatively small number of exporters, yet they are relatively large on average. In contrast, Bulgaria has a relatively large number of exporters that are smaller. The correlation between number and size is 0.36. Within countries, we also observe a large difference between the median and the mean values per exporter—the mean values are, on average, 51 times larger than the median values per exporter. This reflects the highly skewed distribution of firm size.

Figure 1 shows firm rank against cross-country average exporter size on a log-log scale for the year 2008. We find that the relationship is nearly linear. We calculate the Pareto

exponent (the slope of the regression of log(rank) on log(export size)) for each country and the average is -0.996, which is consistent with Zipf's law.[4]

In sum, we find that a small number of very large firms co-exist with a large number of smaller firms. This distribution is almost identical regardless of the country or year we consider.

3. The Role of Superstars

The evidence above highlights the extremely skewed distribution of exporters in all countries. This implies that a small group of exporters are disproportionately shaping exports. In this section, we demonstrate the role of the top one percent in explaining trade volumes, diversification and trade growth. We focus on the top one percent for two reasons. First, this small group accounts for roughly half of total exports on average. Second, as we will show in the next section, this group is especially important in explaining sectoral trade patterns. An alternative would have been to focus on multi-product and multi-destination firms, as some of the literature has done (see, for example, Eaton, Kortum and Kramarz 2004 and Bernard et. al. 2007). However, as our data covers a wide range of countries, this metric leads to a very different segment of the firm population depending on the country—for example, very few of even the largest firms in Albania would qualify, while a large share of South Africa's firms are highly diversified. As our goal is to highlight the role of individual firms, we also report results, where possible, for the top firm and the top 10 firms.

Table 2 records summary statistics on superstars using averaged data from 2006-2008 (columns 7-10). Specifically, we use available data from 2006 to 2008 averaged across country-

[4] Following Gabaix and Ibragimov (2012), we also calculated the slope for each country using their modification (firm rank - ½) against export size. The results for the cross-country average have a slope of 1.03, which again is consistent with Zipf's law.

product groups (at HS 2-digits).[5] Averaged data has the advantage of reducing potential noise in the data from a particular year. This creates a cross-section of data on total values exported, average firm size and firm number by country-product group, averaged for this period.

Depending on the size of the country and therefore the size of its export base, the number of superstars varies from a handful of firms, as it is the case of many African countries, to 324 in Mexico, the largest exporter in our sample. These firms are remarkably larger than the non-superstars. The median superstar is more than 1000 times larger than the median firm, while the average superstar is on average, over 100 times larger. Even taking sectoral size variation into account—by first calculating the average size of a superstar relative to the average size of a nonsuperstar within each county-HS2 and then averaging over these for each country country—a superstar is still on average 70 times larger. And despite being a relatively small number of firms (28 if we consider the median number of superstars), they represent, on average, over 50 percent of exports, whether in all trade or only manufacturing.

The next four columns show results for the top firm and the final four for the top 10 firms. The top firm across countries accounts for 14 percent (equivalent to 1.9 USD billion) of total exports, on average. This is a striking number for one firm. The top 10 firms account for nearly 40 percent of exports on average.[6]

[5] We use this period because all of the countries in the sample have data for at least one year within 2006 to 2008. Although 2008 is the year when the financial crisis began, as far as trade flows are concerned, it only started to be reflected in the data towards the last couple months of that year. In that sense, including 2008 in the calculation for the averaged data should not bias patterns in any particular way.

[6] While our sample is a diverse group of developing countries, results are not that different in small and medium sized wealthy countries. As noted above, in countries like Korea and Finland, the top firm alone is 20 percent. In contrast, in the US, the numbers are smaller but individual firms still control much of exports. In particular, the top eight firms account for 10 percent of US total exports (http://www.census.gov/foreign-trade/Press-Release/edb/2010/edbrel.pd), with the top single firm still accounting for 2-3 percent of exports.

Superstars are also more diversified. Figure 2 shows the average number of product and destinations by type of exporter–superstars in red dots vs. non-superstars in black dots for 2007 (other years look nearly identical), controlling for country size. We take out country size effects—regressing on ln GDP at PPP and plotting the residuals—because large countries have larger firms on average, though results look very similar without this correction. We observe that in any given country, the group of superstars always exports more products and serves more markets than their "non-superstars" counterparts. On average across countries, the group of superstars exports 20 more products and serves 12 more markets than non-superstars.

Superstars are everywhere. We next look at the distribution of superstars by broad sectors defined based on the existing Sections in the HS classification. We find that on average across countries superstars are in various sectors, not particularly or disproportionately concentrated in one or a group. While a larger share of them participates in machinery, metals, apparel, and foods (10-15 percent), they can also be found in other products like plastics, wood, chemicals, textiles, miscellaneous manufactures (7-9 percent each). They are less common though still present in glass and transport (3-4 percent each).

Superstars and Stage of Development

The high concentration of exports could be a feature of our sample, which includes mainly developing countries—though, as noted above, similar results are found for the United States and a handful of European countries. Still, it could be more important in our sample, given that they are predominantly developing countries and may be more exposed to market failures and more prone to anticompetitive behaviors. If such governments tend to favor cronies or have a number

of large state-owned enterprises that dominate exports, then concentration may be higher at low income levels. A simple correlation with stage of development suggests this is not the case.

Figure 3 displays a scatter plot of stage of development and concentration in the top one percent, for 43 countries including six high income countries. The graphs show a positive and significant relationship between the share of exports accounted by the top one percent of exporters and the per capita income in a country. For this exercise, we include data from 11 predominantly middle- and high-income countries, where information on the share of the top one percent is available, to show that this pattern is not unique to developing countries.[7] In addition, the wider sample allows us to control for sectoral variation in exports. We do not have access to the raw data to be able to report similar charts for the top firm or top ten firms.[8]

One concern is that it may be that richer countries tend to have greater exports in sectors with particularly large firms (eg. machinery). To control for this, we first regress the share of the top one percent of exports on the countries' export shares in each of 16 sectors (Machinery, Apparel, Metals, Plastics and Rubber, Miscelaneous Manufactures, Wood, Chemicals, Foodstuffs, Textiles, Vegetable, Mineral, Glass, Transport, Animal, Leather, and Precious Metals) and then we plot the residuals from the regression against income. The right-hand graph in Figure 3 shows that the positive and significant correlation remains. These results suggest that enhanced export concentration is a natural phenomenon and that it tends to, if anything, intensify as countries get richer. From a resource allocation perspective this is not particularly surprising.

[7] These additional observations are drawn from the Exporter Dynamics Database, see Cebeci et. al. (2012) for a description. They are for Belgium, Brazil, El Salvador, Estonia, Laos, Mali, New Zealand, Norway Spain, Sweden and Turkey. Unfortunately, we do not have access to the firm-level data needed for these countries to be able to include them in the remaining exercises in this paper.

[8] To some extent, it makes less sense to examine these variables and country size as the top firm tends to be larger but matter relatively less for exports as countries grow. For our 32 countries, the estimation with respect to GDP per capita is broadly flat, with a slight downward slope.

It implies that wealthier countries channel disproportionately more resources to more productive (and hence larger) firms.

The lower two graphs show similar results for country size as opposed to stage of development. As countries get larger more resources are devoted to the top one percent of firms.

Export Dynamics

Superstars are the main driver of export growth. Table 3 shows their contribution to overall export growth and to the growth observed in each margin of trade—intensive and extensive—for the most recent period of three consecutive years for which data are available in 21 countries with positive export growth.[9] Regarding overall growth, we observe that, despite being a small group, superstars' export growth represents over half of the overall export growth observed across countries. The top ten firms alone over one third of export growth.

We also evaluate superstars' contribution to export growth by margins of trade. For that purpose, we define the intensive and the extensive margin in the following way: for a comparison between Year 1 and Year 3 within the period considered for each country, the intensive margin is composed of all those export flows at the country-product (HS6-digit)-destination-year level that existed in Year 1 and Year 3. All other flows at the product-market level that disappear or appear in Year 3 (with respect to Year 1) are considered the extensive margin. Thus, this is about developing new goods or markets at the *country* level. This classification allows us to determine how much of export diversification is driven by superstars.

[9] For this exercise, we use a period different to 2006-2008 (used above for the averaged data) because we want to observe the evolution of firms across three consecutive years. As a result, our sample of 32 countries is reduced to 23. The latest period available for most countries is from 2006 to 2008–although in the case of Albania, Bulgaria, Cambodia, Cameroon and Mexico we consider the period 2004-2006 due to either data availability or to existing breaks in the firm coding that do not allow the identification of the same firm across all three years. We exclude Botswana and Mauritius because of negative trade growth and negative growth in both margins of trade, which makes it difficult to consider contributions of superstars and non-superstars in the same way as for the other countries.

The results are reported in Table 3. Columns 1-4 show the export growth decomposition by margin for each country. Considering the median observation within our sample, we note that superstars are the main contributors to growth in both the intensive and extensive margins. Using our alternate measure for robustness, the top ten firms are responsible for about one third of growth at the intensive and extensive margin. Overall, results for extensive margin and total exports are more pronounced in favor of superstars if we consider the sample of firms operating exclusively in the manufacturing sector.

