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Firm performance and trade with low-income countries: Evidence from China*

Hans-Jörg Schmerer[†] and Luhang Wang[‡]

March 1, 2014

Abstract

Krugman's (1979, 1980) monopolistic competition model of trade showed that countries with more similar per-capita GDP trade more with each other. Does this mean that developing countries shift trade towards developed countries as a result of high economic growth? The results reported in this paper challenge the link between per-capita GDP and trade predicted by the force of gravity. The matched customs-manufacturing firm data used in this study reveal a rising low-income country trade share around and after China's accession to the World Trade Organization. Based on this stylized fact we analyze the link between firm performance and different export strategies. We find strong evidence for sequential sorting into different export-modes. i) only the most productive firms export to low-income countries, ii) export to low-income countries is coupled to export to high-income countries, iii) younger firms solely export to export markets with higher potential, and iv) low-income markets are served additionally by older firms. Moreover, we find that entry into simultaneous exports to low- and high-income destinations is associated with a higher productivity compared to the average productivity measured by incumbents' firm performance.

Keywords: trade, developing countries, productivity, Chinese firms, firm level data.

JEL codes: F1, F6, O1.

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1 Introduction

China's economic reforms and export promoting policies stimulated an impressive growth of exports at the extensive and intensive margin. However, only little is known about the role of low-income countries for China's soaring exports around and after its accession to WTO in 2001. Do firms sort into different markets according to productivity? Are less productive firms picking markets with lower potential, as for instance low-income countries? The matched Chinese manufacturing firm-panel used in this study reveals an increasing importance of low-income countries within our sample period.¹ This finding contradicts the law of gravity, which predicts that bilateral trade volumes are determined by the mass of two countries.² One could expect that China's development to one of the largest economies in the world can be associated with intensified trade with developed countries. However, tariffs and barriers to trade may have distorted the force of gravity. Moreover, the presence of firm heterogeneity can explain the existence of sorting patterns according to export-destination characteristics and differences in barriers to trade.

Our result show one interesting pattern: Albeit its low importance revealed by the low-income trade share, markets in less developed countries are more relevant for high-productivity firms. We use matched firm-level information on firms' productivity to shed light on the reasons for the above stylized facts. The data covers the period of China's rapid development towards a highly competitive economy around its accession to the WTO. To the best of our knowledge, this study is the first that focuses on the role of less developed markets for firm performance in China within this particular period.

What are the driving forces behind the relative importance of low-income coun-

¹ The total share of exports to countries with a per-capita income below the 50th percentile increased from 0.03 to 0.07 percent between 2000 and 2006. The change appears to be rather modest. However, decomposing the effects into the effects at the intensive and extensive margin reveals more pronounced changes. At the extensive margin, we observe that the share of firms exporting to low-income countries increased from 33 to 43 percent. Moreover, we find an increase in the export intensity from 10 to 15 percent at the intensive margin.

² Many cite the Krugman (1979, 1980) model as theoretical foundation of this result.

tries at the firm-level? Do firms serve low-income countries in addition to their sales in high-income countries? This second hypothesis would be consistent with the gravity equation of trade.

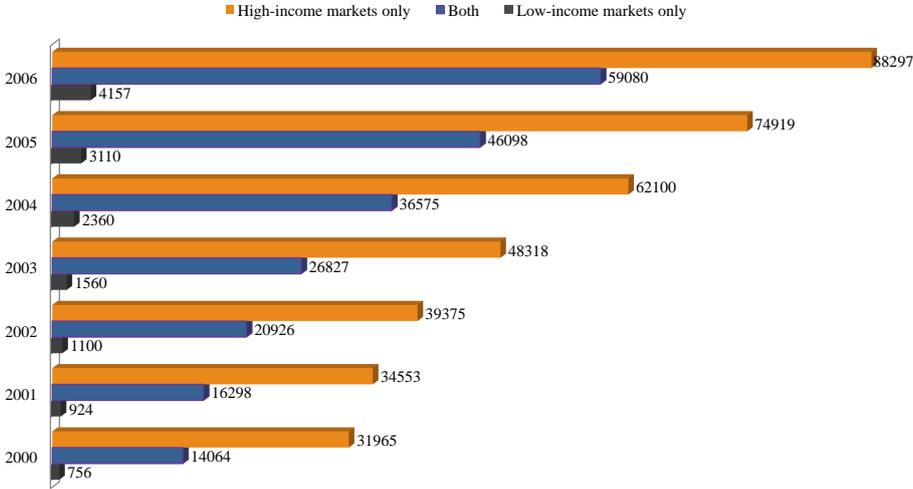


Figure 1: Different export strategies

A first glimpse at the data. Figure 7 presents numbers on different export-strategies over time. We construct dummies indicating whether firms solely export to low-, solely export to high-, or export to both low- and high-income countries. We denote those export-modes by L , H , and LH . Overall, our data reveals a huge increase of entry into export from 2000 to 2006. The number of firms that solely serve low-income countries increased by 3401 firms, whereas the number of firms serving both high- and low-income countries increased by 45016. Thus, firms that export to low-income countries tend to serve both markets. Moreover, comparing L and HL we find an increase of the relative importance of the latter from 0.44 up to 0.67.

One potential explanation is sorting of firms into different export regimes. Tariffs, which are usually higher in low-income countries, induce additional burdens to less productive firms competing with firms in low-income countries. Firms in less developed countries are likely less competitive, which eases Chinese firms entry in earlier stages of the development. By the same token, high tariffs in developing countries prevent entry at least for the least productive firms. Figure 2 analyses the link between

per-capita income taken from the Pennworld table and a tariff measure provided by the KOF globalization index. The latter is a subindex that excludes non-tariff barriers to trade. Higher values of the index are associated with lower trade restrictiveness. The data reveals a positive correlation between per-capita GDP and the inverse-trade restrictiveness index: Countries with high per-capita GDP tend to use tariffs in order to protect infant industries.

In line with the arguments proposed by Chan and Manova (2013) firms may want to start exporting to countries with low tariffs but high potential for demand. The authors argue that finance constraints induce firms to pick more attractive markets first. Learning from exporting may explain why firms turn to low-income countries after reaching a certain productivity level.³ This explanation implies some productivity-upgrading over time associated with sorting into the different export regimes *L*, *H*, and *HL*.

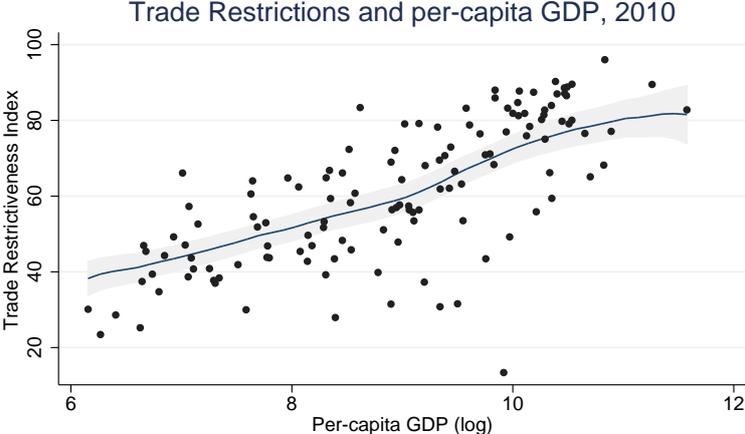


Figure 2: The link between per-capita income and tariffs

Based on those facts and considerations we will study the link between firm performance and the choice of the export mode. Figure 7 identifies the *H* and *HL* export-modes as the most relevant ones in terms of absolute numbers. Figure 3 compares the productivity distributions of firms specializing on high-income markets (*H*) with the distribution of firms that serve both markets (*HL*). The comparison shows that firms serving both markets are on average more productive.

³ See a discussion in the related literature review in the next paragraph.

