Export Premium Reversal: Cross-country Evidence

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Abstract

The difference between exporters and non-exporters has been widely documented. Overall, empirical literature paints a consistent picture: exporters are more productive. In this paper I employ World Bank Enterprise Survey data to document cross-country patterns of productivity differences between exporting and non-exporting establishments. For many countries exporter premium exists which is consistent with the literature on exporting and productivity. Nevertheless, in multiple cases exporters are not significantly different and, more surprisingly, in some cases underperform relative to their domestic counterparts. The difference in the development levels, openness of the economy, infrastructure and governance are considered as possible explanations for cross-country variation in exporter vs. non-exporter productivity differential.

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1. Introduction

The importance of exporters has been broadly studied in the trade literature. Bernard and Jensen (1995) was the first paper to take a careful look at the U.S. exporters in the manufacturing sector. In general the results revealed that relatively to non-exporting plants exporters are substantially larger, have higher capital intensity and investment per worker, and pay higher wages. In addition, exporting establishments were found to have higher labor productivity as measured by value-added and shipments per-employee. The self-selection of "good" plants into exporters is pointed out as the primary mechanism behind exporter productivity premium in U.S.

In the following years Bernard and Jensen published other papers that looked at exporting and productivity (see Bernard and Jensen 1999, 2004a, 2004b). Wagner (2007), documenting current research on exports and productivity, referred to those as "papers that started a literature". Multiple studies employing establishment level data across different countries followed.[2] Overall, empirical literature paints a consistent picture: exporters are more productive and self-select into export markets.[3]

The self-selection story is a take away point from the vast literature on productivity and exporting. Self-selection mechanism is usually related to additional costs a firm faces in export markets. Intuitively, operating in a foreign market poses additional variable and/or fixed costs: transportation costs, expenses related to establishing distribution networks and adaptation costs to mention a few. Further, under the assumption that foreign fixed costs of exporting exceed their

[2] See literature reviews by Greenaway and Kneller (2007a) and Wagner (2007) for detailed information on studies related to the literature on exports and productivity. Wagner (2007), summarizing empirical work using firm-level data, lists 58 studies done for multiple countries with different levels of economic development. Greenaway and Kneller (2007a) survey the theoretical literature on firm heterogeneity and firm level globalization strategies.

[3] Even though the literature points to self-selection as a primary mechanism for becoming an exporter, learning by exporting has also received empirical support. For empirical evidence on learning by exporting see Blalock and Gertler (2004), Van Biesebroeck (2005), and Greenaway and Kneller (2007b) that study Indonesian, nine sub-Saharan countries and UK establishments respectively.

domestic counterpart only most productive firms can profitably enter foreign markets.[4] Self-selection as an empirical artifact preceded the development of theoretical literature on firm heterogeneity that provides a framework where exporters are more productive relative to firms that serve only the domestic market.[5]

The primary focus of this paper is to document a cross country variation in the productivity gap between exporters and non-exporters and to consider country-level factors that might be correlated with the variation in the export premium. This paper asks the following set of questions. How does exporter premium differ across countries? Can the degree of this productivity differential be explained by measurable country level characteristics?

The fact that exporters are more productive is a very robust data artifact. Nevertheless, there exists some evidence that exporters might not be that different in terms of productivity as compared to their domestic counterparts. For example, seminal paper by Bernard and Jensen (1999) documents that ex-ante advantage in levels of TFP for future U.S. exporters controlling for four-digit SIC industry, state and plant size is positive but not significant. Also, Wagner (2002) utilizes German plant level data and reports that a starter premium is not statistically significant when performing matched exporter/non-exporter comparison.[6]

In addition, Clerides et al. (1998) report that Moroccan plants that start exporting have statistically indistinguishable differences in average costs as compared to industry norms. Such pattern is attributed to the fact that many Moroccan plants were founded in response to firm-specific demand shocks and focus solely on selling apparel and textile to the foreign market.

[4] Clerides et al. (1998), Bernard and Jensen (1999), Aw et al. (2000) and Delgado et al. (2002) argue that firms incur large fixed export entry costs and thus only the most productive establishments export.

[5] See Bernard et al. (2003), Melitz (2003), Helpman, Melitz and Yeaple (2004), Yeaple (2005) among others.

[6] Similar to Wagner (2002) results from matched comparison Greenaway and Kneller (2004) use a large sample of UK firms and show that TFP differences by exporting status are insignificant.

Authors point out various subsidies for exporters as the possible factor that might have allowed less efficient plants to compete. Damijan et al. (2004) exploit a rich Slovenian dataset and explain the fact that firms with no "exceptional performance" become exporters due to entering the markets with lower competition.[7]

Girma et al. (2004) examine Irish manufacturing sector and find no clear differences in plant performance across plants with different export status. A possible explanation for such pattern might be couple distinguishing features of Ireland: (i) high export shares (almost 60% of domestic firms export); (ii) foreign multinationals have very significant influence in the Irish industrial structure. Greenaway et al. (2005) report that in Sweden performance characteristics for exporters and non-exporters are remarkably similar. One possible explanation for almost no difference between firms with different export status is that Sweden is characterized by an extremely open economy where even domestic firms face significant competitive pressures and thus look similar to exporters.

The evidence from Morocco, Slovenia, Ireland and Sweden is in contrast with rather persistent and significant exporter premium consistently documented in the literature.[8] Nevertheless, hypotheses as to why exporters and non-exporters look similar provide a good starting point to explore the mechanism behind exporter premium differences across countries examined in section 5.

In this paper I employ cross-country firm level data from World Bank Enterprise Survey. World Bank conducted and still conducts interviews with firm managers primarily to understand

[7] A third of Slovenian exports is directed towards succeeding countries of former Yugoslavia that are less developed compared to other trading partners in EU-15.

[8] See Appendix Table A.1 (column (1) and (2)) for the short summary of the findings of export and productivity literature. Again, for more comprehensive list with the summary of findings see survey papers by Wagner (2007) and Greenaway and Kneller (2007a).

what factors hinder economic development. The survey data spans eleven years (2002 – 2012) and includes countries with different levels of economic development.[9] The advantage of this dataset is three-fold. First, the firm level data is collected for multiple countries which allows for comparing countries with different levels of economic development. Second, the use of a similar data collection methodology provides some consistency of data across countries. Three, stratified sampling generates samples representative of the whole economy which is better for inference.[10]

The results of labor productivity comparison mainly follow the expected pattern: exporters are more productive. A more interesting and less expected results come mostly from developing countries where differences in labor productivity across exporting status are not significant and in some cases non-exporters have significantly higher mean productivity. The difference in the development levels, openness of the economy, infrastructure and government intervention are explored as possible reasons for cross-country differences in exporter premium.

The paper is structured as follows. Section 2 describes the data and construction of the variables of interest. Section 3 documents the facts about cross-country variation in productivity differences by exporting status. Robustness checks are done in section 4. Section 5 provides possible explanations as to why productivity advantage of exporters differs by country and section 6 concludes.

2. World Bank Enterprise Survey Data and Variable Construction

World Bank collects firm level data from manufacturing and service sectors in every region of the world. Firms are a representative sample of the private sector of the economy. The

[9] See Appendix Table A.2 (manufacturing) and Table A.3 (services) for the full list of countries surveyed, years when the survey was administered, total number of firms by country-year pairs and the share of exporters. The data coverage in terms of country-year pairs is quite extensive. For the manufacturing sector there are 198 country-year pairs and 139 country-year pairs for the service sector. Three country-year pairs Syria 2003, Morocco 2004, and Vietnam 2005 seem to have different industrial classification than 4-digit ISIC Rev.3.1 and are dropped from the subsequent analysis.

[10] For details on the survey and sampling methodology see http://www.enterprisesurveys.org/Methodology.

surveys are primarily designed to provide panel data on finance, corruption, infrastructure, crime, competition and performance measures to understand what business environment changes affect firm-level productivity across time and countries. In particular, the data contains firm level information on export status, total sales, net assets, employment numbers and sector information as well as other potentially valuable information (legal status, foreign ownership, importing activity, main product produced etc.).[11]

Different units within the World Bank have been conducting firm-level surveys since 2002. In 2005-2006 the collection efforts have been centralized within Enterprise Analysis Unit. In this paper I use publicly available datasets from the World Bank.[12] Initially the surveys are country-specific and have country-specific questions that are not included in the aggregated datasets employed in this paper. The raw datasets for individual countries might be of great value when a particular country is the focus of the analysis. In this paper a cross-country analysis is the main focus and aggregated datasets are employed.

The other important feature of the data is that the survey samples not only manufacturing firms but also firms from the service sector. The information on 4-digit ISIC codes for the main product firm produces allows making such distinction.[13] Table 1 shows 2-digit ISIC codes for subcategories of manufacturing, services and other industries from which firms are sampled.

Table 1

[11] See Appendix Table A.4 for code names and verbal descriptions for the variables that might be useful for empirical analysis. The 2002-2005 version of the Survey had different code names from 2006-2012 survey. Thus, code names and variable descriptions for both versions of the survey are provided.

[12] Data is available from http://www.enterprisesurveys.org/Data

[13] In 2002-2005 the Survey asked for establishment's main product and in 2006-2012 for two main products (defined as products that generate the most sales) categorized according to 4-digit ISIC Rev.3.1 industry classification.

The firm level performance in the service sectors is an interesting question by itself. Services are an important part of the economy in the developed and developing countries and play increasingly important role for economies overall.[14] Table 2 reports the share of service firms surveyed by income level. In general the share of the service firms sampled in different countries increases in the income level. Such sampling pattern is consistent with the positive correlation between GDP per capita and the share of the services in the economy.

Table 2

The industry codes are not available for all country-year-firm observations. Thus, I drop observations without the information on industry codes since it is not possible to identify a corresponding sector for those firms.[15] Two, I split the data into manufacturing and service firms and proceed mainly with cross country analysis for the firms in manufacturing sector while performing only some exercises for service sector firms due to data limitations.

Multiple country-year pairs have either small number of firms sampled or very few exporters which limits meaningful comparison between exporters and non-exporters. Thus, I drop country-year pairs that have less than twenty exporters. In this paper I do not drop any firms

[14] Service sectors as well as service exports play an important role in the economy of the developed country. In China, an upper-middle income country like, the share of GDP from services rose from about 34% in 1994 to almost 45% in 2012, a percentage point below manufacturing share of the economy. In the less developed countries service sector is likely to expand as countries move up the development ladder.

[15] Due to unavailability of ISIC codes 28% of the data has to be dropped. Nevertheless, it is necessary to do so because unidentified firms might be either manufacturing or service firms which might have some impact on the results of the analysis.

based on employment size but only drop outlier firms with labor productivity below 1st and above 99th percentile.

Labor productivity

As pointed out in the introduction the main focus of this paper is to document cross-country variation in productivity differences between exporters and non-exporters and to provide some explanations of export premium differences. Labor productivity (calculated as total sales per worker) will be used as a primary measure of firm's productivity.[16] The literature on exporting and productivity shows that exporters are more capital intensive and sometimes significantly so. Thus, a portion of labor productivity advantage might come from capital deepening and such possibility has to be accounted for by using measures of capital stock and capital intensity. The information on net capital and gross capital is lacking and analysis including capital intensity controls will be performed on smaller samples of the data. Table 3 shows data coverage by the variables of interest.[17]

Table 3

To distinguish exporters from non-exporters I construct export status dummy. So long as more than ten percent of total output is directly sold abroad a firm is classified as an exporter. The information on the ownership allows distinguishing purely domestic firms from those that are owned by foreign companies. Foreign owned firms have been shown to have superior

[16] Country level sales data is first converted into dollars using a yearly average of exchange rate with US dollar. Further, sales numbers are converted into 2005 constant dollars by using US GDP deflators.

[17] Note that different subset of firms might be missing across different variables. This feature of the data prohibits including multiple controls in regression analysis as it substantially lowers sample sizes. Due to the lack of coverage only the most important variables will be used for the estimations in section 4.

performance in terms of employment, wages and productivity.[18] Thus, I construct an indicator variable for foreign ownership that equals to 1 if the share of foreign ownership is twenty percent and higher, and 0 otherwise. Firm age, skill intensity, dummy on foreign technology license and ISO certification dummy are included as additional controls in the robustness exercises in section 4. The following section presents the results of cross-country productivity differences by export status.

3. Cross-country productivity differences by export status

The empirical pattern of productivity differences between exporters and non-exporters is well documented: commonly exporters are more productive on average in terms of labor productivity and TFP. In addition, some studies have shown that exporters' distribution of productivity first order stochastically dominates that of non-exporters.[19] Nevertheless, the exporter productivity premium is not always statistically significant and for some countries firms with different export status are indistinguishable.[20]

In this paper I consider productivity differentials by export status across multiple countries. As a first look at the data I use quantile-quantile plot (q-q plot) to compare the distribution of labor productivity by export status within each country.[21] In our case we compare the log of labor productivity of exporters on y-axis to the log of labor productivity of non-

[18] Kneller and Pisu (2004) show that foreign firms are more likely to export and export more intensively even after controlling for firm-level variables that are correlated with exporting.

