Income inequality and export prices across countries *

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Abstract

This paper provides theory and evidence on the links between income inequality within a destination country and the patterns of trade and export prices. The theoretical framework relates income inequality to product quality and prices using a simple demand composition effect. The model predicts that a more unequal income distribution in a destination country leads to higher average prices, though the effect is non-linear and disappears for rich enough countries. The predictions are tested using detailed firm-level data. Controlling for income per capita, prices are systematically higher in more unequal destinations, and the strength of this effect depends on income per capita. Results are particularly important for middle-income countries, hold only for differentiated goods and in particular for products with a high degree of vertical differentiation.

Key-words: exports prices, income inequality, product quality.
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1 Introduction

The relation between income per capita on the one hand and consumption and trade patterns on the other hand has attracted a lot of attention in the international trade literature. Virtually every empirical paper studying trade prices predicts a positive relation between a country's income per capita and average trade prices, suggesting that high-income countries consume and produce goods of higher quality.[1] Yet income per capita might not fully explain the patterns of trade and prices in some economies. Mitra and Trindade (2005) investigate the impact of income inequality on trade flows. Fajgelbaum, Grossman, and Helpman (2011) and further recent studies strongly suggest that income inequality within a country matters for trade patterns and pricing of traded goods.[2] While the effect of consumption and trade on income distribution has been widely investigated, we are interested in this reverse channel. Does income inequality within a destination matter for consumption patterns and export prices across destinations? This channel has not been given much attention in the empirical literature (which is discussed in section 2).

Understanding the above channel is important because it allows economists to better predict the patterns of trade (in terms of quality differentiation) and prices of goods, and thereby contribute to our understanding of the international ramifications from economic development. Income inequality is rising in many countries, either because the number (or wealth) of rich individuals is increasing, and/or because the poor are falling behind.[3] For instance, China has experienced a tremendous increase in per capita income over the last decades. This tends to lead to higher demand for high quality goods and thus higher prices of imported goods. Simultaneously, China's distribution of income has become much more unequal, driven in part by an increase in the number of rich individuals (Chen and Ravallion 2007). Changes in income inequality could decrease or increase product prices and demand for quality, depending on

[1] Hummels and Klenow (2005) and Hallak (2006) show that prices increase with exporter and importer income per capita, respectively, and suggest that countries with higher income produce and consume products of higher quality. Similar evidence is found at the firm-level (see Manova and Zhang (2012) and Bastos and Silva (2010)), and using a structural approach such as Hallak and Schott (2011).

[2] Fajgelbaum, Grossman, and Helpman (2011) derive conditions under which a richer, or more unequal, country has a larger demand for high quality goods. They provide a demand-based explanation for the patterns of trade in goods of different quality.

[3] Poverty has fallen since 1981 in many countries in Latin America, the Middle East and North Africa, but not enough to reduce the total number of poor (Chen and Ravallion 2007). Income inequality has also risen in most OECD countries, as shown by a recent report from OECD (2011).

how the quantity and quality in different consumption categories change with income inequality. Hence the net effect from rising income inequality is a priori unclear.

This paper provides first firm-level evidence on the links between income inequality and the patterns of trade and export prices, and identifies a theoretical mechanism behind these links, which relates income inequality to product quality and prices. We show that more income inequality in a destination country leads to higher average prices of traded goods, and, what is more surprising, that this effect is non-linear and depends on average income. To provide a theoretical framework that accounts for these non-linearities, we present a model based on a simple demand composition effect. Assuming a simple form of non-homothetic preferences, only individuals above a certain income threshold choose among a continuum of differentiated products, while very poor individuals can afford only consumption of necessities (i.e. a numeraire good). This result implies that the quality demanded is a (weakly) convex function of income and thus the distribution of income matters for the average price. Intuitively, when some individuals from the middle class become sufficiently poor (and do not buy the differentiated good) while others become rich, and thus inequality increases, only the demand of the newly rich for the differentiated good matters and thus the average price tends to go up.[4] The intuition is not generally true, however, as increases in inequality for income distributions like the lognormal distribution change not only the number of individuals at the upper end of the distribution, but also the frequency of specific incomes in a non-tivial way. Further results from the model reveal that the mechanism works only in countries with per capita income below a certain level, because richer consumers demand high quality goods whereas poor individuals can only afford consumption of the homogeneous good.

Our empirical results are based on firm-level data with information on export prices by firm, product and destination countries, which is combined with several measures of income inequality of the destination country. Our results suggest that prices are systematically higher in more unequal destinations, though this effect depends on average income and always disappears for countries exceeding a certain level of income. Additional results reinforce the quality mechanism proposed in our theoretical model.

[4]Demand for computers is a good example to illustrate this mechanism. With larger income inequality, the poorer consumers cannot afford consumption of computers, whereas a fraction of the population originally consuming lower quality can now afford consumption of the high-end computers (rich individuals), which tends to increase average prices.

First, results hold only for differentiated goods and in particular for products with high degree of differentiation (using a continuous measure of product differentiation), which supports the quality mechanism. *Second*, concerning the control variables, while results for differentiated goods may be reconciled with heterogeneous firms models with quality differentiation such as Baldwin and Harrigan (2011), results for homogeneous goods are consistent with efficiency sorting models such as Melitz (2003), which reinforce our findings. *Third*, our findings are robust to different measures of income inequality, not driven by selection into destinations and not primarily driven by markups.

Our results are always significant and in general with larger magnitudes for middle-income countries, which can be reconciled with the notion of quality consumption. Middle-income countries experienced several changes in the composition of income groups in the last years and an increase in the number of rich individuals. As discussed in Dalgin, Mitra, and Trindade (2008), when the income expansion path is curved, income distribution becomes a determinant of aggregate demand. In this case, rich individuals buy proportionately more high quality goods and are willing to pay more for high quality goods.

The use of product prices to explain consumption patterns and differences in product quality is not novel in the literature. Yet, we show for the first time empirical evidence at the firm level of the importance of income inequality within a country for trade patterns, and document a positive though non-linear relation between inequality and prices. To guide empirical work, we provide a theoretical framework with non-homothetic preferences that accounts for non-linearities. In our analysis, the main mechanism works through the demand side. However, for the empirical analysis, our data at the firm level have advantages for identification over data aggregated at the country level. Using firm-level data, we are able to track firm behavior, to use a high level of product disaggregation, and to control for any supply-side unobserved heterogeneity not related to product quality.[5] Moreover, using export data instead of import data to explain demand in the destination market has the additional advantage of relying on f.o.b. (free on board) prices. Different from c.i.f. (cost insurance and freight) prices, which contain transportation costs and several other costs not related to pro-

[5]Prices aggregated to the country level might fog important unobserved characteristics related to the firm and product that are not related to the quality of the good. Moreover, the analysis of prices across *countries* instead of across *firms* within a country may be an important source of measurement error, since quantities are collected by different customs and may be reported in different units, which is not the case of the firm-level data, subject to a unique regulatory system.

duction costs, the use of f.o.b. prices allows us to deal with several concerns regarding price measurement.

2 Related Literature

Our paper is related to a large literature on export prices and destination country characteristics. Many of these studies find a strong positive relationship between prices and the country's income per capita (Hallak 2006, 2010; Hummels and Skiba 2004; Hummels and Klenow 2005; Fieler 2012; Feenstra and Romalis 2014), and attribute higher prices to higher quality. Our findings confirm this positive correlation with income per capita and provide evidence for the role of further moments of the income distribution.

Our paper is also related to a sizable theoretical literature on non-homothetic preferences and vertical product differentiation. Flam and Helpman (1987) study consumption and trade patterns in a North-South model with vertical differentiation, in which household income maps to product quality choice. On the production side, producing higher quality requires higher costs and, on the demand side, consumers with higher income choose products with higher quality and therefore higher costs. Fajgelbaum, Grossman, and Helpman (2011) develop a model in which quality rises in income and generate home market effects that help explain why richer countries export products of higher quality. Fieler (2012) develops a Ricardian model with non-homothetic preferences and vertical differentiation. The paper shows in theory and empirics that unit prices increase with importer and exporter income per capita, even within the same commodity category. In contrast to these papers, in our framework quality starts to matter only beyond some income threshold, such that not all consumers necessarily buy from the set of differentiated goods. One exception of a paper that considers a quality consumption threshold refers to Jaimovich and Merella (2012). However, different from our framework, Jaimovich and Merella (2012) model a threshold directly in the utility function, such that quality increases utility only beyond a certain level of income. Using a Ricardian model with non-homothetic preferences, they show that trade may be a source of income divergence when non-homothetic preferences and quality ladders are jointly taken into account. Mitra and Trindade (2005) also offer a demand-side explanation for the patterns of trade using non-homothetic preferences. However, they propose a mechanism to explain the gains from trade due to specialization in consumption, not in production. Also using non-homothetic preferences, Markusen (2013) discusses home bias in consumption and the role of intra-country income distribution.

Empirically, Choi, Hummels, and Xiang (2009) examine a version of the Flam and Helpman (1987) model. They find that countries with more similar income distributions have more similar import price distributions. There are three main differences in their study in comparison to ours. First, they use world imports to investigate whether countries with *similar* income distributions have more *similar* import price distributions, while we study the direct relation between export prices and inequality of the destination country.[6] Second, the source of price variation within a destination country in Choi, Hummels, and Xiang (2009) is the sourcing country, whereas our source of variation is the sourcing firm using f.o.b. prices. Third, we investigate the effect of inequality on prices depending on the level of income, and report a non-linear effect.

On the side of the destination country, and closest to our study, Bekkers, Francois, and Manchin (2012) investigate the predictions from three different theories using the effect of income inequality on prices. They find empirical support for the hierarchic demand model and contradict the quality and ideal variety theories. As individuals become richer, more goods become indispensable, which decreases the price elasticity of these goods and raises markups. Through the reduction in the price elasticity, trade prices decrease with income inequality. These empirical results differ from models incorporating demand for quality, such as Fajgelbaum, Grossman, and Helpman (2011), who show that, under certain conditions, richer or more unequal countries have a larger demand for high quality goods.[7] As in Fajgelbaum, Grossman, and Helpman (2011), we assume a complementarity between the numeraire good and the quality of the differentiated good. However, our theoretical framework differs from theirs by allowing for the case in which the income of some consumers is too small to buy the differentiated good. Moreover, they do not investigate the effect of income inequality on export unit values, which is the core of our analysis.

Bekkers, Francois, and Manchin (2012) suggest that their results do not falsify the quality theory, but rather show that markups explain a great part of the variation

[6] Our approach allows us to control for several country, product and firm characteristics. Moreover, we are rather interested in how inequality affects price patters (not price similarity).