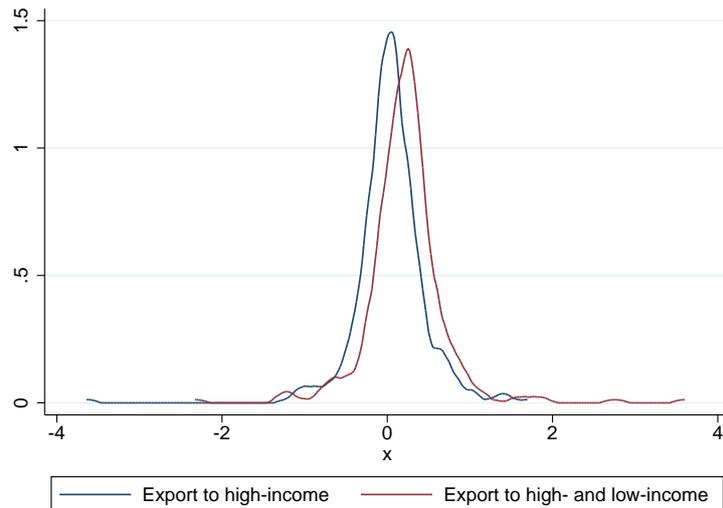


Figure 3: Export destinations and firm performance

To address potential endogeneity between export modes and firm productivity we also look at firm entry into the different export-modes. We find that firms entering the *HL* regime are already more productive compared to the average incumbent firm, which supports the sorting hypothesis. One question remains: What are the potential reasons for an easier access to high-income countries? Higher firm competitiveness may be one reason why governments don't have to protect certain industries in high-income countries. VAT tax rebates for exports helped to promote trade after China's opening up in 1978 and this particular export-promoting policy is still widely used. For instance Yang (2012) reports an huge increase in tax rebate payments:

The total value of the rebate payment increased substantially after China joined the WTO, quintubling in value from 2002 to 2008. These tax rebates are substantial: In 2006, the total tax rebates for exports received by exporting firms were equivalent to 10 percent of aggregate cooperate savings and approximately 14 percent of government tax revenue in the same year.

These export promoting policies can rationalize the fact that relatively less productive firms are able to compete in high-income markets with higher potential demand but more competition with high productive domestic firms. Less productive firms may find it easier to overcome barriers to trade and competition in their earlier stages

of development if their effective exporting costs are lower due to VAT tax rebates. Firms that become more productive over time are able to overcome the higher barriers to trade in low-income countries in a later stage of their development. Additional incentives may stem over-capacities sold for lower prices at low-income countries. Manova and Zhang (2012) provide evidence for the link between quality and trade based on the Chinese customs data.⁴

Related literature. Our paper is closely related to the literature on sorting into export of firms. Sparked by the Melitz (2003) model, recent firm-level studies consider productivity as the main determinant of export. Going beyond Melitz (2003), another strand of literature focuses on short-run dynamics as investments or productivity-upgrading. A theoretical explanation is discussed in Impullitti, Irarrazabal, and Opro-molla (2012), where positive idiosyncratic firm efficiency shocks explain hysteresis in export market participation. More important for our study is the paper by Chan and Manova (2013), Fabling and Sanderson (2012), and Defever, Heid, and Larch (2011).

Chan and Manova (2013) find that financial market imperfections matter for the choice of the number and characteristics of exporters' trade partners. Bigger economies with lower trade costs are relatively more profitable due to potentially higher demand but lower tariffs. Their study is based on aggregated trade data obtained from *Feenstra's World Trade Database*. Their model and empirics show that firms pick trade partners according to market potential if there are finance constraints. Thus, under binding constraints the number of destinations is lower than the first-best outcome, where firms serve all markets that yield positive profits. Chinese firms are heavily constrained as access to credit is difficult for start-ups, especially in the private sector. In line with their model and empirics we would expect firms picking countries with higher potential (size) and/or lower entry barriers first. Our findings support their aggregate results but our empirical results are elaborated at the firm-level, where we have also information on firm productivity.

⁴ Bai, Krishna, and Ma (2013) provide evidence on the effects of direct or indirect export modes on learning on exporting.

Fabling and Sanderson (2012) find that most of the productivity gap between exporting and non-exporting firms can be explained by sorting. Moreover, the authors show that firms invest more after entry into export, which has an enhancing effect on labor productivity. Our study is related to their paper but we take additional information about destination characteristics into consideration, which is new compared to Fabling and Sanderson (2012).

Defever, Heid, and Larch (2011) study spatial export-patterns. They argue that firms spread to closely related markets after entry into one destination. They look at the multi-fiber agreement as natural trade liberalization experiment. The authors find evidence for sequential entry into different destinations with high proximity. Similar to us the authors use the customs data for their empirical application.

Our paper is also related to a study by Chandra and Long (2013). The authors use the Chinese manufacturing survey to analyze the impact of the 2004 VAT tax rebate reform on Chinese manufacturing firms' exposure to trade. Their findings indicate an increase in exports of 13% associated with a one percent tax rebate. Their identification strategy relies on a quasi natural experiment. In 2004 the central government shifted authority over those tax rebate to the local level. This shift created some heterogeneity in VAT tax rebates dependent on the respective government's financial situation, which can be used to determine causal effects on exports.

The paper is structured as follows: Section 2 describes the estimation strategy and data used. We analyze the productivity to export-mode nexus by correlating the respective variables. In a last step we also look at the differences in productivity associated with entry into the different export-modes. Section 3 presents the results obtained from the different regressions. Section 4 concludes.

2 Estimation strategy and data

Data and summary statistics. In this analysis, we use China's customs data and the Annual Manufacturing Survey from the National Bureau of Statistics. The customs data covers the universe of exporters in China and include detailed information about destination and origin of exports. Manova and Zhang (2009) provide a discussion and stylized facts on the data. The survey covers all state-owned manufacturing firms as well as non-state-owned firms with revenues over 5 million RMB. The manufacturing survey contains information on the type of ownership, the size of the firms and the age of the firm. Our data stems from Brandt, Van Biesebröck, and Zhang (2012) who describe all cleaning procedures necessary to obtain their restructured version of the data. Moreover, the authors construct the capital stock using perpetual inventory methods based on the information about investment stocks reported in the survey. The two data sets can be combined through record linkages based on firms' names and location. All variables in the regression except the export-strategy dummies are taken from the survey data. The export-mode dummy was constructed using the customs data.

The dummies H , L , HL indicate the export-strategy. The dummies are mutually exclusive and take the value one if the firm exports to low-income countries only ($L = 1$), high-income countries only ($H = 1$), or both kind of markets ($HL = 1$). We classify countries according to their per-capita income obtained from the Pennworld Table. All countries with per-capita income below the 50th percentile are classified as low-income destination. We add information on non-exporters obtained from the Chinese manufacturing survey, which allows to construct the variable $N = 1$ if firms do not export. TFP is constructed as the residual from a Cobb-Douglas production function:

$$\ln TFP_{i(j)t} = q_{i(j)t} - m_j M_{i(j)t} - k_j K_{i(j)t} - l_j L_{i(j)t} , \quad (1)$$

where q denotes firm revenue, m denotes input of intermediates, K denotes input of capital, and L denotes input of labor in firm i operating in industry j at time t . The

share parameters m, k , and l , are industry-specific and taken from production function estimates reported in Yu (forthcoming).⁵

Table 1: Summary statistics

| Variable | Description | Mean | Std. dev. |
|---------------------|---|-------|-----------|
| TFP (ln) | <i>Total Factor Productivity</i> | 1.708 | 1.147 |
| H (d) | <i>Export to high-income countries only</i> | 0.100 | 0.300 |
| L (d) | <i>Export to low-income countries only</i> | 0.002 | 0.054 |
| HL (d) | <i>Export to high- and low-income countries</i> | 0.062 | 0.242 |
| NE (d) | <i>Non-exporters</i> | 0.833 | 0.372 |
| SOE (d) | <i>State own enterprises</i> | 0.265 | 0.441 |
| COL (d) | <i>Collective enterprises</i> | 0.154 | 0.361 |
| PRI (d) | <i>Private enterprises</i> | 0.399 | 0.489 |
| THK (d) | <i>Enterprises from Taiwan or Hong Kong</i> | 0.087 | 0.282 |
| FOR (d) | <i>Foreign enterprises</i> | 0.092 | 0.290 |
| Size (ln) | <i>Number of employees</i> | 4.649 | 1.113 |
| Age (level) | <i>Age of the firm</i> | 9.923 | 11.387 |
| Capital (ln) | <i>Capital stock of the firm</i> | 8.401 | 1.619 |

Table 1 presents the first and second moments for all variable used in the study.