[19] For evidence on first order stochastic dominance of the productivity distribution of exporters relatively to non-exporters see Delgado et al. (2005) for Spain, Kostevc (2005) for Slovenia, and Wagner (2005) for Germany.

[20] See studies by Girma et al. (2004) for Ireland, Clerides et al. (1998) for Morocco, Damijan et al. (2004) for Slovenia and Greenaway et al. (2005) for Sweden that report exporters to be somewhat identical to non-exporting establishments.

[21] Note, q-q plot is a plot of the quantiles (not to be confused with quintiles) of the first data set against the quantiles of the second data set. See Appendix B.1 for more details on quantile-quantile plots.

exporters on x-axis. Figure 1 plots log of sales per worker of exporters vs. non-exporters for the same quantiles of labor productivity distributions for selected country-year pairs.

Figure 1 groups cross-country results into common patterns. The upper-left plot shows that among Indonesian manufacturing firms in 2003 exporters are more productive than non-exporters for all quantiles of the productivity distribution as each point is above 45-degree line. This data regularity is consistent with previous findings of the literature. The upper-right plot closely follows a 45-degree line which implies that sales per worker are almost identical across exporters and non-exporters.

Figure 1

The two lower plots are a central message of this paper. They show that in some countries exporters are actually less productive than domestic firms. The lower-right plot indicates that productivity differential varies across different quantiles. When comparing firms with small productivity exporters look more productive and at the same time "big" exporters underperform as compared to non-exporting establishments.[22] The lower-left plot indicates that Bulgarian manufacturing exporters in 2005 lag behind domestic firms in terms of labor productivity as all of the points are below the 45-degree line.

Mean labor productivity difference

A more formal test of whether exporters are more productive than non-exporters is a t-test comparing mean productivity by export status. In order to perform mean comparison by

[22] Bernard and Wagner (1997) studying German exporters note that labor productivity is almost identical between exporters and non-exporters. However, comparing labor productivity across plant size shows that small exporters are 3-4% more productive while large exporters are 30-50% more productive as compared to non-exporters of similar size. Bernard and Jensen (1999) show that for U.S. firms larger exporters have higher TFP advantage as compared to smaller firms.

export status I restrict attention to country-year pairs that have at least twenty exporters.[23] For manufacturing firms 101 country-year pairs have more than twenty exporters out of total 196 pairs available initially. For the service firms the restriction on the number or exporters leaves only twelve country-year pairs from initial 131 pairs. Table 4a shows t-test results for manufacturing firms.

Table 4a

Table 4a confirms data patterns in Figure 1. First, for many countries mean labor productivity of exporters exceeds that of non-exporters and the difference is statistically significant. Table 4a column (8) indicates whether the productivity advantage of exporters is statistically significant and 58 out of 101 country-year pairs exhibit such pattern. Second, for the other 37 country-year pairs productivity differences are not significant. Third, consistent with lower average sales per worker for exporters displayed in Figure 1, for seven country-year pairs non-exporters are more productive on average and the differences are significant.[24] Among these seven pairs four are from upper-middle income level: Czech Republic 2009, Poland 2003, Romania 2005 and Lebanon 2006. Two are lower-middle income countries (Armenia 2005 and Laos 2009) and one is a high income country (Slovenia 2009). For these countries exporters exhibit lower mean labor productivity than that of domestic firms.

[23] The cutoff level of at least twenty exporters is somewhat arbitrary and is designed to select a subsample of country-year pairs so that the pattern of productivity differences is less likely to be spurious. Running t-test on the full sample of countries for manufacturing adds only one country-year pair (Poland 2003) that has statistically significant t-test results indicating that non-exporters are more productive on average. For service firms full sample t-test adds 32 pairs. Full sample results of t-tests are available upon request.

[24] Table 4a has six country-year pairs where exporters are less productive on average and the difference is statistically significant. Additional country-year pair (Poland 2003) is from the t-test results on the full set of countries.

In the similar way the mean labor productivity comparison is performed for the firms in the service sector. Again, I restrict attention to a subsample with country-year pairs with at least twenty exporters. Table 4b shows t-test results for the service firms.

Table 4b

Due to relatively lower number of exporters in the service sector only twelve country-year pairs have more than twenty service firms classified as exporters. Even with twelve countries a similar pattern to that in manufacturing industries arises. For most country-year pairs exporters are more productive on average. Bulgaria 2007 exhibits the reverse pattern where exporters lag in terms of labor productivity. Figure 2 shows q-q plots for Germany 2005 and Bulgaria 2007.

Figure 2

The service sector firms are an interesting area for the future research as services become increasingly important for developed and developing economies alike. Service firms are likely to be very different from manufacturing establishments. For instance, producing a service is potentially a very different task as compared to producing a manufactured product. Service sector firms might require much higher shares of skilled labor and use different technology (as compared to with manufacturing) to transform inputs into output (i.e. commonly used production functions form manufacturing might not apply for services). Further, fixed costs, transportation costs and distribution costs might be very different across manufacturing and services causing

barriers to trade to differ significantly for service firms. One thing is clear: service firms, production of services and service exports are a fruitful area for future research.[25]

The results of this section are mainly consistent with previous findings of the productivity and exporting literature: exporters outperform their domestic counterparts. A more surprising result is that for some countries exporters are less productive. In section 4 a more scrupulous comparison of exporters vs. non-exporters is performed. If this data pattern is robust it would be important to understand what factors might facilitate export entry for less productive firms.

4. Robustness exercises

The difference in mean productivity by export status can be driven by multiple factors. For instance, exporters might disproportionately come from industries with average productivity above country level average. Exporter productivity premium might reflect the fact that exporters are more capital intensive. Also, foreign owned firms have been shown to be more productive than purely domestic firms. To the degree that exporters are more likely to have owners of foreign origin exporter premium would be overestimated. Thus, I include capital intensity, industry dummies, ownership and other controls in the exporter premium regressions performed in this section. Below I discuss some of the control variables in more detail.

Capital intensity might be correlated with export status and with productivity and thus has to be controlled for in order to provide a better measure of export premium.[26] Data on capital intensity is provided in the survey as gross value of machinery, equipment and transport after depreciation.

[25] Appendix A (Table A.5) compares sales per worker for manufacturing vs. service firms within country-year pairs. Results show that service firms on average have higher labor productivity as compared to manufacturing firms. The differences are statistically significant but the factors that drive such difference remain to be studied.

[26] Bernard and Jensen (1999) show that while exporters' labor productivity premium is 12-24% TFP premium ranges from 7-22% indicating that higher capital intensity of exporters is partly responsible for labor productivity differentials.

Industry dummy and firm size are important controls for exporter premium regressions. A commonly used methodology to measure a productivity gap between firms with different export status is to perform within industry comparison and control for the size of the firm. This allows comparing firms of similar size and from the same industry with different export status. [27] Size of the firm is an important control as exporters have been reputedly reported to be bigger in terms of total number of workers.

It is reasonable to assume that firms with some foreign capital are more likely to export due to foreign connections.[28] In addition, firm with foreign capital might have a productivity advantage due to technological knowledge transfer from foreign owners. Following this logic it is reasonable to control for foreign ownership. Blalock and Gertler (2004) define foreign firm as the one with the share of foreign equity above twenty percent. I follow this definition and create foreign ownership dummy accordingly. Firm's age, skill intensity, foreign technology license dummy and ISO certification dummy are included in additional robustness checks. Results are not sensitive to inclusion of these controls.

Exporter premium is defined as percentage difference in labor productivity between exporters and non-exporters, all else equal. In order to obtain exporter premium I estimate the following

$$\ln LP_{ict}^{z} = \beta_0 + \beta_1 Export_{ict}^{z} + \beta_2 Size_{ict}^{z} + \alpha^{z} + \alpha_{ct} + \varepsilon_{ict}^{z} \qquad (1)$$

where i denotes firms, c denotes countries, t denoted time and z indexes 4-digit ISIC industries. LP is labor productivity, $Export$ is a dummy variable for export status (equal to 1 if

[27] Alvarez and López (2005) using Chilean data show considerable variation in productivity differential by industry.

[28] For instance, foreign ownership might lower informational barrier for export entry. Foreign ownership might allow the firm to have better information on the market competition, demand, availability of distribution networks or legal environment in the foreign market.

the firm exports more than ten percent of the output, 0 else), *Size* is firm size measured by total employment, α^z and α_{ct} are industry and country-year fixed effects and ε is an error term. Bernard and Jensen (1999) estimate exporter premium on U.S. data similar to equation (1) with industry and state dummies. Additionally, I estimate

$$\ln LP_{ict}^z = \beta_0 + \beta_1 Export_{ict}^z + \beta_2 \ln k_{ict}^z + \beta_3 \ln CAP_{ict}^z + \alpha^z + \alpha_{ct} + \varepsilon_{ict}^z \qquad (2)$$

where indices are as defined in equation (1), $\ln k$ is capital intensity measured as logarithm of capital stock per worker, $\ln CAP$ is logarithm of total capital stock (measures as gross value of machinery, equipment and transport after depreciation), α^z and α_{ct} are industry and country-year fixed effects and ε is an error term. Equation (2) resembles the estimation in Helpman et al. (2004).[29]

In this section I estimate exporter premium using equation (1). Equation (2) is estimated on a subset of the data employed in estimating equation (1) due to limited availability of information on capital stock. Regressions are performed on the groups of countries. The division of countries into groups is based on the t-test results. The regression results for the first group of countries where exporters are found to be more productive on average are presented in Table 5a.

Table 5a

The dependent variable is logarithm of labor productivity in all regressions. Column (1) and (2) in Table 5a present two simplest regressions that estimate coefficient on export status dummy controlling only for country-year in column (1) and country-year and industry in column (2). Controlling for country-year and country-year and industry exporter premium is estimated to

[29] Helpman et al. (2004) estimation additionally includes FDI variable (a foreign affiliate dummy equal to 1 if exporter has a foreign affiliate and 0 else) and logarithm of total capital stock squared.

be around 58 percent for the first group of countries. Controlling for the firm size in column (3) reduces the estimate of export premium to 37.4 percent and controls for capital deepening (i.e. capital intensity and total stock of capital) and foreign ownership in column (4) further reduce premium to 11.4 percent. Consistent with the literature results indicate that controlling for firm size and capital deepening is important as seen from significant drop in estimated productivity advantage of exporters as compared to non-exporters. Overall, exporters in the first group of countries are 11.4 percent more productive in terms of total sales per worker.

Second group is comprised of countries where the productivity differences by export status are insignificant. One would expect that coefficients on export dummy would be lower for the second group of countries as compared to the first group. Table 5b shows the regression results for the second group.

Table 5b

Similarly to results for the first group of countries including controls for firm size and capital deepening lowers exporter premium significantly. In addition, in column (3) exporter premium of 14.4 percent is sizably lower as compared with the estimate of 34.7 percent for the first group of countries. Nevertheless, labor productivity advantage is estimated to be 10.5 percent in column (4) which is closer to 11.4 percent from Table 5a. Overall, productivity gap between exporters and non-exporters in countries from the second group is smaller (by a little less than a percentage point) when compared with the first group.

The third group of countries includes countries where t-test results show that non-exporters are more productive on average. How robust is this result? Table 5c presents regression results for the third group.

Table 5c

Results in Table 5c follow the expected pattern: coefficient on export status dummy is negative indicating that exporters are actually less productive. Nevertheless, only in column (1) productivity disadvantage of exporting firms is statistically significant. Regressions in column (2)-(4) still indicate that exporters are less productive but the export premium estimates are no longer significant. Comparing columns (1) and (2) might explain why results are not statistically significant for the third group of countries where t-test indicates significantly lower mean productivity for exporters. Exporters are estimated to have a significant productivity disadvantage of 28.3 percent in column (1) but are insignificantly less productive (12.1 percent) in column (2). The only difference in those two regressions is that column (2) controls for the industry. Thus, statistically significant disadvantage of exporters as indicated by t-test results might be attributed to industry composition of exporters and non-exporters. Similarly to the result in column (2) controlling for firm size and capital (in column (3) and column (4) respectively) delivers estimates of productivity disadvantage for exporters around 12-14 percent but those are also insignificant.

It is plausible that other factors than those specified in equation (1) and equation (2) might influence exporter premium. To alleviate at least some potential concerns I estimate exporter premium regressions by groups of countries with additional control variables: firm age,

skill intensity (measured as the ratio of non-production workers to total number of workers), foreign technology license dummy (equals 1 the firm uses technology licensed from a foreign-owned company and 0 else), and ISO certification dummy (equals 1 if the firm received ISO certification and 0 else). Table 6 shows the results for exporter premium regressions with additional controls.