[7] In Fajgelbaum, Grossman, and Helpman (2011), the demand patterns translate into patterns of specialization via home-market effects. The model explains why in a richer (or more unequal) country more firms enter to produce high-quality goods, such that the number of producers predict the patterns of trade. The demand differences across countries come from differences in demand for quality.

in prices. Moreover, they also provide a quality model that relates to our theoretical mechanism. Firms may produce different quality for each income group, since there is perfect competition and no fixed production costs. They show that, for utility increasing both in quality and quantity, more inequality leads to higher prices. Hence, this result is in line with our model, although in our case not all individuals consume the differentiated good, which implies non-linearities. Also on the side of the destination country, Garcia-Marin (2014) describes consumer preferences based on an earlier version of our model (Flach and Janeba 2013) and adds a richer production side, by linking quality consumption to a monopolistic competition framework with heterogeneous firms. In Garcia-Marin (2014), the productivity threshold of firms varies across destinations and across quality segments: In a more unequal country, the ratio of firm profits is higher in the high quality segment relative to the low quality segment and the relative productivity threshold for high quality is lower. Hence, in more unequal destinations firm entry is easier in the high quality segment. However, the main results in the paper refer to within-firm quality allocation across destinations. Moreover, while the main result on the non-linear relation between inequality and quality consumption is driven by firm entry into different quality segments, what determines the actual mix of firms in each country is aggregate demand (Garcia-Marin 2014). In our theoretical framework, we show that the demand composition effect alone is enough to generate the link between inequality and prices. In this way we remain agnostic about whether results refer to within-firm effects (i.e. quality variation within a firm-product pair across destinations) and/or effects across firms (i.e. quality variation across firms and products), and investigate both channels empirically. On the side of the home country, Latzer and Mayneris (2012) study the effect of income inequality in the sourcing country on the patterns of trade and find a positive effect only for rich enough countries.

At the aggregate level for *trade flows*, Francois and Kaplan (1996) have shown that the income distribution, and in particular income inequality, has an important effect on trade flows. Dalgin, Mitra, and Trindade (2008) use a gravity approach and show that the difference in import demand for luxuries versus necessities varies with income inequality, which is in line with our empirical results using firm-level trade prices.

Concerning the literature using firm-level data, our paper is related to a rapidly growing literature on the firm-level sources of price variation across destinations (Bastos and Silva 2010; Martin 2012; Manova and Zhang 2012; Kugler and Verhoogen 2012;

Di Comite, Thisse, and Vandenbussche 2014; Chen and Juvenal 2014). Our empirical analysis confirms to a large extent the results from this literature regarding geographic variables across destinations and shows novel results for income inequality. Finally, our paper is also related to a literature suggesting within-firm adjustments in product quality and/or markups to high-income destinations (Verhoogen 2008; Brambilla, Lederman, and Porto 2012; Flach 2014; Simonovska 2015).

3 Model

We consider a small open economy with two goods, a homogeneous good and a differentiated good. The latter comes in a continuum of varieties/qualities $z \in [z^-, z^+]$, with $0 \leq z^- < z^+ < \infty$, where a higher value of z is interpreted as higher quality. We assume that prices are set in the world market. The homogeneous good is produced in the domestic economy under constant returns to scale using labor as the only input, which is the numeraire and whose price is normalized to one. To simplify matters we assume that the economy produces only the numeraire good, which is exported, and imports the differentiated good. We postulate that the supply price of the differentiated good of quality z is given by

$$p(z) = \alpha z, \ \alpha > 0. \tag{1}$$

Consistent with condition (1) is the assumption that in the rest of the world the production of one output unit of quality z requires z units of labor (which is the only input), and in addition labor and product markets are perfectly competitive. We abstract from trade costs so that $p(z)$ is the price faced by domestic consumers. Admittedly, our model is fairly stylized, as we assume fixed prices and impose a particular pattern of specialization and trade.[8] This modeling approach allows to focus on the demand side.[9]

The economy is inhabited by a continuum of individuals who share identical pref-

[8]For an analysis of a two-country trade model with endogenous prices and non-homothetic preferences see Flam and Helpman (1987).

[9]The model could be extended by introducing horizontal product differentiation in addition to the (vertical) quality dimension and assuming that goods are produced in a monopolistic competitive market environment. However, the basic mechanism underlying our final propositions remains unaffected. Hence, we focus on the demand composition effect and show that this is enough to generate the link between inequality and prices that we want to investigate.

erences but differ in their skill. The latter is described in more detail below. The population size is normalized to one. An individual has preferences over the numeraire good and the differentiated good. We assume that the individual buys either one unit of the quality differentiated good or abstains from buying. She may purchase any number of the homogeneous good. The option of not buying the quality differentiated good is a crucial feature of our model. To illustrate how the main mechanism works we postulate the following simple utility function

$$u = c(1 + z), \tag{2}$$

where c is the number of units of the homogeneous good and z is the quality of the differentiated good. By setting $z^{-} = 0$, we capture in a simple way the case of no consumption of the vertically differentiated good when $z = 0$ is chosen. The multiplicative structure displayed in (2) builds on the work by Fajgelbaum, Grossman, and Helpman (2011), who also assume complementarity between the numeraire good and the quality of the differentiated good. Our work differs from theirs by allowing for the case in which income of some consumers is too small to buy the differentiated good. This aspect is crucial for our subsequent results.

Letting y refer to income, the budget constraint of a consumer can be written as[10]

$$c + p(z) \leq y. \tag{3}$$

Conditions (2) and (3) have immediate implications. Assume for the moment that the differentiated good is purchased ($z > 0$, which we verify ex post). Since (3) is binding, we can formulate the utility maximization problem by inserting (3) into (2) and derive the first order condition for the optimal choice of quality:

$$-(1 + z)p'(z) + y - p(z) = 0. \tag{4}$$

Given the linear pricing relationship (1), the second order conditions holds, and the solution to (4) reads

$$z = \frac{y - \alpha}{2\alpha}. \tag{5}$$

Expression (5) is the correct representation of the optimal quality if income is not

[10]Note that $z = 0$ is available to consumers and that $p(0) = 0$.

less than α. The proposed quality is actually offered in the market because we assume $z^- = 0$, which implies that (5) is feasible when $y \geq \alpha$. In this case (5) indicates the global utility optimum. An individual who purchases the differentiated good ($z > 0$) pays $p(z(y)) = (y-\alpha)/2$, has private consumption $c = (y+\alpha)/2$, and therefore obtains indirect utility $v = (y+\alpha)^2/4\alpha$. The utility level is indeed higher than not purchasing the differentiated good, which is identical to buying the differentiated good with quality 0, and leads to private consumption and indirect utility $v = c = y$. Note that indirect utility is continuous at the threshold income level $y = \alpha$.

We thus summarize the optimal consumer choice of the differentiated good as follows:

$$z^* = \begin{cases} \frac{y-\alpha}{2\alpha} & \text{if } y \geq \alpha \\ \\ 0 & \text{if } y < \alpha. \end{cases} \tag{6}$$

Condition (6) implies that the relationship between demand for quality and income is (weakly) convex.

The production of the numeraire good is using labor as only input and exhibits constant returns to scale. This implies that the wage per unit of labor is unity. Individuals differ in their skill level which is described in effective units of labor. The combination of fixed skill levels, exogenous labor supply and unit wages allows us to move directly to the income distribution. We use the notation $F(y)$ for the cumulative income distribution function, for $y \in [\underline{y}, \overline{y}]$, and $f(y)$ as its density.

We now want to analyze the relationship between the income distribution and the average price of the (imported) differentiated good. Let Y be the average (and total) income, and Y_α be the average income of all individuals above the threshold α (i.e., the truncated income distribution). Assuming $\alpha < \overline{y}$, so that at least some individuals buy the differentiated good, the average price of the imported differentiated good is

$$P = \frac{\int_{\max\{\alpha, \underline{y}\}}^{\overline{y}} p(z^*(y)) \cdot f(y) dy}{1 - F(\alpha)} = \begin{cases} \frac{Y_\alpha - \alpha}{2} & \text{if } \alpha > \underline{y} \\ \\ \frac{Y - \alpha}{2} & \text{if } \alpha \leq \underline{y}. \end{cases} \tag{7}$$

Condition (7) makes clear that the average import price of the differentiated good is higher the larger the average income of those who buy the differentiated good.

Our interest lies in relating income inequality, which empirically is often measured by the Gini coefficient, to the average import price. If we knew Y_α for each product, we could proceed directly. However, the threshold is not observable at the product level. Our goal is therefore to relate the distribution of income to the average import price without knowledge of the threshold. Still, we argue below that society's average income is an important parameter that determines whether all, some or no individuals are below the threshold.

Consider first the two extreme cases in which either all individuals in a society are below the threshold, that is $\alpha > \overline{y}$, or all individuals are above the threshold, i.e., $\alpha < \underline{y}$. In the former case, our model has nothing interesting to say. In fact, there is no trade because individuals are too poor to buy the differentiated good. By contrast, in the second case all individuals consume the differentiated good (and thus trade occurs). We think about the latter situation as a rich country where average income is high and individuals regularly consume sophisticated products. Condition (7) implies immediately the following result.

Proposition 1. *Consider a rich country where all individuals buy the differentiated good ($\underline{y} > \alpha$). The average import price of the differentiated good is the same for any income distribution $f(y)$ with a given mean income Y.*

Under the assumption of Proposition 1 the relationship $Y = Y_\alpha$ holds and therefore the average price is unaffected by the distribution of incomes, according to (7). This result becomes also clear from inspection of (6), which makes quality demanded a (weakly) convex function of income. If every individual is above the threshold, the relationship between z and y is linear. Hence, for a given average income level the distribution of income and therefore income inequality is immaterial. The convexity arising from the option to not purchasing the differentiated good is the key factor in our model and differentiates it from the rest of the literature.[11]

Proposition 1 makes clear that if income inequality matters for prices it must be because some individuals do not buy the differentiated good. We show in a first step that the average import price is affected when some consumers do not buy the differentiated good, and that this feature tends to raise the price. Specifically, consider two income distributions $F^i(y)$, $i = 1, 2$, with the same mean income $Y^1 = Y^2$, which differ

[11]For example, in Flam and Helpman (1987) the demand for quality is concave in income, given the specification of preferences and technology. Consumers always consume the differentiated good and the focus is on the pattern of specialization across countries.

in terms of the range of actual incomes at the lower end so that $\underline{y}^1 < \alpha < \underline{y}^2$. Society 2 thus mirrors a country whose income distribution fits with the setup in Proposition 1. It is straigtforward to show that society 1 has the higher import price of the differentiated good.[12] This result does not relate directly to income inequality, but rather shows a link between the average price and the presence of individuals who do not purchase the differentiated good.

We now proceed in a second step and look at the effect of income inequality more specifically and concentrate on the case when societies have some but not all individuals with incomes below the threshold, consistent with society 1 just considered. We set the stage with a simple example which suggests that larger income inequality (measured by the variance of incomes or the Gini coefficient) goes hand in hand with a higher average import price.

Example 1. Consider two different income distributions, $i = 1, 2$, with uniform density $f^i(y) = (\overline{y}^i - \underline{y}^i)^{-1}$, which differ in the maximum and minimum income but share the same average income Y. Both distributions satisfy the condition $\underline{y}^i < \alpha < \overline{y}^i$. Using (7), average income above the threshold α is given by

$$Y^i_\alpha = \frac{\overline{y}^i + \alpha}{2},$$

and thus determines average price. Comparing Y^1_α and Y^2_α, the situation with more unequal incomes (due to the more extreme values of the maximum and minimum income) translates into higher average income above the threshold and thus has the higher average price. The result goes through if we measure inequality not by the variance but by the Gini coefficient, which for the uniform density of incomes is given by $\frac{(\overline{y}^i - \underline{y}^i)}{3(\overline{y}^i + \underline{y}^i)}$.