Are firms that export to low-income countries less productive? Based on the stylized facts presented above we analyze the performance of firms that serve low-income countries. The focus of the analysis lies on the comparison of H and HL , the first being the reference group in our analysis. We estimate the following model

$$TFP_{i(j)t} = C + \kappa_1 H_{it} + \kappa_2 L_{it} + \kappa_3 N_{it} + \sum_{k=1}^K \beta_k CON_{it}^k + \nu_j + \mu_t (+\varrho_i) + \epsilon_{it} \quad , \quad (2)$$

where TFP denotes total factor productivity of firm i in industry j at time t . C denotes the constant, HL , L , and N are dummies that identify the export-strategy, CON includes control variables for size or ownership. The variables ν_j , μ_t , and ϱ_i are the estimated coefficients for the industry-, time-, and firm-fixed-effects. The inclusion of firm fixed-effects allows us to interpret the coefficients as measure for the productivity effects associated with switching from and to the reference export-mode, HL . As a

⁵ As robustness check we also estimate TFP as proposed by Brandt, Biesebroeck, and Zhang (2006).

last step we construct entry into export-modes for two different years, 2003 and 2006 and rerun equation 2 using the entry- instead of status-dummies in order to analyze sorting. We argue that a firm’s productivity was determined before entry into the different export-regimes. Either the firm developed its productivity in the years before entry into export or it already exported using a different mode than the entry-mode observed in 2003 or 2006. The incumbent reference group comprises all firms that are active in the respective year or before without entering any export-mode within the respective year.

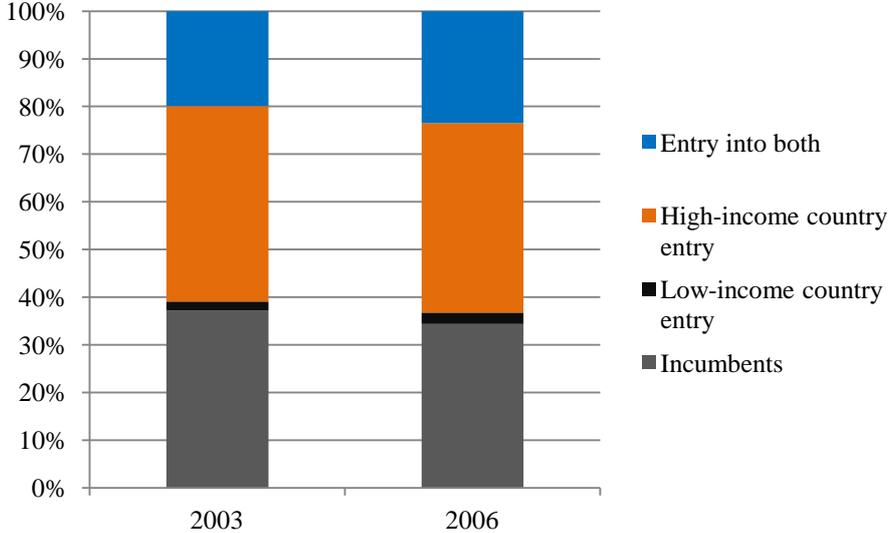


Figure 4: Entry into different export strategies

Figure 4 gives a graphical analysis of the entry data. The entry into low-income countries is negligible but entry into *H* and *HL* is substantial compared to the incumbent group. Moreover, we observe a slight shift towards entry in 2006 compared to 2003.

Productivity and the choice of the export-mode. The correlation between productivity and export-modes is likely driven by firms’ endogenous choice of the right export-mode. We account for that in the analysis using a Multinomial Logit, which has the advantage that we are able to estimate the effects of different firm character-

istics on the probability of choosing particular export-modes. The model reads

$$P(y = j|x) = \exp(x\beta_j) / \left[1 + \sum_{h=1}^J \exp(x\beta_h) \right] , \quad (3)$$

where we follow the notation proposed in the textbook by Jeffrey Wooldrige (2002). The dependent variable summarizes the different binary export-mode dummies into one multinomial variable y . We are interested how changes in the elements of the vector of regressors x change the probability of choosing particular export-modes $P(y = j|x)$ for all different outcomes $j = 0, 1, 2, 3$. The included regressors are identical to the regressors included in the analysis before.⁶ We run two different setups: Firstly we construct the multinomial export-mode variable including the choices *non-export* ($y = 0$), *export to low-income countries only* ($y = 1$), *export to high-income countries only* ($y = 2$), and *export to both* ($y = 3$). We also run regressions with a multinomial entry into export-mode variable that summarizes *incumbent firms* ($y = 0$), *entry into low-income countries only* ($y = 1$), *entry into high-income countries only* ($y = 2$), and *entry into both* ($y = 3$). The analysis is elaborated in the cross-section for the years 2003 and 2006. Estimated probabilities for $J - 1$ outcomes implicitly determine the outcome probability of the reference group. As reference groups, we choose the *HL* group for the first and the incumbent group for the second setup. The vectors β_j contains estimated coefficients for choice j of the included regressors.

3 Results

Total factor productivity and export-modes. Table 2 reports the linear model introduced in equation 2. Column (1) presents the benchmark specification including all firms. Industry- and time-dummies, as well as controls for size, firm-age, and ownership dummies are estimated but not reported in the table.

⁶ However, we include a broader industry-classification variable on the two-digit level. The MLOGIT does not converge for the full set of industry fixed effects at the four-four digit level.

Table 2: Results for the benchmark regressions

| <i>Dependent variable: Total Factor Productivity</i> | | | | | |
|---|----------------------|----------------------|----------------------|----------------------|----------------------|
| <i>Reference group: Active on both high- and low-income markets</i> | | | | | |
| Model | ALL | ALL | SOE | PRI | FOR |
| High-income only | -0.202*** (0.005) | -0.062*** (0.005) | -0.157*** (0.011) | -0.152*** (0.008) | -0.203*** (0.007) |
| Low-income only | -0.125*** (0.016) | -0.089*** (0.015) | -0.149*** (0.028) | -0.084*** (0.023) | -0.223*** (0.028) |
| Non exporters | -0.262*** (0.005) | -0.181*** (0.007) | -0.359*** (0.010) | -0.245*** (0.007) | -0.238*** (0.008) |
| Industry-FE | x | | x | x | x |
| Firm-FE | | x | | | |
| R-squared | 0.491 | 0.897 | 0.436 | 0.530 | 0.521 |
| Observations | 1150856 | 1150856 | 305081 | 638237 | 207538 |

Notes: Standard errors in parentheses, * significant at 10%, ** significant at 5%, *** significant at 1%. Standard errors clustered at the establishment-level. Constant, year-, industry-, and regional-dummies, firm-age, squared firm-age, log size, squared log size, and log capital included in all models but not reported. All coefficients are marginal effects. *ALL* stands for *all firms*, *SOE* for *state owned enterprises including COL collective enterprises*, *PRI* stands for *private enterprises*, *FOR* stands for *foreign enterprises*. *FOR* includes firms from Taiwan and Hong Kong THK and the rest of the world ROW.

The categories *H*, *L*, *N* and *HL* are mutually exclusive so that the coefficients must be interpreted relative to the reference group *HL*. The dummy *N* indicates non-exporters. Firms that specialize either on high- or low-income countries are on average 12.5 to 20 percent less productive than firms that are active on both markets. Moreover, we find that firms that specialize to *H* markets are only 6 percentage points more productive compared to firms that do not export.

Column (2) includes firm-fixed effects instead of industry-dummies. The identification is based on switchers between different export strategies. We obtain the same pattern as documented in column (2). Firms that shift from *L* or *H* to simultaneous export to both type of markets increase productivity by 6 to 9 percentage points. However, the causality may go in both directions. Column (3) to (5) report robustness checks separated for firms with different ownership-types. The magnitude of the ef-

fect is strongest for foreign- and state-owned enterprises and the effect is significant in all columns.

Table 3: Sorting into different export-modes

| <i>Dependent variable: Total factor productivity (log)</i> | | | | |
|--|----------------------|----------------------|----------------------|----------------------|
| <i>Variable of interest: Entry into export (dummy)</i> | | | | |
| <i>Reference group: Incumbents</i> | | | | |
| | (2003) | (2006) | (2003) | (2006) |
| Entry high-income | -0.046*** (0.012) | -0.075*** (0.008) | -0.066*** (0.012) | -0.080*** (0.008) |
| Entry low-income | -0.137*** (0.041) | -0.086*** (0.028) | -0.116*** (0.039) | -0.077*** (0.028) |
| Entry both | 0.108*** (0.014) | 0.071*** (0.009) | 0.071*** (0.014) | 0.066*** (0.009) |
| Industry dummies | x | x | x | x |
| Year dummies | x | x | x | x |
| Additional controls | | | x | x |
| R-squared | 0.510 | 0.520 | 0.539 | 0.541 |
| Observations | 23221 | 44523 | 23221 | 44523 |

Notes: Standard errors in parentheses, * significant at 10%, ** significant at 5%, *** significant at 1%. Standard errors clustered at the establishment-level. Constant, year-, industry-, and regional-dummies included in all models but not reported. All reported results are marginal effects.