4. Superstars and Sectoral Trade Patterns

We have seen that superstars explain over half of trade, trade growth and diversification. We next examine how this small group of giants influences sectoral trade patterns. In particular, we first decompose superstars' and other firms contributions to the variation in sectoral trade pattern across countries. An important result is that superstars explain sectoral trade patterns to an even greater extent than they contribute to trade volumes, trade growth or diversification. Given their large contribution to sectoral variation in trade across countries, we next examine whether superstars reflect and magnify the trade patterns exhibited by the other firms, or whether they are responsible for revealed comparative advantage (RCA) in some industries in the sense that RCA would not exist without them. We find that in most country-industries they magnify RCA, but in 15-20 percent of country-industries superstars create the RCA.

Variance Decomposition

We begin exploring the influence of superstars in defining sectoral differences across countries by decomposing the variance of sectoral exports into the share of variation due to superstars and the share due to the rest of firms, using the averaged data from 2006-2008 described above.

The variance decomposition we perform is derived from $X_{ic} = XSS_{ic} + XNSS_{ic}$, where X_{ic} is total exports in given product group-country pair ("ic" subscript) and XSS_{ic} and $XNSS_{ic}$ are the corresponding exports by superstars and the rest of firms in that same particular product group-country pair. Specifically, we regress exports of superstars and of nonsuperstars on total trade. Given that OLS is a linear estimator and its residuals have an expected value of zero, each coefficient is the share of the overall variation in trade across countries and sectors explained by exports from each group. The results from this decomposition on sectoral exports are presented in Table 4. Each cell reports the coefficient from a separate regression and the coefficients sum to 1. Column 1 contains the basic results. Then, in column 2 and 3, we introduce country and product group effects independently to account for scale effects in terms of country and sector sizes; and finally in column 4, we introduce both types of effects simultaneously.

Two main results arise from this decomposition. First, we note that the contribution of superstars to the variation in sectoral exports is very high (over 80 percent). While superstars account for on average 50 percent of trade, they explain a far larger share of the sectoral distribution of trade across countries. The results imply that non-superstars are far more similar in size and sectoral distribution across countries than superstars. Using the top 10 firms as an alternate measure, we find that this small group accounts for about one third of the variation in exports across sectors.

Second, we find that this strong influence remains remarkably constant regardless of the country or product group effects that we introduce. Even after accounting for variation due to country and sector scale, superstars contribute over 80 percent of the overall variation in sectoral exports and the top 10 firms account for about one third of overall variation. Thus, this result is not because of especially large firms across all sectors in some countries or across all countries in some sectors.

To delve into this result in more depth, we next examine how comparative advantage is altered by the presence or absence of superstars.

Revealed comparative advantage

The results above suggest that superstars explain the lion's share of the variance in sectoral trade patterns. Given that exports of superstars make up just over 50 percent of total exports, if the exports of superstars and non-superstars were similarly allocated across sectors then their share of the sectoral variation should have mirrored their share in trade. Even so, the sectoral makeup of the exports of superstars could be similar to that of other firms just more extreme. For example, a country's exports could be tilted towards metals irrespective of the top firms in the country—the large firms may just magnify the difference. Alternatively, the sectoral distribution of superstar exports could be quite distinct from other firms. In the first case, superstars enhance revealed comparative advantage while in the second they drive it. To evaluate the importance of superstars in revealed comparative advantage, we calculate RCA using the standard Balassa index and also using a regression based approach. We evaluate each measure with all data, and then again excluding the superstars. Large differences between the two measures imply a

deviation between RCA of the country with and without its large firms. We again use the averaged data for the 2006-2008 period.

Balassa Index of Revealed Comparative Advantage

For each country, we calculate the standard Balassa measure of RCA as follows:

$$RCA_{ik} = \frac{\frac{x_{ik}}{X_i}}{\frac{x_{wk}}{X_w}}, \quad (1)$$

where x_{ik} is exports from country i in industry k and X_i is total exports from country i and the subscript w references world exports. A Balassa index greater than one implies that a country has revealed comparative advantage in an industry, as it exports a greater share in that industry than the typical country.

Next, we calculate the *RCA* excluding the country's superstars. An industry loses comparative advantage if *RCA* falls below one when the superstars are excluded.

A Regression-Based Approach to Revealed Comparative Advantage

As an alternative, we also follow Costinot, Donaldson and Komunjer (2012), henceforth CDK, and generate a theoretically consistent alternative to the Balassa index of revealed comparative advantage. Specifically, we use data on exports to the OECD and China from each of our 32 countries, each OECD member, and China, for a total of 66 exporters and 34 importers.[10] The OECD and China together account for 75 percent of exports from the 32 countries. We next estimate a regression with exporter-industry fixed effects, importer-industry fixed effects and country-pair fixed effects. Specifically, we have:

[10] We include exports from each of the OECD members and China to help identify the exporter fixed effects of our countries more precisely. Among OECD members, Luxembourg is not included in the estimation because export data are not available.

(2) $$lnx_{ijk} = \delta_{ij} + \delta_{ik} + \delta_{jk} + \varepsilon_{ijk},$$

where $\delta_{ij,}$ $\delta_{ik,}$ $\delta_{jk,}$ are exporter-importer, exporter-industry, and importer-industry fixed effects. CDK show that the exporter-industry fixed effects can be used to construct revealed measures of productivity, given an estimate of the elasticity of trade flows with respect to productivity, θ. Their preferred estimate of θ is 6.5, which we also use, though our results are robust to variation in the estimate or using the fixed effects directly.[11] Specifically, the revealed measured of productivity is

(3) $$RMP = e^{\delta_{ik}/\theta}.$$

We calculate the fixed effects using the aggregate country-industry data and again eliminating the exports of superstars for each of the 32 countries in our sample. Specifically, we run 33 regressions, one for the full data, and one removing the superstars in each of our 32 countries. For example, for a given industry, Albania has an exporter fixed effect when all exports are included and one for that industry when only non-superstar exports of Albania are included and all exports from other countries are included. Thus, for each of our country-industries we have a pair of exporter-industry fixed effects, one for the full data (δ_{ik}) and one for the full data excluding that particular country's superstars (δ_{ik}^{*}). From these we also generate the revealed measure of productivity, RMP and RMP*, as described in equation 3.

A potential concern with this methodology four our purpose is that fixed effects are by design relative to the excluded constant. We exclude apparel and US, so all exporter-industry effects are relative to the US and within the country to the apparel industry. We use the apparel sector because the Balassa index of *RCA* suggest that superstars, though present, are not critical

[11] We try 6, 6.5, and 7 and the total variation due to the superstars remains between 21 and 22 percent. We also try using the exporter fixed effects directly and results are similar.

to *RCA* in apparel and this is confirmed when we run the regressions excluding an alternate sector.

Once we have the full set of fixed effects, we calculate the *RMP* for each country. We choose the six industries with the highest overall exporter *RMP*s, as the comparative advantage sectors. If the superstars do not affect *RMP* then the pair of productivities should be identical *RMP* = *RMP**. The extent to which superstars influence revealed productivity can be described by the share of the variance in *RMP* that is not explained by *RMP**. Specifically, we estimate superstars share of the variance as $\frac{\sum(RMP-RMP^*)^2}{\sum(RMP-E(RMP))^2}$. The expected value of *RMP* is estimated by the country mean over the full sample of industries.

For both exercises, we use export data from Comtrade in 15 broad industries. In order to remove exports of superstars, we use the shares of the superstars in the exporter-industry (for *RCA*) or the exporter-industry-destination (for *RMP*) from the firm-level data. In the case of *RMP*s we have results for 14 industries because apparel is excluded when we run the fixed effects. Below, we report aggregate results as well as results by industry and country.

Results on Revealed Comparative Advantage

The results from these exercises are reported in Tables 5 and 6, by industry *and* country, respectively. The first column of Table 5 shows the number of countries that have *RCA* in an industry, using Balassa as the metric. The second column shows the share of industries that lose *RCA* when exports from the top one percent of firms are removed from the country. Overall, 20 percent of country-industries disappear when superstars are removed. The lase three columns focus on CDK's regression-based method. Column 4 shows countries with *RMP* in a sector. The comparative advantage industries measured via *RMP*s and the Balassa RCAs are very

similar, with a correlation 0.80 (columns 1 and 4). Using these sectors, column 5 shows the share of variation in the *RMP*s not explained by the same measure excluding the superstars. Overall, using this methodology, 22 percent of comparative advantage is driven by the superstars.

Both methods show similar and substantial variation across industries. The results on chemicals, electrical machinery, machinery, metals, minerals, miscellaneous manufactures, paper and transport from both *RCA* and *RMP* indicate that superstars are critical to having comparative advantage in these industries. Using *RCA*, chemicals and transport are especially dependent on superstars, with all or nearly all of *RCA* coming from them; according to the *RMP* method, superstars drive revealed productivity in these industries plus paper and metals. In contrast, sectors like apparel, food, stone and glass, precious metals, and wood show very little variation driven by superstars. The rank correlation between the two methods is 0.82.