Table 6

Column (1) in Table 6 is the same regression as in column (4) from Table 5. Exporter premium estimates do not change significantly across all four regressions with different controls as seen from comparing coefficients on export status in column (1) with columns (2)-(5). The overall pattern remains unchanged: countries in group one and group two have more productive exporters while productivity differences by export status for the third group are not statistically significant.

Table 7

In order to show how significant different groups of countries are in terms of economic size I compute for each of the groups five shares (relative to the world): (i) share in world's GDP; (ii) population share; (iii) share in trade; (iv) share in merchandise exports and (v) share in the world's agricultural value added. Table 7 reports the results for each of the groups. Countries where the established pattern of productivity advantage of exporters does not hold (i.e. countries with insignificant differences in mean productivity and countries where non-exporters are more

productive on average) account for approximately 12 percent of world's GDP, 20 percent of world's population and almost 16 percent of world's trade.

Figure 3

In conclusion, results from this section are twofold. First, previous literature findings that exporters are more productive than non-exporters hold. Second, for some countries coefficient on export status is negative but insignificant which indicates that exporters might underperform relatively to domestic firms or at least be similar in terms of labor productivity. More importantly, this section shows that there exists a variation in exporter premium between countries (see Figure 3).[30] Section 5 explores country-level determinant of exporter premium.

5. Country Level Determinants of Exporter Premium

Exporter premium is a robust pattern documented across multiple countries with self-selection being the main explanation widely accepted in the literature. Nevertheless, another well-established empirical fact is that exporter/non-exporter productivity distributions overlap significantly.[31] Productivity overlap indicates that some non-exporters that are more productive than exporters still serve only domestic market. On the other hand, some relatively low productivity firms participate in export markets. Further, the analysis in section 4 reveals significant variation in export premium to the extent that non-exporters are more productive in

[30] See left panel of Figure 3 for a plot of exporter premium estimated from equation (1) against per capita GDP. Exporter premium below 1st percentile and above 99th percentile have been dropped for expositional purposes. Exporter premium in the right panel of Figure 3 is estimated from equation (2).

[31] For instance, Bernard et al. (2003) document for U.S. plants that even though exporters are more productive on average productivity distributions for firms with different export status overlap significantly. Such data pattern indicates that factors other than productivity might determine export entry.

some cases (even though results are insignificant). In this section I explore possible determinants for the cross-country variation in the export premium.

As a starting point for the discussion of productivity differences by export status it would be informative to revisit self-selection and learning mechanisms that have been used to explain the existence of exporter premium. The empirical evidence for self-selection shows that only more productive establishments enter foreign markets. The common reasoning behind self-selection story is that there are additional costs of selling abroad and those costs exceed corresponding domestic costs and only the most productive firms can profitably enter foreign markets. Thus, self-selection is a possible explanation as to why exporter premium exists.

The research on learning effects shows that firms that start exporting can experience post-entry productivity increase. Van Biesebroeck (2005) shows that learning can occur through resolving firms' demand problems. More anecdotally, foreign markets expose a firm to tougher competition, best management practices and knowledgeable clients. It is not entirely implausible to suppose that post-entry learning about foreign markets, production technologies and foreign tastes can lead to improved productivity. Thus, learning can potentially explain exporter premium especially in less developed countries where learning from exporting is more likely to occur.[32]

The purpose of this section is not to favor self-selection or learning but to consider country level characteristics that might influence exporter premium through self-selection, learning or any other mechanism. Relying on the previous research and intuition from self-selection and learning mechanisms I propose four groups of country level variables that can potentially explain cross country variation in exporter premium: development, openness, infrastructure and governance. I subsequently address each of the four groups.

[32] See footnote 3 for additional literature references on learning.

Development

The survey data used in this paper covers multiple countries with different levels of development. One possibility is that development level of a country determines the relative position of the firms in that country to global productivity frontier. It is plausible that firms in less developed countries might learn more from participation in export markets. If that is the case exporter premium might be negatively related to development level.[33] Also, firms from less developed countries would face much tougher completion in foreign markets and self-selection effect could be even more pronounced (compared with developed country case) again contributing to higher export premiums in less developed countries. The above explanations are hypotheses and the direction of correlation between development levels and export premium remains to be studied.

Openness

Two studies provide some evidence that the openness of the economy might influence export premium. Girma et al. (2004) examine Irish manufacturing sector and find no clear differences in plant performance across establishments with different export status. For a possible explanation for such pattern authors point to couple distinguishing features of Ireland: (i) high export shares (almost 60% of domestic firms export); (ii) foreign multinationals have very significant influence in the Irish industrial structure. Greenaway et al. (2005) studying Swedish manufacturing firms report remarkably similar performance characteristics for exporters and non-exporters. Sweden, similar to Ireland, is characterized by an extremely open economy where even domestic firms face significant competitive pressures due to high levels of import

[33] Yasar and Rejesus (2005) examine the performance of Turkish manufacturing plants. The results suggest that learning by exporting may explain export premium. It is plausible that learning occurs due to the fact that Turkey is a low middle-income country which allows for learning to take place.

penetration. It is possible that in extremely open economy both exporters and domestic firms face very similar competitive pressures and thus look "identical" in terms of performance.

Infrastructure

In order to state a hypothesis for the relationship between infrastructure and exporter premium I assume that good infrastructure lowers barriers to trade. Such assumption is reasonable when considering trade and transport-related infrastructure. Unless more productive firms can disproportionately benefit from the infrastructure development one would expect countries with better infrastructure to have lower export premiums.

Governance

The governance here is used as a broad term that might potentially include measures of business environment, corruption and government subsidies. The literature on exporters and productivity provides some guidance on possible correlation between governance measures and export premium. For instance, Clerides et al. (1998) consider Moroccan manufacturing firms and point out that "Moroccan policies during the sample period (1984 – 1991) provided various subsidies to exporters, and these may have allowed less efficient plants to compete." Also, creating favorable business environment might allow firms to better exploit product specific demand shocks. Such was the case for young plants in Morocco that produced particular apparel and textile products exclusively for foreign market (World Bank, 1994). More anecdotal evidence suggests that corruption and selective granting of export license can result in obstructing proper market functioning and allow for less productive firms to export.

Table 8

To explore the correlation between exporter productivity premium and various country level characteristics I use the World Bank Indicators data. Table 8 lists country level variables as well as coefficients from regressing export premium on those country-level measures of development, openness, infrastructure and governance. In column (1) exporter productivity premium is calculated by estimating equation (1) where exporter premium is a percentage difference in mean sales per worker across exporters and non-exporters after controlling for industry and plant size. Correlations in column (3) employ exporter premium estimated from equation (2) that controls for capital intensity, capital stock and foreign ownership. Column (2) and column (4) show the number of country-year pairs that are used in the regression. Measures of capital stock are limited as seen from the smaller sample sizes when using exporter premium from equation (2).

The results in Table 8 shed some light on possible country-level determinants of exporter premium. To proxy for development I use GDP per capita, trade in services as percentage of GDP and R&D expenditure as percentage of GDP. All three variables have negative coefficients with the exception of the coefficient on trade in services in column (3). Correlation between development level and export premium is statistically insignificant but in the predicted direction: more developed countries have lower productivity gap between exporters and non-exporters.

Country-level proxies for openness are exports (imports) of goods and services as a percentage of GDP. The correlation between openness and export premium is in the predicted direction but insignificant. An increase in exports to GDP ratio is associated with lower export premiums. This is consistent with previous research on Ireland and Sweden that shows that in these two countries (with relatively open economies) exporters and non-exporters have similar performance characteristics.

To measure an infrastructure three quite different indicators are utilized: (i) logistics performance index (measures quality of trade and transport related infrastructure); (ii) paved roads as a percentage of total roads; (iii) internet users (per one hundred people). Better infrastructure seems to lower exporter premium. In column (1) the coefficient on paved roads is statistically significant. The mechanism behind negative correlation between infrastructure and exporter premium is less clear. It is possible that good infrastructure effectively lowers trade barriers and allows more firms to export which results in more similar productivity characteristics of exporters and domestic firms.

As mentioned previously governance is defined as a rather broad category. Five variables are used to measure different aspects of country level governance: (i) lead time to export (median case in days); (ii) number of documents needed to export; (iii) number of days required to start a business; (iv) transparency, accountability and corruption index.

Two variables have consistent sign across columns (1) and (3). First, exporter premium increases in the number of documents needed for exporting. It is plausible that less efficient document procedures related to trade increase trade barriers and only most productive firms enter foreign markets contributing to higher productivity advantage of exporters. Second, corruption as measured by percentage of firms that are expected to informally pay for "getting things done" increases exporter premium. The results for other measures of governance are mixed and coefficient on lead time to export in column (3) is surprisingly negative and significant.[34]

In this section I have explored correlation between four groups of country level variables and export premium. In conclusion, the level of development, openness of the economy and good infrastructure seem to lower exporter premium. The relationship between governance and

[34] One would expect a positive relationship between lead time to export and export premium due to the fact that higher lead times most likely act as a trade barrier and should reinforce self-selection.

exporter premium is somewhat less clear. Nevertheless, cross-country variation of export premium is not significantly related to most of the country level measures utilized in this section and the results (as well as hypothesized mechanisms behind exporter premium variation) have to be taken with caution.

Conclusion

This paper documents the patterns of productivity differences between exporters and non-exporters across multiple countries employing firm level data collected by the World Bank. In addition, cross country variation in development levels, openness of the economy, infrastructure and governance are explored as possible determinants of the productivity advantage of exporters.

The results of the paper contribute to the literature on exporting and productivity in three ways. First, exporter vs. non-exporter comparison in the literature is usually carried out in a single country setting which makes it somewhat harder to compare results across countries. In this paper exporter premium for different countries is estimated using the same methodology which allows cross-country comparison. Second, cross-country nature of this study allows exploring country-level determinants of exporter premium. In section 5 I show that development levels, openness of the economy, infrastructure and governance are correlated with exporter premium. Nevertheless, the question of whether country-level variables contribute to observed productivity gap between exporters and domestic firms remains to be studied. Third, I show that for many countries exporter premium is not significant which is in contrast to the research on the developed countries where exporter premium is persistent and statistically significant.

Future research in exporting and productivity might focus on the following areas. First, it might be useful to develop a theoretical framework that allows for non-exporters to be more productive. Such framework would provide an understanding of the mechanism that contributes

to similarity between establishments with different export status. Second, comparing productivity of manufacturing firms with service sector firms revealed that in almost all countries service firms have higher sales per worker. In addition, service sector as the share of the economy has been continuously growing in many countries. Thus, even though the data on services is relatively sparse, significant efforts should be made to better understand service sector of the economy.

In conclusion, the findings of this paper challenge the notion that exporters are always more productive than non-exporting establishments. Country-level variables are shown to partly determine the productivity gap between firms with different export status.

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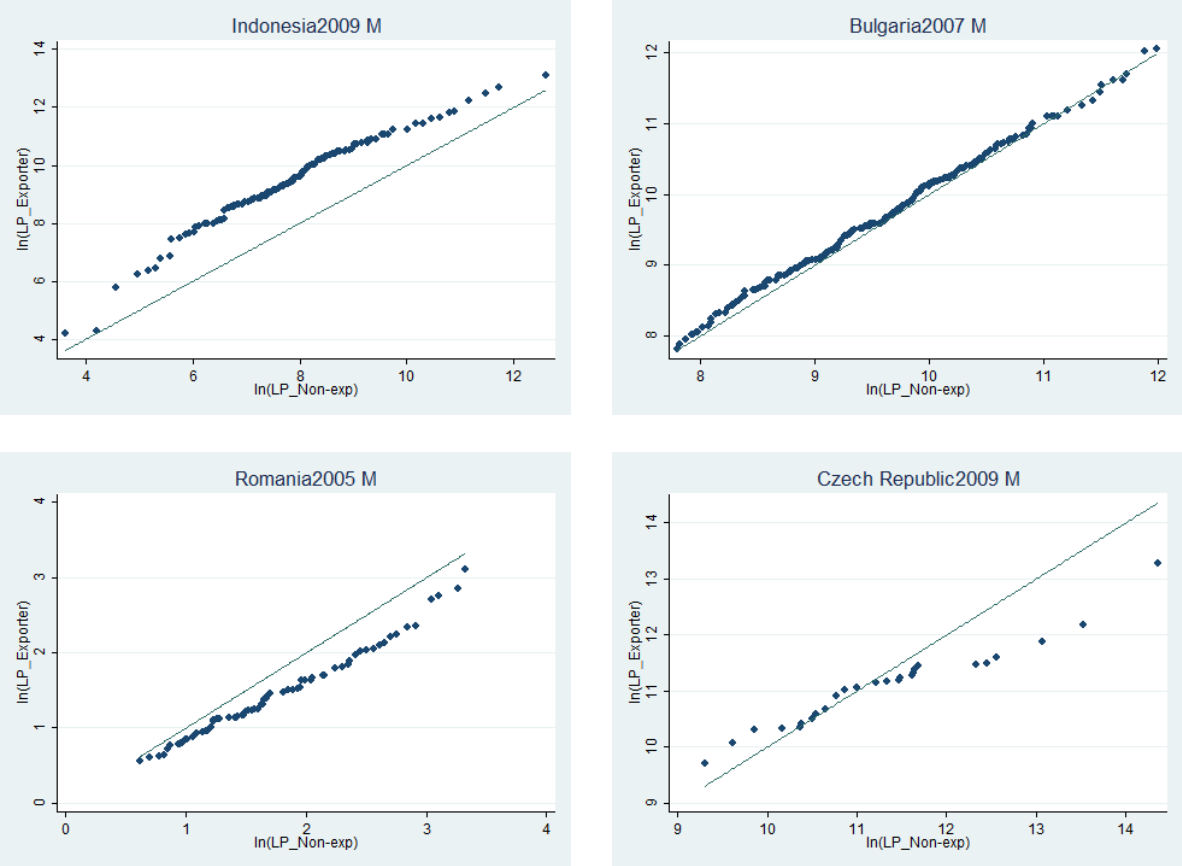