Sorting into export. The hypothesized link between tariffs and per-capita income motivates our second analysis. It may be that the described pattern can be explained by more productive firms' sorting into the *HL* regime. We use entry into different strategies in order to check whether firms that enter into the different modes significantly differ with respect to productivity compared to the incumbent firms that already export. The advantage of the customs data is that we observe the universe of Chinese exporters. Thus, we can be sure that firms that export the first time to particular markets were not exporting in earlier periods. The analysis is conducted for entry in the years 2003 and 2006.

The reference group are incumbent firms. Incumbent firms were active in the periods before 2003 or 2006, respectively. Entry into export can be specializing on

low-income markets, high-income markets, or simultaneous entry into both markets. Entry into both market-types includes switchers from the L to the HL regime. The sorting-hypothesis would be supported by our results if we find that firms that enter the different export-modes significantly differ compared to the average incumbent firms. The productivity of entry firms must be determined before the entry takes place, which addresses potential reverse causality between productivity and export-modes. We expect that firms entering the HL mode are already more productive than the average firm productivity measured through productivity of incumbent firms.

The results are reported in Table 14. Column (1) and (2) exclude additional controls, whereas columns (3) and (4) add all firm controls that were included in the benchmark specification. Again, we find a clear pattern. Firms that enter exporting through specializing on low- or high-income countries are less productive compared to the reference group of established exporters. Firms that enter both markets are on average more productive compared to the average incumbent firm. Notice that sole entry into low-income countries is negligible. Firms tend to specialize on high-income countries, whereas entry into low-income countries is usually coupled with exports to high-income countries. This pattern is in line with the sorting into export hypothesis. High tariffs in low-income countries may prevent less productive firms from entry into low income countries. However, firms with higher productivity are also productive enough to export to high-income countries or became productive enough to switch from H to HL . More research has to be done on the reasons why entry into L mostly coupled with export into H . One reason may be over capacities sold for lower prices at markets with lower per-capita income.

Multinomial Logit Results. The correlations between entry into export-modes and productivity hints towards endogenous choice. Thus, we compare the results obtained from the linear regression model with results obtained from a Multinomial Logit model. Results are presented in Tables 4, 5, and 6. Coefficients for TFP are in line

Table 4: Benchmark results for the Multinomial Logit model

| <i>Multinomial Export-Mode</i> | | | | | | |
|---|----------------------|-----------|---------------|------------|----------------|------------|
| <i>Model: MLOGIT, reference group H</i> | | | | | | |
| | <u>Non-exporters</u> | | <u>L-mode</u> | | <u>LH-mode</u> | |
| | <i>dy/dx</i> | St. error | <i>dy/dx</i> | Std. error | <i>dy/dx</i> | Std. error |
| TFP | −0.0204*** | (0.0005) | 0.0003*** | (0.0001) | 0.0209*** | (0.0004) |
| Size (ln) | −0.0511*** | (0.0006) | 0.0008*** | (0.0001) | 0.0231*** | (0.0004) |
| Age | −0.0004*** | (0.0000) | 0.0000*** | (0.0000) | 0.0002*** | (0.0000) |
| Capital (log) | −0.0167*** | (0.0004) | 0.0004*** | (0.0001) | 0.0156*** | (0.0003) |
| N | 1150572 | | | | | |

Notes: Standard errors in parentheses, * significant at 10%, ** significant at 5%, *** significant at 1%. Standard errors clustered at the establishment-level. Constant, year-, industry-, and regional-dummies included but not reported. All coefficients are marginal effects. Reference group is export to high-income countries only *H*. *L* denotes export to low-income countries only, and *LH* denotes export to low- and high-income countries.

with the results discussed in the first part of the analysis. Relative to the reference group *H*, we find that more productive firms are more likely to choose to export to both *H* and *L*. A one-hundred percent increase in TFP is associated with a 2.1 percent higher probability of choosing the *HL* mode over the *L* mode.

The coefficient is significant at the 5 percent level. Less productive firms are relatively more likely to serve only the domestic market. The Multinomial Logit has the advantage that we can also analyze the role of firm-size, firm-age, and capital for the choice of the export-mode. Firms that choose to export to both *L* and *H* are larger, older, and report higher capital-stocks. Firms that specialize on high- or low-income countries are hardly different with respect to size and age. Only the coefficient for TFP and capital stock is significant but the magnitude of the effect is rather small.

We run the same Multinomial Logit model using the multinomial entry-into-export-mode as dependent variable. Results are reported separately for the years 2003 (Table 5) and 2006 (Table 6). Again, the results confirm the findings for the sorting according to productivity. The firm-age coefficients reveal another interesting pattern. Firms that start to export to both countries are younger than the average incumbent firm and the coefficient is double the coefficient for the entry into *H* mode. It is not

Table 5: Entry into export-modes: Multinomial Logit model

Multinomial Export-Mode, year 2003
Model: MLOGIT, reference group incumbents

| | <u>Entry into H</u> | | <u>Entry into L</u> | | <u>Entry into LH</u> | |
|---------------|---------------------|-----------|---------------------|------------|----------------------|------------|
| | <i>dy/dx</i> | St. error | <i>dy/dx</i> | Std. error | <i>dy/dx</i> | Std. error |
| TFP (log) | -0.0364*** | (0.0040) | -0.0023** | (0.0010) | 0.0315*** | (0.0034) |
| Size (log) | -0.0164*** | (0.0041) | -0.0015 | (0.0010) | -0.0047 | (0.0033) |
| Age | -0.0088*** | (0.0005) | 0.0000 | (0.0000) | -0.0034*** | (0.0003) |
| Capital (log) | -0.0285*** | (0.0032) | -0.0029*** | (0.0008) | 0.0144*** | (0.0025) |
| N | 23221 | | | | | |

Notes: Standard errors in parentheses, * significant at 10%, ** significant at 5%, *** significant at 1%. Standard errors clustered at the establishment-level. Constant, year-, industry-, and regional-dummies included but not reported. All coefficients are marginal effects. Reference group is *incumbent firms*. *H* denotes export to high-income countries only, *L* denotes export to low-income countries only, and *LH* denotes export to low- and high-income countries.

Table 6: Entry into export-modes: Multinomial Logit model

Multinomial Export-Mode, year 2006
Model: MLOGIT, reference group incumbents

| | <u>Entry into H</u> | | <u>Entry into L</u> | | <u>Entry into LH</u> | |
|--------------|---------------------|-----------|---------------------|------------|----------------------|------------|
| | <i>dy/dx</i> | St. error | <i>dy/dx</i> | Std. error | <i>dy/dx</i> | Std. error |
| TFP (ln) | -0.0421*** | (0.0029) | -0.0006 | (0.0008) | 0.0364*** | (0.0025) |
| Size (ln) | -0.0113*** | (0.0029) | -0.0039*** | (0.0008) | -0.0209*** | (0.0024) |
| Age | -0.0143*** | (0.0006) | 0.0001 | (0.0001) | -0.0058*** | (0.0005) |
| Capital (ln) | -0.0249*** | (0.0023) | 0.0003 | (0.0006) | 0.0241*** | (0.0019) |
| N | 44523 | | | | | |

Notes: Standard errors in parentheses, * significant at 10%, ** significant at 5%, *** significant at 1%. Standard errors clustered at the establishment-level. Constant, year-, industry-, and regional-dummies included but not reported. All coefficients are marginal effects. Reference group is export to high-income countries only *H*. *L* denotes export to low-income countries only, and *LH* denotes export to low- and high-income countries.

surprising that entry into export is associated with lower firm age. However, the finding that firms entering *H* are on average younger than firms entering *HL* is consistent with the hypothesis that firms may start to export to high-income countries before serving both low- and high-income countries. The effect is even more pronounced in the year 2006, where the *HL* coefficient for age is three times larger compared to the coefficient obtained for the *L* export-mode. This finding is in line with the model and empirics reported in Chan and Manova (2013), where financial frictions induce

firms to pick markets according to highest market potential in early years. Firms that become more productive over time enter into markets with lower potential or higher barriers to entry in later stages of their development.