The results point to a potentially important role for increasing returns to scale (IRTS) in production in explaining comparative advantage and trade flows in a number of industries. Consistent with our results, existing empirical work finds a role for IRTS in US manufacturing data, especially in durable goods (Basu and Fernald, 1997). Also related to our findings, Diewert and Fox (2012) estimate returns to scale in a model with imperfect competition and technological process, using US data. They find only four industries where they cannot reject the null hypothesis of constant returns to scale and these are textiles, apparel, lumber and wood, and instruments. The two industries with the strongest returns to scale in their analysis are chemicals and Paper, which also exhibit a critical role of superstars in our data. The results suggest that in sectors with large entry costs, getting a single highly productive firm can transform trade in the industry.

Table 6 reports the number of *RCA* or *RMP* industries by country and the two indicators of the importance of superstars. In some countries, the top firms matter much more than others—in particular, in Latin America and other emerging markets, such as South Africa and Bulgaria superstars appear important to comparative advantage. In contrast, in much of sub Saharan Africa and other poor countries, such as Yemen, superstars are less important in defining comparative advantage. Indeed, the correlation between the log of per capita GDP at PPP and the importance of superstars in *RCA* using the *RMP* method is 0.54 and significant at the one percent level (Figure 4). Similarly, the correlation with the share that lose *RCA* using the Balassa method is 0.37 and significant at the 5 percent level. This suggests that superstars play an important role in middle income countries, but the direction of causality warrants further research. Global investors may be attracted to these growing markets or developing superstars may help them to grow. It also suggests that if we had a sample of countries that was less skewed towards low income, we would find a greater role for large firms.

The remaining columns of Tables 5 and 6 show results using instead the top 10 firms. The results are slightly weaker, suggesting that the top 10 firms define about 12-13 percent of *RCA*. They still show an important role for these firms in many of the IRTS industries, especially Chemicals and Paper.

The results from this section show that superstars explain a great deal of the variation in trade across sectors. While in some cases this is because superstars seem to mirror what other firms are doing, but on a larger scale; in others, especially the IRTS sectors and the middle income countries, superstars are often responsible for *RCA*.

5. Origin of Superstars

Given their role in export growth and diversification, and in defining comparative advantage, we consider it important to understand superstars' origins. For that purpose, we look at the three countries where we have a longer time series—Costa Rica, Peru, and Morocco—and we analyze the origin of superstars within a decade. We also compare this with results from a broader sample over a shorter period. Finally, we explore the origins of today's superstars before they began exporting in three countries (Jordan, Peru and Tanzania) where we can identify the firms and trace their roots.

Table 7 presents the distribution of the superstars of 2009, in terms of their size in 2000, for Costa Rica and Peru, and of superstars of 2010 in 2002 for Morocco. Table 7a shows that the top one percent of firms in 2009 for Costa Rica and Peru and 2010 for Morocco, were either a) already large firms operating 10 years ago, or b) new firms that appeared in the sample sometime during the years within. Twenty-two percent of 2009/2010's superstars were superstars almost 10 years before in Costa Rica and the share is even higher for Morocco and Peru, 48 and 36 percent, respectively. Also, in all countries, there is a non-trivial percent of superstars that appeared sometime within the sample period evaluated.[12] This percent reaches 41 percent in Costa Rica. Digging deeper into these "new" superstars, we observe that over half of them started as large firms—52 percent of the superstars "born" within the period analyzed in the three countries were born straight into the top five percent of exporters (Table 7b).

Finally, we identify superstars in the beginning of the period and evaluate how they develop over time, i.e. in which group they end up in 2009/2010. Table 7c shows that most of the superstars of 2000 in Costa Rica and Peru and of 2002 in Morocco remained large and within

[12] Table A2 in the Appendix includes the tables with the full percent distribution for the firms in the remaining percentile categories, for each of the three countries.

the top five percent in the end of the period. In the case of Morocco and Peru the staying power is the highest; over 80 percent of superstars of the past remained in the top five percent in recent years. In Costa Rica, it is not the case that superstars shrink, rather there are a considerable number of exits from exporting within the superstars group.[13] In contrast, the exits within the group of superstars are not high for the other two countries.

The evidence indicates that superstars are born large, also, they stay large or exit; shrinking is rare. There is an up or out phenomenon. All these results are similar if we take into the consideration the firms in the manufacturing sector only.[14]

Although we are limited by the length of the time series available for each country, it is worth noting that the patterns observed are very similar in the three countries analyzed above, regardless of their differences in terms of size and geographical location.

The results show that most of today's superstars were already superstars or large firms in the past or were new firms that became superstars—ie they were not small exporters that grew slowly into superstars. Regarding the latter, we also analyze the speed at which the firms that entered into the sample sometime after 2000 became superstars. We find that in Costa Rica, for all firms that were superstars in 2009 but did not exist in the sample in 2000, it typically took 2.5 years to reach the top one percent. The pace was 3 years on average for the new superstars firms in Peru. In Morocco, it took new firms 1.5 years to reach superstar status in 2010. Again, these

[13] There is a potential concern that the high percentage of exits and entrants are in fact the same firms, after changing firm IDs. We examine this possibility for Costa Rica, where the problem is potentially more severe, by comparing the export sectors of the large firm exits and the superstar entrants. With the exception of one firm, there is little similarity, suggesting that these are in fact new superstars. Moreover, the firms seem to grow upon entry in a manner consistent with a new strong entrant. In Peru, we are able to do a more complete account because we have firm names. We research the new superstars and find that all are new firms. Seven out of fifteen are mining firms. We also find that a large number are tied to FDI—eight out of fifteen are subsidiaries of multinationals.

[14] The tables under A2 in the Appendix contain the full distribution of firms—in percent, by percentile. Another feature that can be observed from these tables is that there is little rotation between the different percentile groups analyzed. The high concentration of firms along the diagonal in the tables indicates that most firms stay in their same percentile group regardless of the time. The vast majority of large firms were already large 10 years ago, the same way that most of the small firms stayed small. There is also more churning (firms that go out of the exporting sector and other that come in) within the lower quartiles in the distribution.

results reflect that in three countries located in different regions; patterns are similar and the superstars of the present were born relatively large and grew fast.

On this last point and as a robustness check across a larger number of countries, we also analyzed the distribution of the new superstars that appear in the sample sometime within the three-consecutive year period evaluated in Table 3.[15] Table 8 shows the distribution of these new superstars across countries—upper table. We find once again that most of the firms that appear in Year 2 or Year 3 of the period in analysis enter at a relatively large size. In fact, in the aggregate, over 80 percent of them appeared within the top five percent of firms. The cases of firms that started small and then became superstar are rare. Again, these results hold for the sample including manufacturing exporters only.

Superstar Characteristics

Unfortunately, the data do not allow us to observe superstars *before* they begin exporting, as we do not have information on domestic sales or how they became exporters. However, given that in a number of countries it was possible to identify the superstars by name, we selected three countries from our sample—each from a different region: Jordan, Peru and Tanzania—and researched the superstars.[16] Table 9 presents a summary of the findings from this investigation.[17] In all three countries, the overwhelming majority of the superstars are either producers or

[15] While we have more countries, the shorter time span of data makes finding that superstars were born relatively large more likely, given that the exporters were by definition large at the end of the sample. This is why we focus on the longer time span available in the three countries above. Still, within this three-year period there were 128 new exporters that were superstars by the end of the period and only 5 of them entered exporting below the median.
[16] The years used in the identification of the superstars were 2009 in the case of Peru and Tanzania and 2010 in the case of Jordan. The total sample of firms that fall under the "superstars" category are 25 in Jordan, 69 in Peru and 16 in Tanzania.
[17] Table A3 in the Appendix has the percent of superstars whose information was accounted for in each of the issues investigated and presented in Table 8.

manufacturers—only in Peru we find a few traders.[18] This result is consistent with evidence from Bernard et. al. (2010) and Ahn et al. (2011), who find that that the most productive firms or largest firms export directly.

We also find that superstars are very linked to the presence of foreign capital and this association seems to be stronger in the countries with lower GDP per capita.[19] Finally, while the evidence is somewhat mixed, most of them become exporters almost immediately after they begin operations. The case of successful domestic firms that turn to export markets and become superstars over time is important only in the case of Tanzania; in Jordan and Peru, most are born to be exporters.

To sum up, the group of superstars is a unique group of firms, they explain most of the export growth and diversification observed across countries, they drive comparative advantage, and they are born big or very rapidly become so. The cases of small firms making it to the top are rare.

