DISCUSSION PAPER Nº IDB-DP-1089

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April 2025

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Abstract*

We propose a novel mechanism to explain the incomplete pass-through of exchange rates to exporter prices and quantities, based on the relationship between exporters' dynamic pricing strategies and currency risk premia. When domestic currency risk premium increases, the relative value of current foreign currency cash flows rises compared to future ones. Consequently, exporters who set prices in customer markets are inclined to increase markups today, leading to higher prices in response to elevated risk premia. This risk-based explanation provides a new perspective on the exchange rate disconnect puzzle, suggesting that a higher currency risk premium dampens the direct impact of exchange rate changes on export prices. We test this mechanism empirically using firm-product level data from Colombian exporters on prices and quantities.

JEL classifications: F31, F12, F14

Keywords: Exchange Rate Pass-Through, Currency Risk Premia, Customer Markets

*We are grateful to seminar participants in the Bank of England, Lancaster University Management School, the University of Cardiff, the University of York, and the Macroeconomics Network in the South West 5th Workshop for useful comments. The views expressed are those of the authors and do not necessarily reflect official positions of the IDB.

1 Introduction

In international markets where firms face customer inertia, the evolution of their customer base is closely tied to their past pricing decisions (Phelps and Winter, 1970; Bils, 1989; Rotemberg and Woodford, 1999; Nakamura and Steinsson, 2011). This connection transforms firms' pricing strategies from purely short-term cashflow considerations to dynamic forward-looking decisions, even in environments with flexible prices. By temporarily sacrificing higher markups, firms can grow their customer base and secure higher profits in the future. This dynamic pricing behavior is particularly relevant for exporters entering new markets, where empirical evidence suggests that initial pricing strategies significantly influence market shares and sales growth (Foster et al., 2016; Piveteau, 2021).

In much of the literature on export pricing in dynamic frameworks where firms optimize intertemporally (whether due to nominal rigidities in menu cost models, customer capital accumulation, search frictions, or other similar mechanisms), how firms discount nominal payoffs often receives limited attention. However, to understand how exporters choose their pricing strategy, we should account for the fact that firms' valuation of future nominal cash flows must align with an equilibrium discount factor, which captures both the time value of money and the risk preferences of economic agents who invest in the firm. Crucially, if the risk premium associated with the valuation of nominal cash flows is time-varying, then fluctuations in this premium will directly influence exporters' investment and pricing strategies.[1]

Building on this insight, we demonstrate that when a currency depreciation arises from heightened risk premia, exporters become more inclined to raise markups today, curbing the usual incentive to price low and grow their customer base. As a result, the same currency depreciation that would ordinarily spur export growth can be blunted if it stems from heightened risk premia, deepening our understanding of why exchange rate movements often fail to translate into proportional changes in trade flows.

In this paper, we propose a novel mechanism that links these time-varying currency risk premia shocks to incomplete pass-through of exchange rates into export prices and quantities. In contrast to canonical pricing-to-market (PTM) explanations, where firms adjust markups primarily based on local demand factors or sticky-price frictions, we highlight an intertemporal asset valuation channel. Specifically, risk premium shocks shift the firm's

[1] Juvenal and Santos Monteiro (2024) show that fluctuations in the risk premium significantly influence exporters' sales along both the intensive and extensive margins.

optimal markup decisions by altering the intertemporal valuation of assets denominated in the domestic currency relative to dollar-denominated assets. An increase in the domestic currency risk premium raises the opportunity cost of forgoing current profits for future market expansion, prompting firms to favor higher markups in the short term.

This mechanism underscores a key channel through which currency risk premia shapes microeconomic pricing behavior, with important implications for exchange rate pass-through. For instance, when a depreciation of the exporter's currency reflects an increase in the required excess return on domestic assets (i.e., a higher currency risk premium), the present value of future market share expansion declines, inducing firms to raise their markups. This mechanism leads to lower exchange rate pass-through conditional on risk-led depreciations. Fluctuations in the stochastic discount factor (SDF) and the associated risk premia therefore become pivotal for understanding exporters' pricing strategies. At the same time, fluctuations in risk premia affect the dynamics of exchange rates, creating a direct link between firms' optimal export pricing decisions and pass-through.

We build on standard asset pricing theory to measure currency risk premia and examine their pass-through to export prices and trade volumes. We model the relationship between exchange rates and the SDF for domestic and dollar payoffs, identifying the domestic currency risk premia vis-à-vis the dollar as the difference between the dollar forward premium and the expected exchange rate depreciation. Specifically, we measure currency risk premia across a panel of currencies by leveraging deviations from uncovered interest parity (UIP) and realized currency excess returns. To operationalize this, we combine forward and spot exchange rates to compute realized excess returns, then perform Fama regressions to isolate their predictable components. Finally, we decompose these predicted excess returns into a currency-specific factor and a dollar factor common to all currencies, following the insight that the dollar often behaves as a global safe haven.[2] This three-step procedure yields a measure of time-varying currency risk premia that allows us to trace how changes in investors' required excess return affect exporters' dynamic pricing choices. In doing so, our analysis forges a direct empirical link between UIP deviations, risk premia, and export

[2]This approach is, in part, motivated by Hassan and Mano (2019), who show that expected returns on the dollar vary with the average forward premium against other currencies, underscoring the importance of a dollar common factor that is closely linked to the forward premium puzzle. Indeed, recent studies have developed models and demonstrated empirically how the U.S. dollar's valuation in foreign exchange markets is affected by foreign investors' demand for US safe assets (Maggiori, 2017; Jiang et al., 2021; Engel and Wu, 2023). Similarly, Adrian and Xie (2020) establish a causal relationship between the demand for dollar assets by non-US banks and the dollar exchange rate. Changes in the foreign demand for dollar assets forecast the dollar exchange rate both in and out of sample, over horizons of 2 to 5 years, pointing to the importance of time-varying risk premia.

dynamics, revealing how risk-led currency movements propagate into real outcomes through firm-level pricing behavior.

We provide empirical support for our proposed mechanism by leveraging a rich dataset of Colombian customs records from 2006 to 2022, disaggregated at the firm, product, and destination levels. This granular perspective allows us to track how the same products, sold by the same exporters, are priced differently across different markets over time. Our analysis uncovers robust evidence in favor of the customer markets model: prices systematically rise as firms gain tenure in a given destination, indicating that exporters initially forego higher markups to cultivate and retain new customers. This finding also aligns with earlier work suggesting that exchange rate pass-through depends non-linearly on the exporter's market share, becoming most pronounced when that share is largest (Alessandria, 2004; Auer and Schoenle, 2016).

Next, we estimate the effects of exchange rate fluctuations–both bilateral and dollar exchange rates–on export prices (unit values) and volumes. We first estimate a baseline model for bilateral exchange rates without accounting for currency risk premia. Here, a 10 percent depreciation in the nominal exchange rate results in a 7.1 percent increase in export prices (in domestic currency), implying a pass-through rate of 29 percent, consistent with prior studies. However, once we account for currency risk premia, the estimated pass-through rate increases by 34 percent, reaching 44 percent. This finding aligns with our theoretical framework and highlights that omitting risk premia biases pass-through estimates downward. Export volumes decline with both a higher currency risk premium and a depreciation of the bilateral exchange rate.

Given that most international goods trade is invoiced in U.S. dollars (Boz et al., 2022; Goldberg and Tille, 2008; Gopinath, 2015), recent research has placed considerable emphasis on understanding how dollar exchange rate movements propagate to trade flows. In particular, Gopinath et al. (2020), using the same Colombian customs data we do, demonstrate that the dollar exchange rate dominates bilateral exchange rates in pass-through and trade elasticity regressions. Accordingly, our analysis reveals that export prices rise nearly one-for-one with dollar appreciations, reinforcing the importance of dominant currency pricing. Yet, once we control for fluctuations in currency risk premia, peso depreciations are associated with higher exports—restoring a positive trade elasticity and suggesting that much of the PTM behavior reflects risk-premia-driven incentives. Exploiting currency risk premia shocks as an instrumental variable for dollar appreciations further confirms that risk-led dollar appreciations induce higher export prices and lower export volumes, evidence that directly supports our structural model of dynamic markup adjustments in customer markets.

Lastly, we find that the pass-through of risk premia shocks varies systematically across firms, with more productive exporters adjusting their markups more aggressively. This heterogeneity aligns with our theoretical framework: higher-productivity firms place a greater value on building (and retaining) future market share, and thus respond more strongly to changes in the cost of forgoing present profits. As a result, firm-level productivity interacts with currency risk premia in shaping both the level of pass-through and the evolution of export volumes.

Related Literature — Our analysis ties together multiple strands of international economics and finance. An established consensus now recognizes the importance of customer capital accumulation in explaining how exporters expand their market shares over time in new destinations (Drozd and Nosal, 2012; Gourio and Rudanko, 2014; Ravn et al., 2006). Prior work identifies two main mechanisms driving this dynamic: i) non-pricing strategies such as marketing and advertising, which generate demand persistence; and ii) temporary price cuts aimed at building a durable customer base (the customer markets model). Fitzgerald et al. (2023) provide compelling evidence for the first mechanism, showing that Irish exporters primarily rely on non-price investments to grow their customer base post-entry. Yet, these findings do not rule out the role of dynamic pricing, nor do they exclude the possibility that discount-factor shocks—and, by extension, risk premia shocks—may alter the incentive to reduce markups for future market expansion (Gilchrist et al., 2017). Our paper highlights how risk-led currency depreciations also affect incentives to invest in building customer capital in foreign markets, therefore leading to higher markups.

Several recent studies likewise emphasize the importance of dynamic pricing to build demand across foreign markets. Rodrigue and Tan (2019), using detailed Chinese customs data, find that Chinese exporters initially enter new markets at relatively low prices and that prices, product quality, and sales increase as demand grows. Similarly, Chen and Juvenal (2022), document how Argentinean wine producers discriminate across destinations based on distance, charging higher markups where entry and market-cultivation costs are greater. Our results extend this logic by showing how fluctuations in currency risk premia systematically affect these dynamic pricing choices.

Our paper fits within a large literature investigating the channels behind incomplete pass-through and deviations from the law of one price. These channels include local currency pricing (LCP), where sticky prices in the destination market's currency lead to zero short-run pass-through (Devereux and Engel, 2002; Gopinath and Rigobon, 2008); PTM, where firms adjust markups across destinations based on local conditions (Atkeson and Burstein, 2008; Fitzgerald and Haller, 2014; Knetter, 1993); and the imported inputs channel (Amiti et al., 2014), resulting in incomplete pass-through to producer prices because of exchange rates led variations in marginal costs. Corsetti and Dedola (2005) combine PTM with distribution costs, which require non-traded goods priced in the currency of the destination country, making the price elasticity of demand country-specific and smaller following a depreciation. Particularly relevant for our work is Krugman (1987), who demonstrates that the incentive to maintain a customer base can yield different pass-through rates for transitory versus persistent depreciations. Extending Krugman's framework, we incorporate risk premia into this analysis, showing that elevated risk premia discourage exporters from investing in customer base expansion, resulting in higher markups and lower pass-through conditional on a depreciation caused by fluctuations in currency risk premia.[3]

A related strand of research addresses how heterogeneous firm characteristics affect exchange rate pass-through. Berman et al. (2012) find that the more productive firms react to a depreciation by increasing significantly more their markup and by increasing less their export volume. This is consistent with our theoretical prediction, with regards to depreciations caused by elevated currency risk premia, since our model predicts that the price set by the more productive firms is more elastic to changes in the valuation of customer capital and, thus, risk premia. Chen and Juvenal (2016) also examine heterogeneous exporters, focusing on product quality, in which heterogeneous pass-through across exporters stems from the assumption that higher quality products have higher distribution costs. However, these models are static and give no role for decisions under risk, whereas we focus on variation across markets and over time in the exporters' incentives to invest in customer markets, within an equilibrium asset pricing framework.

While prior research has extensively studied the role of currency risk to explain the cross-section of excess returns on foreign currency (Lustig and Verdelhan, 2007; Nucera et al., 2024), its implications for exporters' pricing strategies remain underexplored. This gap is particularly notable given that many export prices are denominated in foreign currencies, directly exposing exporters to currency risk. By incorporating risk premia into the analysis, this paper demonstrates their pivotal role in shaping export pricing strategies. It highlights

[3]Our work also relates to Forbes et al. (2018) who develop a structural Vector Autoregression (SVAR) framework for the United Kingdom and show that prices respond differently to exchange rate fluctuations based on what shocks caused the movements, with pass-through estimated to be low in response to domestic demand shocks and relatively high in response to domestic monetary policy shocks.

how these premia influence the degree of exchange rate pass-through to export prices. These findings contribute to a deeper understanding of the links between exchange rates, risk premia, and global trade. Specifically, we show that fluctuations in currency risk premia are crucial for understanding the pricing strategies of exporters and the pass-through of exchange rate movements to export prices.

Finally, our paper connects to the literature on general equilibrium models of exchange rate determination and the disconnect between exchange rates and macroeconomic aggregates, focusing on risk premia shocks and stochastic deviations from the UIP condition. Devereux and Engel (2002) argue that incomplete pass-through, incomplete international financial markets, and UIP deviations amplify exchange rate volatility while insulating macroeconomic aggregates. Alvarez et al. (2009) propose a general equilibrium monetary model in which time-varying risk premia emerges from endogenous fluctuations in asset market segmentation, and explains almost entirely the movements in currency forward premia. Gabaix and Maggiori (2015) show how risk-averse intermediaries and capital flows drive exchange rates, often disconnecting them from fundamentals.