Table 7: Results for the robustness check with different TFP

| <i>Dependent variable: Total Factor Productivity</i> | | | | | |
|---|----------------------|----------------------|----------------------|----------------------|----------------------|
| <i>Reference group: Active on both high- and low-income markets</i> | | | | | |
| Model | ALL | ALL | SOE | PRI | FOR |
| High-income only | -0.219*** (0.007) | -0.067*** (0.009) | -0.159*** (0.015) | -0.152*** (0.012) | -0.219*** (0.009) |
| Low-income only | -0.132*** (0.022) | -0.081*** (0.025) | -0.166*** (0.039) | -0.083*** (0.032) | -0.216*** (0.041) |
| Non exporters | -0.247*** (0.007) | -0.183*** (0.011) | -0.362*** (0.013) | -0.224*** (0.010) | -0.199*** (0.010) |
| Industry-FE | x | | x | x | x |
| Firm-FE | | x | | | |
| R-squared | 0.288 | 0.789 | 0.285 | 0.323 | 0.228 |
| Observations | 1090376 | 1090376 | 460598 | 433278 | 196500 |

Notes: Standard errors in parentheses, * significant at 10%, ** significant at 5%, *** significant at 1%. Standard errors clustered at the establishment-level. Constant, year-, industry-, and regional-dummies, firm-age, squared firm-age, log size, squared log size, and log capital included in all models but not reported. All coefficients are marginal effects. *ALL* stands for *all firms*, *SOE* for *state owned enterprises including COL collective enterprises*, *PRI* stands for *private enterprises*, *FOR* stands for *foreign enterprises*. *FOR* includes firms from Taiwan and Hong Kong THK and the rest of the world ROW.

3.1 Robustness checks

As robustness check we also estimate TFP as proposed by Brandt, Biesebroeck, and Zhang (2006) assuming that log value added, q , is produced according to a Cobb-Douglas production function by input of log capital k and log labor, l so that $\ln TFP$ can be obtained from $\ln TFP_{it}^{IND} = (q_{it} - \bar{q}_t) - \tilde{S}_{it}(l_{it} - \bar{l}_t) - (1 - \tilde{S}_{it})(k_{it} - \bar{k}_t)$. Variable \tilde{S}_{it} is a proxy for the elasticity of the Cobb-Douglas production function measured as wage sum over value-added. All variables used in the estimation are taken from their original data set. The results are qualitatively similar to the ones reported in the

last section.

For the entry into different export-modes we find slightly different results. The coefficients are much lower compared to the benchmark results. The low-income only entry dummy is insignificant in 2006. However, we already identified this group as irrelevant due to the low number of cases. Most important for our sorting story are entry into high-income only or both type of markets simultaneously. Both coefficients are significant and have the right sign, which further supports the robustness of our findings.

Table 8: Sorting into different export-modes

| <i>Dependent variable: Total factor productivity (log)</i> | | | | |
|--|----------------------|----------------------|----------------------|----------------------|
| <i>Variable of interest: Entry into export (dummy)</i> | | | | |
| <i>Reference group: Incumbents</i> | | | | |
| | (2003) | (2006) | (2003) | (2006) |
| Entry high-income | -0.037** (0.016) | -0.075*** (0.012) | -0.053*** (0.016) | -0.070*** (0.013) |
| Entry low-income | -0.147*** (0.054) | -0.062 (0.042) | -0.126** (0.053) | -0.048 (0.041) |
| Entry both | 0.079*** (0.019) | 0.041*** (0.014) | 0.065*** (0.019) | 0.079*** (0.014) |
| Industry dummies | x | x | x | x |
| Year dummies | x | x | x | x |
| Additional controls | | | x | x |
| R-squared | 0.243 | 0.325 | 0.265 | 0.356 |
| Observations | 22770 | 40558 | 22770 | 40558 |

Notes: Standard errors in parentheses, * significant at 10%, ** significant at 5%, *** significant at 1%. Standard errors clustered at the establishment-level. Constant, year-, industry-, and regional-dummies included in all models but not reported. All reported results are marginal effects.

Multinomial Logit with lagged TFP. as a final robustness check we include lagged TFP as variable of interest in the multinomial Logit model. Again, sorting into different export-modes implies that TFP was already higher in the periods before entry. Our results do not change compared to the benchmark table discussed above.

Table 9: Multinomial Logit robustness check

Multinomial Export-Mode and lagged TFP
Model: MLOGIT, reference group H

| | <u>Non-exporters</u> | | <u>L-mode</u> | | <u>LH-mode</u> | |
|--------------|----------------------|-----------|---------------|------------|----------------|------------|
| | <i>dy/dx</i> | St. error | <i>dy/dx</i> | Std. error | <i>dy/dx</i> | Std. error |
| Lag TFP (ln) | −0.0152*** | (0.0006) | 0.0004*** | (0.0001) | 0.0187*** | (0.0004) |
| Size (ln) | −0.0648*** | (0.0007) | 0.0010*** | (0.0001) | 0.0320*** | (0.0006) |
| Age (ln) | −0.0001* | (0.0000) | 0.0000 | (0.0000) | 0.0000 | (0.0000)* |
| Capital (ln) | −0.0129*** | (0.0005) | 0.0004*** | (0.0000) | 0.0147*** | (0.0004) |
| N | 759067 | | | | | |

Notes: Standard errors in parentheses, * significant at 10%, ** significant at 5%, *** significant at 1%. Standard errors clustered at the establishment-level. Constant, year-, industry-, and regional-dummies included but not reported. All coefficients are marginal effects. Reference group is export to high-income countries only *H*. *L* denotes export to low-income countries only, and *LH* denotes export to low- and high-income countries.

4 Conclusion

Our analysis shows that China’s rise in exports is associated with higher share of trade going to low-income countries. Two potential reasons for the increased relevance of developing countries over time may be firms’ over-capacities due to excess-supply or higher tariffs in developing countries. Developing countries may serve as an additional market for firms to sell their over-capacities at lower prices in markets with less competition. Market segmentation prevents consumers in high-income countries to buy at lower prices in low-income countries. Moreover, countries with lower per-capita income tend to set higher tariffs to protect domestic firms from international competition. Infant-industry protection is one of the argument in favor of tariffs accepted by the WTO. Thus, many low-income countries still set high tariffs in order to protect domestic producers from international competition. More productive firms may find it easier to cover higher trade costs, which explains this large share of firms serving both market-types. Both arguments are potential explanations for our finding that firms that export to both high- and low-income countries are on average more productive.

Moreover, our findings indicate that entry into both low- and high-income markets

is associated with higher productivity. This supports the sorting-hypothesis that the correlation between productivity and export modes is causal. Only more productive firms are able to export to low-income countries.

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A Additional results

What factors determine the low-income trade share? This subsection discusses additional results that shed light on the determinants of the low-income trade share. The dependent variable is the share of low-income trade over total trade volume for firm i in time t . We exclude processing trade and run the following regression

$$TS_{i(j)tL} = C + \alpha TFP_{it} + \gamma S_{it} + \sum_{k=1}^K \beta_k CON_{it}^k + \nu_j + \nu_t + \mu_r + \epsilon_{it} \quad (4)$$

in a Tobit model. The Tobit allows us to account for the large number of zeros in the dependent variable. We define zero low-income trade share as the lower censoring ceiling. Moreover, we are able to disentangle the total effect into the effects at the extensive and intensive margin. Felbermayr and Kohler (2006) use this kind of corner solution approach in order to study the distance puzzle in a Tobit type of gravity equation. The advantage is that the corner solution Tobit estimates the extensive- and intensive-margin simultaneously. The dependent variable takes the value zero with a certain probability $p(EXP = 0|x)$. Particular values above zero have zero mass in the distribution. Thus, the export intensity is partly continuous between 0 and 100.

Instead of the partial derivatives on the "latent" variables of interest, the effects at the extensive and intensive margin can be computed as

$$\underbrace{\frac{\partial P(T_l > 0|x)}{\partial x}}_{Extensive}, \quad \underbrace{\frac{\partial E(T_l|x, T_l > 0)}{\partial x}}_{Intensive}, \quad \underbrace{\frac{\partial E(T_l|x)}{\partial x}}_{Total}, \quad (5)$$

which can be predicted based upon the estimates obtained from the Tobit.⁷ All marginal effects are evaluated at the sample means. The effects at the intensive margin can be interpreted as the marginal effect of variable x on the expected low-income trade share of firms that already export to low-income countries. The effect at the extensive margin is the change in probability of becoming an exporter to low-income

⁷ We use the Stata commands `mfx compute`, `predict(p(0,.))`, `mfx compute`, `predict(e(0,.))`, `mfx compute`, `predict(ys(0,.))` in order to predict the marginal effects at the different margins. See Galiani (2008) for more information.

countries if x changes. As explanatory variables we include variable on firms' total factor productivity, TFP , size S , age, and ownership dummies. Moreover, to control for fixed effects we include industry-, regional-, and year-dummies.

