On-the-match price renegotiation: Evidence from Pakistan's import data[*]

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Abstract

Using matched importer-exporter transaction level trade data, this study offers evidence quantifying the extent of price dispersion within a foreign seller across importing firms in Pakistan. Furthermore, we examine the key mechanisms describing the pricing strategy of foreign sellers of narrowly defined product categories. We show that, within a given firm-to-firm network, importers tend to renegotiate prices on-the-match, resulting in prices to drop over time. Although these price adjustments do not differ substantially for differentiated products, foreign sellers of differentiated goods charge a significantly higher price to their newly acquired and one-shot buyers.

Keywords: Price discrimination; transactional relationships; firm-to-firm trade

JEL classification: F1; F14; L14

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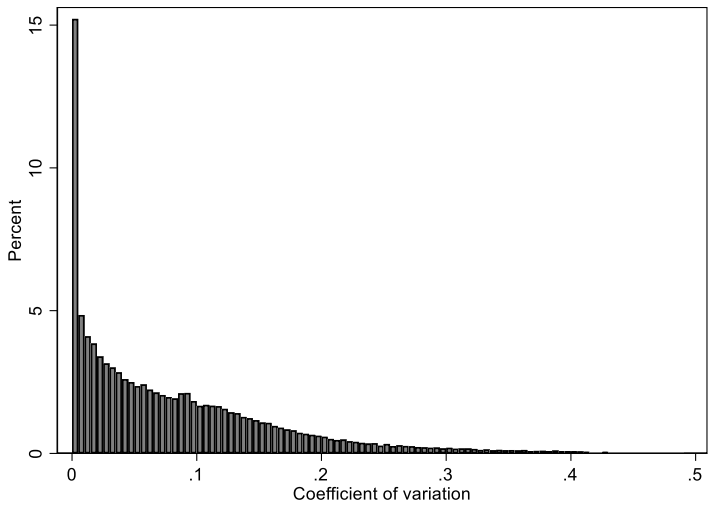
1. Introduction

A number of studies have documented substantial deviations from the law of one price (LOP) in international trade. Firms often discriminate prices across buyers to exploit the heterogeneity in their product valuation, or in the presence of information asymmetries (Varian 1980). The pricing strategy of exporting firms has recently received considerable attention due to the availability of detailed customs trade data for many countries.

This paper uses transaction-level trade data over 2016-2017 to demonstrate the variation in prices paid by Pakistani importers. We show that foreign sellers often charge heterogeneous prices across buyers located within the same country. Our empirical methodology builds on the pricing model adopted by Fontaine et al. (2020), which allows for a two-sided unobserved heterogeneity to illustrate the dynamics of firm-to-firm price determination. The estimation results indicate that firm-to-firm prices are likely to decrease with the age of the network. We show that although the extent of price renegotiation is not significantly different for differentiated varieties of imported products, firms exporting differentiated goods are able to capture a much higher premium on their first transaction. Our findings offer useful insights, and are indicative of price bargaining that occurs between firms in a small open economy and their foreign partners.

Fig 1. Coefficient of variation density plot



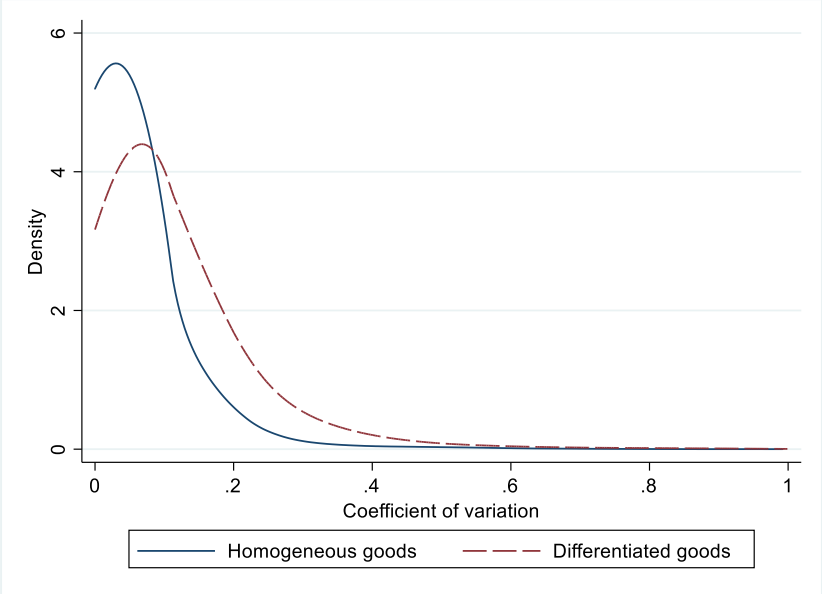
Source: Based on authors' calculations.