Figure 1
Quantile-quantile plot of log labor productivity of exporters vs. non-exporters
(Manufacturing industries)

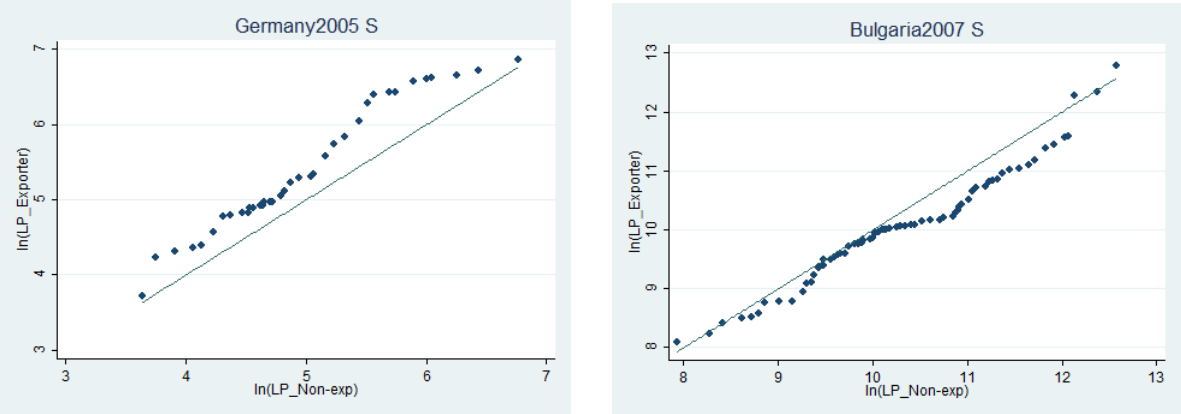
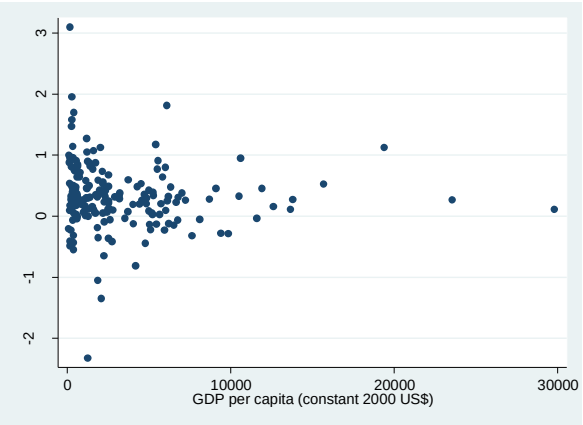


Figure 2
Quantile-quantile plot of log labor productivity of exporters vs. non-exporters
(Service industries)



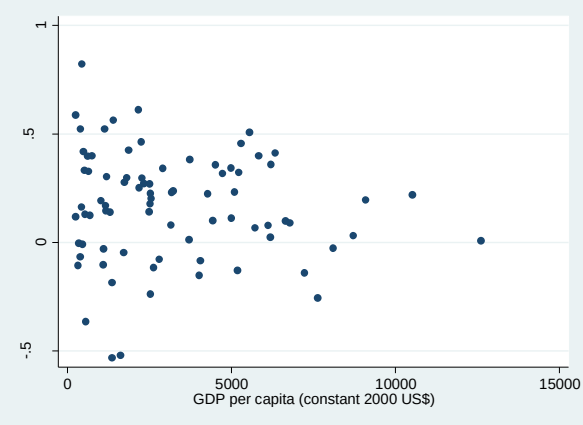


Figure 3
Export premium and per capita GDP

Table 1 – Industry breakdown

Industry sector	*2-digit ISIC Rev 3.1 code*	*Industry sector*	*2-digit ISIC Rev 3.1 code*
Manufacturing		***Services***	
Food	15	Wholesale	51
Textiles	17	Retail	52
Garments	18	IT	72
Chemicals	24	Hotels and restaurants	55
Plastics and rubber	25	Other services	50
Nonmetallic mineral products	26		
Basic metals	27	***Other***	
Fabricate metal products	28	Construction	45
Machinery and equipment	29	Transport	60 - 64
Electronics	31, 32		
Other manufacturing	2		

Table 2 – The share of service firms surveyed by income level

Country income level	*Share of service firms*
High-OECD	0.56
High	0.55
Upper-middle	0.29
Lower-middle	0.24
Low	0.27

Note: 34 OECD member countries are: Australia, Austria, Belgium, Canada, *Chile**, *Czech Republic*, Denmark, *Estonia**, Finland, France, *Germany*, *Greece*, *Hungary*, Iceland, *Ireland*, Israel*, Italy, Japan, Korea, Luxembourg, *Mexico*, Netherlands, New Zealand, Norway, *Poland*, *Portugal*, *Slovak Republic*, *Slovenia**, *Spain*, Sweden, Switzerland, *Turkey*, United Kingdom, and United States. Italics denote countries available in the current dataset and asterisk denotes countries that became OECD members in 2010.

Table 3 – Data coverage for manufacturing sector

Variable	*Coverage, %*
Firm age, Years	99
Current legal status	82
Foreign ownership, Dummy	99
Main product(s), 4-digit ISIC code	100
Exporting experience, Years	25
Inputs imported directly, %	57
Inputs imported indirectly, %	78
Legal environment, Dummy	79
Capacity utilization, %	93
Licensed technology, Dummy	86
ISO certification, Dummy	97
Total labor last year, Number	100
Total labor 3 years ago, Number	90
Non-production workers, Number	92
Skilled production workers, Number	91
Unskilled production workers, Number	91
Total wage, LCU	45
Total compensation, LCU	45
Total sales last year, LCU	100
Total sales 3 years ago, LCU	63
Gross capital, LCU	51
Net capital, LCU	69

Note: The coverage is conditional on keeping the firms that have 4-digit industry code, total sales and total labor. Thus, product code, sales and total number of workers have one hundred percent coverage. Initial dataset for 2002-2012 contains 142’413 firms across multiple countries and years. The number of observations drops to 60’644 when keeping the firms with data on 4-digit industry code, total sales and total labor. After deleting outliers by sales per worker and splitting the data into manufacturing and services 42’330 observations are left for manufacturing industries and 17’615 for services.

Table 4a – t-test results for manufacturing firms

Country-year (1)	N_T (2)	S_E (3)	SPW_E (4)	SPW_{NE} (5)	SD_E (6)	SD_{NE} (7)	T_E (8)	T_{NE} (9)
Argentina2006	1624	0.32	33,194	21,509	46,898	34,696	***	-
Argentina2010	862	0.34	107,633	61,887	90,449	67,473	***	-
Armenia2005	298	0.19	24	34	16	31	-	**
Bangladesh2007	1242	0.33	7,487	6,751	10,006	10,265	-	-
Barbados2010	46	0.52	99,551	47,554	171,395	24,172	*	-
Bhutan2009	44	0.56	61,368	36,552	94,144	60,895	-	-
Bolivia2006	1056	0.16	11,565	11,508	28,892	29,056	-	-
Bosnia And Herzegovina2009	70	0.43	13,233	11,061	24,973	13,502	-	-
Botswana2006	258	0.18	14,542	16,652	24,181	56,247	-	-
Brazil2003	1580	0.15	96,047	34,289	146,221	87,076	***	-
Brazil2009	1660	0.08	97,699	51,976	125,901	74,128	***	-
Bulgaria2007	800	0.32	24,657	23,296	25,967	25,583	-	-
Bulgaria2009	76	0.41	44,959	56,320	70,321	98,688	-	-
Cameroon2006	102	0.35	76	34	85	75	**	-
Chile2004	728	0.27	176,350	3,817,199	220,038	39,150,604	-	-
Chile2006	2024	0.15	52,542	29,572	90,586	62,534	***	-
Chile2010	960	0.22	135,759	67,478	136,697	86,754	***	-
Colombia2006	2044	0.12	14,548	11,618	23,298	19,013	**	-
Colombia2010	958	0.21	101,979	49,876	120,076	64,212	***	-
Costarica2005	308	0.22	132	48	137	67	***	-
Costarica2010	316	0.26	73,594	34,802	79,520	31,511	***	-
Croatia2005	34	0.54	11,229	9,404	6,702	3,995	-	-
Croatia2007	402	0.42	87,632	68,464	89,167	63,579	**	-
Czech Republic2009	52	0.59	89,848	190,401	117,042	355,294	-	*
Czech2005	66	0.38	2,179	1,772	941	1,301	-	-
Dominicanrepublic2010	130	0.24	30,295	29,189	25,823	33,881	-	-
Ecuador2006	894	0.17	1	1	2	2	**	-
Elsalvador2003	608	0.3	29,946	17,070	35,976	22,824	***	-
Elsalvador2006	1126	0.3	1,976	1,047	3,978	2,405	***	-
Elsalvador2010	114	0.46	3,931	3,092	4,396	3,723	-	-
Estonia2009	42	0.58	285,564	48,583	987,849	29,889	-	-
Fyr Macedonia2009	88	0.44	50,376	36,570	66,334	38,981	-	-
Germany2005	154	0.41	191,215	145,197	139,475	117,145	**	-
Guatemala2003	492	0.3	27,787	16,382	30,713	22,053	***	-
Guatemala2006	772	0.25	17,855	8,267	31,108	14,437	***	-
Guatemala2010	312	0.28	38,717	22,956	32,459	35,413	***	-
Honduras2003	448	0.25	33,905	15,890	47,932	22,748	***	-
Honduras2006	598	0.15	22,685	9,082	37,857	17,557	***	-

Hungary2005	324	0.38	304	293	176	151	-	-
Hungary2009	82	0.52	331,647	79,260	803,408	103,844	**	-
Indonesia2009	1564	0.13	33,274	10,907	64,741	40,270	***	-
Ireland2005	72	0.6	202,972	163,412	170,629	134,263	-	-
Jordan2006	80	0.4	63	30	56	46	***	-
Kazakhstan2005	422	0.11	100	55	67	51	***	-
Kenya2007	416	0.34	44,897	33,540	57,147	42,538	**	-
Laopdr2009	130	0.34	5,823	12,795	9,071	21,981	-	**
Laos2006	224	0.23	5	5	6	8	-	-
Latvia2009	56	0.44	74,647	47,552	73,115	54,088	*	-
Lebanon2006	60	0.5	45,630	73,007	39,494	93,511	-	*
Lithuania2009	58	0.5	60,014	57,774	49,952	65,657	-	-
Madagascar2005	182	0.36	27,518	31,334	43,264	39,481	-	-
Madagascar2009	158	0.31	6,069	8,346	7,070	11,114	-	-
Mauritania2006	176	0.2	22,210	9,503	44,869	18,531	**	-
Mauritius2005	94	0.56	41,380	31,136	79,384	47,649	-	-
Mauritius2009	254	0.19	38,881	32,349	90,936	58,434	-	-
Mexico2006	3588	0.11	17,309	15,350	31,352	29,426	-	-
Mexico2010	1464	0.19	84,272	43,159	82,444	53,648	***	-
Moldova2003	116	0.36	5,343	6,205	5,213	7,779	-	-
Moldova2005	164	0.25	565	530	310	233	-	-
Moldova2009	124	0.33	30,678	24,127	87,178	49,629	-	-
Mongolia2009	162	0.2	32,392	14,427	63,877	24,578	**	-
Namibia2006	202	0.21	34,434	18,506	50,212	29,122	**	-
Nicaragua2003	522	0.11	28,762	9,922	38,546	15,282	***	-
Nicaragua2006	894	0.1	16,317	5,333	35,746	12,164	***	-
Panama2006	470	0.14	33,023	19,983	48,984	33,416	**	-
Paraguay2006	866	0.15	30,130	10,975	54,542	22,455	***	-
Peru2006	1010	0.27	29,559	22,660	57,187	48,958	*	-
Peru2010	868	0.3	72,462	50,153	83,048	64,090	***	-
Philippines2009	1104	0.24	55,473	40,246	104,361	82,358	**	-
Poland2005	560	0.25	13,886	12,273	8,920	7,779	**	-
Poland2009	112	0.37	83,255	44,522	152,929	42,643	**	-
Portugal2005	66	0.52	134,013	105,377	104,274	76,123	-	-
Romania2005	492	0.22	5,124	7,396	3,892	5,896	-	***
Romania2009	128	0.26	39,031	26,268	85,127	30,385	-	-
Russia2009	812	0.13	45,140	43,264	40,143	94,789	-	-
Russia2012	1362	0.07	83,116	42,344	102,313	58,170	***	-
Senegal2007	304	0.11	54,759	18,720	54,453	26,138	***	-
Serbia2009	106	0.45	47,975	69,485	61,693	252,304	-	-
Slovak Republic2009	54	0.5	90,365	97,834	69,470	150,748	-	-
Slovenia2005	22	0.75	749	456	479	335	**	-
Slovenia2009	42	0.73	1,418	5,953	5,799	24,787	-	*