As suggested by Wagner (2001) and Wagner (2011) regressions that include trade shares as dependent variable should be estimated in a Fractional Probit/Logit model. This estimator goes back to Papke and Wooldridge (2008). Fractional Probit fits a distribution that accounts for the proportions 0 and 1. We run the same specification but using a Fractional Probit in order to compare the results obtained from both estimators. To run the Fractional Probit we have to recode the dependent variable by dividing by 100 in order to make sure that the depend variable takes values from 0 to 1. Notice that Wagner (2001) also argues that the Tobit is not appropriate if the dependent variable is bounded between 0 and 1. The corner solution 0 is the true value as exports cannot become negative. Thus, there is no unobserved latent variable. Nevertheless, we report Tobit in order to compare the results with more appropriate Fractional Probit and in order to account for the distinction between the extensive and intensive margin.

Tobit results. Table 10 presents the results obtained from estimating the Tobit model introduced in the last section. We estimate equation 4 with zero trade-share treated as left-censored in the Tobit model. Marginal effects at the extensive and intensive margin are computed and reported separately.

Column (1) and (2) report marginal effects for the extensive and intensive margin based upon all available observations. The first row reports coefficients for total factor productivity. We find that a 100 percent increase in TFP is associated with a 2 percent higher probability to serve low-income countries. The same increase in firm productivity is associated with a 0.426 percentage points higher expected increase in low-income trade share at the intensive margin. Thus, changes in TFP have a significantly positive but modest effect on low-income country trade share. Column (3) to (8) rerun the same specification for subsamples including state-owned and collective

firms (column (3) to (4)), private firms (columns (5) to (6)) and foreign owned firms (columns (7) to (8)). The results are identical to the ones in column (1) and (2), which we have already discussed.

Table 10: Benchmark results for the Tobit model

| <i>Dependent variable: Low-income country trade share</i> | | | | | | | | |
|---|----------------------|----------------------|---------------------|---------------------|----------------------|----------------------|---------------------|---------------------|
| <i>Model: Tobit with left-censoring at zero</i> | | | | | | | | |
| Observations ⇒ | ALL | ALL | SOE | SOE | PRI | PRI | FOR | FOR |
| Margin ⇒ | Ext | Int | Ext | Int | Ext | Int | Ext | Int |
| TFP (log) | 0.042*** (0.002) | 0.872*** (0.043) | 0.024*** (0.005) | 0.617*** (0.121) | 0.041*** (0.005) | 0.978*** (0.119) | 0.049*** (0.002) | 0.816*** (0.042) |
| Employment (log) | -0.007*** (0.002) | -0.137*** (0.042) | -0.002 (0.005) | -0.045 (0.127) | -0.028*** (0.005) | -0.683*** (0.116) | -0.005* (0.002) | -0.078* (0.041) |
| Age | 0.000** (0.000) | 0.009** (0.004) | 0.000 (0.000) | 0.005 (0.006) | -0.000 (0.001) | -0.005 (0.012) | 0.001** (0.000) | 0.018** (0.007) |
| Capital (log) | 0.026*** (0.002) | 0.525*** (0.033) | 0.012*** (0.004) | 0.297*** (0.101) | 0.040*** (0.004) | 0.953*** (0.093) | 0.029*** (0.002) | 0.479*** (0.032) |
| COL (dummy) | 0.003 (0.009) | 0.056 (0.180) | -0.006 (0.009) | -0.163 (0.237) | | | | |
| PRI (dummy) | -0.003 (0.005) | -0.052 (0.108) | | | | | | |
| THK (dummy) | -0.102*** (0.005) | -2.090*** (0.104) | | | | | 0.037*** (0.004) | 0.624*** (0.070) |
| ROW (dummy) | -0.141*** (0.005) | -2.899*** (0.106) | | | | | | |
| Observations | 191441 | 191441 | 36522 | 36522 | 39684 | 39684 | 115235 | 115235 |

Notes: Standard errors in parentheses, * significant at 10%, ** significant at 5%, *** significant at 1%. Standard errors clustered at the establishment-level. Constant, year-, industry-, and regional-dummies included in all models but not reported. All coefficients are marginal effects. All coefficients are marginal effects. *ALL* stands for *all firms*, *SOE* for *state owned enterprises including COL collective enterprises*, *PRI* stands for *private enterprises*, *FOR* stands for *foreign enterprises*. *FOR* includes firms from *Taiwan and Hong Kong THK and the rest of the world ROW*.

The second row reports the marginal effects of the firm size variable. Larger firms are more likely to export to low-income countries at both margins. Again the effect is significant but the magnitude of the effect is rather small. Running the regressions separately for different types of ownership reveals an interesting pattern. For state owned enterprises we find coefficients which are hardly different from zero. For private firms we also find the reverse pattern. Smaller firms tend to export more to low-income countries.

The significant positive link between size and low-income country trade seems

Table 11: Fractional Probit results

| <i>Dependent variable: Low income country trade share</i> | | | | |
|---|----------------------|----------------------|----------------------|----------------------|
| <i>Variable of interest: Size and TFP</i> | | | | |
| | (ALL) | (SOE) | (PRI) | (FOR) |
| TFP (log) | 0.000 (0.001) | −0.003* (0.002) | 0.002 (0.002) | 0.001** (0.000) |
| Employment (log) | −0.004*** (0.001) | −0.003* (0.002) | −0.014*** (0.002) | −0.002*** (0.000) |
| Age | 0.000* (0.000) | 0.000 (0.000) | −0.000 (0.000) | 0.000 (0.000) |
| Capital (log) | −0.000 (0.000) | −0.005*** (0.002) | 0.005*** (0.001) | 0.000 (0.000) |
| COL (dummy) | 0.002 (0.002) | 0.002 (0.004) | | |
| PRI (dummy) | −0.001 (0.001) | | | |
| THK (dummy) | −0.022*** (0.001) | | | 0.005*** (0.001) |
| ROW (dummy) | −0.031*** (0.001) | | | |
| Industry dummies | x | x | x | x |
| Year dummies | x | x | x | x |
| Observations | 191415 | 36393 | 39563 | 115185 |

Notes: Standard errors in parentheses, * significant at 10%, ** significant at 5%, *** significant at 1%. Standard errors clustered at the establishment-level. Constant, year-, industry-, and regional-dummies included in all models but not reported. All coefficients are marginal effects. *ALL* stands for *all firms*, *SOE* for *state owned enterprises including COL collective enterprises*, *PRI* stands for *private enterprises*, *FOR* stands for *foreign enterprises*. *FOR* includes firms from Taiwan and Hong Kong *THK* and the rest of the world *ROW*.

to be driven by foreign firms. The coefficients reported in columns (1) and (2) are similar to the ones in columns (7) and (8). Age is insignificant in all regressions and the capital stock replicates the results we found for productivity. It is not surprising that firms with higher capital stocks are also more productive, which explains the similarities between coefficients reported in row (1) and (7).

Fractional Probit results. Table 11 reports coefficients obtained from the Fractional Probit model. Firstly, total factor productivity is insignificant. More productive firms not necessarily trade more with low income countries as far as relative trade volumes are concerned. Only more productive foreign-owned firms trade relatively more with

low-income countries. The Fractional Probit supports the negative coefficient for size. Smaller firms have a higher low-income country trade share and the magnitude of the effect is stronger in private owned firms. Age and capital coefficients are significant in the benchmark specification and the ownership dummies support the findings discussed for the Tobit results: Foreign owned firms report lower low-income trade shares.