Example 1, while simple and intuitive, is special because the uniform density assumption is restrictive. The next result shows that the positive link between income inequality and average import price extends *grosso modo* to two commonly used (in-

[12]Using (7), the average price under the first distribution is higher than under the second one ($P^1 > P^2$) when $Y^1_\alpha > Y^2 = Y$. To see this, we start with the observation that $Y > Y^1_{\alpha^-}$,where $Y^1_{\alpha^-} = \int_{\underline{y}^1}^{\alpha} y f^1(y)dy/F^1(\alpha)$ is the average income of individuals below the threshold under distribution 1. The inequality must hold because by assumption $Y = Y^2 = Y^1$ and all individuals under distribution 2 are above the threshold. Using the observation and the definition of $Y^1_{\alpha^-}$ we obtain that $Y > Y^1_{\alpha^-}$ which is equivalent to $-F^1(\alpha)Y^1_{\alpha^-} > -F^1(\alpha)Y$ and thus via $Y - \int_{\underline{y}^1}^{\alpha} y \cdot f^1(y)dy > Y(1 - F^1(\alpha))$ also to $Y^1_\alpha = (1 - F^1(\alpha))^{-1} \int_{\alpha}^{\overline{y}^1} y \cdot f^1(y)dy > Y = Y^2$.

come) distribution functions, namely the Pareto and lognormal distribution.

Consider first the Pareto distribution for which the cumulative distribution function can be written

$$F(y) = 1 - \left(\underline{y}/y\right)^k, \text{ for } y \geq \underline{y}, \tag{8}$$

and zero else, where $\underline{y}$ is the minimum income level (the scale or location parameter) and $k > 1$ is the shape parameter. For this distribution the mean income is given by

$$Y = \frac{k\underline{y}}{k-1} \tag{9}$$

and inequality measured by the Gini coefficient is[13]

$$G = \frac{1}{2k-1}. \tag{10}$$

We can now state the following result.

Proposition 2a. *Consider two income distributions ($i = 1, 2$) that are Pareto distributed with the same mean income $Y^1 = Y^2$, but with different scale $\underline{y}^i$ and shape parameters k^i. Assume furthermore that for both distributions the condition $\underline{y}^i < \alpha < \overline{y}^i$ holds. The society with the more unequal income distribution measured by the Gini coefficient has the higher average import price.*

Proof: Given (9) the equal means condition requires

$$Y^1 = \frac{k^1\underline{y}^1}{k^1 - 1} = Y^2 = \frac{k^2\underline{y}^2}{k^2 - 1} = Y,$$

which removes one degree of freedom in choosing the four parameter values $\{k^1, k^2, \underline{y}^1, \underline{y}^2\}$. Hence, we are free to choose the shape parameters k^i when one of the location parameters is endogenous to satisfy the equal means condition.

From the definition of the Gini coefficient (10) it is clear that the distribution with the lower level of k is the more unequal one. In order to link inequality to average price we now need to consider the truncated income distribution, where the cutoff is α. A well known feature of the Pareto distribution is that the truncated distribution is also

[13] See, for example, Lubrano (2013).

Pareto distributed. The mean income of the truncated distribution is

$$Y_\alpha^i = \frac{k^i \alpha}{k^i - 1}. \tag{11}$$

Hence the distribution with the lower level of k has the higher average income level above the threshold and thus the higher average price. To finalize the proof we need to relate to the Gini coefficient of the truncated income distribution. Theorem 3 of Ord, Patil, and Taillie (1983) proves that the Gini coefficient of the Pareto distribution is invariant to any truncation from the left. Hence, we may conclude that the distribution with more unequal incomes in the original distribution is also the one which is more unequal under truncation with threshold α. This completes the proof.

Proposition 2a is a powerful result in so far as it links the inequality measure of the original income distribution to the average income of the truncated distribution. Theorem 3 of Ord, Patil, and Taillie (1983) establishes the crucial step for the proof. Unfortunately, the same theorem shows as well that the invariance result holds only for the Pareto distribution.[14] The Pareto distribution underlying Proposition 2a carries a special implication. Condition (11) shows that the mean income of the truncated distribution is independent of the average income of the original distribution, and depends only on the threshold parameter and the shape parameter. This implies that the average price of the imported good should not differ across countries with different average incomes (for given threshold and inequality levels). In the empirical analysis, when we investigate asymmetries across countries with different average income in Table 7, the results for income per capita are not significant. However, when we investigate the effect for the whole distribution of countries (see Tables 3 and 4) without accounting for the asymmetric effects that we expect from our model, we find a positive and significant effect of income per capita on prices.[15]

[14]We like to emphasize the role played by the assumption that under both income distributions some individuals have incomes below the consumption threshold α. In this case the ranking of the average import price (P^1 vs. P^2) is related to the ranking of average incomes above the threshold (Y_α^1 vs. Y_α^2). Because the latter depend only on the *common* threshold α and the shape parameters k^1 and k^2, we can link the ranking of average incomes above α directly to the ranking of the Gini coefficients (G^1 vs. G^2), which depend only on k^i. By contrast, if only one income distribution has individuals below the threshold, we cannot link unambiguously the ranking of average incomes above the threshold to the shape parameters k^i because now the thresholds differ across income distributions (α vs. $\underline{y}$). Hence, the chain of proof is interrupted.

[15]This significant result is in accordance with previous empirical results from the literature on trade prices and product quality (see related literature in section 2).

The special implication of the Pareto distribution makes it desirable to check the robustness of the link between inequality and average price. The strong invariance result used in the proof of Prop. 2a, which holds only for the Pareto distribution, makes clear that we cannot hope to show the same result without imposing another restriction. We now prove a comparable result for the lognormal distribution (with an additional assumption), which is often used to describe real income distributions with a small number of parameters. Let income y be lognormally distributed with parameters μ and σ. The density of the lognormal distribution is $f(y) = \frac{1}{\sigma y\sqrt{2\pi}} e^{-0.5\left(\frac{\ln y-\mu}{\sigma}\right)^2}$ for $y > 0$, $\sigma > 0$, and the mean (expected) income is given by

$$Y = e^{\left(\mu+\frac{\sigma^2}{2}\right)}. \tag{12}$$

As for the Pareto distribution, we will need the average income of the truncated distribution. Head (2013) and Söderlind (2013) provide formulas for the mean income of a truncated lognormal distribution (here with threshold α):

$$E[y\,|y > \alpha] = E[y]\frac{\Phi(\sigma - a_0)}{\Phi(-a_0)}, \text{ where } a_0 = \frac{\ln\alpha - \mu}{\sigma}. \tag{13}$$

where Φ is the cumulative density function of the standard normal distribution. In contrast to the Pareto distribution, the average income of the truncated distribution depends on the average income of the original distribution, which is in line with our general empirical findings (Tables 3 and 4) and the previous empirical literature (see related literature in section 2). Inequality is measured by the Gini coefficient, which for the lognormal distribution is given by

$$G = 2\Phi(\sigma/\sqrt{2}) - 1, \tag{14}$$

The Gini coefficient depends positively on the parameter σ. Therefore inequality rises with an increase in σ.

Proposition 2b. Let income be lognormally distributed with parameters μ and $\sigma > 0$ such that some but not all individuals buy the differentiated goods ($\underline{y} < \alpha < \overline{y}$). For given average income an increase in σ that raises inequality measured by the Gini coefficient leads to a higher average import price of the differentiated good if $\mu > \ln\alpha$.

Proof: As shown in equation (7), the average import price depends on the average income of all individuals with income above the threshold α. Holding average income constant it must be true that $\mu + \sigma^2/2 = const. = k$. Denoting the pdf of the standard normal distribution by ϕ, we differentiate (13) to obtain

$$\begin{aligned} \frac{dE[y\,|y>\alpha]}{d\sigma} &= \frac{E[y]}{\Phi(-a_0)^2}\left[\phi(\sigma-a_0)\Phi(-a_0)\frac{d(\sigma-a_0)}{d\sigma} - \phi(-a_0)\Phi(\sigma-a_0)\frac{d(-a_0)}{d\sigma}\right] \\ &= E[y\,|y>\alpha]\cdot\left[\frac{\phi(\sigma-a_0)}{\Phi(\sigma-a_0)}\frac{d(\sigma-a_0)}{d\sigma} - \frac{\phi(-a_0)}{\Phi(-a_0)}\frac{d(-a_0)}{d\sigma}\right]. \end{aligned} \tag{15}$$

The sign of (15) follows the sign of the large square bracket. We approach the problem in steps by first analyzing the two derivatives in the bracketed term and then the ratios of density functions. Together the two steps imply that (15) is positive.

We first note that the term a_0 in (13) can be expressed as function of σ only when the equal means condition is imposed: $\mu(\sigma) = k - \sigma^2/2$. With this in mind we can write and sign the derivatives in (15) as follows:[16]

$$0 > \frac{d(\sigma-a_0)}{d\sigma} = \frac{\ln\alpha-\mu}{\sigma^2} > \frac{\ln\alpha-\mu}{\sigma^2} - 1 = \frac{d(-a_0)}{d\sigma}. \tag{16}$$

The first inquality follows from the assumption $\mu > \ln\alpha$. Both derivatives are negative, but the first one in (16) less so than the second.

Next we consider the ratio of the pdf and cdf of the standard normal distribution $\phi(w)/\Phi(w) > 0$, which can be understood as a (modified) hazard rate. The hazard rate is declining in w if the pdf is declining in w, that is $\phi' < 0$. This property holds in the case of a standard normal function when $w > 0$. Moreover, the sufficient condition stated in the Proposition implies $0 < -a_0 < \sigma - a_0$. Combining the two statements we conclude that

$$\frac{\phi(\sigma-a_0)}{\Phi(\sigma-a_0)} < \frac{\phi(-a_0)}{\Phi(-a_0)} \tag{17}$$

must hold.

Inequalities (16) and (17) now imply that the large square bracket in (15) is positive. This concludes the proof.

The strength of Proposition 2b clearly depends on the assumption $\mu > \ln\alpha$, which guarantees that $\Phi(\sigma - a_0)$ is rising in σ. The stated condition is a relatively weak sufficient condition, because even with $\Phi(\sigma - a_0)$ falling in σ the truncated mean could

[16]Note that $\frac{d(\sigma-a_0)}{d\sigma} = 1 + \frac{d(-a_0)}{d\sigma}$ and $\frac{d(-a_0)}{d\sigma} = \frac{\ln\alpha-\mu}{\sigma^2} - 1$.

be increasing, if the slope of $\Phi(\sigma - a_0)$ is not too negative. It is difficult to evaluate the realism of this assumption, mainly because the parameter α is not directly observable. Bandourian et al. (2002) provide estimates for the parameter values of a lognormal income distribution for several countries and selected years from the 1960s to 2000s (with most estimates for the 1980s and 90s). For most (industrialized) countries and most periods μ is estimated to be between 8 and 12. Only for few poorer countries such as Mexico (in the mid 1980s) and Slovakia (in the early 1990s) estimated values go down to close to 6 and up to 7. Later estimates for Mexico put the number in the range of 9 to 10 as well. These estimates are roughly in line with those we obtain from the income data we use further below.