Southafrica2003	440	0.37	106,838	138,071	156,452	725,626	-	-
Southafrica2007	816	0.18	77,559	55,219	63,113	63,274	***	-
Southkorea2005	178	0.37	225	149	161	138	***	-
Spain2005	88	0.4	217,495	113,570	129,311	95,994	***	-
Srilanka2011	496	0.1	14,576	14,316	18,464	30,814	-	-
Swaziland2006	130	0.39	12,316	9,816	26,095	18,159	-	-
Tanzania2006	662	0.09	21,893	8,526	51,008	19,677	***	-
Thailand2004	1020	0.52	41,600	24,602	44,520	29,051	***	-
Trinidadandtobago2010	106	0.3	67,072	44,514	68,019	43,779	**	-
Turkey2004	80	0.52	27,775	21,274	15,669	13,581	**	-
Turkey2008	818	0.39	155,152	151,881	216,643	327,253	-	-
Uganda2006	616	0.13	13,301	4,550	27,184	14,314	***	-
Ukraine2008	566	0.24	21,651	17,677	28,587	28,699	-	-
Uruguay2006	862	0.24	36,235	20,657	61,831	40,381	***	-
Uruguay2010	380	0.26	113,135	55,489	102,077	60,702	***	-
Vietnam-B2005	228	0.27	1	1	1	1	**	-
Vietnam2005	252	0.35	13,182	16,673	20,546	22,101	-	-
Vietnam2009	870	0.31	26,297	22,178	36,985	31,001	*	-
Westbank_Gaza2006	294	0.34	163	95	221	145	***	-
Zambia2007	422	0.11	23,333	17,518	22,414	21,277	*	-
Zimbabwe2011	568	0.08	178	156	401	253	-	-

Note: In column (2) N_T is the total number of firms surveyed for a particular country-year pair; in column (3) S_E is the share of exporters; in column (4) and (5) SPW_E and SPW_{NE} is sales per worker for exporters and non-exporters respectively; in column (6) and (7) SD_E and SD_{NE} is standard deviation of sales per worker for exporters and non-exporters respectively; in column (8) T_E is the significance level for one-sided t-test with the null hypothesis that mean labor productivity is higher for exporters and in column (9) T_{NE} is the significance level for one-sided t-test that mean labor productivity is higher for non-exporters as a null. *** p<0.01, ** p<0.05, * p<0.1.

Table 4b – t-test results for firms in service sectors

Country-year	N_T	S_E	SPW_E	SPW_{NE}	SD_E	SD_{NE}	T_E	T_{NE}
(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*
Argentina2010	330	0.16	77,536	99,762	80,075	120,394	-	-
Bulgaria2007	494	0.22	39,349	51,018	56,475	57,667	-	*
Dominica2010	110	0.28	54,665	50,032	26,551	34,880	-	-
Germany2005	594	0.11	307,238	197,682	265,156	183,338	***	-
Greece2005	430	0.09	169,446	160,137	103,264	141,099	-	-
Guatemala2010	244	0.16	76,875	35,441	79,798	37,273	***	-
Russia2012	2668	0.03	206,310	86,983	238,687	136,563	***	-
Serbia2009	264	0.19	124,218	80,295	121,238	103,076	**	-
Spain2005	374	0.1	284,680	159,350	180,669	162,280	***	-
Stlucia2010	94	0.33	40,921	50,505	25,742	38,726	-	-
Turkey2004	262	0.15	26,670	24,504	15,752	15,941	-	-
Turkey2008	266	0.15	569,993	274,040	1,713,496	359,425	**	-

Note: In column (2) N_T is the total number of firms surveyed for a particular country-year pair; in column (3) S_E is the share of exporters; in column (4) and (5) SPW_E and SPW_{NE} is sales per worker for exporters and non-exporters respectively; in column (6) and (7) SD_E and SD_{NE} is standard deviation of sales per worker for exporters and non-exporters respectively; in column (8) T_E is the significance level for one-sided t-test with the null hypothesis that mean labor productivity is higher for exporters and in column (9) T_{NE} is the significance level for one-sided t-test that mean labor productivity is higher for non-exporters as a null. *** p<0.01, ** p<0.05, * p<0.1.

Table 5a – Exporter premium regression (group 1)

Log (Sales per worker)	*(1)*	*(2)*	*(3)*	*(4)*
Export status, Dummy	0.585***	0.581***	0.347***	0.114***
	(0.0344)	(0.0339)	(0.0369)	(0.0271)
Log (Total labor)			0.174***	
			(0.0106)	
Log (Capital intensity)				0.600***
				(0.0107)
Log (Net capital), 2005 USD				0.0854***
				(0.00857)
Foreign ownership, Dummy				0.100***
				(0.0341)
Industry dummy	N	Y	Y	Y
Country-year dummy	Y	Y	Y	Y
Constant	10.42***	14.02***	13.63***	5.728***
	(0.116)	(0.183)	(0.178)	(0.886)
Observations	27,491	27,491	27,491	19,179
R-squared	0.591	0.604	0.608	0.852

Note: Regressions are performed on the group of countries that have positive and significant exporter productivity premium in t-test for mean comparison of labor productivity between exporters and non-exporters. Robust standard errors are given in parentheses (*** p<0.01, ** p<0.05, * p<0.1).

Table 5b – Exporter premium regression (group 2)

Log (Sales per worker)	*(1)*	*(2)*	*(3)*	*(4)*
Export status, Dummy	0.180***	0.259***	0.144***	0.105***
	(0.0396)	(0.0394)	(0.0427)	(0.0384)
Log (Total labor)			0.0881***	
			(0.0138)	
Log (Capital intensity)				0.580***
				(0.0158)
Log (Net capital), 2005 USD				0.0469***
				(0.0123)
Foreign ownership, Dummy				0.196***
				(0.0507)
Industry dummy	N	Y	Y	Y
Country-year dummy	Y	Y	Y	Y
Constant	5.606***	8.963***	8.680***	6.150***
	(0.0951)	(0.274)	(0.277)	(0.353)
Observations	13,713	13,713	13,713	9,426
R-squared	0.590	0.603	0.605	0.835

Note: Regressions are performed on the group of countries that do not have significant differences in exporter productivity premium in t-test for mean comparison of labor productivity between exporters and non-exporters. Robust standard errors are given in parentheses (*** p<0.01, ** p<0.05, * p<0.1).

Table 5c – Exporter premium regression (group 3)

Log (Sales per worker)	*(1)*	*(2)*	*(3)*	*(4)*
Export status, Dummy	-0.283***	-0.121	-0.148	-0.128
	(0.0766)	(0.0813)	(0.0937)	(0.169)
Log (Total labor)			0.0184	
			(0.0259)	
Log (Capital intensity)				0.190**
				(0.0788)
Log (Net capital), 2005 USD				0.0434
				(0.0502)
Foreign ownership, Dummy				0.347**
				(0.156)
Industry dummy	N	Y	Y	Y
Country-year dummy	Y	Y	Y	Y
Constant	3.233***	3.303***	3.252***	8.795***
	(0.0573)	(0.0648)	(0.0963)	(0.618)
Observations	875	875	875	310
R-squared	0.888	0.898	0.898	0.782

Note: Regressions are performed on the group of countries that have negative and significant exporter productivity premium in t-test for mean comparison of labor productivity between exporters and non-exporters. Robust standard errors are given in parentheses (*** p<0.01, ** p<0.05, * p<0.1).

Table 6 – Export premium regressions with additional controls

Log (Sales per worker)	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*
Group 1					
Export status	0.114***	0.113***	0.117***	0.104***	0.0990***
	(0.0271)	(0.0271)	(0.0279)	(0.0282)	(0.0272)
Firm age, Years		-6.59e-05			
		(8.77e-05)			
Log (Skill intensity)			0.168***		
			(0.0167)		
Foreign technology license dummy				0.0996***	
				(0.0315)	
ISO certification dummy					0.0500*
					(0.0266)
Group 2					
Export status	0.105***	0.0993***	0.121***	0.111***	0.0985**
	(0.0384)	(0.0385)	(0.0416)	(0.0397)	(0.0393)
Firm age, Years		0.000283***			
		(9.30e-05)			
Log (Skill intensity)			0.0951***		
			(0.0243)		
Foreign technology license				-0.0150	
				(0.0455)	
ISO certification dummy					0.0644
					(0.0395)
Group 3					
Export status	-0.128	-0.125	-0.254	-0.180	-0.124
	(0.169)	(0.169)	(0.216)	(0.267)	(0.177)
Firm age, Years		-0.000470*			
		(0.000255)			
Log (Skill intensity)			0.191*		
			(0.100)		
Foreign technology license				0.129	
				(0.370)	
ISO certification dummy					0.309
					(0.190)
Observations (group 1)	19,179	19,167	17,255	18,084	18,873
Observations (group 2)	9,426	9,384	8,006	9,028	9,266
Observations (group 3)	310	310	146	145	305

Note: Column (1) is the same regression as column (4) from Table 5a, 5b and 5c. Constant term, capital intensity, total capital stock, foreign ownership, industry and country-year dummies coefficients are suppressed. Robust standard errors are given in parentheses (*** p<0.01, ** p<0.05, * p<0.1). See table notes for definition of groups 1, 2, and 3 in Table 5a, 5b and 5c respectively.

Table 7 – Cross country regressions of export premium

Group of countries	*Share in the world's*				
	GDP	*Population*	*Trade*	*Merchandise exports*	*Agricultural Value Added*
Group 1	22.59	30.21	27.73	27.14	31.35
Group 2	10.33	18.65	13.36	13.35	16.06
Group 3	1.28	1.32	2.16	2.12	1.7

Note: Groups are based on t-test results. Group 1 consists of countries for which t-test on mean sales per worker indicates that exporters are more productive on average. When mean labor productivity differences are insignificant countries are assigned to group 2. For countries in group 3 non-exporters are more productive on average.

Table 8 – Cross country regressions of export premium

Country level variables	EP_1 *(1)*	N_1 *(2)*	EP_2 *(3)*	N_2 *(4)*
Development				
GDP per capita (constant 2000 US$)	-9.09e-06	188	-8.91e-06	80
	(1.34e-05)		(1.05e-05)	
Trade in services (% of GDP)	-0.000318	163	0.00111	69
	(0.00349)		(0.00249)	
Research and development expenditure (% of GDP)	-0.108	86	-0.0757	40
	(0.0821)		(0.0946)	
Openness				
Exports of goods and services (% of GDP)	-0.000191	184	-0.00180	81
	(0.00333)		(0.00170)	
Imports of goods and services (% of GDP)	0.00328	184	-0.000463	81
	(0.00290)		(0.00148)	
Infrastructure				
Logistics performance index: Quality of trade and transport-related infrastructure (1=low to 5=high)	-0.172	39	-0.0237	17
	(0.266)		(0.129)	
Roads, paved (% of total roads)	-0.00505**	65	-0.000107	38
	(0.00223)		(0.00133)	
Internet users (per 100 people)	-0.00324	189	-0.00120	81
	(0.00280)		(0.00144)	
Governance				
Lead time to export, median case (days)	-0.00946	27	-0.0395*	15
	(0.0267)		(0.0211)	
Documents to export (number)	0.00735	176	0.00641	73
	(0.0258)		(0.0173)	
Time required to start a business (days)	-0.000695	192	0.000830	82
	(0.000930)		(0.000909)	
Informal payments to public officials (% of firms)	0.00125	189	0.000775	80
	(0.00235)		(0.00128)	
CPIA transparency, accountability, and corruption in the public sector rating (1=low to 6=high)	0.133	81	-0.0343	21
	(0.161)		(0.141)	

Note: Column (1) and (3) show the coefficients from regressing exporter premium on the variables of interest. EP_1 denotes exporter premium estimated from equation (1) and EP_2 denotes exporter premium estimated from equation (2). Standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1). Column (2) and (4) show the number of country-year observations used in each estimation. The data on capital is limited and less estimates of exporter premium are available as seen from smaller sample sizes.