Recently, Itskhoki and Mukhin (2021, 2024) highlight how, in an environment with an imperfect financial market and limits to arbitrage, demand shocks for specific currencies create exchange rate fluctuations largely unrelated to macroeconomic quantities. Kekre and Lenel (2024) show how, particularly at high frequencies, rising demand for safe assets can appreciate safe-haven currencies (specifically, the dollar), and lead to a decline in global output. Our partial equilibrium model, treating risk premia shocks as exogenous, complements these studies by linking such shocks to exporters' pricing strategies, showing how they influence markups and exchange rate pass-through, thus connecting foreign exchange and financial markets shocks to international goods prices and trade dynamics.

Outline — The remainder of the paper is organized as follows. Section 2 constructs our measure of currency risk premia. Section 3 presents a theoretical model of pricing in customer markets, where firms dynamically adjust markups under equilibrium discounting of cash flows, emphasizing the role of currency risk premia in shaping pricing strategies. Section 4 describes the data. Section 5 includes empirical evidence on exporters' pricing behavior, outlines the econometric framework, and presents the main findings. Section 6 explores extensions and robustness checks. Section 7 concludes.

2 Currency Risk Premia

Under fairly general conditions (see, for example, Backus et al., 2001; Brandt et al., 2006; Lustig and Verdelhan, 2007), when international currencies are efficiently priced in equilibrium, the local currency nominal exchange rate with the dollar follows this equation

$$s_{t+1} - s_t = m^{\star}_{t+1} - m_{t+1}, \tag{1}$$

with $s_t = \ln(\mathcal{S}_t)$, the logarithm of the spot nominal exchange rate in local currency per dollar, and where $m^{\star}_{t+1} = \ln\left(\mathcal{M}^{\star}_{t+1}\right)$ and $m_{t+1} = \ln(\mathcal{M}_{t+1})$ represent the logarithm of the SDF for payoffs in dollars and the logarithm of the SDF for payoffs in local currency, respectively. The SDF serves as the key asset-pricing object that translates a future payoff into its present value, accounting for both the uncertainty of the future state and the investor's marginal utility in that state.

Taking conditional expectations of equation (1) and assuming that the SDF follows a conditional log-normal distribution, we obtain

$$\begin{aligned} E_t\left(\Delta s_{t+1}\right) &= E_t\left(m^{\star}_{t+1}\right) - E_t\left(m_{t+1}\right) \\ &= \ln\left(E_t \mathcal{M}^{\star}_{t+1}\right) - \ln\left(E_t \mathcal{M}_{t+1}\right) + \left[\frac{\text{var}_t\left(m_{t+1}\right) - \text{var}_t\left(m^{\star}_{t+1}\right)}{2}\right] \\ &= i_t - i^{\star}_t + \left[\frac{\text{var}_t\left(m_{t+1}\right) - \text{var}_t\left(m^{\star}_{t+1}\right)}{2}\right], \end{aligned} \tag{2}$$

where Δs_{t+1} denotes the nominal exchange rate depreciation. The final equality follows from the fundamental asset pricing conditions, $E_t \mathcal{M}_{t+1} = \exp(-i_t)$ and $E_t \mathcal{M}^{\star}_{t+1} = \exp(-i^{\star}_t)$, where i_t and $i^{\star}_t$ are the risk-free nominal interest rates on domestic- and dollar-denominated assets, respectively.

Since there is no evidence of deviations from covered interest parity (CIP) beyond very high frequencies (Akram et al., 2008), we express the interest rate differential in terms of the dollar forward premium: $f_t - s_t = i_t - i^{\star}_t$, where f_t is the logarithm of the forward exchange rate in units of the local currency. When the dollar trades at a forward premium, meaning that $f_t - s_t > 0$, the domestic risk-free rate must exceed the dollar risk-free rate, $i_t - i^{\star}_t > 0$. Substituting this into equation (2), we express the expected excess return on local currency-denominated assets, or the currency risk premium, as

$$\texttt{crp}_t = \frac{\mathrm{var}_t\left(m^\star_{t+1}\right)}{2} - \frac{\mathrm{var}_t\left(m_{t+1}\right)}{2}, \tag{3}$$

where the currency risk premium is the difference between the dollar forward premium and the expected local currency depreciation, $\texttt{crp}_t = f_t - s_t - E_t\left(\Delta s_{t+1}\right)$.

From equation (3), currency risk premia predictability requires heteroskedasticity in either the dollar payoff SDF, the domestic payoff SDF, or both (Lustig and Verdelhan, 2012). Without loss of generality, we assume that only the domestic SDF exhibits heteroskedasticity, yielding

$$\widehat{\texttt{crp}}_t = \texttt{crp}_t - \overline{\texttt{crp}} = -\left[\frac{\mathrm{var}_t\left(m_{t+1}\right) - \sigma^2}{2}\right], \tag{4}$$

where $\widehat{\texttt{crp}}_t$ is the currency risk premium in deviation from its unconditional mean, $\overline{\texttt{crp}}$, and σ^2 denotes the unconditional variance of the dollar payoff SDF. Next, we derive an empirical proxy for the currency risk premium in equation (4) to examine the pass-through of currency risk premia shocks to the exchange rate, export prices, and export quantities.

2.1 Measuring Currency Risk Premia Empirically

We can use the fundamental asset pricing conditions just outlined to estimate risk premia for any currency using realized currency excess returns. To do this, we follow a three-step procedure. First, we compute for a panel of $\texttt{C}$ currencies their realized log excess returns vis-à-vis the dollar, given by

$$rx_{\texttt{c},t+1} = f_{\texttt{c},t} - s_{\texttt{c},t} - \Delta s_{\texttt{c},t+1}, \qquad \texttt{c} = 1, \ldots, \texttt{C}, \tag{5}$$

where $rx_{\texttt{c},t+1}$ denotes the excess return, $f_{\texttt{c},t} - s_{\texttt{c},t}$, represents the dollar forward premium relative to currency $\texttt{c}$, and $\Delta s_{\texttt{c},t+1}$ is the local currency depreciation. Excess returns are computed using 3-month maturity forward contracts and spot exchange rates, both obtained at the start of each quarter, to ensure consistency in measuring quarterly excess returns.

If the UIP condition holds, excess returns should be unpredictable at time t. However, since the seminal work of Fama (1984), a growing body of evidence has documented what is now known as the forward premium puzzle: high-interest-rate currencies often appreciate rather than depreciate, and interest rate differentials predict excess returns. Lustig and Verdelhan (2007) show that UIP fails in the cross-section, as investors earn large excess returns simply by holding bonds denominated in high-interest-rate currencies. Moreover, the predictability of excess returns has led many to argue that they reflect variation in priced currency risk (Alvarez et al., 2009; Hassan and Mano, 2019; Kalemli-Özcan and Varela, 2021; Lustig et al., 2011; Lustig and Verdelhan, 2007).

A common approach to characterizing currency risk premia is through the unconditional covariance of expected currency returns with the dollar forward premium (Hassan and Mano, 2019), which is often regarded as the best predictor of currency excess returns (Lustig et al., 2011). Accordingly, the second step for estimating the currency risk premium for each currency c involves correlating the excess returns from equation (5) with the dollar forward premium. Specifically, we estimate the pooled predictive regression of Fama (1984), given by

$$rx_{\mathsf{c},t+1} = \gamma_0 + \gamma_1 \left(f_{\mathsf{c},t} - s_{\mathsf{c},t}\right) + e_{\mathsf{c},t+1}. \tag{6}$$

We then obtain the predicted excess return using the fitted values from the regression, as follows

$$\widehat{rx}_{\mathsf{c},t+1} = \widehat{\gamma}_0 + \widehat{\gamma}_1 \left(f_{\mathsf{c},t} - s_{\mathsf{c},t}\right). \tag{7}$$

Table 1 reports the estimates of equation (6) and confirms the well-documented positive relationship between excess returns and the dollar forward premium, indicating that high-interest-rate currencies tend to earn positive excess returns. The estimated coefficient, $\widehat{\gamma}_1$, is less than unity, implying that while high-interest-rate currencies generate positive excess returns, they still depreciate over time, partially but not fully offsetting interest rate differentials.[4]

The estimated coefficient is consistent with the common risk-based interpretation of the UIP deviations. For each currency, c, the predicted excess return can be decomposed as the sum of a currency-specific fixed effect, a dollar-time effect, and a currency-time random effect, as follows

$$\widehat{rx}_{\mathsf{c},t+1} = \alpha_{\mathsf{c}} + \beta_t^{\star} + \epsilon_{\mathsf{c},t}, \tag{8}$$

where $\epsilon_{\mathsf{c},t}$ captures idiosyncratic risk factors or, simply, noise.[5] Hassan and Mano (2019) argue that to parsimoniously capture the cross-sectional and time-series variation in excess returns for panels of currencies, only the first two components are necessary: the currency

[4] This finding aligns with Hassan and Mano (2019) and is consistent with empirical evidence on exchange rate dynamics, interest rates, and deviations from UIP documented in Kalemli-Özcan and Varela (2021).

[5] All three components are measurable with the date t information filtration, as this is a decomposition for the predicted excess return.

Table 1: Fama Regression

dependent variable: currency c's excess return , $rx_{\mathtt{c},t+1}$			
	coeff.	**std. err.**	**t-stat**
\$ forward premium, $(f_{\mathtt{c},t} - s_{\mathtt{c},t})$	0.25	0.11	2.38
# observations			$2,366$
Number of currencies			26

Notes: Robust standard errors are clustered at the currency level. The dollar forward premium for each currency, $(f_{\mathtt{c},t} - s_{\mathtt{c},t})$, is computed using 3-month maturity forward contracts, obtained at the start of each quarter, to compute quarterly frequency excess returns. Specifically, we use spot exchange rates on January 2nd, April 1st, July 1st, and October 1st, and their corresponding 3-month forward rates. The constant term is omitted from the table.

fixed effect, $\alpha_{\mathtt{c}}$, which makes some currencies systematically offer higher expected returns than others, and the dollar factor, $\beta_t^{\star}$, which drives time variation in the dollar's return relative to all other currencies.

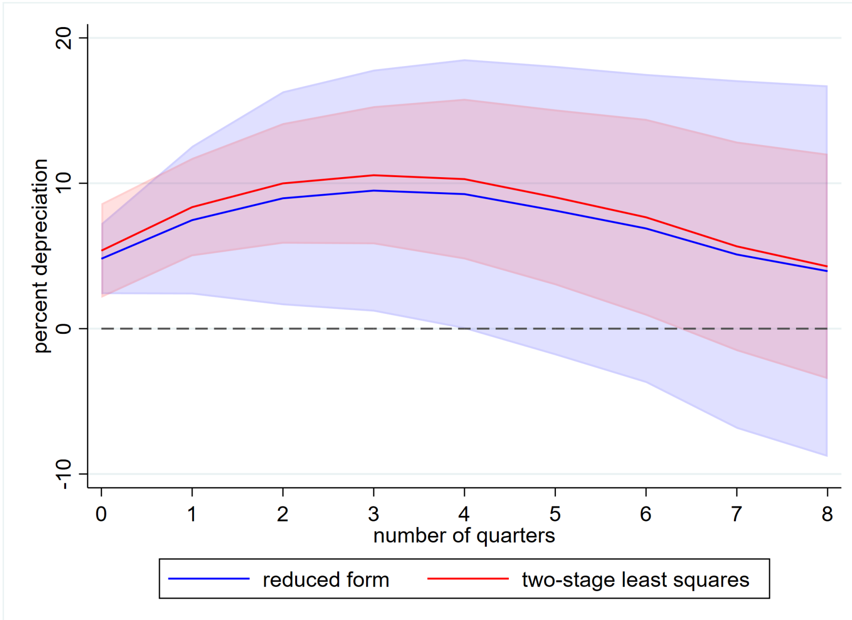
The two factors, $\alpha_{\mathtt{c}}$ and $\beta_t^{\star}$, can be directly recovered from the panel of predicted currency excess returns obtained from equation (7). This is achieved by regressing these predicted returns on a currency-specific fixed effect and a time effect common across currencies. Therefore, the third and final step in our procedure for estimating currency risk premia is to estimate the panel regression model (8), yielding the cross-sectional and dollar factors, $\widehat{\alpha}_{\mathtt{c}}$ and $\widehat{\beta}_t$. From these estimates, we compute the currency risk premium for each currency as

$$\widehat{\mathtt{crp}}_{\mathtt{c},t} = \widehat{\alpha}_{\mathtt{c}} + \widehat{\beta}_t^{\star} - \overline{\mathtt{crp}}, \tag{9}$$

where $\overline{\mathtt{crp}}$ denotes the overall sample average of the currency risk premia.

Figure 1 presents the estimated response of the exchange rate to a one percentage point shock to the currency risk premium, identified using the procedure described in this Section. The results, based on panel local projections, indicate that a risk premium shock induces a depreciation that peaks at approximately 10% after four quarters and persists for nearly two years. Since the common factor, $\widehat{\beta}_t^{\star}$, drives fluctuations in currency risk premia over time, these findings align with recent evidence on the role of global demand for dollar assets in shaping exchange rate dynamics (Engel and Wu, 2023; Jiang et al., 2021; Maggiori, 2017).