Estimating the threshold α for buying differentiated goods is less straightforward. The theoretical model captures the purchase of one unit of one differentiated good, whereas in reality households may buy multiple units of many differentiated goods. Perhaps one way to think about the issue though is to consider the income necessary to get out of poverty, which according to conventional measures of absolute poverty lies at incomes of around 2$ per day and person. It we interpret α then as this threshold and therefore assume that it takes about an annual income of 1,000 US dollars to buy some sophisticated goods beyond necessities we obtain $\ln 1000 \approx 6.9$. Going to a somewhat higher income level, an annual income of $2,635 (which is the threshold between poor and middle income countries in our data set) we obtain $\ln 2635 \approx 7.9$. Of course, these are crude approximations that should be taken with great care, but indicate that the assumption in Prop. 2b is not completely unrealistic.

To conclude, we think that Propositions 2a and 2b are particularly relevant for middle income countries who experience an increase in inequality when average income is high enough so that many but not all households have means to spend on sophisticated consumption goods beyond basic food and shelter.

4 Data and descriptive statistics

We now turn to the empirical analysis in which we study the link between inequality in destinations countries and the prices of Brazilian exports into these countries.

4.1 Brazilian firm-level data

We use firm-level data for Brazilian manufacturing exporters collected by the Foreign Trade Secretariat (SECEX) to relate product prices to income inequality. The data contains export values ($Value_{fcg}$) and export quantities ($Quant_{fcg}$) by firm (f), product (g) and destination country (c), which we use to calculate average prices ($Price_{fcg} = \frac{Value_{fcg}}{Quant_{fcg}}$). The precise steps to build the SECEX export data are described in the Appendix.

One important feature of the data is to be uniformly reported in U.S. dollars free on board (f.o.b.) across all destination countries, which enables a cross-country comparison of unit values. As we show in Table A2, within the product categories available in the data (8-digit products), there is large scope for quality differentiation. For instance, within the 8-digit product 63090010 (Articles for apparel) there are men/women/children overcoats, capes, windcheaters, dresses, trousers and many others. Thus, f.o.b. prices within firms across destinations may well reflect differences in product quality, as reported by Verhoogen (2008) and Flach (2014).

Firm-level 8-digit products are classified according to the Rauch (1999) (discrete measure) and the Khandelwal (2010) (continuous measure) classification of goods.

Table 1 shows the variation in prices ($Price_{fcg}$) in terms of standard deviations across destinations and across firms. The standard deviation of log prices across destinations is on average 0.10 for a firm-product pair (fg). Across firms this variation is much larger (0.21), in accordance with the literature on firm heterogeneity discussed in section 2. Moreover, the price variation comes mostly from differentiated goods.[17]

4.2 Country-level variables and world trade data

Income inequality data: Data on income inequality comes from the UNO-WIDER.[18] The main variable of interest is the Gini coefficient, $Gini_c$, measured on a scale of 0 to 100. Additional measures used in the paper include deciles and decile ratios of the income distribution. For the purposes of our study, information on disposable income was preferred, when available (according to a recent study by Aguiar and Bils

[17]Values in Table 1 are smaller than the ones reported in Manova and Zhang (2012), respectively, 0.46 and 0.90 for the variation across destinations and across firms.

[18]United Nations World Institute for Development Economics Research. The data is available at http://www.wider.unu.edu/research/Database/en_GB/wiid/.

(2011), consumption inequality has largely tracked income inequality in the last years). Detailed information on the construction of the index is available in the Data Appendix.

Further control variables: Import demand elasticities ($Sigma_{c,s}$) at the 3-digit HS are estimated for 73 countries by Broda, Greenfield, and Weinstein (2006). Distance to Brazil, $Dist_c$, comes from the CEPII - Centre d'Etudes Prospectives et d'Informations Internationales. Data on bilateral imports and exports by SITC2 sector (s) come from NBER-UN yearly bilateral trade data, documented by Feenstra, Lipsey, Deng, Ma, and Mo (2005).[19] Using trade data, we calculate different measures of market power of Brazilian firms in every destination country. Data on GDP per capita ($CGDP_c$) comes from the Penn World Table.[20] Variables are described in Table A1. The main explanatory variables are summarized in Table 2, where countries are divided according to the tertile of the income distribution.

Figure 1 shows the correlation between income per capita and the Gini coefficient. One could cast doubt on the explanatory power of the second moment of the income distribution (if the correlation with income per capita is high, $Gini_c$ does not provide much additional information). However, as shown in Figure 1, the correlation between the Gini coefficient and the income per capita is -0.193 for rich countries, and 0.149 for poor countries. This result is not surprising: according to the Kuznets curve (Kuznets 1955), there is a natural cycle of inequality and income per capita, leading to an inverted u-shaped curve (with Gini on the Y-axis and income per capita on the X-axis).

5 Empirical Analysis

This section presents the empirical strategy and the main results following the predictions from the theoretical model. First we show results for all countries. Then we evaluate asymmetries across destination countries. Results are reported for products with different degrees of differentiation, within and across firms.

[19]The NBER-UN data uses the Standard International Trade Classification (SITC 2 - Division), 4 digits.

[20]PWT version 6.2, which uses the year 2000 (the same year of the firm-level data) as the base year.

5.1 Effect of inequality on prices: Homogeneous versus differentiated goods

Propositions 1 and 2 from the theoretical model suggest that prices increase in income inequality, though the effect disappears for rich enough countries. We first investigate the effect for all countries, when there are individuals above and below the income threshold, and in the next section we show evidence of asymmetries across countries depending on income per capita. The results are reported within and across firms, for homogeneous and differentiated goods. Since homogeneous goods do not have scope for quality differentiation, we do not expect significant results for this type of goods.

We start by investigating the effect across firms, using prices in country c for good g weighted by firm sales, $price_{cg}$.[21] Using this measure of prices, we estimate the following specification

$$log(price_{cg}) = \alpha + \beta Inequality_c + \gamma \mathbf{X}_{cg} + \delta_g + \epsilon_{cg}, \tag{18}$$

where $\mathbf{X}_{cg}$ is a vector of control variables described in Table A1, including the first moment of the income distribution ($CGDP_c$), ϵ_{cg} is an error term and δ_g are product fixed effects that control for systematic product differences. Errors are clustered at the country level.

$Inequality_c$ is our measure of income inequality. In the benchmark results, we use the Gini coefficient ($Gini_c$), the most commonly used measure in economic research and the most comprehensive one. Results using further measures of income distribution are shown in section 5.4.

Table 3 shows results for equation 18 for differentiated goods. Results for β are positive and significant for all specifications in columns (1) to (6). In our benchmark specification in column (2), the magnitude of the Gini coefficient means that 1 percentage point increase in income inequality leads to an increase in prices of differentiated goods by 1 percent. This means that, if we move Gini from a country such as Canada to the US (both similar in income per capita but with roughly 10 percentage points difference in Gini), average export prices increase by roughly 10%.

[21] We use prices weighted by sales as unweighted prices may give a relatively high weight to small firms. In results available upon request, we estimate the empirical specification in equation 18 using unweighted prices defined as $price_{cg} = \frac{\sum_f price_{fcg}}{N_{cg}}$, where N_{cg} is the number of firms selling product g in country c and $price_{cg}$ is the average price paid in country c for good g. In this case, the inequality effect is significant but smaller in magnitudes.

Results remain significant when adding control variables. Crucially, the sign of the coefficients of control variables are in accordance with the literature on firm heterogeneity and product quality. The interpretation is provided later in this section.[22]

We are also interested in the price variation within the firm across destinations. Therefore, we estimate the following specification:

$$log(price_{cgf}) = \alpha + \beta Inequality_c + \gamma \mathbf{X}_{cg} + \delta_{gf} + \epsilon_{cgf}, \tag{19}$$

where δ_{gf} are firm-product fixed effects, with errors clustered at the country level.

The results are shown in Table 4 for differentiated goods. Also within firms, β is positive and significant in all specifications, although the results are smaller in magnitudes in comparison to the results reported in Table 3. In the benchmark specification from column (2) in Tables 3 and 4, a comparison of β's reveals that the effect within firms (0.44%) is much smaller than the effect across firms (1%). Although a comparison of magnitudes of the two results is not straightforward, we note that the results shown in Table 4 include firm-product fixed effects, which implies that all price variation in this case comes from adjustments in quality within a firm-product pair across destinations, whereas the results at the product-country level include only product fixed effects. Hence, in the results at the product level the price variation could come from quality adjustments within and across firms. In this sense, without accounting for firm selection (which is discussed in Appendix A5), one could argue that quality adjustments within the firm are likely smaller than the adjustments across firms.[23]

Although the channel we propose in the theory is product quality, results may also suggest markup adjustments across destinations. We discuss markups in a later section. Crucially, quality variation is high even within an 8-digit product (our unit of variation). One 8-digit product is, for instance, a leather shoe covering the ankle. Wihin this category, firms may choose for instance among inputs with varying degrees of quality depending on the production line. The literature on within-firm adjustment has reported substantial product quality variation within the firm.[24]

Control variables: Results for inequality in Tables 3 and 4 are consistent with

[22] Besides the control variables reported in Table 3, we also investigate further control variables such as governance indicators and the level of corruption in the destination country, since higher prices could reflect a premium for risky exports. Results remain significant when adding further control variables.

[23] The results including firm-product fixed effects can also be reconciled with the results from Garcia-Marin (2014) on the share of firm sales in the high/low quality segment across destinations.

[24] For instance, Verhoogen (2008) and Brambilla, Lederman, and Porto (2012).

the mechanism from our theoretical model when there are individuals above and below the income threshold. Results for the control variables are in accordance with the predictions from the literature on product quality. Our results for distance ($Dist_c$) suggest that, with per unit transaction costs, the relative price of the high quality products increases with distance (Alchian and Allen 1964). Thus, the highest quality is shipped to more distant countries.[25] The prediction for market size (GDP_c) may be related to the toughness of the market: as the market grows, competition gets tougher and leads to lower prices.[26]

Markups are discussed in more detail in a later section. However, by adding further control variables, we already notice that the predicted income effect for differentiated goods can not be explained only by higher markups because of greater market power, since $Mktshare_{fc}$ and $Mktshare_{fcg}$ (in columns (3) and (4)) control for the firm's market share in each country, as also discussed in Manova and Zhang (2012). To minimize concerns with the correlation between market share and prices, we use alternative measures to control for market power, based on the NBER-UN Data. The coefficient for income inequality remains significant in all specifications. Moreover, results are also robust controlling for the number of firms present in each market, reported in column (6), and for the *elasticity of substitution* measured by Broda, Greenfield, and Weinstein (2006), shown in column (7).