6. Conclusions

Using a novel dataset containing firm-level information on exports from a diverse group of 32 countries, this paper contributes to the literature on firm-level analysis of trade by providing compelling new evidence on a striking feature of the distribution of firms. Exports are highly concentrated among a few very large firms, and this small group of superstars helps define

[18] There could be many producers that export, but an intermediary firm that coordinates the process and thus appears in the data as a large exporter. This would have implications about the interpretation of the results in terms of accurately capturing firm-level production for the export sector. For the purpose of this investigation, a firm is defined as a trader if it acts as an intermediary, without engaging in any type of transformation of the merchandised traded. If a firm engages in packaging or basic processing of goods (for example, sorting or drying) we consider that firm a "transformer" and it is not counted as a trader.

[19] The importance of foreign capital among the group of superstars is consistent with the work of Helpman, Melitz and Yeaple (2004). They develop a model to explore the role of firm heterogeneity in explaining the structure of trade and find that within exporters, only the most productive—superstars in our context—engage in FDI.

sectoral trade structures. The high concentration is evident across a wide range of countries and this concentration tends to increase with stage of development

Superstars are part of a unique group. Superstars are remarkably larger and more diversified than the rest of firms; as a group they account for more than half of export volumes, growth and diversification; they are often linked to foreign capital; and many are born to be exporters. Importantly, superstars define export structures, accounting for over 80 percent of the variation in exports across sectors and creating comparative advantage in 20 percent of comparative advantage industries. Superstars themselves do not grow as the result of a lengthy process. In fact, they seem to be born large and when they are not, it does not take them long to become superstars.

The results have implications for both theoretical and empirical studies of exporter behavior. From a theoretical perspective, they imply that models that treat individual firms as atomistic overlook the prominence of a few firms at the very top of the distribution for trade volumes and sectoral trade patterns. From an empirical perspective, they suggest that evidence on firm responses to various policy interventions from standard regression analysis may not translate into economically meaningful aggregate effects if the largest firms are not affected by the intervention.

In terms of policy, the results imply that creating an environment where future or potential superstars can thrive is fundamental to promote export growth and diversification. In that sense, measures that aim at reducing variable trade costs are likely to have a larger impact than reducing fixed costs to exporting, since marginal firms are relatively unimportant in trade. In fact, on this latter point, given the evidence on the very rare occurrence of small exporting

firms thriving to superstar levels, policies that disproportionately allocate resources to export programs in support of SMEs might prove to be a misguided effort if the quest is to achieve higher levels of export development and diversification. On the same line of thought, costly regulations that disproportionately target large firms will also hold back export growth. Finally, policies to attract large multinational firms are likely to be crucial for small countries interested in expanding exports and diversifying their export base.

Our results are consistent with recent literature on firm dynamics using census data (as opposed to trade data), which also points to a critical role for large firms. In particular, Hsieh and Klenow (2012) show that an important difference in firm dynamics in India, Mexico, and the US relates to the ability for firms to grow large. Firms in the US grow to be much larger, with weak life-cycle dynamics constraining productivity in Mexico and India by an estimated 25 percent. Similarly, Haltiwanger, Jarmin, and Miranda (2012) show that young, fast-growing and large firms are the primary job creators in the US. Our work implies similar dynamics exist for trade, with highly productive firms growing quickly into large firms that dominate exports, and there is evidence of an up or out phenomenon among these firms. Taken together this implies that jobs, productivity, export growth, and diversification all rely heavily on the ability of an economy to foster the development of large firms. Further research is needed in order to understand what factors are most important in their evolution.

References

Ahn, JaeBin, Amit Khandelwal and Wei, Shang-Jin, 2011. "The Role of Intermediaries in Facilitating Trade," *Journal of International Economics*, Elsevier, vol. 84(1), pages 73-85.

Basu, S., Fernald, J.G., 2002. "Aggregate Productivity and Aggregate Technology". *European Economic Review* 46, 963–991.

Bernard, Andrew, Bradford Jensen, Stephen Redding and Peter Schott, 2007. "Firms in International Trade," *Journal of Economic Perspectives*, 21(3): 105-130.

Bernard, Andrew, Bradford Jensen, Stephen Redding and Peter Schott, 2010. "Wholesalers and Retailers in US Trade," *American Economic Review*, American Economic Association, vol. 100(2), pages 408-13.

Cebeci, Tolga, Ana M. Fernandes, Caroline Freund and Martha Denisse Pierola, 2012. "Exporter Dynamics Database," World Bank, Policy Research Working Paper 6229.

Costinot, Arnaud, Dave Donaldson and Ivana Komunjer, 2012. "What Goods Do Countries Trade? A Quantitative Exploration of Ricardo's Ideas," Review of Economic Studies, Oxford University Press, vol. 79(2), pages 581-608.

Di Giovanni, Julian and Andrei Levchenko, 2010. "Firm Entry, Trade, and Welfare in Zipf's World," NBER Working Paper 16313, National Bureau of Economic Research, Inc.

Diewart, Erwin and Kevin Fox, 2008. "On the estimation of returns to scale, technical progress and monopolistic markups" *Journal of Econometrics*, 145, 174-193.

Eaton, Jonathan, Marcela Eslava, Maurice Kugler and James Tybout, 2007. "Export Dynamics in Colombia: Firm-Level Evidence," NBER Working Paper 13531, National Bureau of Economic Research, Inc.

Eaton, Jonathan, Samuel Kortum and Francis Kramarz 2004. "Dissecting Trade: Firms, Industries, and Export Destinations" *American Economic Review* 94(2): 150-154.

Eaton, Jonathan, Samuel Kortum and Sebastian Sotelo 2012. "International Trade: Linking Micro and Macro," NBER Working Paper 17864, National Bureau of Economic Research, Inc.

Gabaix, Xavier and Rustam Ibragimov, 2011. "Rank – ½: A Simple Way to Improve the OLS Estimation of Tail Exponents," *Journal of Business and Economic Statistics*, vol. 29(1), pages 24-39.

Haltiwanger, John, Ron Jarmin and Javier Miranda, 2012. "Who Creates Jobs? Small vs. Large vs. Young," *Review of Economics and Statistics*, forthcoming.

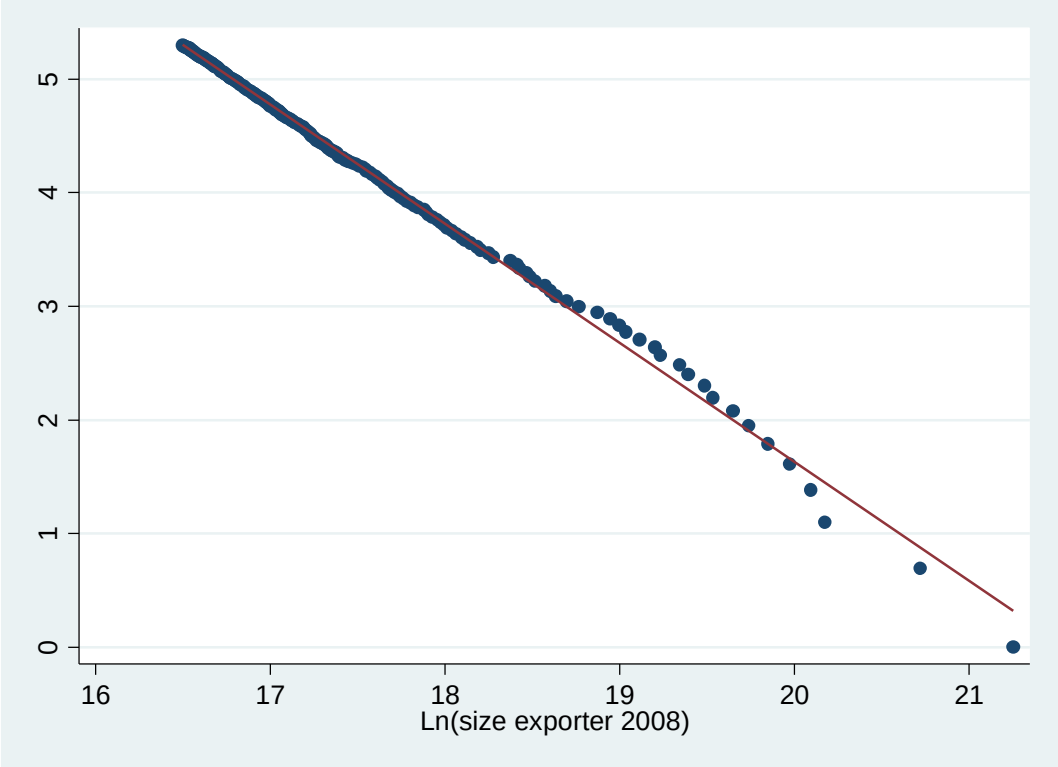
Helpman, Elhanan, Marc J. Melitz and Stephen R. Yeaple, 2004. "Export Versus FDI with Heterogeneous Firms," American Economic Review, American Economic Association, vol. 94(1), pages 300-316, March.

Hsieh, Chang-Tai and Pete Klenow, 2012. "The Life-cycle of Plants in India and Mexico," NBER Working Paper 18133, National Bureau of Economic Research, Inc.