B Detailed regression output

Table 12: Results for the benchmark regressions

| <i>Dependent variable: Total Factor Productivity</i> | | | | | |
|---|----------------------|----------------------|----------------------|----------------------|----------------------|
| <i>Reference group: Active on both high- and low-income markets</i> | | | | | |
| Model | ALL | ALL | SOE/COL | PRI | THK/FOR |
| High-income only | −0.202*** (0.005) | −0.062*** (0.005) | −0.157*** (0.011) | −0.152*** (0.008) | −0.203*** (0.007) |
| Low-income only | −0.125*** (0.016) | −0.089*** (0.015) | −0.149*** (0.028) | −0.084*** (0.023) | −0.223*** (0.028) |
| Non exporters | −0.262*** (0.005) | −0.181*** (0.007) | −0.359*** (0.010) | −0.245*** (0.007) | −0.238*** (0.008) |
| COL (dummy) | 0.336*** (0.004) | 0.001 (0.005) | 0.369*** (0.005) | | |
| PRI (dummy) | 0.227*** (0.003) | 0.022*** (0.004) | | | |
| THK (dummy) | 0.235*** (0.005) | 0.026** (0.012) | | | −0.074*** (0.006) |
| FOR (dummy) | 0.316*** (0.006) | 0.022* (0.013) | | | |
| Size (ln) | −0.033*** (0.008) | 0.004 (0.014) | 0.148*** (0.012) | −0.329*** (0.012) | −0.214*** (0.015) |
| Size (ln) ² | 0.052*** (0.001) | 0.035*** (0.002) | 0.037*** (0.001) | 0.081*** (0.001) | 0.065*** (0.001) |
| Age | −0.018*** (0.000) | 0.001* (0.000) | −0.025*** (0.001) | 0.008*** (0.001) | −0.006*** (0.001) |
| Age ² | 0.000*** (0.000) | −0.000* (0.000) | 0.000*** (0.000) | −0.000*** (0.000) | 0.000 (0.000) |
| Capital (ln) | −0.520*** (0.001) | −0.579*** (0.002) | −0.513*** (0.002) | −0.568*** (0.001) | −0.491*** (0.003) |
| Industry-FE | x | | x | x | x |
| Firm-FE | | x | | | |
| R-squared | 0.491 | 0.897 | 0.436 | 0.530 | 0.521 |
| Observations | 1150856 | 1150856 | 305081 | 638237 | 207538 |

Notes: Standard errors in parentheses, * significant at 10%, ** significant at 5%, *** significant at 1%. Standard errors clustered at the establishment-level. Constant, year-, industry-, and regional-dummies, firm-age, squared firm-age, log size, squared log size, and log capital included in all models but not reported. All coefficients are marginal effects. *ALL* stands for *all firms*, *SOE* for *state owned enterprises*, *COL* stands for *collective enterprises*, *PRIV* stands for *private enterprises*, *THK* stands for *Taiwan and Hong Kong enterprises*, *FOR* stands for *foreign enterprises*.

C Additional descriptives

The numbers about the evolution of the low income trade share over time are taken from the following graph. The blue dashed line with the highest locus in graph 5 represents the extensive margin computed as the share of exporters to low-income countries. The solid line in the middle of the graph represents the intensive margin, and the black solid line at the bottom of the graph represents the unconditional low-income country trade share. The axis associated with the extensive margin is the right axis.

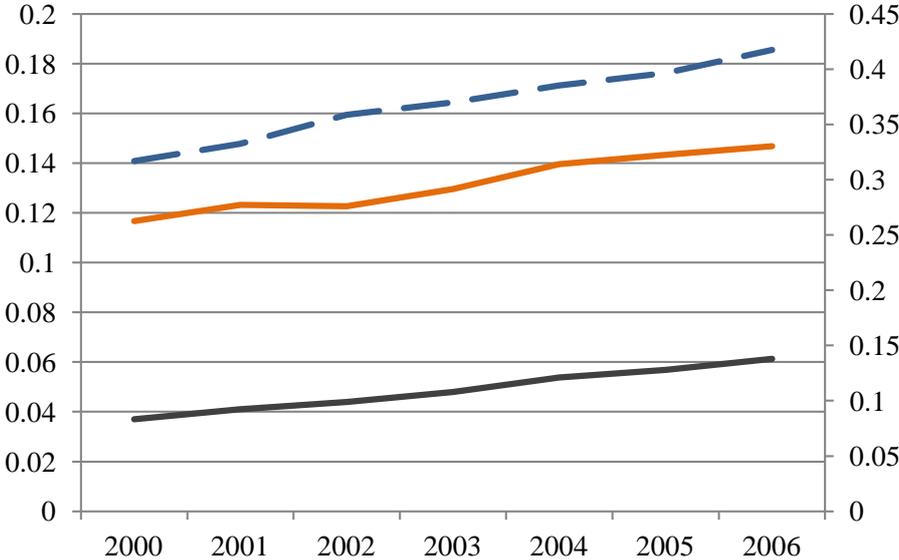


Figure 5: Relative importance of different export strategies

D Robustness checks II

The benchmark classification for our low-income country identifier was the 50th percentile of per-capita GDP. All countries with per-capita GDP below the 50th percentile were classified as *less attractive* markets. This classification implies that some less developed countries in the middle of the distribution are classified high-income. Thus, we perform further robustness checks with a higher threshold at 12.000 US dollar per-capita GDP. Thus, the low income trade-share drastically increases by more than 5 percentage points in the year 2000. However, the results hardly change compared to our benchmark results based on the 50th percentile classification discussed in the body of the paper. Regressions reported below are identical to the ones in the body of the paper but with the higher cutoff for the low-income identification. The headers indicate the respective Table in the main text. Overall, Figure 6 the number of firms that solely export to low-income countries increases in all years. Moreover, the ratio between solely export to high-income and exporting to both type of markets becomes more equal. However, the broad picture discussed in the introduction remains intact. Export to low-income countries is mostly coupled to exports to high-income countries.

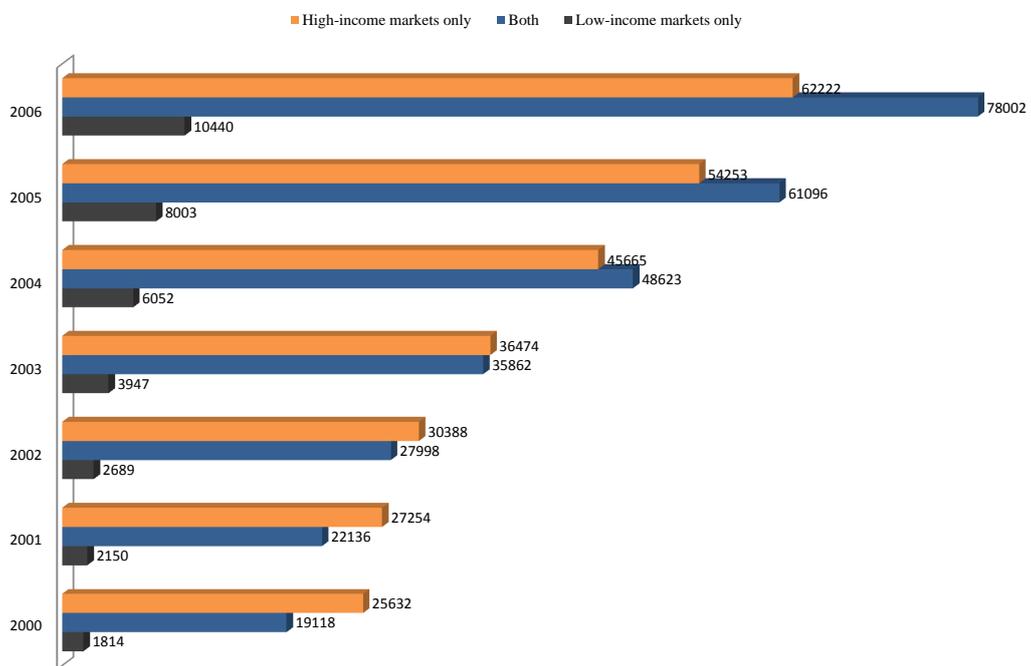


Figure 6: Different export strategies

Table 13: Robustness checks to Table 2

| <i>Dependent variable: Total Factor Productivity</i> | | | | | |
|---|----------------------|----------------------|----------------------|----------------------|----------------------|
| <i>Reference group: Active on both high- and low-income markets</i> | | | | | |
| Model | ALL | ALL | SOE | PRI | FOR |
| High-income only | −0.199*** (0.005) | −0.063*** (0.005) | −0.167*** (0.012) | −0.162*** (0.009) | −0.197*** (0.006) |
| Low-income only | −0.101*** (0.010) | −0.080*** (0.010) | −0.150*** (0.020) | −0.070*** (0.015) | −0.149*** (0.019) |
| Non exporters | −0.230*** (0.004) | −0.175*** (0.006) | −0.343*** (0.009) | −0.224*** (0.006) | −0.204*** (0.007) |
| Industry-FE | x | | x | x | x |
| Firm-FE | | x | | | |
| R-squared | 0.491 | 0.897 | 0.436 | 0.530 | 0.521 |
| Observations | 1150856 | 1150856 | 305081 | 638237 | 207538 |

Notes: Standard errors in parentheses, * significant at 10%, ** significant at 5%, *** significant at 1%. Standard errors clustered at the establishment-level. Constant, year-, industry-, and regional-dummies, firm-age, squared firm-age, log size, squared log size, and log capital included in all models but not reported. All coefficients are marginal effects. *ALL* stands for *all firms*, *SOE* for *state owned enterprises including COL collective enterprises*, *PRI* stands for *private enterprises*, *FOR* stands for *foreign enterprises*. *FOR* includes firms from Taiwan and Hong Kong THK and the rest of the world ROW. Low-income countries are all countries with less than 12000 GDP per-capita.