Figure 1: Response of Spot Exchange Rate to Currency Risk Premia Shocks



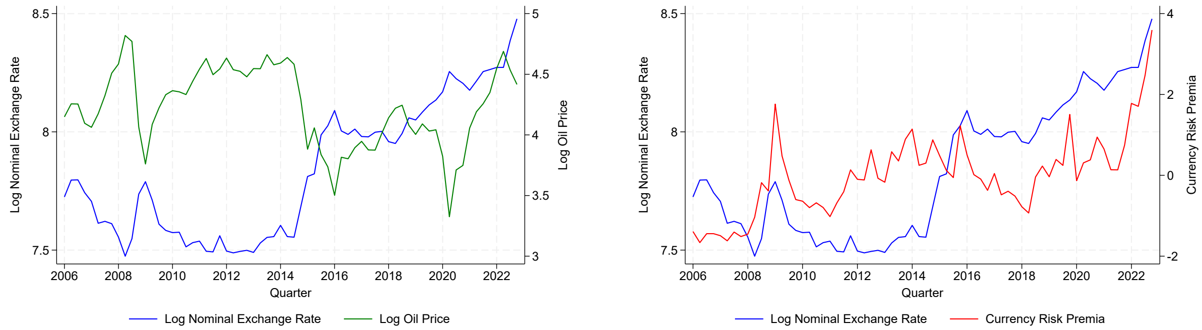
Notes: The shaded areas correspond to 95% confidence intervals constructed using robust standard errors. The impulse response functions are based on the estimation of the local projection model $\Delta_h s_{\mathtt{c},t+h} = \rho_0^h + \rho_1^h s_{\mathtt{c},t-1} + \rho_2^h s_{\mathtt{c},t+h+1} + \beta^h \widehat{\mathtt{crp}}_{\mathtt{c},t} + \epsilon_{\mathtt{c},t+h+1}$, where $\Delta_h s_{\mathtt{c},t+h} = s_{\mathtt{c},t+h} - s_{\mathtt{c},t-1}$ represents the h-horizon cumulative change in the exchange rate. The coefficient β^h captures the response of the exchange rate to a shock in the currency risk premia, $\widehat{\mathtt{crp}}_{\mathtt{c},t}$, defined in equation (9). In the two-stage least squares regression, the predicted excess returns, as defined in equation (8), are instrumented using the currency risk premia, $\widehat{\mathtt{crp}}_{\mathtt{c},t}$.

In particular, Adrian and Xie (2020) establish a causal relationship between dollar demand and exchange rate movements, with effects lasting between two to five years. The persistence we document aligns well with their findings, reinforcing the importance of time-varying risk premia in explaining exchange rate volatility.

Figure 2 illustrates the relationship between Colombia's nominal exchange rate, oil prices, and currency risk premia. The left panel shows that, as a net oil exporter, Colombia's currency appreciates when oil prices rise, reflecting an improvement in its terms of trade. By contrast, the right panel indicates that an increase in the peso risk premium triggers a depreciation of the peso, with spikes in risk premia aligning with episodes of dollar strength and, consequently, peso depreciation.[6] These patterns suggest that fluctuations in risk premia can drive exchange rate movements of a similar magnitude to those caused by terms-of-trade shocks, such as oil price fluctuations.

[6]For instance, we observe pronounced spikes in currency risk premia during the global financial crisis in 2009, the dollar appreciation in 2015, and again during the COVID-19 crisis.

Figure 2: Exchange Rate, Oil Prices, and Currency Risk Premia in Colombia



(a) Exchange rate and oil prices (b) Exchange rate and peso risk premium

Standard asset pricing theory and the risk-based explanation of the forward premium puzzle (Engel, 2014) attribute deviations from UIP to currency risk premia, allowing us to identify country-specific risk premium shocks. These shocks drive exchange rate depreciations and contribute to exchange rate volatility. We examine how depreciation from risk premium shocks passes through to prices and trade. In the next section, we show that when monopolistically competitive firms in customer markets set optimal markups, a risk premium shock lowers domestic asset values, discourages investment in customer capital, and raises markups. Using Colombian customs data, we confirm that exporters' pricing responses depend on whether exchange rate fluctuations stem from risk premium shocks or other fundamentals.

3 Exporters and the Currency Risk Premium

We develop a partial-equilibrium framework to show how *currency risk premia* shape exporters' internationalization strategies, focusing on dollar-pricing firms operating in *customer markets*. The world economy consists of $N + 1$ countries, labeled $n = 0, \ldots, N$, with country 0 representing the domestic economy and the remaining N countries comprising the rest of the world. Consistent with the dominant-currency paradigm (see Gopinath et al., 2020), all trade is invoiced in U.S. dollars, and production uses imported intermediate goods (also priced in dollars).

3.1 Set-Up: Exporters in Customer Markets

Each domestic exporter is identified by a firm $i \in \mathcal{I}$ producing a differentiated good $z = 1, \ldots, Z$. In each period, the firm must choose the (dollar) price $P_{izn,t}$ to set in each foreign destination $n = 1, \ldots, N$. Following Juvenal and Santos Monteiro (2024), firms are *publicly traded* in domestic capital markets and, therefore, are efficiently priced, with their valuation determined by the SDF, $\mathcal{M}_{t+1}$. Denoting the cum-dividend nominal value of firm i operating in sector z by $\mathcal{V}_{iz,t}$, and the exchange rate, in units of domestic currency per dollar, by $\mathcal{S}_t = \exp(s_t)$, the firm's value satisfies:

$$\mathcal{V}_{iz,t} = \sum_{n=1}^{N} \Pi\left(P_{izn,t}, K_{izn,t}\right) \mathcal{S}_t + E_t\left(\mathcal{M}_{t+1}\mathcal{V}_{iz,t+1}\right), \tag{10}$$

where $\Pi\left(P_{izn,t}, K_{izn,t}\right)$ corresponds to the exporter's dollar profits at date t in market n, and depends on the (dollar) price chosen, $P_{izn,t}$, and $K_{izn,t}$, representing the firm's customer base in destination n. The first key assumption is that $\mathcal{M}_{t+1} = \exp\left(m_{t+1}\right)$, is the equilibrium SDF that prices nominal domestic payoffs and thus satisfies equation (1). The other key assumption is that a firm that has accumulated a larger customer base in a given export market will enjoy higher sales in that market.[7]

Customer Base Accumulation and Foreign Demand — We assume a larger customer base $K_{izn,t}$ in destination n raises sales due to brand recognition or distribution networks (Foster et al., 2016). In particular, the customer base in each market evolves endogenously, as follows

$$K_{izn,t+1} = \Phi_{izn,t} + (1-\delta)\left(K_{izn,t} + R_{izn,t}\right), \tag{11}$$

where $\Phi_{izn,t}$ is an exogenous factor contingent on firm characteristics (such as the age and overall reputation of the firm), and where $R_{izn,t} = P_{izn,t}\mathcal{S}_t X_{izn,t}$ is the revenue (in units of the domestic currency) earned by firm i from exporting to destination n at date t. Thus, additional sales today *augment* future demand, but depreciate at rate δ. Customer base accumulation contingent on the firm's past sales captures how demand frictions slow down

[7] As our theoretical model is a partial equilibrium model, we do not restrict the equilibrium SDF in any way. In particular, we do not impose complete financial markets. However, we assume that volatility in the SDF used to price domestic exporters is driven by the same factors as the volatility in the SDF used to price domestic currency payoffs in international capital markets. This assumption aligns well with the findings in Kekre and Lenel (2024) that risk premium measures associated with different categories of assets, such as corporate bonds (the Gilchrist and Zakrajšek, 2012, excess bond premia) and the index of aggregate risk aversion (proposed by Miranda-Agrippino and Rey, 2020), help explain fluctuations in G7 currencies excess returns vis-à-vis the dollar over short-horizons.

the growth of exporters entering new markets (Bils, 1989; Nakamura and Steinsson, 2011).

Each destination n features CES demand over differentiated varieties. Following Atkeson and Burstein (2008) and Amiti et al. (2014), the quantity demanded from firm i is

$$X_{izn,t} = K_{izn,t}^{\gamma} \left(\mathcal{S}_t / \mathcal{S}_{n,t}\right)^{-\epsilon} P_{izn,t}^{-\epsilon} \mathtt{Y}_{zn,t}, \tag{12}$$

where $\epsilon > 1$ is the demand elasticity, $\gamma \in (0,1)$ captures the importance of the customer base, and $\mathcal{S}_{n,t}$ corresponds to the bilateral exchange rate between the peso and the importer's country currency. Therefore, $(\mathcal{S}_t/\mathcal{S}_{n,t})$ yields the exchange rate of the importer's currency vis-à-vis the dollar. Intuitively, a larger $K_{izn,t}$ raises the quantity demanded because of brand recognition or a well-established distribution network. Lastly, $\mathtt{Y}_{zn,t} > 0$, captures exogenous macroeconomic factors affecting the demand for sector z products, from destination n at date t, and may include numerous exogenous shocks affecting aggregate demand in the destination. Substituting (12) into (11), we obtain the dynamic accumulation equation for customer capital, given by

$$K_{izn,t+1} = \Phi_{izn,t} + (1-\delta)\left[K_{izn,t} + K_{izn,t}^{\gamma} \left(\mathcal{S}_t / \mathcal{S}_{n,t}\right)^{-\epsilon} P_{izn,t}^{1-\epsilon} \mathcal{S}_t \mathtt{Y}_{zn,t}\right]. \tag{13}$$

3.2 Firm's Problem and Pricing

Turning to production, each firm uses labor and imported intermediates (priced in dollars) through a Cobb-Douglas technology, The share of expenditure in intermediate inputs is equal to ζ, and without loss of generality, the dollar price of the imported intermediate inputs is assumed fixed at unity. There are nominal rigidities, represented by a wage rate that is predetermined in the domestic currency, given by $W_{z,t}$, and which is allowed to be sector-specific. The upshot is that the cost expressed in dollars of producing each unit of output is given by $(W_{z,t}/\mathcal{S}_t)^{1-\zeta}$, and the instantaneous dollar profits for firms in sector z from exporting to destination n are

$$\Pi\left(P_{izn,t}, K_{izn,t}\right) = \left[P_{izn,t} - \left(\frac{W_{z,t}}{\mathcal{S}_t}\right)^{1-\zeta}\right] K_{izn,t}^{\gamma} \left(\mathcal{S}_t / \mathcal{S}_{n,t}\right)^{-\epsilon} P_{izn,t}^{-\epsilon} \mathtt{Y}_{zn,t}. \tag{14}$$

The following Bellman equation defines the firm's problem

$$\mathcal{V}_{iz,t} = \max_{P_{izn,t}, K_{izn,t+1}} \left[\sum_{n=1}^{N} \Pi\left(P_{izn,t}, K_{izn,t}\right) \mathcal{S}_t + E_t\left(\mathcal{M}_{t+1} \mathcal{V}_{iz,t+1}\right)\right], \tag{15}$$

where $K_{izn,t+1}$ must obey the accumulation equation (13). The optimal dollar price chosen by firm i, operating in sector $z = 1, \ldots Z$, to be set in destination $n = 1, \ldots, N$, is given by

$$P_{izn,t} = \left(\frac{\epsilon}{\epsilon - 1}\right)\left[\frac{\left(W_{z,t}/\mathcal{S}_t\right)^{1-\zeta}}{1 + (1-\delta)\, E_t\left(\mathcal{M}_{t+1}\tilde{\Gamma}_{izn,t+1}\right)}\right], \tag{16}$$

where $\epsilon/(\epsilon - 1)$ denotes the static CES markup, and $\tilde{\Gamma}_{izn,t+1} = (d\mathcal{V}_{iz,t+1}/dK_{izn,t+1}) > 0$, corresponds to the shadow value for firm i of additional customer capital in market n at date $t+1$, reflecting *how valuable* it is to expand future demand in market n. The detailed derivation of the optimal price formula (16) is given in Appendix A.

The shadow value of additional customer capital in a given destination, $\tilde{\Gamma}_{in,t+1}$, for firm i is likely to be mostly determined by firm and destination-specific characteristics, such as how long the firm has operated in that destination, the productivity of the firm, and how costly it is to export to that destination. Therefore, the aggregate SDF is plausibly independent of the shadow value of additional customer capital in each market, and we can express the optimal pricing formula as follows

$$P_{izn,t} = \left(\frac{\epsilon}{\epsilon - 1}\right)\left[\frac{\left(W_{z,t}/\mathcal{S}_t\right)^{1-\zeta}}{1 + (1-\delta)\, \Gamma_{izn} E_t\left(\mathcal{M}_{t+1}\right)}\right], \tag{17}$$

with $\Gamma_{izn} = E_t\left(\tilde{\Gamma}_{izn,t+1}\right) \geq 0$, the conditional expectation of the shadow value of customer capital assumed to be contingent only on firm i and market n, and equal to the unconditional expectation and, thus, not time dependent.