Homogeneous goods: As a first falsification exercise to our results, we investigate the effect of inequality on prices for homogeneous goods. Since these goods do not have scope for quality differentiation, we do not expect a correlation between *prices* and inequality. Results in Table 5 show that this is the case.[27] Crucially, for the main control variables, the signs of the coefficients are in accordance with efficiency sorting models such as Melitz (2003) and the *opposite* when compared to results for differentiated goods (which follow a quality sorting pattern). For the control variable $Dist_c$, higher distance implies lower prices. Following the interpretation from efficiency sorting models, only the most productive firms make it to export to distant markets.

[25] In the literature on firm heterogeneity with product quality, more productive firms sell higher quality at higher prices, and only those firms are able to reach more distant destinations (see, for instance, Baldwin and Harrigan (2011)).

[26] Firms may also adjust markups: Heterogeneous firms models with linear demand, such as Melitz and Ottaviano (2008), predict that markups decrease as the market sizes increases, since competition gets tougher.

[27] The fact that our results hold only for differentiated goods and that non-differentiated goods follow a different pattern may be also explained by a cost-competence versus quality-competence model, discussed in Eckel, Iacovone, Javorcik, and Neary (2015).

Since more productive firms have lower marginal costs for their non vertically differentiated products, they charge lower prices. For GDP_c, when market size grows, average efficiency of firms present in the market decreases and therefore average marginal costs increase, leading to a positive correlation between size and prices.

Concerning the consumption of the homogeneous good, our model features a complementarity between the quantity of the homogeneous good and the quality of the differentiated good. This complementarity is also present in the data, with a positive and significant correlation (0.048) between the average price of the imported product (by country) and the import quantity of the homogeneous good (by country and 1000 inhabitants).

5.2 Is the effect asymmetric across groups of countries?

According to Proposition 1, in rich countries where all individuals consume the differentiated good, prices are invariant to changes in inequality. Therefore, we expect the effect of inequality to disappear for these countries. To investigate asymmetries across countries, we divide the destination countries according to the tertiles, quintiles and deciles of income per capita.

First, we discuss the results across the deciles of income per capita. In this case, we estimate the effect for the full sample adding decile dummies interacted with Gini. The results reported in Table 7 for the deciles reveal that the inequality effect is positive and significant, but disappears for richer countries (in the ninth and tenth deciles), in accordance with our theoretical model.[28] Hence, with exception of the first decile (which is discussed later in more detail), the results are in general in accordance with the theoretical predictions. Concerning the magnitudes, there is no clear direction for the effect across deciles, although results reported in columns (1) and (2) reveal a larger magnitude for countries in the fifth to seventh deciles.

The second way we investigate asymmetries across countries is by dividing countries in 3 samples corresponding to the tertiles of income per capita. The results are reported in Table 6 and fit well our theoretical model with exception of the first tertile. A further exercise using quintiles of the distribution, available upon request, reveals that the results fit well our theoretical model with exception of the first quintile.

[28] In results available upon request, we conduct the same exercise for the full sample using dummies for the tertiles of income instead of deciles. In this case, the effect disappears for the third tertile, as suggested by the theory. For the first tertile results are significant at the 1 percent level.

Note that our model predicts that poor individuals can only afford consumption of the homogeneous good. Hence, the fact that the results are not significant for the first decile/quintile/tertile may be a consequence of this particular feature of the model, as countries in the first tertile are extremely poor countries, with average annual income of 2,365 dollars.[29] The results may also be a consequence of the correlation in the data: from Figure 1, we note that the correlation between the Gini coefficient and income per capita is positive and statistically significant for the first tertile, such that the Gini coefficient does not add much additional variation in this case, when controlling for income per capita. Crucially, if we conduct the same exercise of Table 6 without income per capita, the effect of inequality on prices becomes significant for the first and second tertiles, whereas the effect for the third tertile remains not significant. Finally, one could also argue that the fact that the results are not significant might be driven by the sensitivity of the Gini to transfers in the middle range of the distribution, which affects the notion of inequality we want to investigate. For the first tertile, once we use poverty rates instead of Gini, we find that the effect of poverty on inequality is significant for the first tertile, as suggested by our model (see results in Table 6).

In the results from Table 6, the effect of inequality on prices is driven by middle income countries. The fact that our results are particularly large and significant for middle-income economies is not surprising. Many middle-income economies experienced a sharp increase in the number of upper middle class and rich individuals. With curved income-expansion paths, the *new rich* will buy proportionately more high quality goods. Moreover, firms may charge even higher markups for these goods: As individuals get wealthier, they tend to devote a higher share of income to brands, luxury, and positional goods, and will be willing to pay higher prices. However, note that our model does not account for markup adjustments and for these particularly large effects for middle-income countries. For an overview on models that account for markup variations across destination countries, see for instance Simonovska (2015) and the ideal variety model in Bekkers, Francois, and Manchin (2012). Concerning the relation between income inequality within a country and prices, the ideal variety model in Bekkers, Francois, and Manchin (2012) shows that an increase in the mean-preserving spread in income (measured by the Atkinson index) reduces the overall price elasticity

[29]However, note that this fact cannot fully explain the results. If no consumers can afford consumption of the differentiated good, then no trade should be observed, which is not the case.

and increases prices in a country.

In rich countries, increases in inequality are mostly driven by the rise in income of the 20% wealthiest (i.e., the rich individuals are getting richer). According to OECD (2011), while real disposable income increased in most OECD countries, the majority of the increase is due to rich individuals, for which income grew faster, therefore widening income inequality.[30]

Poverty results: When we present example 1 and proposition 1 in the theory, we discuss a link between prices and the threshold α, which can be interpreted as the poverty rate in a country. To provide more direct evidence for this result, we use information on the share of the population below the poverty line. We collect poverty data from the World Bank on the poverty headcount ratio at 1.25 a day[31], which measures the percentage of the population living on less than 1.25 a day at 2005 international prices. Results reported in Table 6 show that poverty is positively associated with higher prices, but only for poor and middle-income countries. For rich countries the relation is not significant, in accordance with our theory.[32]

5.3 Effect across products using a continuous measure of product differentiation

We have shown that our results for the first and second moment of the income distribution hold only for differentiated goods. However, the Rauch (1999) classification may be restrictive, and therefore we extend the analysis using a continuous measure of product differentiation. Moreover, the continuous measure is also more closely related to our theoretical framework.

We use the measure of differentiation estimated by Khandelwal (2010). The measure characterizes industries according to the product markets' scope for quality differentiation (*Ladders*), and is constructed by evaluating changes in prices conditional on market shares: A product is classified as more differentiated if the firm can increase

[30]The increase in wealth without an increase in the number of rich individuals in rich countries may be a further reason why we do not find any effect for rich countries, since wealthy individuals are already consumers of high quality products.

[31]Source: `http://data.worldbank.org/topic/poverty`.

[32]Summary statistics for the poverty headcount ratio data follows: Mean value 7.318, standard deviation 9.602, minimum value 0 and maximum value 84.23. Note that we do not have the same number of observations in comparison to results reported for Gini. The reason is that poverty data is not available for some countries in our sample and the sample is restricted to 66,889 observations.

prices without losing market shares. We classify industries as long and short quality ladders, i.e., with long and short scope for quality differentiation. We expect the effect of $Gini_c$ on prices to be magnified for sectors classified as high quality ladders, since for these sectors firms can more easily adjust quality.

The results are shown in Table 8. The interaction term $Gini_c * Ladders$ reveals that the effect of income inequality on prices is captured by sectors with high scope for quality differentiation. This result provides further support for the quality hypothesis: For long quality ladders, prices are higher in more unequal destinations.

5.4 Further measures of inequality:

The $Gini_c$ coefficient, the most commonly used measure in economic research and the most comprehensive one, has several advantages. In particular, it can be easily compared across countries, which is the purpose of this paper, and easily interpreted. It does not depend on the sample or scale used and is versatile across different population groups. However, results based on $Gini_c$ might be sensitive to transfers in the middle range, affecting the notion of inequality we want to investigate (in particular, we are interested in the consumption of high quality by high income consumers). One important concern is that the Lorenz curves can have different shapes in different countries that still yield the same $Gini_c$ coefficient. In this case, we would have countries with very different income distributions that still have very similar $Gini_c$. Therefore, this section investigates further measures of income inequality, which test whether our results are driven by some peculiarity in the choice of $Gini_c$.

For this purpose, we use quantile ratios and deciles of the distribution. All results in the robustness checks are reported using firm and product fixed effects (within-firm effect, δ_{gf}), since results *across firms* are always higher in magnitudes. In results available upon request, we estimate the effect on prices using only product fixed effects (δ_g) and report results that are at least 10% higher in magnitudes.

The analysis of quantile ratios allows us to compare inequality at different points of the distribution. Data for the quantiles come from the UN-WIDER. We start by evaluating a widely used measure of inequality, namely the 90:10 ratio ($Quantile_c$ $90:10$). The higher this ratio, the higher the consumption of the richest 10 percent of the population in comparison to the poorest 10 percent of the population. In results available upon request, we report coefficients in accordance with the results from Table 6. However, we are more interested in evaluating which part of the distribution is driving the results. Therefore, we decompose the quantile ratio to evaluate whether results are better explained by inequality among the rich or among the poor individuals.

Hence, we evaluate inequality in the top of the distribution (given by $Quantile_c$ $90:50$) and in the bottom of the distribution (given by $Quantile_c$ $50:20$). Results are shown in Table 9 and reveal that the positive effect on prices is captured by the top $90:50$ of the distribution of income. This result is consistent with our theoretical mechanism of consumption of high quality. In the theoretical model, the effect on prices is driven by consumption of the differentiated good by individuals above the income threshold.

5.5 Markups and product quality

Our baseline theoretical model suggests quality consumption as the main driver of the results. However, a natural concern is whether our empirical results reflect, instead of quality, markup adjustments that happen to be correlated with the income inequality of the destination country. We address this issue by investigating the links between market shares and markups, which suggest that our results are not primarily driven by markups.[33]

According to Melitz and Ottaviano (2008) and Amiti, Itskhoki, and Konings (2014), the higher the market share of a firm, the larger its markup. As shown in Proposition 1 in Amiti, Itskhoki, and Konings (2014), the market share of a firm is a sufficient statistic for its markups. Their empirical results support this monotonically increasing relationship.[34] Thus, as a first and straightforward exercise, we account for the sensitivity of the results when adding measures of firm market share as control variables, as reported in Tables 3 and 4. Results reported in columns (3) and (4) show that, after controlling for the firm market share, the coefficient on income inequality is still

[33]In terms of the model, one could also think of an interpretation for product quality and markups as in Fajgelbaum, Grossman, and Helpman (2011), where markups are increasing in quality if θ_z rises sufficiently strongly in quality. In the model, θ_z is a parameter of the generalized extreme value distribution that measures the heterogeneity of preferences over the varieties with a given quality z. If θ_z rises sufficiently strongly in quality, the markup is larger for higher quality goods.

[34]Although their results are not general (since demand structures other than CES emphasize other determinants of markup variability), this relation emerges in a wide class of models and is supported by empirical evidence, as discussed in their paper.

positive, significant, and with similar magnitudes.