Neary, Peter, 2010. "Two and a Half Theories of Trade," *The World Economy*, 33: 1–19. DOI: 10.1111/j.1467-9701.2009.01255.x

Mayer, Thierry and Gianmarco Ottaviano, 2008. "The Happy Few: The Internationalisation of European Firms, New Facts based on Firm-level Evidence," *Intereconomics*, vol 43(3), pages 135-148. DOI: 10.1007/s10272-008-0247-x.

Figure 1: Size Distribution of Exporters –Average Values Exported by Rank

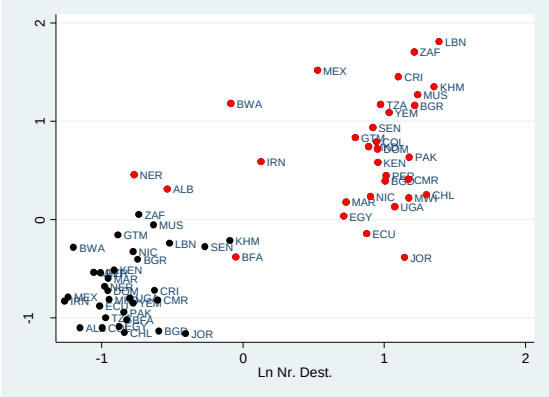


Note: Data are averaged across 32 countries.

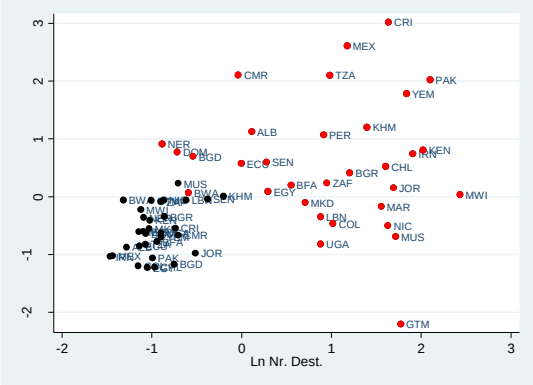
Figure 2: Average Number of Products and Destinations, by Type of Exporter

(Controlling for Country Size)

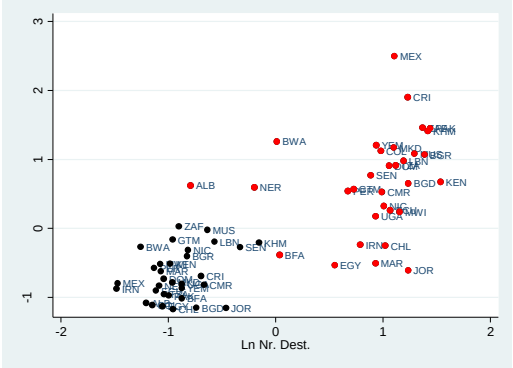
Top 1%



Top firm



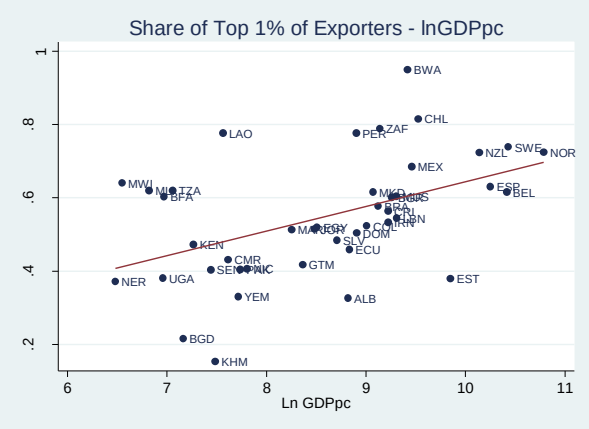
Top 10 firms



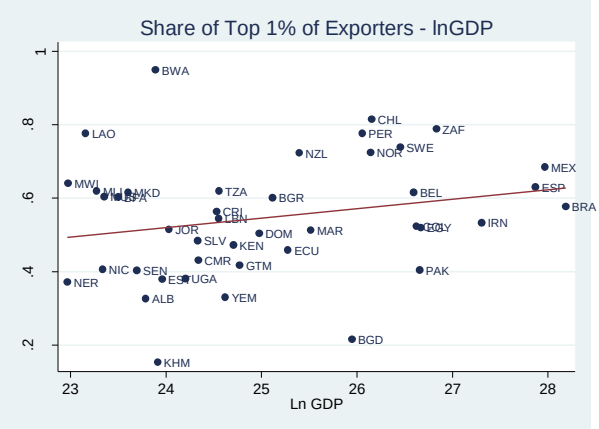
Note: Observations marked in red are average number of products and destinations for a superstar in the country, those shown in black represent the average numbers for other firms (not in the top one percent). We regress log umber of product and log number of destinations on ln GDP at PPP then plot the residuals.

Figure 3: Share of the Top One Percent, Level of Development, and Country Size

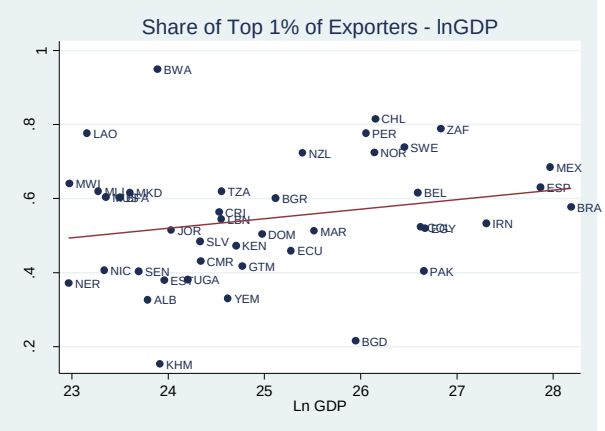
i. Scatter Superstars and lnGDPPC



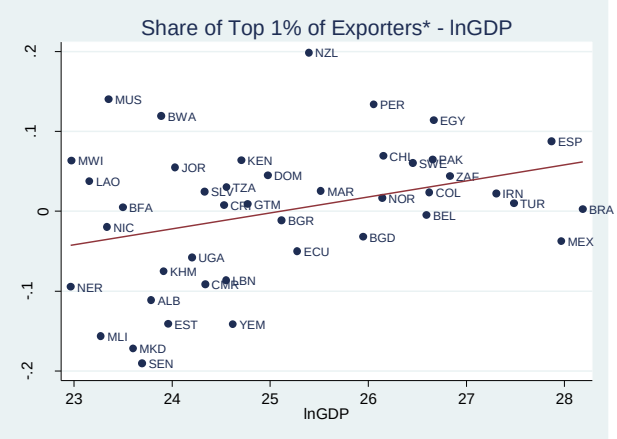
ii. Controlling for Sector Distribution



iii. Scatter Superstars and lnGDP



iv. Controlling for Sector Distribution



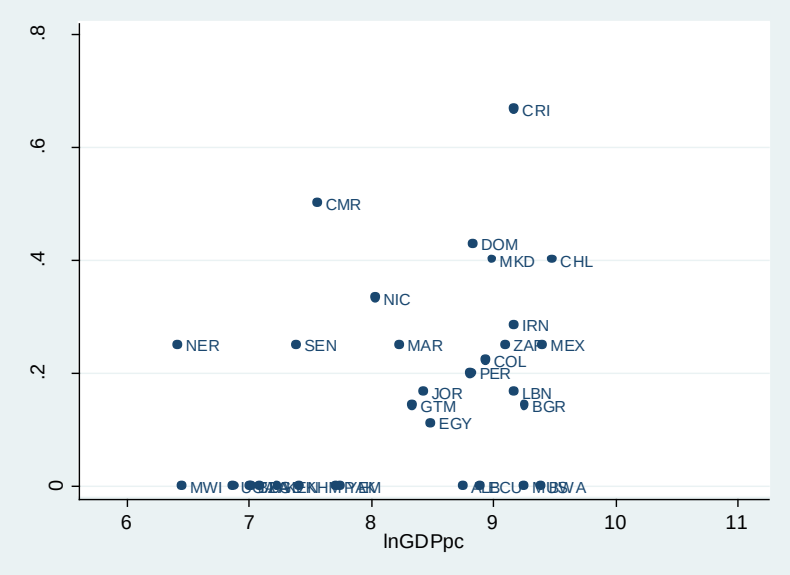
Note:

The coefficient on share of top ope percent is significant at the 5 percent level in Figure i. (coefficient=0.05, t-stat=3.41) and significant at the 10 percent level in Figure ii. (coefficient= 0.02, t-stat 1.97).