Figure 1 exhibits the distribution of the coefficients of variation of prices measured across importers of a narrowly defined product category within a foreign seller in a given quarter.[1] It

[1] This part of the analysis is limited to foreign firms serving at least five Pakistani firms in a given quarter. Note that the extent of dispersion is smaller than the one found by Fontaine et al. (2020) due to differences in the coverage of

confirms that a sizeable share of foreign sellers charge different prices across importing firms in Pakistan.[2] To understand the underlying causes of the observed price differences, in Figure 2, we display density plots for the restricted samples of differentiated and homogenous goods. The distribution for homogenous commodities lies to the left of the distribution for differentiated goods. This is not surprising since the possibility of product differentiation, and consequently, price discrimination is lower for non-differentiated goods. Nevertheless, as indicated by Fontaine et al. (2020), we also observe considerable within seller price dispersion even for non-differentiated products, suggesting that exporting firms tend to discriminate prices across their partners by adjusting markups, and not necessarily by means of vertically differentiating their products.

Fig 2. Homogeneous versus differentiated goods



Source: Based on authors' calculations.

We contribute to the literature on firm-to-firm trade (Bernard et al. 2012; Kugler and Verhoogen 2012; Manova and Zhang 2012), but our findings are also broadly related to studies on the deviations from LOP (Gopinath et al. 2011; Engel and Rogers 1996; Goldberg and Verboven 2005). Many recent studies reveal how market segmentation influences price dispersion across countries based on destination market characteristics. This note, on the other hand, identifies the variation of prices across buyers within a single destination. It is one of the first studies to empirically analyze pricing dynamics using detailed information on transaction-level unit values

importers in the respective datasets; while Fontaine et al. (2020) study price discrimination across buyers located under wide-ranging economic settings across EU25 over five years, our focus is on the price disparity across importers located within a single low-income country over a two-year period.

[2] Figure 1 also indicates that about 15 percent of sellers do adopt uniform pricing strategy.

with both the buyer and seller dimensions. Although most of our findings are closely tied to those emphasized in Fontaine et al. (2020), we make several additional contributions. While their study focuses on price variation across buyers in the European Monetary Union specifically for French products, our paper examines the pricing behaviour of a much broader set of exporters located all over the world competing in a small open economy. We characterize importing patterns of firms in the context of a developing country. Moreover, we utilize a more precise measure of prices, as explained in the following section, alleviating concerns regarding composition effects. Finally, this study sheds light on a specific channel at the root of pricing strategy of firms, i.e., the role of cross-border buyer-seller connections, and how it differs for differentiated products.

The rest of the paper is organized as follows. The next section briefly describes our dataset. The empirical methodology used to understand the microeconomic underpinnings of price determination and the estimation results are explained in Sections 3 and 4, respectively. Section 5 concludes.

2. Data

We use administrative data collected by the Federal Board of Revenue Pakistan (FBRP) from January 1st, 2016 to December 31st, 2017. Our dataset reports the universe of Pakistan's foreign trade transactions and contains comprehensive information about the date of the transaction, product imported, origin country, unit value of imports, and the total value and quantity imported.[3] For each transaction, we observe an anonymized identification code for the importer and the corresponding foreign seller. This information allows us to track exports by a foreign firm to its Pakistani importers over time, and thus, to detect repeated transactions within firm-to-firm networks.

The data encompasses 33,978 importers in Pakistan and 237,308 foreign sellers. It uses the standard industrial classification system (SITC), and comprises of 5740 product categories defined at the eight-digit level, of which approximately 3998 are differentiated goods. Our dataset is unique because it directly reports the unit value for each transaction, mitigating potential composition bias associated with the computation of unit values based on the value and quantity of imports.[4] In addition, the unit price is independently verified and electronically recorded by the customs officers. Due to the nature of the data collection process, it is subject to much less measurement error compared to what is typically the case for a developing country.