Link to Currency Risk Premia — Next, from the assumption made in Section 2, that the logarithm of the SDF, represented by $m_{t+1} = \ln\left(\mathcal{M}_{t+1}\right)$, obeys the conditional normal distribution with conditional variance $\text{var}_t\left(m_{t+1}\right)$, we obtain the following optimal pricing formula

$$P_{izn,t} = \left(\frac{\epsilon}{\epsilon - 1}\right)\left(\frac{W_{z,t}}{\mathcal{S}_t}\right)^{1-\zeta}\left[1 + (1-\delta)\,\Gamma_{izn}\exp\left(\mu_t + \frac{\text{var}_t\left(m_t\right)}{2}\right)\right]^{-1}, \tag{18}$$

with $\mu_t = E_t\left(m_{t+1}\right)$ the conditional mean of the logarithm of the SDF.

Making use of equation (4) to obtain $\text{var}_t\left(m_{t+1}\right)/2 = -\widehat{\texttt{crp}}_t + \sigma^2/2$, we derive our structural pricing equation, establishing the relationship between the currency risk premia and the optimal price chosen by the firm i in export market n, as follows

$$P_{izn,t} = \left(\frac{\epsilon}{\epsilon - 1}\right)\left(\frac{W_{z,t}}{\mathcal{S}_t}\right)^{1-\zeta}\left[1 + (1-\delta)\,\Gamma_{izn}\mathrm{exp}\left(\mu_t + \frac{\sigma^2}{2} - \widehat{\mathtt{crp}}_t\right)\right]^{-1}. \tag{19}$$

Taking logs of equation (19) yields

$$p_{izn,t} = \lambda + (1-\zeta)\,(w_{z,t} - s_t) \underbrace{- \ln\left(1 + (1-\delta)\,\Gamma_{izn}\mathrm{exp}\left(\mu_t + \frac{\sigma^2}{2} - \widehat{\mathtt{crp}}_t\right)\right)}_{\text{dynamic markdown}}, \tag{20}$$

where $\lambda = \ln\left(\epsilon/\left(\epsilon-1\right)\right)$ is the optimal static markup in logs, and $p_{izn,t}$, $w_{z,t}$ and s_t, denote the optimal price, nominal wage, and nominal exchange rate in logs, respectively. The final term on the right-hand side, labeled *dynamic markdown*, reflects the firm's incentive to set a price below the static optimal price to accumulate additional customer capital.

Crucially, this incentive for dynamic markup adjustments also requires the firm to substitute intertemporally foreign currency cash flows. Specifically, as it sets a markup that is below the optimal static markup, the firm sacrifices foreign currency cash flows today in exchange for higher foreign currency cash flows tomorrow. When the expected value of future cash flows relative to current cash flows increases—implying a rise in the expected SDF, $E_t\left(\mathcal{M}_{t+1}\right)$—the exporter has a greater incentive to shift revenues to the future. To do so, the firm lowers prices today to expand future demand by building customer capital. However, if the domestic currency risk premium increases, this intertemporal substitution is more costly, since a higher domestic currency risk premium implies that foreign currency is relatively more valuable today. The upshot is that a higher domestic currency risk premia affects the dynamic pricing strategy of exporting firms. When $\widehat{\mathtt{crp}}_t$ rises, future payoffs are more heavily discounted, so the firm invests less in expanding its customer base. In equilibrium, this raises the markup and dampens pass-through of exchange rate movements.

Finally, substituting the last term in equation (20), corresponding to the dynamic markdown, with its first-order Taylor expansion around $\mu_t = -\sigma^2/2$, and $\widehat{\mathtt{crp}}_t = 0$, yields the following linear relationship

$$p_{izn,t} = \lambda + (1-\zeta)\,(w_{z,t} - s_t) + \left[\frac{(1-\delta)\,\Gamma_{izn}}{1 + (1-\delta)\,\Gamma_{izn}}\right] i_t + \left[\frac{(1-\delta)\,\Gamma_{izn}}{1 + (1-\delta)\,\Gamma_{izn}}\right]\widehat{\mathtt{crp}}_t, \tag{21}$$

where $i_t = -\ln\left(E_t\mathcal{M}_{t+1}\right) = -\left(\mu_t + \sigma^2/2\right)$, corresponds to the domestic risk-free rate and is, therefore, contingent on macroeconomic fundamentals such as GDP growth and the inflation rate. A detailed derivation of equation (21) is included in Appendix A.

Equation (21) offers the underpinnings for our empirical investigation that follows, as it establishes a relationship between currency risk premia and the pass-through of exchange rate shocks into exporters' prices and quantities. In particular, omitting the currency risk premia, $\widehat{\texttt{crp}}_t$, leads to a downward biased estimate of the degree of exchange rate pass-through if, as is often found in the empirical literature (and also found in this paper, in Section 2), higher domestic currency risk premia are associated with depreciated exchange rates vis-à-vis the long-run level of the exchange rate. The rest of the paper empirically investigates this structural relationship and the implications for the pass-through of exchange rate fluctuations to export prices and quantities.

4 Data and Descriptive Statistics

Our main dataset is constructed from Colombian customs records, which provide detailed information on trade flows at the firm level. We integrate these data with macroeconomic and firm-level variables obtained from multiple sources, including official statistics and private databases. In this Section, we describe the data sources and present summary statistics.

Currency risk premia — To construct the measure of currency risk premia, as outlined in Section 2, we obtain spot exchange rates and 3-month forward exchange rates provided by J.P. Morgan. Specifically, we use spot exchange rates on January 2nd, April 1st, July 1st, and October 1st, and their corresponding 3-month forward rates. These dates align with the four quarters of the year. In cases where data for any of these specific dates are unavailable, we use the exchange rates from the next available business day. We discard the currencies for which we do not have enough coverage. This allows us to obtain information for 26 currencies.

Firm-level data — Our firm-level analysis draws on export data from DANE, Colombia's national statistical agency, which includes comprehensive information on exports by firm, destination, product, covering the period from 2006 to 2022. The dataset includes information on the exporter tax identification number (NIT), the product code at the 10-digit level (according to the Nandina classification system, based on the Harmonized System), the FOB value (in U.S. dollars) and volume (net kilograms) of exports, and the country of destination. We construct unit values, expressed in domestic currency, as the FOB export value in Colombian pesos divided by net kilograms, which serve as a proxy for prices. The data are available on a monthly basis, and we aggregate exports at the quarterly level. The sample includes all manufactured products (HS chapters 16 to 97) excluding the oil industry (HS chapter 27).

We clean up the data in several ways. First, we drop observations for which the firm, destination, FOB value of exports, or quantity of exports are missing. Second, we also eliminate the observations for which quantities of values of exports are zero, as well as exports to Colombia or special economic zones. Third, to avoid including transactions with no commercial value, we drop observations for which the FOB value is lower than 100 dollars. Finally, we minimize the influence of potential outliers by dropping the observations with abnormally large price jumps, namely with year-to-year price ratios above 2 or below 2/3 (i.e., this represents about 1.7% of the value of FOB exports).[8]

To examine if the pass-through of currency risk premium shocks is heterogeneous across firms with different characteristics, we merge the customs-level transaction records with firm characteristics data from Orbis using a crosswalk between Orbis identifiers and tax identification numbers. The universe of firms covered by the Orbis database accounts for over 85 percent of total exports every year of our sample. However, we only have firm characteristics information up to 2019 because Orbis changed the firm identifier, and we are no longer able to match the firm's tax identification numbers.

Additional controls — For the regression analysis at the firm level, we incorporate several control variables. Quarterly nominal exchange rates against the U.S. dollar are sourced from the IMF's International Financial Statistics. Additionally, data on consumer price indices and real GDP for the destination countries are taken from the IMF's World Economic Outlook. We use the West Texas Intermediate spot crude oil price obtained from the Federal Reserve Bank of St. Louis, FRED. Bilateral distances between Colombia and its trading partners are calculated using the capital cities' distances sourced from the CEPII database. We obtain the percent of imports invoiced in U.S. dollars for each destination country in our dataset from Boz et al. (2022).

4.1 Descriptive Statistics

Table 2 provides an overview of the dataset, which spans the period from 2006 to 2022 and includes 25,583 exporting firms, 6,717 distinct ten-digit Nandina products, and 181

[8]Consistent with Gopinath et al. (2020), we exclude exports to Venezuela due to the extreme volatility observed in the data.

Table 2: Summary Statistics

	Mean	Median	Standard deviation	5th percentile	95th percentile
Exporters	25,583	–	–	–	–
Products	6,717	–	–	–	–
Destination countries	181	–	–	–	–
Products per exporter	27.7	5	57.8	1	188
Destinations per exporter	4.6	2	6.2	1	21
Unit values (U.S. dollar/kg, log)	2.7	2.6	1.7	0.1	5.3
Transaction values (U.S. dollar)	101,290	5,615	1,258,569	196	279,244
U.S. dollar invoicing (%)	84	94	23	25	97

Notes: For each variable, the table reports its mean, median, standard deviation, and values at the 5th and 95th percentiles.

destination countries, for a total of 1,812,400 observations.[9] On average, each firm exports 27 different products to 4.6 destinations (5th and 95th percentiles: 1 and 188 products, and 1 and 21 destinations, respectively). The mean export transaction value is 101,290 U.S. dollars, while the mean (log) unit value is 2.7.

The sample covers a broad range of destinations. The largest destination markets are the United States (32.1%), followed by Ecuador (16.9%) and Peru (10.5%). The dataset highlights the significant role of the U.S. dollar in the export destinations of Colombian firms. On average, 84% of transactions in these markets are invoiced in dollars, reflecting the widespread use of the currency in international trade. However, there is substantial variation across destinations: at the lower end, only 25% of transactions are invoiced in dollars (5th percentile), whereas at the upper end, dollar invoicing reaches 97% (95th percentile). While this statistic does not directly indicate that Colombian exporters themselves set prices in dollars, it strongly suggests that a large share of trade is invoiced in U.S. dollars. This could reflect exporter pricing decisions, importer preferences, or financial and institutional factors that favor dollar-denominated trade, even in transactions involving non-U.S. destinations.

5 Empirical Analysis

In this Section, we begin by documenting how firms adjust their prices in customer markets. We then present the empirical specification that guides our analysis, followed by our main results.

[9] Because some observations are perfectly predicted by the fixed effects (i.e., singletons), our regressions in Table 4 use only 1,805,179 of these observations.

5.1 Evidence of Pricing in Customer Markets

We provide initial evidence on the importance of customer markets, showing that new exporters to a given market set lower initial prices compared to the prices they charge for the same product in markets where they have already established a strong presence. To measure export experience at the firm-product-destination level, we propose two alternative indicators of market history.[10]

The first indicator, *cumulative history*, is defined as the total number of years that a firm has exported a given product to a particular destination. This measure is given by

$$\text{cumulative history}_{izn,t} = \sum_{k=1}^{t} \mathbf{1}(\text{Exported}_{iznk}),$$

where $\mathbf{1}(\text{Exported}_{iznk})$ equals 1 if firm i exported product z to destination n in year k, and 0 otherwise.

The second measure, *export age*, captures the length of a firm's current uninterrupted exporting relationship. To construct this measure, we first define an *export spell* as a period of continuous exporting activity with no gaps. For each firm-product-destination (i, z, n), we sort the data by year t, identify gaps in exporting (by comparing t to its lag), and then reset the count to 1 whenever a gap is detected. Formally, the export age within each spell is computed as follows

$$\text{ExportAge}_{izn,t} = \begin{cases} 1, & \text{if } t \text{ is the first year of a spell,} \\ \text{ExportAge}_{izn,t-1} + 1, & \text{otherwise.} \end{cases}$$

These measures provide alternative ways to quantify a firm's export history in a given market, allowing us to assess how past exporting behavior influences pricing decisions in customer markets. For these alternative measures of export market history, we estimate the following regression equation

$$p^{\text{peso}}_{izn,t} = \beta \text{history}_{izn,t} + \mathtt{D_t} + \epsilon_{izn,t}, \tag{22}$$

[10] Although our baseline model is estimated at the quarterly frequency, to account for the role of seasonality, which is important in our setting, we aggregate the data to the annual frequency to construct the measure of the exporting history of the firm in each destination market (similar to what is done in Fitzgerald et al., 2023).

Table 3: Export History and Prices

	(1)	(2)
log (cumulative history)	0.09***	
	(0.00)	
log (export age)		0.04***
		(0.00)
Prod-Time FE	✓	✓
Firm FE	✓	✓
Destination FE	✓	✓
# Observations	998,604	998,604

Notes: This table shows the estimation of equation (22) at the yearly frequency. Robust standard errors are reported in parenthesis and clustered at the product level. *, **, and *** indicate significance at 10%, 5% and 1% levels.

where $p^{\text{peso}}_{izn,t}$ denotes the log price, in Colombian pesos, of product z set by firm i in export market n at time t, β is our coefficient of interest, capturing the impact of market history at the firm-product level on the price set by the firm, and $\mathtt{D_t}$ is a control vector that includes destination, product-time, and firm fixed effects.[11]

The results reported in Table 3 show that exporters set higher prices in markets in which they already are well established, consistent with the predictions of our model of pricing in customer markets.[12]

5.2 Empirical Framework

Using the cross-sectional asset-pricing equations in Section 2, we can estimate domestic currency risk premia, which in turn allows us to identify parameters in equation (21). A key challenge, however, is the unobserved and heterogeneous shadow value of customer capital, Γ_{izn}, which varies across firms, sectors, and destinations. Since this value is only relevant when a firm can access a particular market, it diminishes with rising trade costs. Accordingly, we impose the following functional relationship between Γ_{izn} and distance,

[11] Since the measure of export history varies by firm, product, and time, we cannot include firm-product-time fixed effects.