We also investigate the effect of inequality on prices for firms with large versus small market shares in every destination. If results of inequality on prices were primarily driven by markups, we would expect the effect of inequality on prices to be much smaller for firms with small market shares, since these firms find it harder to adjust their markups. For this exercise, we investigate two measures: $Mktshare_{fc}$, the market share of firm f in country c with respect to other firms, and $Sharesales_{fc}$, which refers to the share of sales of firm f in country c with respect to its own sales in further destinations.[35] Finally, in a related exercise, we follow Fan, Li, and Yeaple (forthcoming) and rank firms based on their market share in each destination market (using $Mktshare_{fc}$). We investigate the effect of inequality for firms with small market shares in each destination by picking up the bottom 10, 30 and 50 percentiles. Also in this case, if results were driven by markup adjustments across destinations, we should observe a smaller effect for these sample groups.

Results are reported in Table 10. Columns (1)-(3) show the results for the sample of firms below the 10, 30 and 50 percentile of market shares. All coefficients on income inequality are positive and significant, and with no clear direction in terms of magnitudes. Columns (4) and (5) report results for firms with high and low market shares (or high and low share of sales), using a dummy variable for observations above or below the median. Also in this case, the coefficients for income inequality are similar in both groups and with no clear direction, which suggests that market power is not the main driver of our results.

5.6 Additional robustness checks:

Region/country effects: In order to rule out *region or country effects*, we exclude the main Brazilian trade partners from the sample at a time. Results are shown in Table A4 in the Appendix: Results are significant when we exclude the United States, Argentina, Mercosur, or the European Union. Thus, results are not specific to coun-

[35] In the case of $Sharesales_{fc}$, we investigate the effect of inequality on prices in countries where the firm has a small versus large share of sales (it could be that firms find it easier to adjust markups in destinations where they have the largest sales). This exercise would not work if the share of sales were highly correlated with inequality. However, our summary statistics reveals that this is not the case.

tries or regions in the sample.

Firm selection in the destination country: Results could be driven by self-selection of firms across destination markets with more or less income inequality (though we also show robust results for within-firm price variation across destinations). To show that results are robust despite sorting patterns, in Table A5 we estimate the effect of inequality on export prices only for firms exporting to more than 20 and 30 markets and that export to both developing and developed countries (results in columns (5) to (8)). Moreover, we also report results only for the top 10 destinations of Brazilian products (results for top 10 destinations in terms of *number* of firms exporting to each destination are shown in columns (1) and (2) and for top 10 destinations in terms of *sales*, in columns (3) and (4)). Throughout the specifications, the effect of inequality on prices remains statistically significant.

Intra-firm trade and foreign direct investment: In results available upon request, we use information on the foreign ownership status of the firm in the period 1997-2000 to account for a multinational price premium that could bias our price measure. Hence, we construct a dummy $FDI_f = 1$ if the firm has foreign ownership status, and zero otherwise, and investigate an interaction term $FDI_f * Gini_c$ along with $Gini_c$. Results reveal that both coefficients (level and interaction) are positive but the effect of $Gini_c$ on prices is not completely captured by the interaction term, meaning that results are not driven by sales of foreign-owned firms.

Price dispersion and income inequality: Besides evaluating price levels, we investigate whether firms ship a more diverse bundle of products for countries with higher income inequality. We investigate the effect of inequality on price dispersion, where price dispersion is measured by the standard deviation of log prices within a bundle of 4-digit products in each destination market. Results reported in Table A6 show that price dispersion is higher in more unequal destination countries. This result can further rationalize the hypothesis from this paper: Demand for multiple quality versions in a country may explain the presence of multiple quality versions, since firms may offer a more diverse bundle of products.

6 Conclusion

This paper provides first firm-level evidence on the links between income inequality and export prices, and identifies a theoretical mechanism behind these links. The theoretical framework is based on a demand composition effect and non-homothetic preferences. Individuals have preferences over homogeneous and differentiated goods, with different levels of quality and different prices associated to them. Poor individuals can only afford consumption of necessities, while individuals above a certain income threshold can afford consumption of a continuum of differentiated goods. An increase in income inequality leads to higher average prices, with this effect disappearing for rich enough countries.

Using data with information on average export prices by firm, product, and destination country, we show that prices are systematically higher in more unequal destinations, though the effect is non-linear and depends on average income. Our results hold only for differentiated goods and in particular for products with high scope for quality differentiation (using a continuous measure of product differentiation), in accordance with the quality mechanism proposed in the theory. Results are robust to different measures of income inequality and not driven by selection into destinations.

Our results suggest that prices increase in inequality of the destination country and that this effect vanishes for rich enough countries. Thus, market-specific quality differerentiation is an important margin of adjustment and important to explain the patterns of trade.

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Table 1: Variation in export prices - standard deviation

	Obs	Mean	Std. Dev.	Min	Max
Variation in export prices across destinations within firm-product pairs					
Standard deviation of prices across destinations:					
Total trade	54619	**0.1073**	0.2180	0	1.5677
Differentiated goods	45271	0.1099	0.2201	0	1.5677
Homogeneous goods	1203	0.0607	0.1331	0	1.0653
Variation in export prices across firms within country-product pairs					
Standard deviation of prices across firms:					
Total trade	43525	**0.2106**	0.3211	0	1.5955
Differentiated goods	34314	0.2268	0.3282	0	1.5955
Homogeneous goods	924	0.1048	0.2089	0	1.5032

Table 2: Main explanatory variables, according to the tertile of the income distribution

Variable	Mean	Std. Dev.	Min.	Max.	N
First tertile of the distribution of $CGDP_c$					
GDP_c	329,513,308	1,003,365,021	2,606,171	5,052,199,936	31
$CGDP_c$	2,635.498	1,383.968	513.906	4,732.128	31
$Dist_c$	8,881.426	4,478.001	2,380.92	18,396.479	31
$Gini_c$	44.687	9.625	26	62.5	31
Second tertile of the distribution of $CGDP_c$					
GDP_c	198,419,970	283,274,398	2,040,752	1,352,476,032	30
$CGDP_c$	8,201.286	2,102.586	4,753.42	11,430.188	30
$Dist_c$	8,400.192	4,163.122	1,134.65	16,409.975	30
$Gini_c$	42.53	10.179	24.3	57.8	30
Third tertile of the distribution of $CGDP_c$					
GDP_c	714,360,206	1,786,852,465	5,536,964	9764,800,512	30
$CGDP_c$	24,095.87	6,835.66	13,616.582	48,217.272	30
$Dist_c$	10,338.795	2,393.837	6,343.316	18,821.258	29
$Gini_c$	32.767	6.627	24.8	57.5	30

Figure 1: Gini and income per capita for different tertiles of income per capita

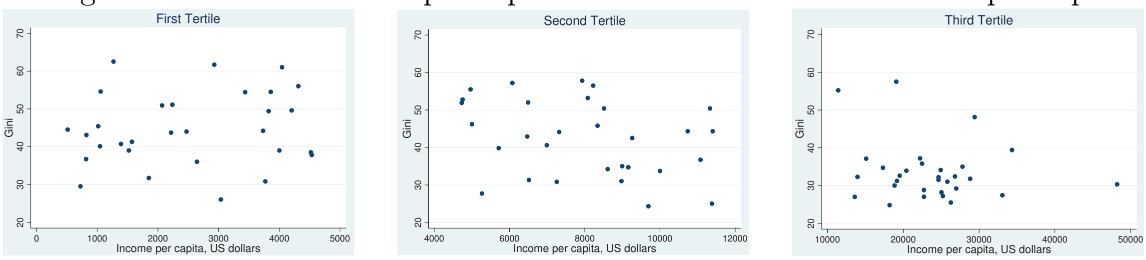

Table 3: Export prices within product pairs for differentiated goods

Dependent variable: $ln(price)_{cg}$	(1)	(2)	(3)	(4)	(5)	(6)
$Gini_c$	0.00730***	0.0105***	0.00907***	0.00911***	0.00985***	0.0138***
	(0.000949)	(0.00106)	(0.00110)	(0.00113)	(0.00107)	(0.00157)
$ln(GDP)_c$		-0.00705	-0.0286***	-0.0284***	-0.0157**	-0.00159
		(0.00573)	(0.00721)	(0.00706)	(0.00666)	(0.00756)
$ln(CGDP)_c$		0.0353***	0.0167	0.0188	0.0304**	0.0599***
		(0.0130)	(0.0149)	(0.0144)	(0.0132)	(0.0204)
$ln(Dist)_c$		0.0531***	0.0389**	0.0462***	0.0928***	0.0864***
		(0.0142)	(0.0170)	(0.0150)	(0.0203)	(0.0193)
$Mktshare_c$			-0.0383			
			(0.0422)			
$ShareExp_{c,s}$				-1.299		
				(1.135)		
$ln(Nfirms)_{cg}$					0.0461***	
					(0.0144)	
$Sigma_{c,s}$						9.16e-05
						(0.000194)
Product FE	Y	Y	Y	Y	Y	Y
Constant	Y	Y	Y	Y	Y	Y
Observations	27,937	27,174	24,091	24,472	27,174	20,899
R-squared	0.884	0.886	0.889	0.887	0.886	0.888

NOTES: The standard errors (in parentheses) are clustered at the country level. R-squared include product FE.

Table 4: Export prices within firm-product pairs for differentiated goods

Dependent variable: $ln(price)_{fcg}$	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$Gini_c$	0.00194**	0.00444***	0.00507***	0.00424***	0.00346***	0.00399***	0.00444***
	(0.000826)	(0.00112)	(0.00112)	(0.00112)	(0.00113)	(0.00111)	(0.00112)
$ln(GDP)_c$		-0.0218***	-0.0169***	-0.0277***	-0.0288***	-0.0282***	-0.0216***
		(0.00595)	(0.00601)	(0.00633)	(0.00663)	(0.00621)	(0.00596)
$ln(CGDP)_c$		0.0456***	0.0482***	0.0433***	0.0310*	0.0426***	0.0452***
		(0.0161)	(0.0161)	(0.0161)	(0.0164)	(0.0162)	(0.0161)
$ln(Dist)_c$		0.0478***	0.0275*	0.0555***	0.0477***	0.0764***	0.0473***
		(0.0135)	(0.0141)	(0.0138)	(0.0139)	(0.0168)	(0.0135)
$Mktshare_{cg}$			0.122***				
			(0.0262)				
$Mktshare_{fcg}$				0.107***			
				(0.0345)			
$ShareExp_{c,s}$					-0.547		
					(1.025)		
$ln(Nfirms)_{cg}$						0.0275***	
						(0.0106)	
$Sigma_{c,s}$							0.000129
							(0.000218)
Firm-product FE	Y	Y	Y	Y	Y	Y	Y
Constant	Y	Y	Y	Y	Y	Y	Y
Observations	82,716	82,716	82,716	82,716	73,766	82,716	82,716
R-squared	0.926	0.926	0.926	0.926	0.928	0.926	0.926

NOTES: The standard errors (in parentheses) are clustered at the country level. R-squared includes firm-product FE.