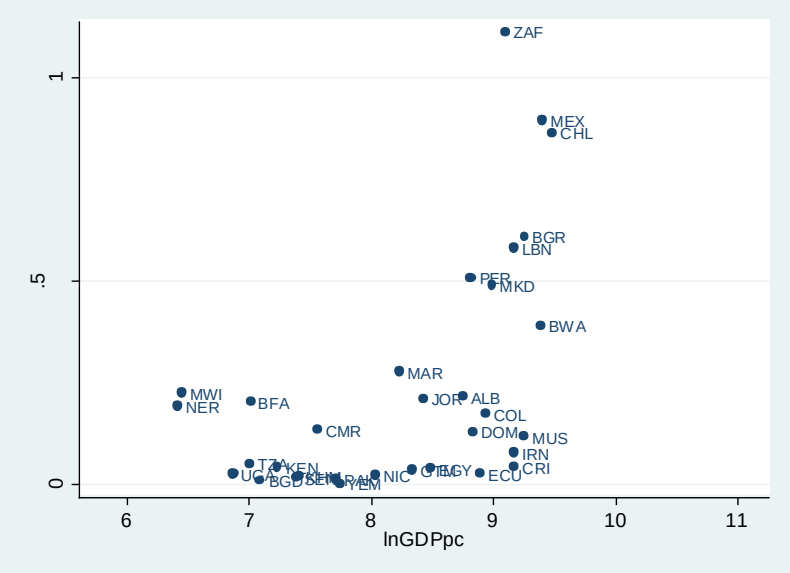
Figure i. shows scatter of the share of exports in the top one percent of firms and the log of per capita GDP. Figure ii. shows the scatter of the residuals from a regression including the country's share of exports in each of 16 sectors as explanatory variables (Machinery, Apparel, Metals, Plast. Rub., Misc., Wood, Chemicals, Foodstuffs, Textiles, Vegetable, Mineral, Glass, Transport, Animal, Leather, and Prec. Met). The additional countries included in the scatter are: Belgium, Brazil, El Salvador, Estonia, Laos, Mali, New Zealand, Norway Spain, Sweden and Turkey. For these countries, we do not have access to the firm-level data so these countries could not be included in the remaining sections of the paper.

Figure 4: Superstars Contribution to RCA and Real GDP per capita

i. Balassa Method



ii. Regression Method



Note: Figure i shows the contribution of superstars to a country's revealed comparative advantage from Table 6 against the log of real GDP per capita at PPP. Figure ii shows the contribution of superstars to revealed measured productivity in a country versus the log of GDP per capita at PPP.

Table 1: Sample and Summary Statistics

Country	Period	Nr. Firms	Total Exports (US$ millions)	Median Value per Exporter (US$)	Average Value per Exporter (US$)
Albania **(ALB)**	2004 - 2008	1,561	904	51,248	569,113
Bangladesh **(BGD)**	2004 - 2008	5,636	10,066	300,730	1,727,897
Botswana **(BWA)**	2004 - 2008	1,025	4,245	11,576	4,135,269
Bulgaria **(BGR)**	2004 - 2006	11,920	10,825	35,644	909,326
Burkina Faso **(BFA)**	2005 - 2008	375	450	46,211	1,230,219
Cambodia **(KHM)**	2004 - 2008	548	2,760	562,908	5,008,879
Cameroon **(CMR)**	2004 - 2008	755	1,540	34,242	2,030,908
Chile **(CHL)**	2004 - 2008	6,998	51,308	63,373	7,210,810
Colombia **(COL)**	2007 - 2008	10,435	19,716	48,435	1,889,322
Costa Rica **(CRI)**	2004 - 2008	2,526	7,787	78,516	3,068,453
Dominican Republic **(DOM)**	2007 - 2008	2,642	4,743	37,654	1,811,882
Ecuador **(ECU)**	2006 - 2008	2,822	5,735	36,148	2,019,939
Egypt **(EGY)**	2008 - 2008	7,881	18,132	104,921	2,300,722
Guatemala **(GTM)**	2004 - 2008	4,072	5,743	47,288	1,404,071
Iran **(IRN)**	2006 - 2008	13,466	12,886	94,482	968,244
Jordan **(JOR)**	2008 - 2008	2,111	4,700	78,610	2,226,479
Kenya **(KEN)**	2006 - 2008	4,471	3,979	26,573	899,536
Lebanon **(LBN)**	2008 - 2008	5,120	3,465	40,418	676,835
Macedonia **(MKD)**	2006 - 2008	2,710	2,215	30,269	811,453
Malawi **(MWI)**	2006 - 2008	473	629	15,984	1,389,175
Mauritius **(MUS)**	2004, 2006 - 2008	1,946	2,850	33,143	1,465,816
Mexico **(MEX)**	2004 - 2008	32,584	205,528	51,157	6,314,737
Morocco **(MAR)**	2004 - 2008	5,151	13,167	104,689	2,568,212
Nicaragua **(NIC)**	2004 - 2005, 2007	1,086	950	28,079	868,812
Niger **(NER)**	2008	143	346	29,535	2,416,470
Pakistan **(PAK)**	2004 - 2008	14,243	15,304	64,283	1,070,787
Peru **(PER)**	2004 - 2008	5,867	20,703	43,035	3,463,227
Senegal **(SEN)**	2008 - 2008	765	1,177	91,199	1,538,503
South Africa **(ZAF)**	2004 - 2008	19,280	51,326	38,690	2,647,761
Tanzania **(TZA)**	2004 - 2008	1,498	1,983	31,340	1,309,037
Uganda **(UGA)**	2004 - 2005, 2007 - 2008	692	963	34,283	1,375,414
Yemen **(YEM)**	2006 - 2008	461	393	64,358	852,033

Note: The averages shown in columns 3-6 are annual average for the period reported in column 2.

Table 2: Superstar Characteristics

	SS = Top 1% of Exporters					SS = Top Exporter				SS = Top 10 Exporters			
Country	Number of Superstars	Ratio MedianSS/ MedianNSS	Ratio AverageSS/ AverageNSS	SS Share of Total Exports	SS Share of Total Manuf. Exports	Ratio MedianSS/MedianNSS	Ratio AverageSS/AverageNSS	SS Share of Total Exports	SS Share of Total Manuf. Exports	Ratio MedianSS/MedianNSS	Ratio AverageSS/AverageNSS	SS Share of Total Exports	SS Share of Total Manuf. Exports
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Albania	17	259	45	32%	33%	1,040	92	5%	6%	448	55	24%	28%
Bangladesh	62	116	27	21%	21%	978	157	2%	2%	193	48	7%	7%
Botswana	11	3,404	1,426	94%	84%	249,792	2,090	66%	54%	5,294	1,479	93%	83%
Bulgaria	119	851	137	58%	59%	36,441	1,406	11%	12%	7,771	452	28%	30%
Burkina Faso	4	803	155	64%	39%	4,985	303	43%	16%	358	120	75%	62%
Cambodia	6	149	19	17%	16%	194	23	4%	4%	117	18	23%	24%
Cameroon	8	2,399	68	42%	48%	6,395	103	12%	20%	2,242	67	47%	56%
Chile	74	3,214	400	80%	80%	216,484	2,056	22%	25%	25,015	846	53%	50%
Colombia	105	1,337	112	53%	52%	26,270	720	7%	9%	5,463	253	20%	22%
Costa Rica	28	1,284	123	56%	61%	31,098	895	25%	31%	2,064	187	41%	50%
Dominican Republic	27	1,881	96	50%	49%	5,498	119	4%	5%	3,608	105	29%	31%
Ecuador	28	1,857	78	44%	47%	8,697	165	6%	8%	3,151	98	26%	30%
Egypt	79	742	96	49%	52%	7,900	377	5%	7%	2,366	160	17%	24%
Guatemala	42	931	68	41%	41%	6,918	238	5%	8%	1,901	103	20%	22%
Iran	135	175	115	53%	59%	23,416	2,773	16%	21%	1,931	666	33%	41%
Jordan	22	908	118	55%	53%	11,179	485	19%	20%	1,321	154	42%	42%
Kenya	45	1,143	81	45%	47%	5,511	169	4%	5%	2,833	119	21%	26%
Lebanon	52	586	118	55%	52%	4,659	294	5%	6%	2,655	226	31%	31%
Macedonia	27	877	155	61%	65%	11,772	523	16%	19%	2,162	231	46%	53%
Malawi	5	3,576	142	62%	67%	12,081	192	31%	35%	1,376	117	72%	80%
Mauritius	20	1,726	116	54%	58%	9,417	237	11%	12%	2,362	131	40%	44%
Mexico	324	4,246	205	67%	66%	150,142	1,205	4%	4%	77,399	811	20%	21%
Morocco	51	558	104	51%	49%	16,893	801	13%	16%	2,179	261	33%	33%
Nicaragua	12	1,248	68	42%	47%	1,802	63	5%	7%	1,385	70	38%	47%
Niger	2	3,386	96	58%	92%	4,345	84	37%	92%	400	138	91%	99%
Pakistan	145	500	66	40%	40%	3,531	211	1%	1%	1,834	137	9%	9%
Peru	63	2,392	330	77%	74%	60,942	817	12%	12%	22,441	659	51%	50%
Senegal	8	420	78	45%	48%	2,618	192	20%	23%	385	73	49%	54%
South Africa	196	1,618	349	78%	80%	103,773	1,547	7%	9%	39,403	1,033	35%	40%
Tanzania	17	1,740	144	60%	63%	9,393	226	12%	14%	2,779	165	50%	59%
Uganda	8	1,361	52	37%	44%	3,880	92	11%	18%	1,332	50	40%	52%
Yemen	5	358	50	37%	42%	943	83	15%	24%	190	40	47%	58%
Average	55	1,439	164	53%	54%	32,468	586	14%	17%	7,011	283	39%	42%
Median	28	1,195	108	53%	52%	8,298	238	11%	12%	2,171	138	36%	41%

Note:
1. SS = Superstars; NSS=Non-superstars
2. The averages correspond to the period between 2006 and 2008 for all countries.