Table 14: Robustness checks to Table 3

| <i>Dependent variable: Total factor productivity (log)</i> | | | | |
|--|----------------------|----------------------|----------------------|----------------------|
| <i>Variable of interest: Entry into export (dummy)</i> | | | | |
| <i>Reference group: Incumbents</i> | | | | |
| | (2003) | (2006) | (2003) | (2006) |
| Entry high-income | −0.074*** (0.013) | −0.096*** (0.009) | −0.093*** (0.013) | −0.101*** (0.009) |
| Entry low-income | −0.092*** (0.027) | −0.074*** (0.019) | −0.084*** (0.026) | −0.065*** (0.019) |
| Entry both | 0.093*** (0.012) | 0.048*** (0.008) | 0.059*** (0.012) | 0.043*** (0.008) |
| Industry dummies | x | x | x | x |
| Year dummies | x | x | x | x |
| Additional controls | | | x | x |
| R-squared | 0.510 | 0.520 | 0.539 | 0.541 |
| Observations | 23221 | 44523 | 23221 | 44523 |

Notes: Standard errors in parentheses, * significant at 10%, ** significant at 5%, *** significant at 1%. Standard errors clustered at the establishment-level. Constant, year-, industry-, and regional-dummies included in all models but not reported. All reported results are marginal effects. Low-income countries are all countries with less than 12000 GDP per-capita.

Table 15: Robustness checks to Table 4

| <i>Multinomial Export-Mode</i> | | | | | | |
|---|----------------------|-----------|---------------|------------|----------------|------------|
| <i>Model: MLOGIT, reference group H</i> | | | | | | |
| | <u>Non-exporters</u> | | <u>L-mode</u> | | <u>LH-mode</u> | |
| | <i>dy/dx</i> | St. error | <i>dy/dx</i> | Std. error | <i>dy/dx</i> | Std. error |
| TFP | −0.0205*** | (0.0073) | 0.0008** | (0.0004) | 0.0238 | (0.0104) |
| Size (ln) | −0.0513** | (0.0202) | 0.0020* | (0.0011) | 0.0323 | (0.0129) |
| Age | −0.0004*** | (0.0001) | 0.0000 | (0.0000) | 0.0002 | (0.0000) |
| Capital (ln) | −0.0167*** | (0.0046) | 0.0005*** | (0.0001) | 0.0167 | (0.0063) |
| N | 191441 | | | | | |

Notes: Standard errors in parentheses, * significant at 10%, ** significant at 5%, *** significant at 1%. Standard errors clustered at the establishment-level. Constant, year-, industry-, and regional-dummies included but not reported. All coefficients are marginal effects. Reference group is export to high-income countries only *H*. *L* denotes export to low-income countries only, and *LH* denotes export to low- and high-income countries. Low-income countries are all countries with less than 12000 GDP per-capita.

Table 16: Robustness checks to Table 5

Multinomial Export-Mode, year 2003
Model: MLOGIT, reference group incumbents

| | <u>Entry into H</u> | | <u>Entry into L</u> | | <u>Entry into LH</u> | |
|--------------|---------------------|-----------|---------------------|------------|----------------------|------------|
| | <i>dy/dx</i> | St. error | <i>dy/dx</i> | Std. error | <i>dy/dx</i> | Std. error |
| TFP | −0.0362*** | (0.0037) | −0.0047*** | (0.0014) | 0.0340*** | (0.0038) |
| Size (ln) | −0.0137*** | (0.0037) | −0.0038** | (0.0015) | −0.0049 | (0.0037) |
| Age | −0.0064*** | (0.0005) | −0.0000 | (0.0001) | −0.0055*** | (0.0004) |
| Capital (ln) | −0.0212*** | (0.0029) | −0.0062*** | (0.0012) | 0.0101*** | (0.0029) |
| N | 23221 | | | | | |

Notes: Standard errors in parentheses, * significant at 10%, ** significant at 5%, *** significant at 1%. Standard errors clustered at the establishment-level. Constant, year-, industry-, and regional-dummies included but not reported. All coefficients are marginal effects. Reference group is *incumbent firms*. *H* denotes export to high-income countries only, *L* denotes export to low-income countries only, and *LH* denotes export to low- and high-income countries. Low-income countries are all countries with less than 12000 GDP per-capita.

Table 17: Robustness checks to Table 6

Multinomial Export-Mode, year 2006
Model: MLOGIT, reference group incumbents

| | <u>Entry into H</u> | | <u>Entry into L</u> | | <u>Entry into LH</u> | |
|--------------|---------------------|-----------|---------------------|------------|----------------------|------------|
| | <i>dy/dx</i> | St. error | <i>dy/dx</i> | Std. error | <i>dy/dx</i> | Std. error |
| TFP | −0.0376*** | (0.0026) | −0.0021* | (0.0012) | 0.0337*** | (0.0027) |
| Size (ln) | −0.0123*** | (0.0026) | −0.0081*** | (0.0012) | −0.0157*** | (0.0027) |
| Age | −0.0093*** | (0.0006) | 0.0000 | (0.0001) | −0.0106*** | (0.0006) |
| Capital (ln) | −0.0178*** | (0.0021) | −0.0018** | (0.0009) | 0.0191*** | (0.0021) |
| N | 44523 | | | | | |

Notes: Standard errors in parentheses, * significant at 10%, ** significant at 5%, *** significant at 1%. Standard errors clustered at the establishment-level. Constant, year-, industry-, and regional-dummies included but not reported. All coefficients are marginal effects. Reference group is export to high-income countries only *H*. *L* denotes export to low-income countries only, and *LH* denotes export to low- and high-income countries. Low-income countries are all countries with less than 12000 GDP per-capita.

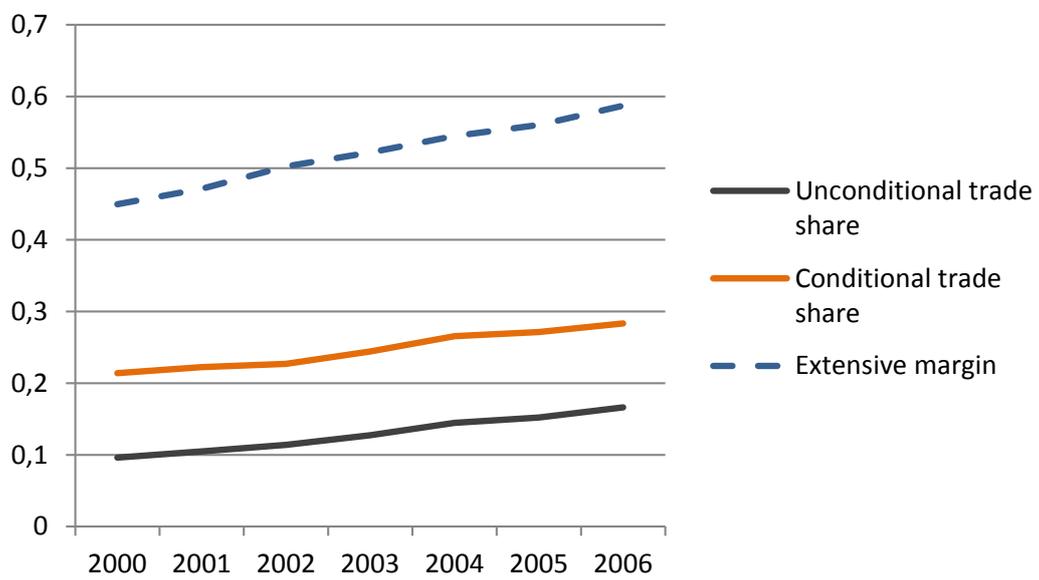


Figure 7: Export share over time