[12] The results are robust when we consider a specification where the measure of history varies by firm and destination only, allowing us to include firm-product-time fixed effects and destination fixed effects. They are also robust to measuring prices at the quarterly frequency while keeping the measures of export history at the annual level.

reflecting the notion that the value of customer capital declines as trade barriers increase:

$$(1-\delta)\,\Gamma_{izn} = \frac{1}{\text{distance}_n}, \tag{23}$$

where distance_n is the logarithm of the distance (in kilometers) from Bogotá to export destination n. Greater distance implies reduced market access, and hence a lower shadow value of customer capital.

With this proxy for the shadow value of customer capital in market n, we propose to estimate an empirical regression equation tightly underpinned by the structural pricing formula (21), capturing not only the traditional exchange rate pass-through, but also the pass-through of currency risk premia to prices, given by

$$p^{\text{peso}}_{izn,t} = \phi^{\text{risk PT}} \left(\frac{\widehat{\texttt{crp}}_t}{1 + \text{distance}_n} \right) + \theta^{\text{PTM}} s_{n,t} + \Lambda_n + \Omega_{z,t} + \Upsilon_i + \eta_{izn,t}, \tag{24}$$

where $p^{\text{peso}}_{izn,t} = p_{izn,t} + s_t$ denotes the log price, in Colombian pesos, of product z set by firm i in export market n at time t, and where we make use of (23) to substitute for $(1-\delta)\,\Gamma_{izn}$ in (21). The variable $s_{n,t}$ denotes the log bilateral exchange rate between Colombia and the destination country and is defined as the price of currency n in units of Colombian pesos, such that an increase in $s_{n,t}$ reflects a depreciation of the peso relative to currency n. The main coefficients of interest are $\phi^{\text{risk PT}}$ and θ^{PTM}.The former captures the pass-through of currency risk premia to prices, while the latter is the pricing-to-market (PTM) coefficient. Accordingly, $1-\theta^{\text{PTM}}$ corresponds to the degree of exchange rate pass-through.[13]

Making use of the structural equation (21), the level of exchange rate pass-through corresponds to

$$1-\theta^{\text{PTM}} = 1 - \zeta \mathcal{E}_{n,\$}, \tag{25}$$

with $\mathcal{E}_{n,\$} = (\partial s_t / \partial s_{n,t})$, corresponding to the elasticity of the dollar exchange rate to changes in the bilateral exchange rate (measuring the percentage depreciation of the peso vis-à-vis the dollar when the peso depreciates one percent to the importer-country's currency). The derivation of equation (25) is presented in Appendix A.

Therefore, in our model that incorporates dominant currency pricing (as in Gopinath

[13]Our results are based on customs data from the exporting country (Colombia), reported as free on board (FOB), and, thus, correspond to producers' prices that exclude transport costs and other distribution fees that may impose a wedge between export and import prices. However, for reporting purposes, we ignore this wedge and refer to the percentage pass-through into import prices obtained as $100 \times \left(1-\theta^{\text{PTM}}\right)$, the difference between 100% and the degree of pricing to market in percentage.

et al., 2020) and incomplete pass-through due to imported intermediate goods in foreign currency (as in Amiti et al., 2014; Gopinath et al., 2020), the degree of exchange rate pass-through into prices will be smaller the more correlated the value of the importing country's currency is with the value of the dollar (measured by $\mathcal{E}_{n,\$}$) and, also, the greater is the share of imported intermediate goods, ζ. But, as explained in Section 3, omitting the currency risk premia from the regression model (24) will result in an upward bias estimate for θ^{PTM} (and, hence, a downward biased estimate of pass-through), since periods of high dollar valuation driven by heightened risk premia simultaneously lead to higher markups, because the currency risk premia pass-through, $\phi^{\text{risk PT}}$, is positive.

The terms Λ_n, $\Omega_{z,t}$, and Υ_i are destination-specific fixed effects, product-time effects, and firm fixed effects, respectively. The destination-specific fixed effects control for characteristics unique to each destination, such as market access conditions (e.g., distance, tariffs), that directly influence prices. Product-time effects capture product-specific demand shocks and other time-varying factors. Firm fixed effects account for time-invariant firm characteristics, including industry-specific attributes, long-term productivity, access to capital, and brand reputation.

We also estimate a more stringent specification by replacing firm and product-time fixed effects with firm-product-time fixed effects. Because products are defined at the 10-digit level, they are not firm-specific. By including firm-product-time fixed effects, we control for product-level variation in marginal cost over time, $w_{z,t}$. This specification therefore allows us to interpret the elasticity of prices with respect to changes in the interaction term $\widehat{\texttt{crp}}_t/\big(1+\text{distance}_n\big)$ and the exchange rate as stemming from the impact of changes in the currency risk premium on the firm's markup.

The counterpart of equation (24) but for volumes can be written as

$$x_{izn,t} = \phi^{\text{risk }\mathcal{E}}\left(\frac{\widehat{\texttt{crp}}_t}{1+\text{distance}_n}\right) + \theta^{\text{trade }\mathcal{E}} s_{n,t} + \Lambda_n + \Omega_{z,t} + \Upsilon_i + \varphi' X_{n,t} + \eta_{izn,t}, \tag{26}$$

where $x_{izn,t}$ is the log of the export volume and $X_{n,t}$ includes the CPI and the GDP of the importing country. The remaining variables are defined in the same way as before. We use these controls as distance-time effects cannot be included since they would be collinear with the exchange rate. The two coefficients of interest are the risk trade elasticity, $\phi^{\text{risk }\mathcal{E}}$, and the trade elasticity to the exchange rate, $\theta^{\text{trade }\mathcal{E}}$, respectively. Based on the structural foreign demand equation (12), it follows that the trade elasticity corresponds to

$$\begin{aligned}\theta^{\text{trade } \mathcal{E}} &= \epsilon\left(1-\zeta\right)\mathcal{E}_{n,\$} + \epsilon\left(1-\mathcal{E}_{n,\$}\right), \\ &= \epsilon\left(1-\zeta\mathcal{E}_{n,\$}\right).\end{aligned} \tag{27}$$

Notice that even restricting the import share of intermediate inputs, ζ, to be relatively small, the sign of the trade elasticity is not defined, and could be negative if, when the peso depreciates vis-à-vis the importer's currency, it tends to depreciate even more to the dollar, so that $\mathcal{E}_{n,\$} > 1$. Moreover, the risk trade elasticity, $\phi^{\text{risk } \mathcal{E}} = -\epsilon\phi^{\text{risk PT}}$, is unambiguously predicted to be negative by the structural model.

5.3 Empirical Results

In this Section, we present our main empirical findings. To test empirically the predictions of our theoretical model of currency risk premia pass-through, we use the firm and product level customs data at the quarterly frequency. We estimate pass-through regressions at the firm and product level for prices and quantities, using specifications (24) and (26), and also considering alternative models. Our results support the pricing model, demonstrating how firms adjust markups in response to currency risk premia shocks.

5.3.1 Pass-Through Regressions

Having established the importance of customer markets for pricing, we now turn to the estimation of the pass-through structural equation (24), for prices.

We begin by examining how Colombian manufacturing firms adjust their export prices in response to bilateral exchange rate movements. Table 4 summarizes the baseline unit value estimates. Column (1) includes product-time effects, firm fixed effects, and destination fixed effects, with the bilateral exchange rate between the Colombian peso and the destination currency as the main regressor. By including time effects, we control for aggregate macroeconomic shocks, notably fluctuations in the dollar exchange rate. The results indicate that a 10 percent depreciation of the peso leads to a 7.1 percent increase in unit values, implying a pass-through rate to import prices of 29 percent, computed as $100 \times \left(1-\theta^{\text{PTM}}\right) = 100 \times (1-0.71)$. Therefore, exporters increase their markups in response to a depreciation, rather than passing the full exchange rate change to importers, consistent with PTM (Atkeson and Burstein, 2008).[14]

[14] The estimated degree of pass-through is remarkably close to what is found elsewhere in the literature.

Table 4: Bilateral Exchange Rate Pass-Through into Unit Values

dependent variable: log unit values in Colombian peso, $p_{izn,t}^{\mathbf{peso}}$						
	(1)	(2)	(3)	(4)	(5)	(6)
$s_{n,t}$	0.71***		0.56***	0.68***		0.54***
	(0.01)		(0.01)	(0.01)		(0.01)
$\left(\frac{\widehat{\text{crp}}_t}{1+\text{distance}_n}\right)$		1.38***	0.99***		1.34***	0.99***
		(0.01)	(0.02)		(0.01)	(0.02)
Prod-Time FE	✓	✓	✓			
Firm FE	✓	✓	✓			
Destination FE	✓	✓	✓	✓	✓	✓
Firm-Prod-Time FE				✓	✓	✓
# observations	1,805,179	1,805,705	1,805,179	1,724,671	1,725,196	1,724,671

Notes: Robust standard errors are reported in parenthesis and clustered at the product level. *, **, and *** indicate significance at 10%, 5% and 1% levels.

We now turn to the results in columns (2) and (3), which incorporate the role of currency risk premia (CRP). Column (2) only includes the CRP measure interacted with the inverse of distance. As explained above, the effect of CRP is heterogeneous across destinations, with closer markets experiencing a larger impact due to the greater value firms attach to investments in customer capital in these markets. The results indicate that currency risk premia shocks positively affect unit values (prices), consistent with the model's prediction that risk premia shocks raise markups, with the effect more pronounced in destinations where customer capital is more valuable to firms. Importantly, because the interaction of CRP with distance varies over time and across destinations, it is possible to identify the effect of risk premia shocks even in the presence of time effects, which control for aggregate macroeconomic shocks. This finding provides strong empirical support for the model's main mechanism, linking currency risk premia to pricing in customer markets.

In column (3), we include both the bilateral exchange rate and currency risk premia as regressors. The pricing-to-market coefficient decreases from 0.71 in column (1) to 0.56, implying a higher pass-through rate of 44 percent. This finding suggests that excluding currency risk premia leads to omitted variable bias, as part of the variation otherwise attributed to exchange rate fluctuations is in fact driven by changes in risk premia that affect exporters' optimal markups. Including currency risk premia therefore highlights

For example, Boz et al. (2017) estimate an average pass-through to import prices of bilateral exchange rates of about 36% when controlling for the dollar exchange rate (which is the relevant comparison since we include time effects that capture fluctuations in the dollar exchange rate).

Table 5: Bilateral Exchange Rate Pass-Through into Volumes

dependent variable: log export volumes, $x_{izn,t}$						
	(1)	(2)	(3)	(4)	(5)	(6)
$s_{n,t}$	-0.09^{***}		-0.08^{***}	-0.12^{***}		-0.10^{***}
	(0.01)		(0.01)	(0.01)		(0.01)
$\left(\frac{\widehat{\texttt{crp}}_t}{1+\text{distance}_n}\right)$		-0.18^{***}	-0.14^{***}		-0.19^{***}	-0.15^{***}
		(0.02)	(0.02)		(0.02)	(0.02)
Product-Time FE	✓	✓	✓			
Firm FE	✓	✓	✓			
Destination FE	✓	✓	✓	✓	✓	✓
Firm-Prod-Time FE				✓	✓	✓
# observations	423,125	423,155	423,125	420,197	420,227	420,197

Notes: Robust standard errors are reported in parenthesis and clustered at the product level. Three lags of the dependent variable are included in the regressions but not reported. The log of CPI and GDP in the importing country are also included as controls. *, **, and *** indicate significance at 10%, 5% and 1% levels.

how exchange rate movements and risk premia shape exporters' pricing decisions, and the importance of accounting for risk premia in dynamic pricing-to-market models.

Finally, in columns (4) through (6), we re-estimate the model with firm-product-time fixed effects to control for fluctuations in firm-level marginal costs within each product category. With these fixed effects, the remaining variation in unit values can be interpreted as changes in markups. The estimates continue to align with the earlier results.

5.3.2 Volumes Regressions

Next, we estimate equation (26), which captures the impact of a depreciation of the Colombian peso relative to the importer's currency on export volumes. The results are presented in Table 5. All specifications include time effects, either at the firm level or at the firm and product level, ensuring that macroeconomic shocks, including fluctuations in the dollar exchange rate, are accounted for. Column (1) indicates that the bilateral exchange rate has a small, negative effect on export volumes, suggesting that, on average, a depreciation of the producer's currency reduces the volume of exports. This finding is similar to that in Gopinath et al. (2020), who also look at Colombian exporters and, as we discussed above, would indicate an high degree of pricing to market θ^{PTM}, and also that the peso tends on average to depreciate strongly to the dollar when it depreciates vis-à-vis

Table 6: Unit Value Regressions with Dollar Exchange Rate

dependent variable: log unit values in Colombian peso, $p^{\mathbf{peso}}_{izn,t}$						
	(1)	(2)	(3)	(4)	(5)	(6)
s_t	0.98***		0.84***	0.98***		0.83***
	(0.01)		(0.01)	(0.01)		(0.01)
$s_{n,t}$				0.01***	0.01***	0.01***
				(0.00)	(0.00)	(0.00)
$\left(\frac{\widehat{\mathtt{crp}}_t}{1+\text{distance}_n}\right)$		1.43***	0.49***		1.42***	0.49***
		(0.02)	(0.02)		(0.02)	(0.02)
Firm/Ind/Dest FE	✓	✓	✓	✓	✓	✓
# observations	1,792,555	1,792,555	1,792,555	1,792,038	1,792,038	1,792,038

Notes: Robust standard errors are reported in parenthesis and clustered at the product level. s_t denotes the exchange rate between the Colombian peso and the U.S. dollar. The regression includes quarterly time dummies, the log of the oil price as additional controls. *, **, and *** indicate significance at 10%, 5% and 1% levels.

other trade partners, meaning that the elasticity $\mathcal{E}_{n,\$}$ is on average greater than unity. Consistent with our model's predictions, columns (2) and (3) show that higher currency risk premia are associated with lower export volumes. Finally, columns (4) to (6) incorporate firm-product-time and destination fixed effects, and the results remain consistent across these specifications.