Table 5: Export prices within firm-product pairs for homogeneous goods

Dependent variable: $ln(price)_{fcg}$	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$Gini_c$	0.000149		0.000149	0.000165	0.000208	0.000321	-0.000260
	(0.00185)		(0.00185)	(0.00187)	(0.00197)	(0.00196)	(0.00195)
$ln(CGDP)_c$			0.00591	0.00566	-0.00481	-0.00303	0.00828
			(0.0159)	(0.0155)	(0.0171)	(0.0167)	(0.0158)
$ln(Dist)_c$		-0.0723**	-0.0718**	-0.0711**	-0.0613*	-0.0615*	-0.0798**
		(0.0314)	(0.0341)	(0.0343)	(0.0346)	(0.0346)	(0.0346)
$ln(GDP)_c$		0.0185***	0.0175***	0.0172***	0.00803	0.00818	0.0208***
		(0.00613)	(0.00600)	(0.00653)	(0.00600)	(0.00586)	(0.00714)
$Mktshare_{fcg}$				-0.00724			
				(0.0514)			
$ShareImp_{c,s}$					-0.428		
					(1.285)		
$ShareExp_{c,s}$						-1.062**	
						(0.536)	
$ln(Nfirms)_{cg}$							-0.0169
							(0.0129)
Firm-product FE	Y	Y	Y	Y	Y	Y	Y
Constant	Y	Y	Y	Y	Y	Y	Y
Observations	2,107	2,107	2,107	2,107	1,872	1,872	2,107
R-squared	0.983	0.983	0.983	0.983	0.984	0.984	0.983

NOTES: The standard errors (in parentheses) are clustered at the country level.

Table 6: Export prices within firm-product pairs for the tertiles of the income per capita: Poverty versus Gini

Dependent variable:	**First Tertile**		**Second Tertile**		**Third Tertile**	
$ln(uprice)_{fcg}$	(1)	(2)	(3)	(4)	(5)	(6)
$Gini_c$	-0.00215		0.00431**		0.000762	
	(0.00473)		(0.00209)		(0.00556)	
$ln(Poverty, 1.25\$)_c$		0.142**		0.0626***		-0.00352
		(0.0665)		(0.0176)		(0.0433)
$ln(CGDP)_c$	0.165**	0.184**	0.00812	0.0188	0.201	0.142
	(0.0745)	(0.0814)	(0.0649)	(0.0201)	(0.122)	(0.105)
$ln(Dist)_c$	0.0990*	0.188**	0.0648**	0.147***	-0.0965	-0.0276
	(0.0530)	(0.0768)	(0.0273)	(0.0306)	(0.152)	(0.0263)
$ln(GDP)_c$	-0.0907***	-0.0394	-0.0450***	-0.106***	-0.0206	-0.468*
	(0.0260)	(0.154)	(0.0120)	(0.0205)	(0.0227)	(0.271)
Firm-product FE	Y	Y	Y	Y	Y	Y
Constant	Y	Y	Y	Y	Y	Y
Observations	18,290	12,216	43,328	29,866	21,098	11,973
R-squared	0.953	0.960	0.947	0.944	0.959	0.963

NOTES: The standard errors (in parentheses) are clustered at the country level.

Table 7: Export prices across deciles of income per capita

Dependent variable:	Results across firms		Results within firms	
$ln(price)_{fcg}$	(1)	(2)	(3)	(4)
$ln(GDP)_c$	-0.0195***	-0.0226***	-0.0323***	-0.0277***
	(0.00645)	(0.00663)	(0.00858)	(0.00863)
$ln(CGDP)_c$	0.0730	0.0738	0.0205*	0.0281
	(0.0477)	(0.0477)	(0.0109)	(0.0176)
$ln(Dist)_c$	0.0215	0.0309	0.0499**	0.0216
	(0.0204)	(0.0212)	(0.0197)	(0.0205)
$Mktshare_{fcg}$		0.0501*		0.134***
		(0.0303)		(0.0266)
$Gini_c * Decile_1$	0.00610	0.00698	0.000836	0.000445
	(0.00492)	(0.00496)	(0.00951)	(0.00950)
$Gini_c * Decile_2$	0.00599**	0.00624***	0.00533***	0.00598***
	(0.00239)	(0.00238)	(0.00141)	(0.00141)
$Gini_c * Decile_3$	0.00629***	0.00660***	0.00349***	0.00417***
	(0.00200)	(0.00201)	(0.00126)	(0.00127)
$Gini_c * Decile_4$	0.00493***	0.00514***	0.00725**	0.00816**
	(0.00136)	(0.00136)	(0.00339)	(0.00339)
$Gini_c * Decile_5$	0.0106***	0.0110***	0.00427***	0.00490***
	(0.00207)	(0.00207)	(0.00119)	(0.00120)
$Gini_c * Decile_6$	0.0139***	0.0142***	0.0160***	0.0178***
	(0.00366)	(0.00366)	(0.00429)	(0.00429)
$Gini_c * Decile_7$	0.00954***	0.00985***	0.00506***	0.00539***
	(0.00356)	(0.00357)	(0.00192)	(0.00192)
$Gini_c * Decile_8$	0.00530**	0.00560**	0.00706	0.00940
	(0.00269)	(0.00269)	(0.0244)	(0.0244)
$Gini_c * Decile_9$	0.00330	0.00344	0.0105	0.0131
	(0.00237)	(0.00236)	(0.0182)	(0.0182)
$Gini_c * Decile_{10}$	-0.00178	-0.00159	-0.00472	-0.00352
	(0.00913)	(0.00912)	(0.00414)	(0.00414)
$D_c^i(Decile)$ FE	Y	Y	Y	Y
Constant	Y	Y	Y	Y
Product FE	Y	Y		
Firm-product FE			Y	Y
Observations	27,172	27,172	82,716	82,716
R-squared	0.895	0.895	0.926	0.926

NOTES: The standard errors are clustered at the country level.

Table 8: Export prices using a continuous measure of product differentiation $Ladders_s$

Dependent variable: $ln(price)_{fcg}$	(1)	(2)	(3)
$Ladders_s * Gini_c$	0.00129*	0.00124*	0.00130*
	(0.000665)	(0.000667)	(0.000668)
$Gini_c$	-0.00199	-0.00120	-0.00115
	(0.00129)	(0.00142)	(0.00142)
$ln(CGDP)_c$		Y	Y
$Mktshare_{fcg}$			Y
$ln(Dist)_c$, $ln(GDP)_c$	Y	Y	Y
Firm-product FE	Y	Y	Y
Constant	Y	Y	Y
Observations	56,222	56,222	56,222
R-squared	0.970	0.970	0.970

NOTES: The standard errors (in parentheses) are clustered at the country level.

Table 9: Export prices for income tertiles: Quantile ratios

Dependent variable: $ln(price)_{fcg}$	First Tertile (1)	(2)	Second Tertile (3)	(4)	Third Tertile (5)	(6)
$Quantile_c$ 90 : 50	-0.0174		0.0179**		-0.202	
	(0.0132)		(0.00769)		(0.160)	
$Quantile_c$ 50 : 20		-0.0104*		-0.0968**		-0.0781
		(0.00587)		(0.0405)		(0.0653)
$ln(CGDP)_c$	0.225***	0.147**	-0.0983	-0.199**	-0.397	-0.105
	(0.0713)	(0.0735)	(0.0627)	(0.0835)	(0.382)	(0.345)
$ln(Dist)_c$	0.0810*	0.0305	0.0448**	0.00534	-0.403	-0.219
	(0.0437)	(0.0585)	(0.0218)	(0.0272)	(0.422)	(0.394)
$ln(GDP)_c$	-0.0892***	-0.0765***	-0.0383***	0.00627	-0.0644	-0.0634
	(0.0217)	(0.0203)	(0.0112)	(0.0168)	(0.0407)	(0.0410)
Constant	Y	Y	Y	Y	Y	Y
Observations	19,859	19,859	41,083	41,083	9,379	9,379
R-squared	0.952	0.952	0.952	0.952	0.967	0.967

NOTES: The standard errors are clustered at the country level.

Table 10: Export prices and market shares across destination markets

Dependent variable: $ln(uprice)_{fcg}$	Bottom 10 percentile (1)	Bottom 30 percentile (2)	Bottom 50 percentile (3)	High and low market shares (4)	(5)
$Gini_c$	0.00684**	0.00467**	0.00669***		
	(0.00305)	(0.00186)	(0.00132)		
$Gini_c * HIGH(Mktshare_{fc})$				0.00600***	
				(0.00174)	
$Gini_c * LOW(Mktshare_{fc})$				0.00454***	
				(0.00112)	
$Gini_c * HIGH(Sharesales_{fc})$					0.00303**
					(0.00127)
$Gini_c * LOW(Sharesales_{fc})$					0.00456***
					(0.00112)
$ln(CGDP)_c$	0.130***	0.0765***	0.0812***	0.0468***	0.0462***
	(0.0449)	(0.0280)	(0.0194)	(0.0162)	(0.0161)
$ln(Dist)_c$	0.0485	0.0366	0.0575***	0.0468***	0.0493***
	(0.0383)	(0.0223)	(0.0160)	(0.0135)	(0.0135)
$ln(GDP)_c$	-0.0325*	-0.0385***	-0.0311***	-0.0217***	-0.0222***
	(0.0174)	(0.0105)	(0.00719)	(0.00595)	(0.00596)
Firm-product FE	Y	Y	Y	Y	Y
Constant	Y	Y	Y	Y	Y
Observations	16,412	32,659	56,768	82,716	82,716
R-squared	0.933	0.925	0.918	0.926	0.926

NOTES: The standard errors (in parentheses) are clustered at the country level.

A Data Appendix

A.1 Description of Main Variables

Table A1: Main control variables $\mathbf{X}_{gfc}$:

$\mathbf{x}_{gfc}$	**Variable description**
Country characteristics:	
GDP_c	GDP of country c (measure of country size)
$Dist_c$	Distance to country c
$CGDP_c$	GDP per capita of c
Firm and country characteristics:	
$Mktshare_{fgc}$	Market share of fg in c with respect to the sum of firms exporting g to c
$Mktshare_{fc}$	Market share of f in c with respect to the sum of firms exporting to c
$Sharesales_{fc}$	Share of sales of f in c with respect to firm sales in further destinations.
$ShareImp_{c,s}$	$\frac{Imp_{cs_i}}{\sum_{j \neq i} Imp_{cs_j}}$. Share of imports of c in sector s_i with respect to all sectors $j \neq i$
$ShareExp_{c,s}$	$\frac{Exp_{cs_i}}{\sum_{j \neq i} Exp_{cs_j}}$. Share of exports of c in sector s_i as *proxy for production in* c
$Mktshare_{fc,s}$	Share of imports in s_i from Brazilian firms with respect to total imports from the World
$Nfirms_{gc}$	Number of Brazilian firms selling g in country c (competition measure)
$Sigma_{c,s}$	Import demand elasticities at the 3-digit HS for each country c
$Ladder_s$	Degree of vertical differentiation of the product, aggregated to sector s from Khandelwal (2010)

A.2 SECEX firm-level data for the year 2000: data construction

Firms in the SECEX data are identified by the unique CNPJ tax number and products are coded according to the 8-digit NCM Mercosur classification of goods (NCM-SH *Nomenclatura Comum do Mercosul, Sistema Harmonizado*). The first 6 digits correspond to the international HS classification (Harmonized System).[36]

The Brazilian SECEX exports data contains information on agricultural sector and observations without information on quantities. The procedure to construct the data for the cross-section 2000 follows:

1. If the observation relates to agricultural and mining sector, it was dropped from the sample. The same was done if the observation refers to commercial intermediates. Hence, we consider only the sample of 3,034 products which refer to machinery, metals,

[36]Since the first six digits coincide with the 6-digit HS classification, it is possible to match the HS and NCM classification with the SITC classification (Standard International Trade Classification). Thus, the data can be matched with the Rauch (1999) classification of goods and the NBER-UN World trade data. Moreover, the similarity in classification between NCM and HS allows better comparison to the literature.

stone/glass, plastics/rubbers, footwear, textiles, wood products, and leather products.