APPENDIX A

Table A.1 – Comparative literature overview

Study (published) *Country (period covered)* *(1)*	*Differences in LP/TFP between exporters and non-exporters* *(2)*	*Exporter premium estimated from:* *(i) equation (1); (ii) equation (2).* *(3)*
Isgut (2001) Colombia (1981–1991)	LP higher for exporting firms than for non-exporters, 80–100 percent for plants up to 100 employees and 27–32 percent for larger plants. EP ca. 45 percent.	(i) 31.9 (2006), 38.1*** (2010) (ii) 34.1** (2006), 23.7*** (2010)
Hobdari and Sinani (2010) Estonia (1994–1999)	LP higher for exporting firms than for non-exporters	(i) -23.3 (2005), 63.9 (2009) (ii) 39.9 (2009)
Bernard and Wagner (1997) Germany (1978–1992)	LP is 3–4 percent lower in smaller export firms, but 30–50 percent higher in larger export firms. EP about 20 percent on average, increasing with share of exports in total sales.	(i) 26.3 (2005) (ii) NA
Sjöholm (1999) Indonesia (1980–1991)	LP higher for exporting firms than for non-exporters; growth of LP higher for exporters and increasing with share of exports in output.	(i) 16.7 (2009) (ii) -10.3 (2009)
Girma, Görg and Strobl (2004) Ireland (2000)	LP on average higher for exporters than non-exporters, but the hypothesis of identical distribution of productivity cannot be rejected for exporters relative to non-exporters.	(i) 11.0 (2005) (ii) NA
Aw et al. (2000) Korea (Republic of) (1983–1993)	TFP between 3.9 and 31.1 percent higher for exporters than non-exporters in five industries.	(i) 26.9* (2005) (ii) NA
Bernard (1995) Mexico (1986–1990)	LP almost 30 percent (shipments) or more than 50 percent (value added) greater for exporters. EP 34 percent (value added).	(i) -12.3 (2006), 24.7*** (2010) (ii) 36.0** (2006), 7.88 (2010)
Kostevc (2005) Slovenia (1994–2002)	Exporters are more productive than non-exporting firms. Productivity distribution of exporters stochastically dominates as compared with non-exporters.	(i) 45.5** (2005), 15.8 (2009) (ii) 0.75 (2009)
Farinas and Martin-Marcos (2003), Spain (1990–1999)	LP and TFP higher for exporters than for non-exporters. EP 17 percent.	(i) 52.6** (2005) (ii) NA
Yasar et al. (2005) Turkey (1990–1996)	EP around 19 percent. EP varies significantly from 9 to 21 percent from lower quantile to higher quantile.	(i) 25.8 (2004), 34.3*** (2008) (ii) 45.5*** (2008)
Bigsten et al. (2000) Cameroon, Ghana, Kenya and Zimbabwe. (Time coverage ranges by country from 1991–1995).	Exporters exhibit higher average efficiency levels than non-exporters.	Cameroon: (i) 81.6*** (2006), 84.7 (2009) (ii) 32.7 (2006) Ghana: (i) 39.6*** (2007) (ii) NA Kenya: (i) 17.3 (2007) (ii) -0.83 (2007) Zimbabwe: (i) -6.04 (2011) (ii) -0.35 (2011)

Hallward-Driemeier et al. (2002) Indonesia, Korea (Republic of), Malaysia, Philippines and Thailand. (Time coverage ranges by country from 1996–1998).	TFP larger for exporters than non-exporters; gap is larger the less developed is the local market. Firms that export from the beginning have higher levels of TFP years later, due to different firm policy (investment in fixed and human capital etc.).	Philippines: (i) 11.7 (2009) (ii) 14.0 (2009) Thailand: (i) 42.4*** (2004) (ii) 29.6*** (2004) See above for results on Indonesia and Korea (Republic of). Malaysia is not available.
Van Biesebroeck (2005) Ethiopia, Tanzania, Burundi, Zambia, Kenya, Ghana, Ivory Coast, Cameroon and Zimbabwe. (Time coverage ranges by country from 1991–1995).	EP for LP about 50 percent.	Ethiopia: (i) 26.7 (2011) (ii) NA Tanzania: (i) 50.2 (2006) (ii) 52.2 (2006) Burundi: (i) 88.3 (2006) (ii) NA Zambia: (i) 5.88 (2007) (ii) -6.70 (2007) Ivory Coast: (i) 27.7 (2009) (ii) NA See above for results on Cameroon, Ghana, Kenya and Zimbabwe.

Note: In column (3) the year when firms were surveyed is given in the brackets and *NA* indicates that there was not enough information to run the specification as in equation (2). Standard errors in parentheses (*** $p<0.01$, ** $p<0.05$, * $p<0.1$).

Table A.2 – Manufacturing firm coverage by country year

Country (1)	*Year* (2)	N_T (3)	N_E (4)	S_E (5)	*Country* (1)	*Year* (2)	N_T (3)	N_E (4)	S_E (5)
Albania	2005	38	14	0.37	Lebanon	2006	60	30	0.5
Albania	2007	54	12	0.22	Lesotho	2003	22	10	0.45
Angola	2006	248	0	0	Lithuania	2005	23	13	0.57
Angola	2010	54	1	0.02	Lithuania	2009	58	29	0.5
Antigua and Barbuda	2010	18	5	0.28	Macedonia	2005	22	5	0.23
Argentina	2006	1213	389	0.32	Macedonia	2009	78	34	0.44
Argentina	2010	666	226	0.34	Madagascar	2005	145	53	0.37
Armenia	2005	186	35	0.19	Madagascar	2009	116	35	0.3
Armenia	2009	69	15	0.22	Malawi	2005	34	6	0.18
Azerbaijan	2009	92	11	0.12	Malawi	2009	46	5	0.11
Bahamas	2010	31	6	0.19	Mali	2007	283	19	0.07
Bangladesh	2007	944	308	0.33	Mali	2010	101	6	0.06
Barbados	2010	48	25	0.52	Mauritania	2006	112	22	0.2
Belarus	2005	20	5	0.25	Mauritius	2005	110	62	0.56
Belarus	2008	64	14	0.22	Mauritius	2009	159	30	0.19
Belize	2010	43	11	0.26	Mexico	2006	2052	220	0.11
Benin	2009	26	7	0.27	Mexico	2010	923	176	0.19
Bhutan	2009	50	28	0.56	Micronesia	2009	7	1	0.14
Bolivia	2006	644	109	0.17	Moldova	2003	90	32	0.36
Bolivia	2010	76	15	0.2	Moldova	2005	112	30	0.27
Bosnia and Herzegovina	2005	31	9	0.29	Moldova	2009	92	30	0.33
Bosnia and Herzegovina	2009	61	26	0.43	Mongolia	2009	103	20	0.19
Botswana	2006	160	30	0.19	Montenegro	2009	20	3	0.15
Botswana	2010	54	8	0.15	Mozambique	2007	249	12	0.05
Brazil	2003	953	149	0.16	Namibia	2006	130	28	0.22
Brazil	2009	917	70	0.08	Nepal	2009	104	15	0.14
Bulgaria	2005	39	15	0.38	Nicaragua	2003	297	32	0.11
Bulgaria	2007	602	194	0.32	Nicaragua	2006	506	49	0.1
Bulgaria	2009	64	26	0.41	Nicaragua	2010	76	10	0.13
Burkinafaso	2006	31	8	0.26	Niger	2005	23	5	0.22
Burkinafaso	2009	66	6	0.09	Niger	2009	32	7	0.22
Burundi	2006	138	2	0.01	Nigeria	2007	755	18	0.02
Cameroon	2006	78	27	0.35	Oman	2003	50	14	0.28
Cameroon	2009	68	14	0.21	Panama	2006	278	39	0.14
Capeverde	2006	26	1	0.04	Panama	2010	59	3	0.05
Capeverde	2009	39	2	0.05	Paraguay	2006	521	80	0.15
Central African Republic	2011	26	2	0.08	Paraguay	2010	113	18	0.16
Chad	2009	34	4	0.12	Peru	2006	708	195	0.28
Chile	2004	509	138	0.27	Peru	2010	631	188	0.3
Chile	2006	1221	192	0.16	Philippines	2009	738	176	0.24
Chile	2010	626	138	0.22	Poland	2003	77	11	0.14
Colombia	2006	1185	145	0.12	Poland	2005	381	96	0.25
Colombia	2010	618	131	0.21	Poland	2009	89	33	0.37
Congo, Democratic Republic	2006	224	8	0.04	Portugal	2005	69	36	0.52
Congo, Democratic Republic	2010	67	1	0.01	Romania	2005	320	68	0.21
Costarica	2005	199	44	0.22	Romania	2009	86	22	0.26

Costarica	2010	218	58	0.27	Russia	2005	60	12	0.2
Croatia	2005	37	20	0.54	Russia	2009	472	58	0.12
Croatia	2007	351	145	0.41	Russia	2012	750	57	0.08
Czech Republic	2005	53	20	0.38	Rwanda	2006	84	12	0.14
Czech Republic	2009	63	37	0.59	Rwanda	2011	42	8	0.19
Dominica	2010	21	6	0.29	Samoa	2009	14	3	0.21
Dominican Republic	2010	86	21	0.24	Senegal	2007	173	20	0.12
Ecuador	2006	546	92	0.17	Serbia	2009	97	44	0.45
Ecuador	2010	93	12	0.13	Serbia and Montenegro	2005	37	19	0.51
Elsalvador	2003	444	137	0.31	Slovak Republic	2009	54	27	0.5
Elsalvador	2006	820	244	0.3	Slovakia	2005	23	18	0.78
Elsalvador	2010	107	48	0.45	Slovenia	2005	45	34	0.76
Eritrea	2009	53	5	0.09	Slovenia	2009	78	57	0.73
Estonia	2005	23	12	0.52	South Africa	2003	353	129	0.37
Estonia	2009	50	29	0.58	South Africa	2007	510	94	0.18
Ethiopia	2011	155	18	0.12	South Korea	2005	143	54	0.38
Fiji	2009	17	6	0.35	Spain	2005	73	29	0.4
Gambia	2006	42	4	0.1	Srilanka	2011	279	27	0.1
Georgia	2005	23	13	0.57	St. Kitts and Nevis	2010	14	7	0.5
Georgia	2008	64	18	0.28	St. Lucia	2010	49	18	0.37
Germany	2005	133	55	0.41	St. Vincent and Grenadines	2010	30	12	0.4
Ghana	2007	239	18	0.08	Suriname	2010	45	5	0.11
Greece	2005	61	19	0.31	Swaziland	2006	110	44	0.4
Grenada	2010	16	4	0.25	Syria	2003	7	2	0.29
Guatemala	2003	358	110	0.31	Tajikistan	2003	88	1	0.01
Guatemala	2006	526	132	0.25	Tajikistan	2005	45	13	0.29
Guatemala	2010	222	62	0.28	Tajikistan	2008	85	15	0.18
Guinea	2006	194	18	0.09	Tanzania	2006	370	36	0.1
Guineabissau	2006	24	2	0.08	Thailand	2004	1084	560	0.52
Guyana	2010	36	13	0.36	Timor Leste	2009	22	1	0.05
Honduras	2003	306	77	0.25	Togo	2009	19	6	0.32
Honduras	2006	357	54	0.15	Tonga	2009	41	4	0.1
Honduras	2010	106	17	0.16	Trinidad and Tobago	2010	76	23	0.3
Hungary	2005	267	103	0.39	Turkey	2004	84	44	0.52
Hungary	2009	86	45	0.52	Turkey	2008	685	266	0.39
Indonesia	2009	914	120	0.13	Uganda	2006	362	50	0.14
Iraq	2011	420	2	0	Ukraine	2005	77	17	0.22
Ireland	2005	90	54	0.6	Ukraine	2008	377	88	0.23
Ivory Coast	2009	138	13	0.09	Uruguay	2006	580	143	0.25
Jamaica	2010	65	14	0.22	Uruguay	2010	261	68	0.26
Jordan	2006	68	28	0.41	Uzbekistan	2003	99	3	0.03
Kazakhstan	2005	242	27	0.11	Uzbekistan	2005	56	19	0.34
Kazakhstan	2009	119	8	0.07	Uzbekistan	2008	104	15	0.14
Kenya	2007	319	105	0.33	Vanuatu	2009	7	0	0
Kosovo	2009	64	6	0.09	Venezuela	2006	82	2	0.02
Kyrgyzstan	2003	93	17	0.18	Venezuela	2010	58	1	0.02
Kyrgyzstan	2005	43	13	0.3	Vietnam	2005	196	69	0.35
Kyrgyzstan	2009	62	12	0.19	Vietnam	2009	643	202	0.31
Laos	2006	148	34	0.23	West Bank and Gaza	2006	228	78	0.34
Laos	2009	99	34	0.34	Yemen	2010	156	7	0.04

Laos	2012	62	18	0.29	Zambia	2007	242	27	0.11
Latvia	2005	16	7	0.44	Zimbabwe	2011	314	24	0.08
Latvia	2009	50	22	0.44					

Note: In column (3) N_T is the total number of firms surveyed for a particular country-year pair; in column (4) N_E is the number of exporters and in column (5) S_E denotes the share of exporters.