5.4 Dominant Currency Pricing

In Table 6, we extend the baseline results for unit values to examine the role of the dollar as the dominant currency for pricing (DCP). To this end, we estimate equation (24) including the exchange rate between the Colombian peso and the U.S. dollar, s_t. For this set of regressions, time effects cannot be included as they would be collinear with the dollar exchange rate. Instead, we include quarterly dummies and control for oil price, given its importance for Colombia as a net oil exporter, and firm-product-destination fixed effects.

The first column in Table 6 shows a very high PTM coefficient on the dollar exchange rate, of 0.98, implying nearly zero pass-through of dollar appreciations to dollar-denominated prices. This result aligns with the dominant currency paradigm (DCP) literature, which argues for the dollar's central role in pricing international trade transactions (Gopinath et al., 2020). Column (2) confirms a positive and significant relationship between currency risk premia and export unit values, consistent with the model's prediction that risk premia influences markups. In column (3), the simultaneous inclusion of the dollar exchange rate and currency risk premia reduces the coefficient on the dollar exchange rate, highlighting the importance of controlling for risk premia to avoid omitted variable bias. The results in columns (4), (5), and (6) reinforce these findings, with the dollar exchange rate overwhelmingly dominating the bilateral exchange rate effects. Overall, these results are consistent with the DCP literature, demonstrating that dollar exchange rate movements primarily drive pricing decisions and trade dynamics in international markets. At the same time, the evidence supports PTM in response to risk premia shocks, in line with the model developed in this paper.

Table 7 examines the effect of the dollar exchange rate on export volumes. Consistent with the DCP literature, the dollar exchange rate has a minor impact on trade volumes (column 1), reflecting the limited responsiveness of exports under dollar pricing. Currency risk premia negatively affects export volumes (column 2), and including both the dollar exchange rate and CRP (column 3) yields a small positive coefficient on the dollar exchange rate, highlighting the importance of controlling for risk premia. The bilateral exchange rate shows a small positive effect when included alongside the dollar exchange rate or CRP (columns 4 and 5). In the fully specified model (column 6), both exchange rates exhibit small positive effects, while currency risk premia continues to reduce trade volumes, underscoring the role of PTM and equilibrium risk discounting in shaping trade responses under DCP.

5.5 Instrumental Variables Regression

Table 7 reports the results of instrumental variable regressions, where exchange rate changes are instrumented using our measure of currency risk premia, to address omitted variable bias and identify the causal effects of depreciations driven by risk premia shocks. Column (1) shows that a depreciation of the peso vis-à-vis the dollar driven by higher currency risk premia increases peso prices significantly, with a PTM coefficient of 1.28, suggesting exporters raise markups in response to risk premia-led depreciations. From the first stage regression, it follows that a one standard deviation increase in the CRP leads to a 13% depreciation of the exchange rate. Since the increase in unit values following a depreciation goes hand in hand (as shown in column 1, in Table 6), this implies that markups are going up an additional 28% following the depreciation driven by an increase in the CRP.

For the volumes regression, shown in column (2) of Table 8, it follows that one standard deviation in the CRP which generates a 13% depreciation reduces export volumes by 24%. This negative trade elasticity is consistent with pricing-to-market (PTM), where

Table 7: Volume Regressions with the Dollar Exchange Rate

dependent variable: log export volumes, $x_{izn,t}$						
	(1)	(2)	(3)	(4)	(5)	(6)
s_t	-0.04^{***}		0.05^{***}	-0.05^{***}		0.03^{***}
	(0.01)		(0.01)	(0.01)		(0.01)
$s_{n,t}$				0.01^{***}	0.02^{***}	0.01^{***}
				(0.00)	(0.00)	(0.00)
$\left(\frac{\widehat{\text{crp}}_t}{1+\text{distance}_n}\right)$		-0.25^{***}	-0.30^{***}		-0.27^{***}	-0.30^{***}
		(0.01)	(0.02)		(0.02)	(0.02)
Firm/Ind/Dest FE	✓	✓	✓	✓	✓	✓
# observations	421,263	421,263	421,263	421,232	421,232	421,232

Notes: Robust standard errors are reported in parenthesis and are clustered at the product level. s_t denotes the exchange rate between the Colombian peso and the U.S. dollar. The regression includes quarterly time dummies, three lags of the dependent variable, the log of the oil price, the log of CPI, and real GDP in the destination country. *, **, and *** indicate significance at 10%, 5% and 1% levels.

firms increase markups, thus, lowering export quantities. Columns (3) and (4) incorporate an interaction term between the exchange rate and dollar invoicing to test the role of pricing strategies. The inclusion of this term in column (3) reveals that dollar-invoiced exports exhibit an additional sensitivity to exchange rate movements, as evidenced by the significant positive interaction coefficient. This greater responsiveness can be explained by the increased attractiveness of dollar cash flows during periods of higher domestic currency risk premia. When the risk premium is elevated, dollar-denominated revenues are more valuable, incentivizing firms to raise prices and increase static cash-flows, particularly in markets with greater dollar invoicing. Meanwhile, column (4) shows no significant interaction effect on export volumes, indicating that the greater price may indeed raise static dollar profits.

6 Extensions and Robustness

In this Section, we extend our baseline empirical specification to examine heterogeneous pass-through conditional on firm characteristics. Next, we present several robustness exercises.

Table 8: Instrumental Variables Regression

	price (1)	volumes (2)	price (3)	volumes (4)
s_t	1.28***	−0.24***	1.27***	−0.25***
	(0.02)	(0.01)	(0.02)	(0.02)
$s_t \times$ \$ Invoicing			0.56***	−0.02
			(0.14)	(0.14)
Firm/Ind/Dest FE	✓	✓	✓	✓
Observations	1,792,038	421,232	1,109,499	373,466

Notes: This table presents the results of using CRP as an instrument for the exchange rate. Robust standard errors are in parentheses and clustered at the product level. Columns (1) and (3) include quarterly time dummies and the the log of the oil price. Columns (2) and (4) include quarterly time dummies, three lags of the dependent variable, the log of the oil price, the log of CPI and real GDP in the destination country. *, **, and *** indicate significance at the 10%, 5%, and 1% levels.

6.1 Productivity and Currency Risk Premia Pass-Through

We investigate whether more productive firms exhibit a larger pass-through of currency risk premia to prices. Our theoretical model predicts this relationship, as more productive firms place a higher value on customer capital, thereby adjusting their pricing more strongly in response to shifts in currency risk premia.

To test this hypothesis, we merge customs-level transaction records with firm-level data from the Orbis database by matching Orbis identifiers to tax identification numbers.[15] We construct our productivity measure following an approach similar to Fitzgerald et al. (2023). First, we aggregate data to the firm level and determine the total number of unique export destinations served by each firm over the sample period. Next, we take the natural logarithms of the firm's age and the number of destinations. We then estimate the following cross-sectional regression:

$$\log(\text{markets})_i = \alpha + \beta \log(\text{age})_i + \varepsilon_i, \tag{28}$$

[15]The Orbis database covers more than 85 percent of total exports each year in our sample. However, data on firm characteristics extend only until 2019, as Orbis changed its firm identifier and we can no longer match it to the relevant tax identification numbers.

Table 9: Productivity and the Pass-Through of Risk Premia

	(1)	(2)	(3)
$s_{n,t}$	0.68***		0.65***
	(0.01)		(0.01)
$\left(\frac{\widehat{\texttt{crp}}_t}{1+\text{distance}_n}\right)$		0.90***	0.73***
		(0.02)	(0.02)
$\left(\frac{\widehat{\texttt{crp}}_t}{1+\text{distance}_n}\right) \times$ productivity		0.03*	0.07***
		(0.02)	(0.02)
productivity		0.02***	0.02***
		(0.01)	(0.01)
# Observations	1,303,146	1,299,562	1,299,130
Product-Time FE	✓	✓	✓
Firm FE	✓	✓	✓
Destination FE	✓	✓	✓

Notes: Robust standard errors are reported in parenthesis and clustered at the product level. *, **, and *** indicate significance at 10%, 5% and 1% levels.

where i indexes firms. The residuals from this regression, $\hat{\varepsilon}_i$, are used as a proxy for firm-level productivity. To standardize this measure, we compute

$$\text{productivity}_i = \frac{\hat{\varepsilon}_i - \overline{\hat{\varepsilon}}}{\sigma(\hat{\varepsilon})}, \tag{29}$$

where $\overline{\hat{\varepsilon}}$ and $\sigma(\hat{\varepsilon})$ are the mean and standard deviation of the residuals, respectively. This standardized measure captures how many more markets a firm reaches relative to what would be expected given its age, thereby reflecting firm-specific productivity. Higher values indicate greater productivity.

Our results are shown in Table 9. Consistent with heterogeneous pass-through of currency risk premia and PTM, we find that more productive firms set higher markups, and more productive firms raise markups by a greater amount when currency risk premia increases. This is consistent with both heterogeneous PTM across customer markets and the efficient pricing of risk, as predicted by our model.

6.2 Sensitivity Analysis

This section discusses alternative specifications we implement to ensure the robustness of our findings. Despite some variation across specifications in the magnitude of the effects of the exchange rate and currency risk premia on unit values and volumes, the broad similarity of the results supports the paper's main conclusions. To conserve space, the results of the exercises described in this section are reported in Appendix C.

Dropping Metal Industries — In our baseline analysis, we focus on manufacturing products excluding oil. To assess the robustness of our results, we also consider a restricted sample that excludes metal products (HS chapters 72–83) in addition to oil. Tables C1–C4 in the Appendix present the results.

First Differences — Following Burstein and Gopinath (2014), we estimate the pass-through regressions in first differences:

$$\Delta p^{\text{peso}}_{izn,t} = \sum_{k=0}^{2} \Delta\phi_k \left(\frac{\widehat{\texttt{crp}}_t}{1 + \text{distance}_n} \right) + \sum_{k=0}^{2} \Delta\theta_k s_{n,t} + \Lambda_n + \Omega_{z,t} + \Upsilon_i + \eta_{izn,t}, \qquad (30)$$

where Δ denotes the first difference.

The volume regression in first differences is:

$$\Delta x_{izn,t} = \sum_{k=0}^{2} \Delta\phi_k \left(\frac{\widehat{\texttt{crp}}_t}{1 + \text{distance}_n} \right) + \sum_{k=0}^{2} \Delta\theta_k s_{n,t} + \Lambda_n + \Omega_{z,t} + \Upsilon_i + \varphi' X_{n,t} + \eta_{izn,t}, \quad (31)$$

where $X_{n,t}$ includes the change in the log of the CPI and GDP of the importing country (and one lag).

Tables C5 and C6 show the results from estimating the regression with the bilateral exchange rate in first differences. Tables C7 and C8 include the results of the dollar exchange rate regressions.

Annual Sample — We evaluate the sensitivity of our results by replicating the analysis with annual data in place of quarterly observations. The results are shown in Tables C9 and C10, which present the pass-through effects on unit values and volumes for the bilateral exchange rate, while Table C11 displays the corresponding estimates for the dollar exchange rate.

Firm Characteristics Sample — We lose a number of observations when merging the firm-level customs data with the Orbis database. Although Orbis covers more than 85 percent of total exports per year in our sample, we can only merge the data up to 2019. This cutoff arises because Orbis changed its firm identifiers, preventing us from matching them to the relevant tax identification numbers thereafter. In Tables C12 and C13, we check the robustness of our baseline regressions using this restricted sample and find consistent results.

7 Conclusion

We examine how currency risk premia affect exchange-rate pass-through and export pricing when firms operate in customer markets. Grounded in asset-pricing theory, we identify currency risk-premium shocks and show how they alter exporters' dynamic pricing strategies. Our framework highlights a direct link between fluctuations in risk premia and markups, thus revealing a new channel through which financial market shocks can propagate to the real economy. In particular, depreciations driven by currency risk-premium increases lead exporters to place a higher value on current dollar revenues, weakening their incentives to price low and grow future market share. As a result, such depreciations generate higher markups, lower pass-through, and more modest trade-volume responses.

We test these predictions using detailed customs data for Colombian exports and find strong empirical support. First, we document that firm-product prices rise systematically with time in a given destination, underscoring the role of dynamic pricing in customer markets. Second, omitting currency risk premia understates pass-through, since elevated risk premia both depreciate the currency and diminish firms' incentive to build customer capital. Finally, instrumental-variables estimates confirm that risk-premium-led depreciations significantly raise export prices while reducing export volumes.