Table 3: Superstars' Share in Export Growth (Intensive, Extensive, All)

	Share in Total Growth						
	Int NSS	Int SS	Ext NSS	Ext SS	Total NSS	Total SS	Total Growth
Albania	0.83	0.29	(0.09)	(0.03)	0.74	0.26	21.66%
Bangladesh	1.04	(0.09)	0.03	0.02	1.07	(0.07)	14.83%
Bulgaria	0.23	0.56	0.04	0.17	0.27	0.73	40.93%
Burkina Faso	1.54	(1.59)	0.26	0.78	1.80	(0.80)	9.37%
Cambodia	0.73	0.19	0.08	0.00	0.81	0.19	35.05%
Cameroon	(0.57)	0.58	0.56	0.43	(0.01)	1.01	9.52%
Chile	0.25	0.76	0.02	(0.03)	0.27	0.73	25.14%
Costa Rica	0.52	0.40	0.05	0.04	0.56	0.44	15.27%
Ecuador	0.44	0.38	0.11	0.07	0.55	0.45	46.42%
Guatemala	0.41	0.48	0.06	0.05	0.46	0.54	29.30%
Iran	0.17	0.68	(0.00)	0.15	0.17	0.83	34.46%
Kenya	0.37	0.53	0.06	0.04	0.44	0.56	47.46%
Macedonia	0.25	0.61	0.08	0.07	0.33	0.67	67.94%
Malawi	0.19	0.47	0.09	0.25	0.28	0.72	54.39%
Mexico	0.27	0.71	0.01	0.01	0.28	0.72	28.11%
Morocco	0.22	0.66	0.02	0.10	0.24	0.76	59.65%
Pakistan	0.51	0.35	0.06	0.08	0.58	0.42	24.47%
Peru	0.28	0.75	0.03	(0.06)	0.31	0.69	27.27%
South Africa	0.16	0.74	0.01	0.09	0.17	0.83	45.32%
Tanzania	0.42	0.38	0.17	0.03	0.59	0.41	56.10%
Yemen	0.47	0.15	0.30	0.08	0.77	0.23	40.96%
Median ALL	0.37	0.48	0.06	0.07	0.44	0.56	34%
Median Manuf.	0.27	0.52	0.07	0.10	0.36	0.64	28%
Top Firm							
Median ALL	0.82	0.05	0.10	0.01	0.92	0.08	34%
Median Manuf.	0.70	0.09	0.14	0.01	0.90	0.10	28%
Top 10							
Median ALL	0.55	0.31	0.07	0.04	0.65	0.35	34%
Median Manuf.	0.44	0.29	0.09	0.05	0.59	0.41	28%

Note:
1. Negative values are in parenthesis.
2. Int=Intensive; Ext=Extensive; NSS=Non-Superstars; SS=Superstars.
3. The averages in this table correspond to the period from 2006 to 2008 for each country; except in the case of Albania, Bulgaria, Cambodia, Cameroon and Mexico where the period taken is from 2004 to 2006. This latter choice is due to data availability or due to breaks in the exporter codes used throughout the period. The restriction to three consecutive years of data explains the more reduced sample of countries with respect to the full sample in previous tables.

Table 4: Variance Decomposition - Sectoral Exports, Superstars vs. Non Superstars

Top 1% and Others: Var X_{ic}

	(1)	(2)	(3)	(4)
Superstars (Top 1%)	0.81	0.82	0.81	0.82
Non-Superstars (Top 1%)	0.19	0.18	0.19	0.18
Country F.E.	No	Yes	No	Yes
HS2 F.E.	No	No	Yes	Yes

Top Firm and Others: Var X_{ic}

	(1)	(2)	(3)	(4)
Superstars (Top 1)	0.06	0.06	0.06	0.06
Non-Superstars (Top 1)	0.94	0.94	0.94	0.94
Country F.E.	No	Yes	No	Yes
HS2 F.E.	No	No	Yes	Yes

Top 10 Firms and Others: Var X_{ic}

	(1)	(2)	(3)	(4)
Superstars (Top 10)	0.32	0.32	0.31	0.32
Non-Superstars (Top 10)	0.69	0.68	0.69	0.68
Country F.E.	No	Yes	No	Yes
HS2 F.E.	No	No	Yes	Yes

Note: This table reports the share of variance in total exports across country-sectors attributed to the exports by the superstars and the share attributed to exports from the remaining firms, using three groups of superstars: the top 1%, the top firm, and the top 10 firms.

Table 5: Superstar Contribution to Revealed Comparative Advantage

	RCA>1 to RCA<1			Share of variation of RMP from SS		
Industry	CA countries	Top 1%	Top10	CA countries	Top 1%	Top10
Apparel	18	0	0	na	na	na
Chemicals	5	0.80	0.60	4	1.56	0.61
Elecrical machinery	2	0.50	0.50	5	0.77	0.01
Food and kindred products	27	0.00	0.00	32	0.05	0.05
Stone, clay and glass	8	0.00	0.00	20	0.10	0.01
Machinery	0	na	na	3	0.28	0.09
Metals	13	0.46	0.23	26	1.04	0.17
Mineral products	20	0.30	0.10	18	0.50	0.33
Miscellaneous goods	3	0.67	0.33	5	0.75	0.25
Paper	10	0.40	0.10	4	25.80	0.62
Plastic and Rubber	4	0.00	0.00	8	0.50	0.35
Precious Metals	13	0.08	0.15	17	0.07	0.02
Textiles	15	0.13	0.20	27	0.21	0.29
Transport	1	1.00	1.00	3	5.54	0.24
Wood	5	0.00	0.00	20	0.03	0.01
All	144	0.19	0.12	192	0.22	0.13

Note: CA countries are the countries with revealed comparative advantage in the sector. Top 1% reports the share that lose CA when the superstars are removed and Top 10 reports the share that lose CA when the top 10 firms in a country are removed.

Table 6: Revealed Comparative Advantage and Superstars across Countries

	RCA>1 to RCA<1			Share of variation of RMP from SS		
Country	CA sectors	Top 1%	Top10	CA sectors	Top 1%	Top10
Albania	5	0.00	0.00	6	0.22	0.16
Bangladesh	2	0.00	0.00	6	0.01	0.00
Botswana	4	0.00	0.00	6	0.39	0.37
Bulgaria	7	0.14	0.00	6	0.61	0.04
Burkina Faso	3	0.00	0.00	6	0.20	0.35
Cambodia	2	0.00	0.00	6	0.02	0.07
Cameroon	4	0.50	0.50	6	0.13	0.13
Chile	5	0.40	0.00	6	0.86	0.30
Colombia	9	0.22	0.11	6	0.17	0.05
Costa Rica	3	0.67	0.67	6	0.04	0.01
Dominican Republic	7	0.43	0.29	6	0.13	0.02
Ecuador	2	0.00	0.00	6	0.03	0.00
Egypt	9	0.11	0.00	6	0.04	0.00
Guatemala	7	0.14	0.14	6	0.03	0.01
Iran	7	0.29	0.14	6	0.08	0.01
Jordan	6	0.17	0.17	6	0.21	0.20
Kenya	4	0.00	0.00	6	0.04	0.01
Lebanon	6	0.17	0.00	6	0.58	0.00
Macedonia	5	0.40	0.00	6	0.49	0.25
Malawi	3	0.00	0.00	6	0.22	0.33
Mauritius	4	0.00	0.00	6	0.12	0.05
Mexico	4	0.25	0.25	6	0.90	0.00
Morocco	4	0.25	0.25	6	0.28	0.26
Nicaragua	3	0.33	0.00	6	0.02	0.02
Niger	4	0.25	0.50	6	0.19	0.21
Pakistan	4	0.00	0.00	6	0.01	0.00
Peru	5	0.20	0.20	6	0.51	0.06
Senegal	4	0.25	0.50	6	0.02	0.05
South Africa	4	0.25	0.00	6	1.11	0.03
Tanzania	4	0.00	0.00	6	0.05	0.03
Uganda	3	0.00	0.00	6	0.03	0.03
Yemen	1	0.00	0.00	6	0.00	0.04
Average	144	0.17	0.12	192	0.24	0.10

Note: CA sectors are the number of sectors with revealed comparative advantage in the country. Top 1% reports the share that lose CA when the superstars are removed and Top 10 reports the share that lose CA when the top 10 firms in a country are removed.

Table 7: Transition of Superstars – Costa Rica, Morocco and Peru

a. What type of firms were 2009/2010's Superstars in 2000/2002?