Table A.3 – Service firm coverage by country year

Country	*Year*	N_T	N_E	S_E	*Country*	*Year*	N_T	N_E	S_E
(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*
Albania	2005	47	7	0.15	Latvia	2009	117	8	0.07
Albania	2007	106	5	0.05	Lebanon	2006	53	14	0.26
Angola	2010	117	1	0.01	Lithuania	2005	62	12	0.19
Antigua and Barbuda	2010	78	17	0.22	Lithuania	2009	103	13	0.13
Argentina	2010	200	32	0.16	Macedonia	2005	43	5	0.12
Armenia	2005	51	0	0	Macedonia	2009	126	18	0.14
Armenia	2009	143	3	0.02	Madagascar	2009	130	10	0.08
Azerbaijan	2009	192	1	0.01	Malawi	2009	46	0	0
Bahamas	2010	56	10	0.18	Mali	2010	82	6	0.07
Barbados	2010	47	6	0.13	Mauritius	2009	117	6	0.05
Belarus	2005	76	7	0.09	Mexico	2010	226	8	0.04
Belarus	2008	117	4	0.03	Micronesia	2009	44	5	0.11
Belize	2010	63	13	0.21	Moldova	2005	74	5	0.07
Benin	2009	60	1	0.02	Moldova	2009	175	10	0.06
Bhutan	2009	75	4	0.05	Mongolia	2009	163	2	0.01
Bolivia	2010	90	2	0.02	Montenegro	2009	45	3	0.07
Bosnia and Herzegovina	2005	45	6	0.13	Nepal	2009	196	4	0.02
Bosnia and Herzegovina	2009	128	8	0.06	Nicaragua	2010	141	3	0.02
Botswana	2010	122	4	0.03	Niger	2005	6	3	0.5
Brazil	2009	256	4	0.02	Niger	2009	69	4	0.06
Bulgaria	2005	91	8	0.09	Panama	2010	101	3	0.03
Bulgaria	2007	321	69	0.21	Paraguay	2010	108	4	0.04
Bulgaria	2009	119	11	0.09	Peru	2006	2	0	0
Burkinafaso	2009	207	5	0.02	Peru	2010	184	13	0.07
Cameroon	2006	1	0	0	Philippines	2009	232	11	0.05
Cameroon	2009	201	5	0.02	Poland	2005	163	18	0.11
Capeverde	2009	58	2	0.03	Poland	2009	115	8	0.07
Central African Republic	2011	89	9	0.1	Portugal	2005	165	6	0.04
Chad	2009	61	2	0.03	Romania	2005	94	8	0.09
Chile	2010	207	12	0.06	Romania	2009	162	5	0.03
Colombia	2010	193	14	0.07	Russia	2005	129	12	0.09
Congo, Democratic Republic	2010	109	2	0.02	Russia	2009	149	0	0
Costarica	2010	146	15	0.1	Russia	2012	1409	49	0.03
Croatia	2005	62	14	0.23	Rwanda	2011	96	1	0.01
Croatia	2007	169	11	0.07	Samoa	2009	46	4	0.09
Czech Republic	2005	102	11	0.11	Serbia	2009	165	31	0.19
Czech Republic	2009	74	8	0.11	Serbia and Montenegro	2005	58	8	0.14
Dominica	2010	76	21	0.28	Slovak Republic	2009	81	10	0.12
Dominican Republic	2010	180	4	0.02	Slovakia	2005	54	8	0.15
Ecuador	2010	191	2	0.01	Slovenia	2005	53	11	0.21
Elsalvador	2010	137	13	0.09	Slovenia	2009	103	19	0.18
Eritrea	2009	38	2	0.05	South Africa	2003	6	1	0.17
Estonia	2005	78	11	0.14	South Korea	2005	190	8	0.04
Estonia	2009	121	8	0.07	Spain	2005	212	21	0.1
Ethiopia	2011	234	5	0.02	Srilanka	2011	214	11	0.05
Fiji	2009	44	6	0.14	St. Kitts and Nevis	2010	71	10	0.14

Georgia	2005	59	2	0.03	St. Lucia	2010	70	23	0.33
Georgia	2008	111	2	0.02	St. Vincent and Grenadines	2010	68	4	0.06
Germany	2005	341	38	0.11	Suriname	2010	46	6	0.13
Greece	2005	240	21	0.09	Tajikistan	2005	58	6	0.1
Grenada	2010	92	5	0.05	Tajikistan	2008	122	3	0.02
Guatemala	2010	147	23	0.16	Timor Leste	2009	35	0	0
Guyana	2010	53	5	0.09	Togo	2009	61	10	0.16
Honduras	2010	109	2	0.02	Tonga	2009	92	8	0.09
Hungary	2005	98	16	0.16	Trinidad and Tobago	2010	168	9	0.05
Hungary	2009	126	13	0.1	Turkey	2004	156	23	0.15
Indonesia	2009	164	2	0.01	Turkey	2008	160	24	0.15
Iraq	2011	212	2	0.01	Ukraine	2005	153	9	0.06
Ireland	2005	144	14	0.1	Ukraine	2008	154	7	0.05
Ivory Coast	2009	263	3	0.01	Uruguay	2010	143	9	0.06
Jamaica	2010	195	11	0.06	Uzbekistan	2005	103	3	0.03
Jordan	2006	1	0	0	Uzbekistan	2008	170	1	0.01
Kazakhstan	2005	73	4	0.05	Vanuatu	2009	64	4	0.06
Kazakhstan	2009	199	3	0.02	Venezuela	2010	109	0	0
Kosovo	2009	101	4	0.04	Vietnam	2009	175	9	0.05
Kyrgyzstan	2005	56	4	0.07	West Bank and Gaza	2006	25	3	0.12
Kyrgyzstan	2009	70	3	0.04	Yemen	2010	144	4	0.03
Laos	2009	191	1	0.01	Zimbabwe	2011	177	2	0.01
Laos	2012	114	13	0.11					
Latvia	2005	77	8	0.1					

Note: In column (3) N_T is the total number of firms surveyed for a particular country-year pair; in column (4) N_E is the number of exporters and in column (5) S_E denotes the share of exporters.

Table A.4 – Variables, codes and verbal descriptions from World Bank Survey Data for the period of 2002-2005 and 2006-2012

Variable	*2002-05*	*2006-12*	*Verbal description (2002-2005)*	*Verbal description (2006-2012)*
Age, Year	c201	b5	In what year did your firm begin operations in this country?	In what year did this establishment begin operations in this country?
Current legal status, Dummy	c202	b1	What is the current legal status of your firm? (Publicly listed company = 1, Private held, limited company = 2, Cooperative = 3, Sole proprietorship = 4, Partnership = 5, Other = 6)	What is this firm's current legal status? (Publicly listed company = 1, Private held, limited liability company = 2, Sole proprietorship = 3, Partnership = 4, Limited partnership = 5, Other = 6)
Ownership, %	c203a c203b c203c c203d	b2a b2b b2c b2d	What percentage of your firm is owned by: (I) Private (domestic); (ii) Private (foreign); (iii) Government/State; (iv) Other	What percent of this firm is owned by each of the following: (i) Private (domestic); (ii) Private (foreign); (iii) Government/State; (iv) Other
Multi-establishment, Number/Dummy	c206a	a7	How many establishments (separate operating facilities) does your firm have in this country?	Is this establishment is part of a larger firm? (YES=1, NO=2)
Multi-country, Dummy	c206b	-	Does your firm have holdings or operations in other countries? (YES=1, NO=2)	-
Main product(s), 4-digit ISIC industry code (Rev. 3.1)	c208	d1a2 d1b2	What is your main product line?	In the last complete fiscal year, what were this establishment's two main products (as represented by the largest proportion of annual sales)?
Sales breakdown, %	c211a1 c211a2 c211a3	d3a d3b d3c	What percent of your establishment's sales are: (i) sold domestically; (ii) exported directly; (iii) exported indirectly (through a distributor)?	In the last complete fiscal year, what percent of this establishment's sales were: (i) national sales; (ii) indirect exports (sold domestically to third party that exports products); (iii) direct exports?
Started exporting, Year	c211c1	d8	If you export: what was the year your establishment first exported?	In what year did this establishment first export directly or indirectly?
Destination markets, Country name	c211c2x c211c3x c211c4x	-	If you export: which countries are the biggest destinations for your exports?	-
Inputs breakdown, %	c2121 c2122 c2123	d12a d12b d13	What percent of your establishment's material inputs and supplies are: (i) purchased from domestic sources; (ii) imported directly; (iii) imported indirectly (through a distributor)	In the last complete fiscal year, as a proportion of all of the material inputs and/or supplies purchased that year, what percent of this establishment's material inputs and/or supplies were: (i) material inputs and/or supplies of domestic origin, (ii) of foreign origin; (iii) any inputs imported directly (Dummy: YES=1, NO=2, Don't know=-9)?
Legal environment, Dummy	c246	h7a	"I am confident that the judicial system will enforce my contractual and property rights in business disputes." To what degree do you agree with this statement? (Fully disagree = 1; Disagree in most cases = 2; Tend to disagree = 3; Tend to agree = 4; Agree in most cases = 5; Fully agree = 6)	"The court system is fair, impartial and uncorrupted." To what degree do you agree with this statement? (Strongly disagree = 1; Tend to disagree = 2; Tend to agree = 3; Strongly agree = 4; Don't know = -9)
Capacity utilization, %	c250	f1	What was this establishment's average capacity utilization over the last year?	In the last complete fiscal year, what was this establishment's current output in comparison with the maximum output possible using its facilities at the time?

Number of products, Number	c253a	-	How many products does your establishment produce?	-
New products, Number	c253b	-	How many new products (i.e. those that involve a significant change in the production process) has your establishment introduced in the last three years?	-
Licensed technology, Dummy	c254	e6	Does your establishment use technology licensed from a foreign-owned company? (YES, NO)	Does this establishment at present use technology licensed from a foreign-owned company? (YES=1, NO=2, Don't know=-9)
ISO certification, Dummy	c257	b8	Has your firm received ISO (e.g. 9000, 9002 or 14,000) certification? (YES=1, NO=2)	Does this establishment have an internationally-recognized quality certification? (YES=1, NO=2, Still in process=-6, Don't know=-9)
Total labor, Number	c262a1y c262a2y c262a3y	l1 l2	Average number of permanent workers: (i) 1 year ago; (ii) 2 years ago; (iii) 3 years ago.	Permanent, full-time employees end of last complete fiscal year: (i) 1 year ago; (ii) 3 years ago.
Non-production workers, Number	c262f1y c262f2y	l3b	Average number of permanent non-production workers: (i) 1 year ago; (ii) 2 years ago.	Non-production workers (e.g., managers, administration, sales) in the last complete fiscal year
Skilled production workers, Number	c262d1y c262d2y	l4a	Average number of permanent skilled production workers: (i) 1 year ago; (ii) 2 years ago.	Skilled production workers in the last complete fiscal year
Unskilled production workers, Number	c262e1y c262e2y	l4b	Average number of permanent unskilled production workers: (i) 1 year ago; (ii) 2 years ago.	Unskilled production workers in the last complete fiscal year
Total wage, LCU	c262a2 c262d2 c262e2 c262f2	-	Total wage bill: (I) all workers; (ii) skilled workers; (iii) unskilled workers; (iv) non-production workers	-
Total compensation, LCU	c262a3 c262d3 c262e3 c262f3	n4a	Total compensation (wages, benefits, food, transport, social security etc.): (i) all workers; (ii) skilled production workers; (iii) unskilled production workers; (iv) non-production workers	In the last fiscal year what was the average monthly compensation, including benefits when applicable, for a full-time production worker?
Foreign workers, %	c264	-	What percent of your permanent skilled workers are foreign nationals?	-
Total sales, LCU	c274a1y c274a2y c274a3y	d2 n3	Total sales value in thousands of local currency units: (i) 1 year ago; (ii) 2 years ago; (iii) 3 years ago.	What were this establishment's total annual sales (LCU): (i) in the last complete fiscal year; (ii) three complete fiscal year?
R&D spending, LCU	c280	-	How much did your establishment spend on design or R&D last year (in thousands)?	-
Gross capital, LCU	c281d1y c281d2y c281d3y	n7a	Gross value (acquisition cost) of machinery and equipment (including transport) in thousands: (i) 1 year ago; (ii) 2 years ago; (iii) 3 years ago.	If this establishment had to hypothetically purchase the machinery and equipment in use now, as they are in their current condition, how much would it cost to purchase each of the following?
Net capital, LCU	c281g1y c281g2y c281g3y	n6a	Net book value of machinery and equipment (including transport) in thousands: (i) 1 year ago; (ii) 2 years ago; (iii) 3 years ago.	What was the net book value, the value of assets after depreciation, of machinery vehicles, and equipment at the end of the last complete fiscal year?