2. If the observation contains zero exporting value, it was removed from the sample. As described in Arkolakis, Ganapati, and Muendler (2014), these observations correspond to reporting errors or shipments of commercial samples. As in Arkolakis, Ganapati, and Muendler (2014), 484 observations are removed.

3. If the observation contains no information on export quantities, it was removed from the sample. This procedure removed 37,903 observations. Without information on quantities, it is not possible to construct unit values, defined as $p_{fcg} = \frac{Value_{fcg}}{Quantity_{fcg}}$, for f the firm, g the product and c the destination country. Importantly, the lack of information on quantities is not systematic by industry, destination or type of product. Thus, there is no concern with sample selection.

Trade unit values may be subject to large measurement errors. Hence, as a robustness check to the results, we reestimate the results after removing extreme unit values. The data trimming removes observations for which the unit value p_{fcg} is either 5 times above or 5 times below the median unit price by product g. This second step drops 19,960 observations 5 times above and 18,184 observations 5 times below the median (for all types of goods). The results remain robust.

A product g is defined as a NCM 8-digit product. Table A2 shows examples of products at different levels of aggregation.

Table A2: Examples of Products:

Example of 2, 4 and 6-digit products:	
64	Fottwear, gaiters, and the like.
6401	Waterproof footwear, rubber or plastics, bond sole.
6402	Footwear, outer sole and upper rubber or plastic nesoi.
6403	Footwear, outer sole rub, plastic or leather and upper leather.
6404	Footwear, outer sole rub, plastic or leather and upper tex.
6405	Footwear nesoi
640110	Waterproof footwear incorporating a protective metal toe-cap
640191	Waterproof footwear covering the knee
Further example of 6 and 8-digit products:	
630900	Worn clothing and other worn articles.
63090010	Articles of apparel, clothing accessories and parts thereof.
63090090	Other textile materials, used.
Complete list of NCM 8-digit products available at	
http://www.sefaz.mt.gov.br/portal/download/arquivos/Tabela_NCM.pdf.	

Table A3 presents a brief summary of average number of destinations and number of products by firm. Column 2 shows that firms that export to more than 10 destinations export on average 26.29 different NCM 8-digit products. And, from Column 3, firms that export more than 10 products export to 8.77 destinations on average.

Table A3: Average number of destinations and number of products by firm

	Average number of products by number of destinations	**Average number of destinations by number of products exported**
1	2.83	1.70
2	3.40	2.84
3	4.25	3.84
4	5.04	4.62
5	6.21	5.57
10+	26.29	8.77
Average	4.69	1.70

A.3 Methodology for construction of the Gini coefficient:

We use income inequality data from WIID2 UNO-WIDER (United Nations World Institute for Development Economics Research). The data contains many duplicate values and missing values for some countries. Thus, in case of duplicate values for a country, we keep the variables that satisfy the following criteria (in this order):

Step 1. Highest quality rating (variable $Quality = 1$, otherwise 2, 3 or 4). The quality rating in the WIID2 was evaluated according to the following criteria: (a) whether the concepts underlying the observations are known; (b) the coverage of the income/consumption concept; and (c) the survey quality. A observation receives quality rating 1 for observations that satisfy the criteria (a) and (b).

Step 2. Latest *Revision*. The WIID1 was updated to construct the new WIID2 database, which is the most recent and updated revision.

Step 3. Area covered refers to the whole country (variable $AreaCovr = All$).

Step 4. Basic statistical unit is the household (variable $IncSharU = household$, instead of tax unit, person or family).

Step 5. Unit of analysis is the person (variable $UofAnala = person$): in this case, the presence of different sized households have been taken into account

Step 6. Equivalence scale has been adjusted (variable $Equivsc = householdpercapita$). Since the different sized households have been taken into account, in the equivalence scale the adjustment has been made for the different sized and composed households.

Step 7. Income definition is *disposable income* (variable $IncDefn = Income, Disposable$). This classification is similar to the one from the Canberra Group on Household Income Statistics with the United Nations Statistics Division [37].

[37]The final report and recommendations from the Canberra Group on household income statistics can be found at http://www.lisproject.org/links/canberra/finalreport.pdf

Step 8. Information on currency is available (variable $Curref$).

Step 9. Income definition is income (variable $IncDefn = Income, ..$).

Step 10. Income definition is gross income (variable $IncDefn = Income, Gross$).

Step 11. Equivalence scale used was the household (variable $Equivsc = Householdeq, OECDmod$).

This methodology leads to 72 unique Gini coefficients (72 countries) [38]. For countries with missing information for the year 2000, we follow the same steps described above for the years 1999 and 2001, respectively. In this way, the final methodology leads to 98 unique Gini coefficients (103 countries) [39]. When we combine the Gini coefficient with the firm-level data, we exclude destination countries with less than 3 observations in the sample.[40]

[38]Only for Finland there were still duplicate values for the year 2000 after all the steps. In this case, the observation was kept if the currency available was in euros $curref = EUR02/year$

[39]The raw data available at http://www.wider.unu.edu/research/Database/en_GB/wiid/.

[40]Countries with less than three observations are Armenia, Azerbaijan, Laos, Lesotho, Moldova, Uzbekistan, and Georgia.

B Additional robustness checks

Table A4: Robustness checks: rule out *region effects*

Dependent variable: $ln(price)_{fcg}$	Without US (1)	(2)	Without Argentina (3)	(4)	Without EU (5)	(6)	Without Mercosur (7)	(8)
$Gini_c$	0.00352***	0.00409***	0.00351***	0.00409***	0.00360***	0.00425***	0.00336***	0.00360***
	(0.00113)	(0.00113)	(0.00116)	(0.00116)	(0.00121)	(0.00121)	(0.00120)	(0.00121)
$ln(CGDP)_c$	0.0328**	0.0339**	0.0458***	0.0461***	0.0703***	0.0744***	0.0458***	0.0460***
	(0.0164)	(0.0164)	(0.0171)	(0.0171)	(0.0179)	(0.0179)	(0.0175)	(0.0175)
$ln(Dist)_c$	0.0467***	0.0248*	0.0209	-0.0104	0.0713***	0.0507***	-0.00641	-0.0364
	(0.0138)	(0.0146)	(0.0171)	(0.0180)	(0.0147)	(0.0153)	(0.0238)	(0.0247)
$ln(GDP)_c$	-0.0291***	-0.0249***	-0.0182***	-0.0102	-0.0348***	-0.0303***	-0.0189***	-0.0112
	(0.00659)	(0.00662)	(0.00703)	(0.00714)	(0.00676)	(0.00680)	(0.00716)	(0.00727)
$Mktshare_{fcg}$		0.128***		0.142***		0.132***		0.137***
		(0.0277)		(0.0282)		(0.0296)		(0.0298)
Firm-product FE	Y	Y	Y	Y	Y	Y	Y	Y
Constant	Y	Y	Y	Y	Y	Y	Y	Y
Observations	74,361	74,361	68,460	68,460	72,587	72,587	59,572	59,572
R-squared	0.928	0.928	0.929	0.929	0.931	0.931	0.931	0.931

NOTES: The standard errors are clustered at the country level.
The R-squared reported refer to the LSDV estimator, which includes the firm-product FE.

Table A5: Robustness checks: Self-selection into destination markets

Dep. variable: $ln(price)_{fcg}$	**Exports to top 10 destinations (number of firms)**[1]		**Exports to top 10 destinations (amount of exports)**[2]		**Firms in more than 20 destinations**		Firms in **more than 30 destinations**	
$Gini_c$	0.00757***	0.00738**	0.00433*	0.00476**	0.00647***	0.00731***	0.00771***	0.00854***
	(0.00289)	(0.00290)	(0.00235)	(0.00234)	(0.00128)	(0.00129)	(0.00148)	(0.00149)
$ln(CGDP)_c$	0.161***	0.159***	0.0439	0.0413	0.0735***	0.0764***	0.0683***	0.0713***
	(0.0469)	(0.0470)	(0.0454)	(0.0454)	(0.0181)	(0.0181)	(0.0206)	(0.0207)
$ln(Dist)_c$	0.0849***	0.0768**	0.0735***	0.0616**	0.0656***	0.0429**	0.0822***	0.0617***
	(0.0323)	(0.0328)	(0.0275)	(0.0288)	(0.0162)	(0.0170)	(0.0190)	(0.0200)
$ln(GDP)_c$	-0.0531***	-0.0509***	-0.0293*	-0.0242	-0.0315***	-0.0256***	-0.0287***	-0.0235***
	(0.0132)	(0.0133)	(0.0161)	(0.0164)	(0.00719)	(0.00730)	(0.00822)	(0.00831)
$Mktshare_{fcg}$		0.130*		0.118*		0.132***		0.117***
		(0.0694)		(0.0616)		(0.0308)		(0.0340)
Firm-product FE	Y	Y	Y	Y	Y	Y	Y	Y
Constant	Y	Y	Y	Y	Y	Y	Y	Y
Observations	44,612	44,612	42,292	42,292	34,093	34,093	24,523	24,523
R-squared	0.956	0.956	0.951	0.951	0.889	0.889	0.881	0.881

NOTES: The standard errors are clustered at the country level.
The R-squared reported refer to the LSDV estimator, which includes the firm-product FE.
[1] All firms that export to the top 10 destinations of exporters, measured as the number of firms that export to the destination.
[2] All firms that export to the top 10 destinations of exporters, measured as the amount of exports in US dollars.

Table A6: Price dispersion and income inequality

Dependent variable: $std_{csf}[ln(price_{cgf})]$	(1)	(2)	(3)
$Gini_c$	0.00269***	0.00146**	0.00162**
	(0.000398)	(0.000637)	(0.000640)
$ln(CGDP)_c$; $ln(Dist)_c$; $ln(GDP)_c$		Y	Y
$Mktshare_{fcg}$			Y
Firm-subcategory FE	Y	Y	Y
Constant	Y	Y	Y
Observations	56,926	54,749	54,749
R-squared	0.533	0.548	0.549

NOTES: 1. The standard errors are clustered at the country level.
2. The R-squared reported refer to the LSDV estimator, which includes the firm-subcategory FE.