We also uncover substantial heterogeneity in firms' responses to currency risk-premium shocks. More productive firms exhibit more pronounced markup responses, reflecting their stronger incentives to exploit customer capital. Likewise, the growth of younger exporters—who account for a large share of aggregate export expansion—appears particularly sensitive to these shocks, potentially giving rise to negative aggregate trade elasticities even at horizons of two to three years. These patterns are consistent with customer market models in which there are protracted growth dynamics in market shares, as well as theories of variable markups, where markup elasticity varies with firm and market characteristics (Atkeson and Burstein, 2008; Berman et al., 2012; Chen and Juvenal, 2022). Consequently, even within the same sector, firms differ markedly in their pass-through rates and pricing behaviors depending on their productivity, age and experience, in particular, in response to risk premium shocks.

Our results have important implications for policy. Depreciations driven by elevated demand for dollar assets and associated currency risk premia shocks lead to higher markups and inflation, complicating monetary policy trade-offs. Moreover, the effectiveness of exchange rate adjustments in rebalancing trade flows is reduced when depreciations stem from risk premia rather than terms of trade or monetary policy shocks, weakening expenditure-switching effects. Finally, the dual role of the dollar as both a dominant trade currency and a safe-haven asset may contribute to the pronounced global trade and inflation dynamics during crisis, such as the great trade collapse (Baldwin, 2009) and missing deflation (Gilchrist et al., 2017), experienced in 2008 – 09, and the recent global trade fragmentation and inflationary burst of 2021 – 22, discussed in (Ambrosino et al., 2024).

This study opens several directions for future research. Investigating how risk premia shocks interact with other determinants of pass-through, such as the choice of invoicing currencies (Gopinath et al., 2010), the formation of supply chains (Amiti et al., 2014), and trade networks (Chaney, 2014; Juvenal and Santos Monteiro, 2024), could deepen our understanding of exchange rate and trade dynamics. Integrating these mechanisms into general equilibrium models would provide richer insights into the macroeconomic consequences of financial shocks. Our findings emphasize the importance of stabilizing currency risk premia to enhance the effectiveness of exchange rate adjustments in addressing inflation and trade imbalances in the global economy.

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Appendix

A Model Derivations

A.1 Optimal Price

The dynamic programming problem solved by the firm wishing to maximize its value is given by the following Bellman equation

$$\mathcal{V}_{iz,t} = \max_{P_{izn,t}, K_{izn,t+1}} \left[\sum_{n=1}^{N} \Pi \left(P_{izn,t}, K_{izn,t} \right) \mathcal{S}_t + E_t \left(\mathcal{M}_{t+1} \mathcal{V}_{i,t+1} \right) \right], \tag{A.1}$$

where $K_{izn,t+1}$ must obey the accumulation equation (11). The first-order condition necessary to solve the problem of the firm is

$$\left[\frac{\partial \Pi \left(P_{izn,t}, K_{izn,t} \right)}{\partial P_{izn,t}} \right] \mathcal{S}_t + E_t \left(\mathcal{M}_{t+1} \left(\frac{d\mathcal{V}_{iz,t+1}}{dK_{izn,t+1}} \right) \right) \frac{\partial K_{izn,t+1}}{\partial P_{izn,t}} = 0, \tag{A.2}$$

and from, in turn, equations (13) and (14), we obtain

$$\frac{\partial K_{izn,t+1}}{\partial P_{izn,t}} = (1-\epsilon)(1-\delta) \left[K_{izn,t}^{\gamma} \left(S_t / S_{n,t} \right)^{-\epsilon} P_{izn,t}^{-\epsilon} \mathcal{S}_t \Upsilon_{zn,t} \right], \tag{A.3}$$

$$\frac{\partial \Pi \left(P_{izn,t}, K_{izn,t} \right)}{\partial P_{izn,t}} = K_{izn,t}^{\gamma} \left(S_t / S_{n,t} \right)^{-\epsilon} P_{izn,t}^{-\epsilon} \Upsilon_{zn,t} - \epsilon \left[P_{izn,t} - \left(\frac{W_{z,t}}{\mathcal{S}_t} \right)^{1-\zeta} \right] K_{izn,t}^{\gamma} \left(S_t / S_{n,t} \right)^{-\epsilon} P_{izn,t}^{-\epsilon-1} \Upsilon_{zn,t}. \tag{A.4}$$

Plugging (A.3) and (A.4) into the first-order condition (A.2) yields the optimal price

$$P_{izn,t} = \left(\frac{\epsilon}{\epsilon - 1} \right) \left[\frac{\left(W_{z,t} / \mathcal{S}_t \right)^{1-\zeta}}{1 + (1-\delta) E_t \left(\mathcal{M}_{t+1} \tilde{\Gamma}_{izn,t+1} \right)} \right], \tag{A.5}$$

with $\tilde{\Gamma}_{izn,t+1} = \left(d\mathcal{V}_{iz,t+1} / dK_{izn,t+1} \right)$, the shadow value for firm i of additional customer capital in market n at date $t+1$. This yields formula (16) in the main text. Of course, the price chosen must be strictly positive.

A.2 First-Order Taylor Expansion in Equation (21)

This section provides details on how we obtain the linear terms in i_t and $\widehat{\texttt{crp}}_t$ in equation (21), starting from the firm's log price:

$$p_{izn,t} = \lambda + (1-\zeta)\big(w_{z,t} - s_t\big) \; - \; \ln\Big[1 + (1-\delta)\,\Gamma_{izn}\,\exp\big(\mu_t + \tfrac{\sigma^2}{2} - \widehat{\texttt{crp}}_t\big)\Big], \tag{A.6}$$

where $\lambda = \ln\big(\frac{\epsilon}{\epsilon-1}\big)$, ζ is the share of dollar-denominated inputs, and the final bracketed term represents the "dynamic markdown." Our objective is to isolate how i_t and $\widehat{\texttt{crp}}_t$ enter linearly around the baseline $\mu_t + \frac{\sigma^2}{2} - \widehat{\texttt{crp}}_t = 0$.

Baseline and Notation

Define

$$\mathbb{X} \;\equiv\; (1-\delta)\,\Gamma_{izn}\;\exp\Big(\mu_t + \tfrac{\sigma^2}{2} - \widehat{\texttt{crp}}_t\Big),$$

so that the dynamic markdown is $-\ln\big[\,1+\mathbb{X}\big]$. We expand around

$$\mu_t = -\tfrac{\sigma^2}{2}, \quad \widehat{\texttt{crp}}_t = 0 \quad\Longrightarrow\quad \mu_t + \tfrac{\sigma^2}{2} - \widehat{\texttt{crp}}_t = 0.$$

Hence, at this point,

$$\mathbb{X}_0 \;=\; (1-\delta)\,\Gamma_{izn}\,\exp(0) \;=\; (1-\delta)\,\Gamma_{izn}.$$

Taylor Expansion

We use a first-order expansion of $\ln\big[\,1 + (\mathbb{X}_0 + \Delta\mathbb{X})\big]$ around $\mathbb{X}_0$. Let $\mathbb{X} = \mathbb{X}_0 + \Delta\mathbb{X}$. Then

$$\ln\big[\,1+\mathbb{X}\big] \;\approx\; \ln\big[\,1+\mathbb{X}_0\big] \;+\; \frac{\Delta\mathbb{X}}{1+\mathbb{X}_0},$$

and hence

$$-\ln\big[\,1+\mathbb{X}\big] \;\approx\; -\,\ln\big[\,1+\mathbb{X}_0\big] \;-\; \frac{\Delta\mathbb{X}}{1+\mathbb{X}_0}. \tag{A.7}$$

Observe that

$$\mu_t + \tfrac{\sigma^2}{2} \;-\; \widehat{\texttt{crp}}_t \;=\; -\,i_t \;-\; \widehat{\texttt{crp}}_t, \tag{A.8}$$

since

$$i_t = -\Big(\mu_t + \tfrac{\sigma^2}{2}\Big). \tag{A.9}$$

Hence $\exp\big(\mu_t + \frac{\sigma^2}{2} - \widehat{\texttt{crp}}_t\big) \approx 1 - \big(i_t + \widehat{\texttt{crp}}_t\big)$ to first order (i.e., $\exp(\Delta) \approx 1 + \Delta$ with $\Delta = -\,i_t - \widehat{\texttt{crp}}_t$). Then

$$\mathbb{X} \;=\; (1-\delta)\,\Gamma_{izn}\,\exp(\Delta) \;\;\approx\;\; (1-\delta)\,\Gamma_{izn}\left[1 - (i_t + \widehat{\texttt{crp}}_t)\right] \;=\; \mathbb{X}_0 \;-\; \mathbb{X}_0\,(i_t + \widehat{\texttt{crp}}_t),$$

where $\mathbb{X}_0 = (1-\delta)\,\Gamma_{izn}$. Thus

$$\Delta\mathbb{X} = \mathbb{X} - \mathbb{X}_0 \;\approx\; -\,\mathbb{X}_0\left(i_t + \widehat{\texttt{crp}}_t\right).$$

From (A.7),

$$-\ln\big[\,1{+}\mathbb{X}\big] \;\approx\; -\,\ln\big[\,1{+}\mathbb{X}_0\big] - \frac{\Delta\mathbb{X}}{1+\mathbb{X}_0} \;=\; -\,\ln\big[\,1{+}(1{-}\delta)\,\Gamma_{izn}\big] + \frac{(1-\delta)\,\Gamma_{izn}}{1+(1-\delta)\,\Gamma_{izn}}\,\big(i_t{+}\widehat{\texttt{crp}}_t\big),$$

because $\Delta\mathbb{X} = -\,\mathbb{X}_0\,(i_t + \widehat{\texttt{crp}}_t)$. Substituting back into the dynamic markdown portion of (A.6) yields a constant plus linear terms in i_t and $\widehat{\texttt{crp}}_t$. Specifically,

$$p_{izn,t} \;=\; \lambda \;+\; (1-\zeta)\,\big(w_{z,t} - s_t\big) \;+\; \frac{(1-\delta)\,\Gamma_{izn}}{1+(1-\delta)\,\Gamma_{izn}}\,i_t \;+\; \frac{(1-\delta)\,\Gamma_{izn}}{1+(1-\delta)\,\Gamma_{izn}}\,\widehat{\texttt{crp}}_t, \quad \text{(A.10)}$$

which is equation (21) in the main text.

A.3 Derivation of Pass-Through Elasticity

This section demonstrates how

$$1-\theta^{\mathrm{PTM}} \;=\; 1 \;-\; \zeta\,\mathcal{E}_{n,\$},$$

follows from the model's dollar-pricing framework, yet remains consistent with a positive pass-through coefficient in the empirical (peso-denominated) setting.

Model vs. Data Perspectives

In the model, the log of the firm's price is $p_{izn,t} = \ln\big(P_{izn,t}\big)$, where $P_{izn,t}$ is expressed in *dollars*. By contrast, the empirical analysis measures the price in domestic currency, so we let $p^{\text{peso}}_{izn,t} \;=\; p_{izn,t} + s_t$, where s_t is the log of the peso–dollar exchange rate (pesos per US dollar).

Derivative with Respect to $s_{n,t}$

Let $s_{n,t} = \ln\bigl(\mathcal{S}_{n,t}\bigr)$ be the bilateral rate (pesos per currency n). Define $\mathcal{E}_{n,\$} = \frac{\partial s_t}{\partial s_{n,t}}$, the elasticity of the peso–dollar rate with respect to $s_{n,t}$. Then the derivative of the domestic (peso) price w.r.t. $s_{n,t}$ is

$$\theta^{\text{PTM}} = \frac{\partial p^{\text{peso}}_{izn,t}}{\partial s_{n,t}} = \frac{\partial\bigl(p_{izn,t} + s_t\bigr)}{\partial s_{n,t}} = \Biggl(\underbrace{\frac{\partial p_{izn,t}}{\partial s_t}}_{\text{model derivative}} +1\Biggr)\frac{\partial s_t}{\partial s_{n,t}} = \Bigl(\tfrac{\partial p_{izn,t}}{\partial s_t} + 1\Bigr)\,\mathcal{E}_{n,\$}. \quad \text{(A.11)}$$

Within the model, $\frac{\partial p_{izn,t}}{\partial s_t} = -\bigl(1-\zeta\bigr)$, because a 1% increase in s_t reduces the dollar wage portion $(1-\zeta)$ and thus the log dollar price. Therefore,

$$\Bigl(\tfrac{\partial p_{izn,t}}{\partial s_t} + 1\Bigr) = -\,\bigl(1-\zeta\bigr) + 1 \;=\; \zeta. \quad \text{(A.12)}$$

Hence

$$\theta^{\text{PTM}} = \zeta\,\mathcal{E}_{n,\$}.$$

Pass-Through

In the empirical regressions, the exchange rate pass-through is defined as $1-\theta^{\text{PTM}}$. Substituting $\theta^{\text{PTM}} = \zeta\,\mathcal{E}_{n,\$}$ directly yields

$$1-\theta^{\text{PTM}} = 1-\zeta\,\mathcal{E}_{n,\$}. \quad \text{(A.13)}$$

This completes the derivation of equation (25).