[3] A detailed description of variables and summary statistics are available in an Online Appendix.
[4] Composition effects arise when differences in unit values reflect not only price disparities, but also variation in the mix of varieties sold.

3. Methodology

To identify the sources of price dispersion in our data, we adopt the estimation methodology used by Fontaine et al. (2020), which has been widely applied in the labor literature using matched employer-employee data (Abowd et al. 1999). The empirical specification takes the following form:

$$\ln p_{i(k)jpt} = \alpha_0 + \alpha_1 m_{i(k)jpt} + \beta \mathrm{X}_{i(k)jpt} + \gamma_{i(k)} + \gamma_j + \gamma_{pt} + \varepsilon_{i(k)jpt}, \quad (1)$$

where $\ln p_{i(k)jpt}$ represents (log-transformed) price charged by foreign seller *i* from country *k* for product p to Pakistani firm *j*. The match duration denoted by $m_{i(k)jpt}$ represents the number of months since firm *i(k)* first started selling product p to firm *j*. $\mathrm{X}_{i(k)jpt}$ is a set of buyer-seller network specific control variables. Time-invariant fixed effects for the buyer and seller are included to control for unobserved heterogeneity across buyers and sellers, respectively.[5] In order to capture the mode of transportation for the shipment, we also control for shipping port fixed effects. Any unexplained variation in prices within a match is accounted for by the residual term, $\varepsilon_{i(k)jpt}$. Lastly, to estimate the differential effect of network characteristics on the price of differentiated products, we re-estimate Eq. (1) including interaction terms with an indicator for differentiated goods based on Rauch's (1999) classification scheme.

A possible limitation of using a relatively short panel to study firm-to-firm connections is that there may be a limited number of firms that are observed to change partnerships overtime. We find that, on average, there are two foreign sellers per importer for a given SITC-8 product. In addition, the mean number of foreign partner switches by an importer for the same product is approximately 1.13 times over the two-year period.[6] Since importers are observed to be frequently changing sellers over the time period considered, and all estimation results control for both the buyer as well as seller fixed effects, the use of two years of data appears to be sufficient to investigate the role of match duration in the determination of import prices.[7]

4. Estimation Results

The estimates underlining price dynamics are depicted in Table 1. The duration of a buyer-seller match is negatively associated with the price charged by a foreign firm to its Pakistani trade partner. In particular, within a buyer-seller match, an increase in the age of the relationship by an additional month, on average, results in a nearly 1% drop in price. Furthermore, we note that price

[5] The inclusion of seller (buyer) fixed effects captures systematic differences in, for example, market (bargaining) power among sellers (buyers).

[6] A 'switch' is defined as an importer to be either adding or dropping foreign seller(s) for a specific SITC-8 product from one month to the next, or if it changes seller(s) when the total number of partners does not change by month.

[7] The Online Appendix provides supplementary information illustrating the variation in the number of foreign sellers for a given product across importers.

declines with an increasing number of transactions between the two firms, with unit values being significantly higher for the first transaction, and for those involving firms which interact only once.

The interpretation of our key result is as follows. The observed heterogeneity in prices can be largely explained by a dynamic downward renegotiation of prices. The importing firm is able to secure a greater share of the surplus of the transaction upon repeated interaction (Fontaine et al. 2020). We observe that price dispersion within a foreign seller is largely caused by firms adjusting their markups overtime to the benefit of their regular customers. Nonetheless, the importer's unobserved heterogeneity accounts for at least 27% of the price variation.

Table 1: On-the-match price dispersion

	(1)	(2)	(3)	(4)	(5)
Match duration		-0.004***	-0.010***	-0.006***	-0.005***
		(0.001)	(0.001)	(0.001)	(0.001)
Match duration x Differentiated					-0.002
					(0.002)
Log (Import value)			0.324***	0.325***	0.325***
			(0.011)	(0.011)	(0.011)
Log (Transactions to date)			-0.022***	-0.017***	-0.017***
			(0.004)	(0.004)	(0.004)
First transaction				0.060***	0.044***
				(0.005)	(0.005)
First transaction x Differentiated					0.022***
					(0.008)
One shot				0.082***	0.042***
				(0.005)	(0.007)
One shot x Differentiated					0.050***
					(0.008)
Observations	5,184,042	5,184,042	5,184,042	5,184,042	5,184,042
Adjusted R-squared	0.783	0.783	0.815	0.815	0.815
Importer effects	Yes	Yes	Yes	Yes	Yes
Seller effects	Yes	Yes	Yes	Yes	Yes
Product x Month effects	Yes	Yes	Yes	Yes	Yes
Shipping port effects	Yes	Yes	Yes	Yes	Yes
Share of within-seller dispersion:					
Importer effects	0.39	0.396	0.278	0.271	0.275
Match residual	0.61	0.604	0.399	0.405	0.401