Table A.5 – t-test results for mean labor productivity (manufacturing vs. service)

Country-year	*ntot*	*smnf*	*spw_mnf*	*spw_ser*	*sd_mnf*	*sd_ser*	*mnf*	*ser*
(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*
Albania2005	94	0.45	342	355	202	172	-	-
Albania2007	212	0.34	49,728	188,202	80,396	557,989	-	**
Angola2010	234	0.32	22,098,216	11,109,839	107,331,744	63,974,696	-	-
Argentina2010	400	0.77	85,322	110,155	125,061	197,071	-	**
Armenia2005	102	0.78	33	33	31	25	-	-
Armenia2009	286	0.33	18,810	301,064	32,877	2,685,037	-	-
Azerbaijan2009	384	0.32	18,560	37,504	31,047	50,045	-	***
Bahamas2010	112	0.36	165,572	156,291	309,744	298,427	-	-
Barbados2010	94	0.51	74,636	45,631	126,346	20,035	*	-
Belarus2005	152	0.21	4	10	3	8	-	***
Belarus2008	234	0.35	20,298	49,022	21,503	68,810	-	***
Belize2010	126	0.41	46,962	59,697	39,810	74,828	-	-
Benin2009	120	0.3	64,216	124,638	127,786	339,227	-	-
Bhutan2009	150	0.4	50,449	67,023	81,412	271,249	-	-
Bih2005	90	0.41	21,878	33,545	12,122	31,383	-	**
Bolivia2010	180	0.46	87,659	66,357	200,297	97,330	-	-
Bosnia And Herzegovina2009	256	0.32	11,987	22,875	19,087	21,897	-	***
Botswana2010	244	0.31	63,453	231,663	186,749	1,352,880	-	-
Brazil2009	512	0.78	120,258	78,700	1,487,230	301,727	-	-
Bulgaria2005	182	0.3	17,219	19,566	18,180	13,412	-	-
Bulgaria2007	642	0.65	26,087	55,288	40,018	97,475	-	***
Bulgaria2009	238	0.35	51,705	57,244	87,829	72,805	-	-
Burkinafaso2009	414	0.24	50,859	115,958	105,104	848,617	-	-
Cameroon2009	402	0.25	58,338	31,794	117,042	70,520	**	-
Capeverde2009	116	0.4	66,467	1,506,037	183,596	7,917,488	-	-
Centralafricanrepublic2011	178	0.23	12,263	23,020	18,585	55,631	-	-
Chad2009	122	0.36	176,787	214,822	754,144	597,622	-	-
Chile2010	414	0.75	107,004	111,973	321,917	143,968	-	-
Colombia2010	386	0.76	792,344	132,734	18,037,632	501,257	-	-
Costarica2010	292	0.6	58,292	79,877	167,851	178,943	-	-
Croatia2005	124	0.37	10,391	23,549	5,626	18,875	-	***
Croatia2007	338	0.68	87,030	184,580	167,213	439,796	-	***
Czech Republic2009	148	0.46	131,346	178,994	247,680	349,399	-	-
Czech2005	204	0.34	1,925	2,014	1,185	1,236	-	-
Dominica2010	152	0.22	41,408	51,312	39,213	32,685	-	-
Dominicanrepublic2010	360	0.32	29,459	41,617	31,960	45,180	-	**
Drc2010	218	0.38	2,937,424	38,060,856	17,956,384	375,723,008	-	-
Ecuador2010	382	0.33	3	5	3	5	-	***
Elsalvador2010	274	0.44	3,724	6,495	4,957	10,484	-	***

Eritrea2009	76	0.58	8,372	11,370	8,149	12,106	-	*
Estonia2005	156	0.23	3,624	5,268	2,501	4,435	-	**
Estonia2009	242	0.29	186,032	187,274	756,274	763,470	-	-
Ethiopia2011	468	0.4	32,910	31,179	144,412	189,552	-	-
Fyr Macedonia2009	252	0.38	42,588	98,544	52,743	209,313	-	**
Fyrom2005	86	0.34	888	937	479	503	-	-
Georgia2005	118	0.28	7,916	10,527	6,010	11,929	-	-
Georgia2008	222	0.37	17,792	82,392	24,137	368,528	-	*
Germany2005	682	0.28	167,819	221,058	145,797	237,704	-	***
Greece2005	480	0.2	127,650	164,874	100,007	148,206	-	**
Guatemala2010	294	0.6	29,765	46,329	44,259	73,811	-	***
Guyana2010	106	0.4	52,013	110,963	58,207	260,877	-	*
Honduras2010	218	0.49	47,067	49,166	94,076	97,567	-	-
Hungary2005	196	0.73	302	484	176	363	-	***
Hungary2009	252	0.41	211,323	198,062	596,049	703,331	-	-
Indonesia2009	328	0.85	80,774	52,058	1,408,117	199,729	-	-
Iraq2011	424	0.66	39,778	30,316	68,327	61,478	**	-
Ireland2005	288	0.38	187,148	867,921	157,501	4,722,780	-	*
Ivory Coast2009	526	0.34	58,195	38,820	224,791	152,246	-	-
Jamaica2010	390	0.25	81,884	68,687	104,829	104,385	-	-
Kazakhstan2005	146	0.77	62	84	62	86	-	***
Kazakhstan2009	398	0.37	22,151	51,569	28,667	108,940	-	***
Kosovo2009	202	0.39	25,459	30,762	38,592	41,100	-	-
Kyrgyz Republic2009	140	0.47	22,993	23,682	46,215	88,981	-	-
Kyrgyzstan2005	112	0.43	140	231	101	216	-	***
Laopdr2009	382	0.34	10,401	20,576	18,823	36,367	-	***
Laopdr2012	228	0.35	51,423	18,190	341,239	42,671	-	-
Latvia2009	234	0.3	59,474	102,328	63,935	101,499	-	***
Lebanon2006	106	0.53	59,318	3,066,573	72,494	20,439,988	-	-
Lithuania2005	124	0.27	12,950	17,614	7,183	12,876	-	*
Lithuania2009	206	0.36	58,894	75,090	57,833	92,096	-	-
Madagascar2009	260	0.47	8,319	45,802	12,764	96,773	-	***
Malawi2009	92	0.5	27,165	21,002	49,868	41,214	-	-
Mali2010	164	0.55	34,819	171,708	89,395	1,257,626	-	-
Mauritius2009	234	0.58	40,331	84,677	109,204	282,028	-	**
Mexico2010	452	0.8	288,765	73,383	7,055,043	84,450	-	-
Moldova2005	148	0.6	543	870	267	835	-	***
Moldova2009	350	0.34	26,263	50,763	63,895	211,163	-	-
Mongolia2009	326	0.39	20,622	14,322	45,852	29,790	*	-
Montenegro2009	90	0.31	46,686	184,858	41,719	257,747	-	**
Nepal2009	392	0.35	14,855	12,035	29,649	28,212	-	-
Nicaragua2010	282	0.35	42,976	41,347	161,129	69,915	-	-
Niger2009	138	0.32	41,021	245,339	39,176	555,243	-	**

Panama2010	202	0.37	1,953,442	529,171	12,701,004	2,905,048	-	-
Paraguay2010	216	0.51	59,969	78,624	125,126	107,583	-	-
Peru2010	368	0.77	61,907	167,336	92,927	271,159	-	***
Philippines2009	464	0.76	88,996	144,526	808,163	505,640	-	-
Poland2005	326	0.7	12,820	19,787	8,540	16,903	-	***
Poland2009	230	0.44	58,884	221,534	99,975	561,083	-	***
Portugal2005	330	0.29	120,318	118,460	92,363	106,544	-	-
Romania2005	188	0.77	7,156	12,127	6,466	11,040	-	***
Romania2009	324	0.35	29,533	211,280	50,060	1,729,808	-	-
Russia2005	258	0.32	491	872	396	791	-	***
Russia2009	298	0.76	57,704	82,876	184,116	274,999	-	-
Russia2012	2818	0.35	84,561	173,487	833,703	1,367,773	-	*
Rwanda2011	192	0.3	34,267	62,448	52,973	177,350	-	-
Serbia&Montenegro2005	116	0.39	40,625	48,244	25,228	39,135	-	-
Serbia2009	330	0.37	59,728	102,032	190,530	208,523	-	*
Slovak Republic2009	162	0.4	94,099	82,319	116,318	92,685	-	-
Slovakia2005	108	0.3	1,483	2,580	651	1,785	-	***
Slovenia2005	106	0.46	663	582	464	334	-	-
Slovenia2009	206	0.43	2,639	995	13,716	944	-	-
Southkorea2005	380	0.43	183	164	170	178	-	-
Spain2005	424	0.26	154,855	178,220	120,946	184,835	-	-
Srilanka2011	428	0.57	17,503	26,174	50,638	66,436	-	*
Stlucia2010	140	0.41	38,961	47,356	35,452	35,095	-	-
Stvincentandgrenadines2010	136	0.31	31,540	60,665	17,434	103,890	-	*
Suriname2010	92	0.49	39,106	43,647	31,304	93,096	-	-
Tajikistan2005	116	0.44	1,223	1,815	636	1,350	-	***
Tajikistan2008	244	0.41	9,458	29,410	22,590	110,089	-	*
Timor Leste2009	70	0.39	11,778	5,440,606	17,902	23,379,658	-	-
Tonga2009	184	0.31	168,105	37,021	945,662	169,280	*	-
Trinidadandtobago2010	336	0.31	51,341	80,112	52,866	329,547	-	-
Turkey2004	312	0.35	24,679	25,143	14,984	16,882	-	-
Turkey2008	320	0.81	601,064	367,171	10,830,399	987,555	-	-
Ukraine2005	306	0.33	2,473	5,295	2,339	5,755	-	***
Ukraine2008	308	0.71	40,363	73,539	387,620	248,041	-	-
Uruguay2010	286	0.65	75,297	142,742	101,498	445,818	-	***
Uzbekistan2005	206	0.35	10	9	11	11	-	-
Uzbekistan2008	340	0.38	3,140,462	12,016	31,911,298	26,494	-	-
Venezuela2010	218	0.35	4,391,677	5,419,265	16,724,198	18,958,356	-	-
Vietnam2009	350	0.79	26,527	62,489	48,807	102,794	-	***
Westbank_Gaza2006	50	0.9	140	85	312	126	-	-
Yemen2010	288	0.52	15,250	52,047	40,263	124,585	-	***
Zimbabwe2011	354	0.64	212	623	711	5,314	-	*

Appendix B

B.1 Quantile-quantile plot (Q-Q plot)

Q-Q plots can be viewed as a non-parametric approach to comparing two distributions. In general a q-q plot is a plot of the quantiles (not to be confused with quintiles) of the first data set against the quantiles of the second data set. A quantile is any set of values of a variable that divide a frequency distribution into equal groups, each containing the same fraction of the total population. For example, the 0.35 (or 35%) quantile is the point at which 35% percent of the data fall below and 65% fall above that value.

The advantage of the q-q plot is that comparison groups do not have to be of equal size and many distributional differences can be graphically displayed. Shifts in location, scale, symmetry differences and the presence of outliers can be easily seen form the plot. For example, (i) if all but few points are on a line possibly there are outliers in the data and (ii) if two distributions differ only by location shift, the plot will be a straight line shifted up of down from the 45-degree reference line.

In the q-q plots presented in this paper vertical axis displays estimated quantiles from the exporters' distribution of sales per worker and horizontal axis displays quantiles for non-exporters. Both axes are in the units of data sets compared. Note that the quantile level is not actually known in these plots but we know that the same quantiles are compared.

B.2 Supplementing 2006-2012 survey data with income level data

The survey data for 2006-2012 years did not have country level information on income level. I use World Bank's data on gross national income (GNI) per capita to construct income level variable. World Bank divides economies into income groups according to 2011 GNI per capita, calculated using the World Bank Atlas method (Please see http://data.worldbank.org/about/country-classifications/world-bank-atlas-method for more details). The income groups are as follows: low income, $1,025 or less; lower middle income, $1,026 - $4,035; upper middle income, $4,036 - $12,475; and high income, $12,476 or more. Note, in previous editions of World Bank's publications, GNI was referred to as gross national product, or GNP.