	ALL			Manufacturing		
	Costa Rica	Morocco	Peru	Costa Rica	Morocco	Peru
top 1	22%	48%	36%	25%	47%	34%
top 02-05	22%	7%	32%	30%	9%	33%
top 06-25	15%	9%	6%	5%	11%	8%
quart 26-50	0%	5%	3%	0%	4%	5%
quart 51-75	0%	2%	1%	0%	2%	0%
bottom 25	0%	0%	0%	0%	0%	0%
NE	41%	29%	22%	40%	28%	20%

b. Size Distribution of 2009's and 2010's New Superstars at their Entry

				All Sectors	
	CRI	MAR	PER	Total	Percent
top1	3	3	1	7	17%
top 02-05	2	4	9	15	36%
top 06-25	5	2	3	10	24%
quart 26-50	1	4	2	7	17%
quart 51-75		1		1	2%
bottom25		2		2	5%

c. What happened with 2000/2002's Superstars in 2009/2010?

ALL							
	top 1	top 02-05	top 06-25	quart 26-50	quart 51-75	bottom 25	NE
Costa Rica	30%	20%	0%	5%	0%	0%	45%
Morocco	55%	29%	4%	6%	0%	0%	6%
Peru	68%	14%	3%	0%	0%	0%	16%

Manufacturing							
	top 1	top 02-05	top 06-25	quart 26-50	quart 51-75	bottom 25	NE
Costa Rica	33%	20%	0%	7%	0%	0%	40%
Morocco	54%	29%	5%	7%	0%	0%	5%
Peru	68%	10%	3%	0%	0%	0%	19%

Note: Panel a shows the size distribution of recent superstars a decade earlier. Panel b shows the size distribution upon entry of current superstars that began exporting during the last decade. Panel c tracks the size distribution of superstars at the beginning of the period to the end of the decade.

Table 8: First-Year Size Distribution of New Superstars

	BFA	BGD	BGR	BWA	CHL	CRI	GTM	IRN	KEN	MAR	MEX	MKD	MWI	PAK	PER	TZA	YEM	ZAF
top1	2		6	1	3	2	1	23		3	12	1		2		1	5	9
top 02-05	1	1	4		3		2	4	2	1	9	1	1	4	2			4
top 06-25	1			1				5					1	2				
quart 26-50					1	1		1										
quart 51-75								1						1		1		
bottom25																		2

	All Sectors		Manuf.	
	Total	Percent	Total	Percent
top1	71	55%	52	50%
top 02-05	39	30%	35	33%
top 06-25	10	8%	10	10%
quart 26-50	3	2%	2	2%
quart 51-75	3	2%	4	4%
bottom25	2	2%	1	1%

Note: The upper panel shows the size distribution upon entry of superstars that began exporting during a period of three consecutive years for which we can identify them. The lower panel is the sum over all countries. The period is is the same as in Table 3 (see note).

Table 9: Features of Superstars

		Tanzania	Jordan	Peru
Type of Exporter	Producer	100%	100%	91%
	Trader	0%	0%	9%
Ownership	Foreign	81%	67%	48%
	Domestic	19%	33%	52%
Age when first exported	0 to 2 years	53%	81%	71%
	3 to 5 years	0%	14%	16%
	More than 5 years	47%	5%	14%

Note: This table reports characteristics of superstars in three countries where we can identify them. The years used in the identification of the superstars were 2009 in the case of Peru and Tanzania and 2010 in the case of Jordan. The sample includes 25 firms in Jordan, 69 in Peru and 16 in Tanzania. A firm is defined as a trader if it only acts as an intermediary, without engaging in any activity that implies any type of transformation of the merchandised traded.

Appendix

Table A1: Countries and Years Dropped from Original Sample

Country	2004	2005	2006	2007	2008
ALB	111%	111%	104%	105%	107%
BFA		105%	NA	109%	107%
BGD	50%	96%	113%	70%	NA
BGR	104%	102%	106%		
BWA	92%	96%	98%	99%	87%
CHL	93%	91%	96%	94%	102%
CMR	93%	100%	99%	100%	101%
COL				100%	100%
CRI	102%	95%	110%	102%	95%
DOM	62%	68%	66%	80%	85%
ECU	55%	59%	92%	100%	99%
EGY			188%	181%	123%
GTM	92%	92%	91%	92%	92%
IRN			107%	NA	NA
JOR	46%	55%	69%	68%	74%
KEN			100%	100%	107%
KHM	77%	79%	81%	83%	99%
KWT					635%
LBN					98%
MAR	99%	100%	101%	104%	99%
MEX	100%	100%	100%	100%	100%
MKD	60%	66%	73%	75%	NA
MLI		53%	63%	44%	46%
MUS	128%	180%	123%	113%	104%
MWI	4%	179%	71%	80%	83%
NER	1%	12%	13%	13%	81%
NIC	100%	99%	140%	106%	61%
PAK	97%	90%	94%	101%	101%
PER	101%	101%	100%	101%	98%
SEN	64%	69%	68%	68%	79%
TZA	112%	111%	99%	107%	94%
UGA	120%	124%	59%	118%	90%
YEM			101%	95%	99%
ZAF	101%	102%	102%	101%	105%

* Empty cell means no data availability for that year

** NA indicates non availability of data in comtrade for comparison

Table A2: Origin of Superstars– Full Size Distribution

a) Costa Rica

What type of firms were 2009's firms in 2000?

2000 \ 2009	top 1	top 02-05	top 06-25	quart 26-50	quart 51-75	bottom 25
top 1	22%	4%	0%	0%	0%	0%
top 02-05	22%	28%	2%	0%	0%	0%
top 06-25	15%	35%	27%	3%	1%	1%
quart 26-50	0%	2%	17%	14%	4%	2%
quart 51-75	0%	2%	5%	7%	8%	4%
bottom 25	0%	0%	2%	2%	3%	4%
NE	41%	30%	48%	74%	83%	89%

What happened with 2000's firms in 2009?

2000 \ 2009	top 1	top 02-05	top 06-25	quart 26-50	quart 51-75	bottom 25	NE
top 1	30%	20%	0%	5%	0%	0%	45%
top 02-05	8%	37%	13%	3%	0%	0%	40%
top 06-25	1%	9%	36%	5%	2%	1%	46%
quart 26-50	0%	0%	18%	19%	6%	3%	54%
quart 51-75	0%	0%	5%	10%	11%	6%	68%
bottom 25	0%	0%	2%	2%	5%	6%	85%

b) Morocco

What type of firms were 2010's firms in 2002?

2002 \ 2010	top 1	top 02-05	top 06-25	quart 26-50	quart 51-75	bottom 25
top 1	48%	6%	0%	0%	0%	0%
top 02-05	7%	28%	5%	1%	0%	0%
top 06-25	9%	19%	30%	7%	2%	0%
quart 26-50	5%	5%	11%	16%	5%	2%
quart 51-75	2%	3%	3%	7%	6%	5%
bottom 25	0%	1%	1%	2%	5%	3%
NE	29%	39%	50%	67%	82%	90%

What happened with 2002's firms in 2010?

2002 \ 2010	top 1	top 02-05	top 06-25	quart 26-50	quart 51-75	bottom 25	NE
top 1	55%	29%	4%	6%	0%	0%	6%
top 02-05	2%	32%	31%	4%	0%	0%	31%
top 06-25	1%	4%	35%	10%	3%	0%	47%
quart 26-50	0%	1%	10%	19%	6%	2%	62%
quart 51-75	0%	0%	2%	8%	7%	5%	77%
bottom 25	0%	0%	1%	3%	6%	4%	87%

c) Peru

What type of firms were 2009's firms in 2000?

2000 \ 2009	top 1	top 02-05	top 06-25	quart 26-50	quart 51-75	bottom 25
top 1	36%	2%	0%	0%	0%	0%
top 02-05	32%	21%	0%	0%	0%	0%
top 06-25	6%	30%	14%	3%	1%	0%
quart 26-50	3%	6%	8%	6%	3%	1%
quart 51-75	1%	1%	2%	3%	4%	2%
bottom 25	0%	1%	1%	2%	2%	2%
NE	22%	40%	74%	85%	90%	94%

What happened with 2000's firms in 2009?

2000 \ 2009	top 1	top 02-05	top 06-25	quart 26-50	quart 51-75	bottom 25	NE
top 1	68%	14%	3%	0%	0%	0%	16%
top 02-05	15%	40%	3%	1%	1%	0%	39%
top 06-25	1%	11%	27%	8%	2%	1%	49%
quart 26-50	0%	2%	12%	11%	6%	2%	66%
quart 51-75	0%	0%	4%	6%	7%	5%	78%
bottom 25	0%	0%	2%	5%	4%	4%	84%

Table A3: Superstars Accounted in Table 9 - Percent

	Jordan	Peru	Tanzania
Question on Producer vs. Trader	96%	96%	94%
Question on ownership structure	96%	97%	100%
Question on age at first export	84%	84%	94%
Total Nr. SS in last year in sample	25	69	16