Notes: The outcome variable is log of price. All regressions include a constant term. Robust standard errors clustered by seller are given in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Price discrimination has been shown to be a common practice amongst firms selling differentiated products. Column (6) includes interaction terms between buyer-seller match controls and a dummy variable classifying the imported commodity as a differentiated good. While the coefficient of the

interaction term with match duration turns out be insignificant, we observe that sellers of differentiated products charge a noticeably higher price for the first transaction with a given importer. Moreover, the premium charged to firms interacting only once is almost twice as large for differentiated commodities compared to non-differentiated goods. Although all sellers charge a greater price to their newly acquired and one-shot buyers, the premium charged by sellers of differentiated goods is much higher, possibly due to offering a customized product based on the heterogeneity in buyers' valuation, and the lack of availability of close substitutes for its brand. Conversely, there is no suggestive indication of the extent of on-the-match price renegotiation to differ across homogeneous and differentiated products.

We conduct several exercises to confirm the robustness of our results. Eq. (1) is re-estimated after removing outliers from the sample.[8] The results are insensitive to alternate levels of standard errors clustering. To directly compare our estimates with those obtained by Fontaine et al. (2020), an alternative specification is estimated including additional variables: a count of foreign seller's partners and seller's experience in Pakistan, and distance from the country of origin. All results are consistent with our baseline findings.[9]

5. Conclusion

We present robust evidence of price discriminatory practices of foreign firms competing in a small open economy, and the downward renegotiation of prices that takes place on-the-match. Using detailed customs data for Pakistan, we provide descriptive evidence of the cross-sectional dissimilarity in prices within sellers. Next, we highlight the underlying mechanisms behind the observed price variation. To our knowledge, our study is the first to shed light on the heterogeneity in pricing behavior of sellers of various types of goods owing to the structure of firm-to-firm connections. We offer useful insights for future theoretical and empirical work to control for factors which could potentially be strongly correlated with pricing strategies of firms engaged in international trade.

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[8] We identify outliers as firms having total imports and/or prices below the 1st percentile or above 99th percentile of the respective distribution.
[9] See Online Appendix.

References

Abowd, J. M., Kramarz, F., & Margolis, D. (1999). High wage workers and high wage firms. *Econometrica, 67*(2), 251–334.

Bernard, A. B., Redding, S. J., Jensen, J. B., & Schott, P. K. (2012). The Empirics of Firm Heterogeneity and International Trade. *Annual Review of Economics, 4*, 283-313.

Engel, C., & Rogers, J. H. (1996). How wide is the border? *American Economic Review, 86*(5), 1112-1125.

Fontaine, F., Martin, J., & Mejean, I. (2020). Price discrimination within and across EMU markets: Evidence from French exporters. *Journal of International Economics, 124*.

Goldberg, P. K., & Verboven, F. (2005). Market integration and convergence to the Law of One Price: evidence from the European car market. *Journal of International Economics, 65*(1), 49-73.

Gopinath, G., Gourinchas, P.-O., Hsieh, C.-T., & Li, N. (2011). International Prices, Costs, and Markup Differences. *American Economic Review, 101*(6), 2450-86.

Kugler, M., & Verhoogen, E. (2012). Prices, Plant Size, and Product Quality. *The Review of Economic Studies, 79*(1), 307-339.

Manova, K., & Zhang, Z. (2011). Export Prices Across Firms and Destinations. *Quarterly Journal of Economics, 127*(1), 379-436.

Rauch, J. E. (1999). Networks versus markets in international trade. *Journal of International Economics, 48*(1), 7-35.

Varian, H. R. (1980). A Model of Sales. *American Economic Review, 70*(4), 651-659.