A.4 Deriving the Demand Elasticity

This section derives the expression

$$\theta^{\text{trade}} \;=\; \epsilon\,(1-\zeta\mathcal{E}_{n,\$})\,,$$

which appears as equation (27) in the main text. We start from the foreign demand equation in logs, then differentiate with respect to the bilateral exchange rate and incorporate the model's assumptions regarding firms' optimal dollar pricing.

The baseline demand function for destination n is given by:

$$X_{izn,t} \;=\; K_{izn,t}^{\gamma} \left(\frac{\mathcal{S}_t}{\mathcal{S}_{n,t}}\right)^{-\epsilon} P_{izn,t}^{-\epsilon}\, \mathcal{Y}_{zn,t}, \tag{A.14}$$

where $P_{izn,t}$ is the *dollar* price, $\mathcal{S}_t$ is the exporter currency per U.S. dollar, $\mathcal{S}_{n,t}$ is the importer currency per U.S. dollar, and $\epsilon > 1$ is the CES elasticity of substitution. Taking logs,

$$\ln X_{izn,t} \;=\; \gamma \ln K_{izn,t} \;-\; \epsilon \ln\!\left(\frac{\mathcal{S}_t}{\mathcal{S}_{n,t}}\right) \;-\; \epsilon \ln\!\big(P_{izn,t}\big) \;+\; \ln(\mathcal{Y}_{zn,t}). \tag{A.15}$$

Since

$$\ln\!\left(\frac{\mathcal{S}_t}{\mathcal{S}_{n,t}}\right) \;=\; s_t \;-\; s_{n,t}, \tag{A.16}$$

we may rewrite:

$$\ln X_{izn,t} \;=\; \gamma \ln K_{izn,t} \;-\; \epsilon\left(s_t - s_{n,t}\right) \;-\; \epsilon\, p_{izn,t} \;+\; \ln(\mathcal{Y}_{zn,t}), \tag{A.17}$$

where $p_{izn,t} = \ln\big(P_{izn,t}\big), \quad s_t = \ln\big(\mathcal{S}_t\big), \quad s_{n,t} = \ln\big(\mathcal{S}_{n,t}\big)$.

Assuming $K_{izn,t}$ and $\mathcal{Y}_{zn,t}$ do not change with $s_{n,t}$, we take partial derivatives:

$$\theta^{\text{trade } \mathcal{E}} = \frac{\partial \ln X_{izn,t}}{\partial s_{n,t}} \;=\; -\,\epsilon \frac{\partial}{\partial s_{n,t}}\big[s_t - s_{n,t}\big] \;-\; \epsilon\, \frac{\partial\, p_{izn,t}}{\partial s_{n,t}}. \tag{A.18}$$

Next, $\frac{\partial}{\partial s_{n,t}}\big[s_t - s_{n,t}\big] \;=\; \frac{\partial s_t}{\partial s_{n,t}} \;-\; \frac{\partial s_{n,t}}{\partial s_{n,t}} \;=\; \frac{\partial s_t}{\partial s_{n,t}} \;-\; 1$. Hence,

$$\theta^{\text{trade } \mathcal{E}} = \frac{\partial \ln X_{izn,t}}{\partial s_{n,t}} \;=\; -\,\epsilon\Big[\frac{\partial s_t}{\partial s_{n,t}} - 1\Big] \;-\; \epsilon\, \frac{\partial p_{izn,t}}{\partial s_{n,t}} \;=\; \epsilon \;-\; \epsilon\,\frac{\partial s_t}{\partial s_{n,t}} \;-\; \epsilon\,\frac{\partial p_{izn,t}}{\partial s_{n,t}}. \tag{A.19}$$

We can rewrite this as:

$$\theta^{\text{trade } \mathcal{E}} = \frac{\partial \ln X_{izn,t}}{\partial s_{n,t}} \;=\; \epsilon \;-\; \epsilon\,\frac{\partial s_t}{\partial s_{n,t}} \;-\; \epsilon\,\frac{\partial p_{izn,t}}{\partial s_{n,t}}. \tag{A.20}$$

Define $\mathcal{E}_{n,\$} = \frac{\partial s_t}{\partial s_{n,t}}$, the elasticity of s_t (log exporter currency per USD) w.r.t. $s_{n,t}$ (log of the bilateral rate). By the chain rule for the firm's log dollar price $p_{izn,t}$,

$\frac{\partial p_{izn,t}}{\partial s_{n,t}} \;=\; \frac{\partial p_{izn,t}}{\partial s_t} \;\times\; \frac{\partial s_t}{\partial s_{n,t}} \;=\; \left(\frac{\partial p_{izn,t}}{\partial s_t}\right) \mathcal{E}_{n,\$}$. Hence,

$$\theta^{\text{trade } \mathcal{E}} \;=\; \epsilon \;-\; \epsilon\, \mathcal{E}_{n,\$} \;-\; \epsilon \left(\frac{\partial p_{izn,t}}{\partial s_t}\right) \mathcal{E}_{n,\$}. \tag{A.21}$$

From earlier results (equation (25) in the main text), we have $\frac{\partial p_{izn,t}}{\partial s_t} = -\big(1-\zeta\big)$.

Therefore,

$$\begin{aligned}
\theta^{\,\text{trade}\ \mathcal{E}} &= \epsilon \ - \ \epsilon\,\mathcal{E}_{n,\$} \ - \ \epsilon\left[-\,(1-\zeta)\right]\mathcal{E}_{n,\$} \\
&= \epsilon \ + \ \epsilon\left[(1-\zeta)\,\mathcal{E}_{n,\$} - \mathcal{E}_{n,\$}\right] \\
&= \epsilon \ - \ \epsilon\,\zeta\,\mathcal{E}_{n,\$}.
\end{aligned} \tag{A.22}$$

The *trade elasticity* in the text satisfies

$$\theta^{\text{trade}} \ = \ \epsilon \ - \ \epsilon\,\zeta\,\mathcal{E}_{n,\$} \ = \ \epsilon\Big(1-\zeta\,\mathcal{E}_{n,\$}\Big). \tag{A.23}$$

This result matches equation (27) in the main text.

B First Stage IV Regressions

Table B1: First-Stage Regression Results for Unit Values and Volumes

	Price	Volumes
Instrumented Variable: s_t		
$\widehat{\texttt{crp}}_t$ (Instrument)	0.13***	0.13***
	(0.001)	(0.001)
First-Stage Test Statistics:		
Kleibergen-Paap F-stat	16,330.68	12,288.90
Underidentification Test	$\chi^2(1) = 542.38$, p = 0.0000	$\chi^2(1) = 375.19$, p = 0.0000
Stock-Yogo 10% Critical Value	16.38	16.38

Notes: This table reports the first-stage regression results for the instrumental variable regressions of s_t on $\widehat{\texttt{crp}}_t$ (instrument). The unit value and volume regressions correspond to the estimation of columns (1) and (2) of Table 8, respectively. Robust standard errors are in parentheses and are clustered at the product level. The unit value regression includes quarterly time dummies and the log of the oil price as additional controls. The volumes regression incorporates three lags of the dependent variable, quarterly time dummies, the log of the oil price, the log of the CPI and GDP in the importing country as controls. *** denotes significance at the 1% level.

Table B2: First-Stage Regression Results for Unit Values and Volumes (Invoicing)

	Unit Values	**Volumes**
Instrumented Variable:	s_t, $s_t \times$ \$ Invoicing	s_t, $s_t \times$ \$ Invoicing
Instruments:	$\widehat{\texttt{crp}}_t$, $\widehat{\texttt{crp}}_t \times$ \$ Invoicing	$\widehat{\texttt{crp}}_t$, $\widehat{\texttt{crp}}_t \times$ \$ Invoicing
$\widehat{\texttt{crp}}_t$	0.1310***	0.1300***
	(0.0010)	(0.0012)
$\widehat{\texttt{crp}}_t \times$ \$ Invoicing	0.0064**	−0.0023
	(0.0026)	(0.0048)
First-Stage Test Statistics:		
Kleibergen-Paap F-stat	9,375.27	6,375.44
Underidentification Test	$\chi^2(2)$ = 19,870.74, p = 0.0000	$\chi^2(2)$ = 2,334.26, p = 0.0000
Stock-Yogo 10% Critical Value	19.93	19.93

Notes: This table reports the first-stage regression results for the instrumental variable regressions. The unit value and volume regressions correspond to the estimation of columns (3) and (4) of Table 8, respectively. The dependent variables in the first stage are s_t and $s_t \times$ \$ Invoicing for both unit values and volumes. The excluded instruments are $\widehat{\texttt{crp}}_t$ and $\widehat{\texttt{crp}}_t \times$ \$ Invoicing. The unit value regression includes quarterly time dummies and the log of the oil price, the bilateral exchange rate of the Colombian peso vis-a-vis the currency of the destination country, and the bilateral exchange rate interacted with invoicing as additional controls. The volumes regression incorporates three lags of the dependent variable, quarterly time dummies, the log of the oil price, the log of the CPI and GDP in the importing country, the bilateral exchange rate of the Colombian peso vis-à-vis the currency of the destination country, and the bilateral exchange rate interacted with invoicing as additional controls as controls. Robust standard errors are in parentheses and are clustered at the product level. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

C Robustness

This Appendix discusses alternative specifications we implemented to ensure the robustness of our findings. Despite some variation across specifications, the broad similarity of the results supports the paper's main conclusions.

C.1 Dropping Metal Industries

In this section, we estimate the price and volume regressions using a restricted sample that excludes both oil products (HS chapter 27), as well as metal products (HS chapters 72–83).

Table C1: Unit Values with Bilateral Exchange Rates: Dropping Metals

dependent variable: log unit values in Colombian peso, $p_{izn,t}^{\textbf{peso}}$						
	(1)	(2)	(3)	(4)	(5)	(6)
$s_{n,t}$	0.70***		0.56***	0.68***		0.54***
	(0.01)		(0.01)	(0.01)		(0.01)
$\left(\frac{\widehat{\texttt{crp}}_t}{1+\text{distance}_n}\right)$		1.38***	0.99***		1.34***	0.98***
		(0.02)	(0.02)		(0.01)	(0.02)
Prod-Time FE	✓	✓	✓			
Firm FE	✓	✓	✓			
Destination FE	✓	✓	✓	✓	✓	✓
Firm-Prod-Time FE				✓	✓	✓
# observations	1,666,058	1,666,577	1,666,058	1,595,815	1,596,333	1,595,815

Notes: Robust standard errors are reported in parenthesis and clustered at the product level. The sample includes all manufactured products excluding oil and metal industries. *, **, and *** indicate significance at 10%, 5% and 1% levels.

Table C2: Volumes with Bilateral Exchange Rates: Dropping Metals

dependent variable: log export volumes, $x_{izn,t}$						
	(1)	(2)	(3)	(4)	(5)	(6)
$s_{n,t}$	-0.09^{***}		-0.07^{***}	-0.11^{***}		-0.10^{***}
	(0.01)		(0.01)	(0.01)		(0.01)
$\left(\frac{\widehat{\texttt{crp}}_t}{1+\text{distance}_n}\right)$		-0.17^{***}	-0.13^{***}		-0.18^{***}	-0.14^{***}
		(0.02)	(0.02)		(0.02)	(0.02)
Product-Time FE	✓	✓	✓			
Firm FE	✓	✓	✓			
Destination FE	✓	✓	✓	✓	✓	✓
Firm-Prod-Time FE				✓	✓	✓
# observations	395,653	395,683	395,653	392,937	392,967	392,937

Notes: Robust standard errors are reported in parenthesis and clustered at the product level. Three lags of the dependent variable are included in the regressions but not reported. The log of CPI and GDP in the importing country are also included as controls. The sample includes all manufactured products excluding oil and metal industries. *, **, and *** indicate significance at 10%, 5% and 1% levels.

Table C3: Unit Value with Dollar Exchange Rate: Dropping Metals

dependent variable: log unit values in Colombian peso, $p^{\mathbf{peso}}_{izn,t}$						
	(1)	(2)	(3)	(4)	(5)	(6)
s_t	0.96^{***}		0.82^{***}	0.96^{***}		0.81^{***}
	(0.01)		(0.01)	(0.01)		(0.01)
$s_{n,t}$				0.01^{***}	0.01^{***}	0.01^{***}
				(0.00)	(0.00)	(0.00)
$\left(\frac{\widehat{\texttt{crp}}_t}{1+\text{distance}_n}\right)$		1.41^{***}	0.50^{***}		1.40^{***}	0.50^{***}
		(0.02)	(0.02)		(0.02)	(0.02)
Firm/Ind/Dest FE	✓	✓	✓	✓	✓	✓
# observations	1,654,204	1,654,204	1,654,204	1,653,694	1,653,694	1,653,694

Notes: Robust standard errors are reported in parenthesis and clustered at the product level. s_t denotes the exchange rate between the Colombian peso and the U.S. dollar. The regression includes quarterly time dummies, the log of the oil price as additional controls. The sample includes all manufactured products excluding oil and metal industries. *, **, and *** indicate significance at 10%, 5% and 1% levels.

Table C4: Volumes with Dollar Exchange Rate: Dropping Metals

dependent variable: log export volumes, $x_{izn,t}$						
	(1)	(2)	(3)	(4)	(5)	(6)
s_t	-0.04^{***}		0.05^{***}	-0.05^{***}		0.04^{***}
	(0.01)		(0.01)	(0.01)		(0.01)
$s_{n,t}$				0.01^{***}	0.02^{***}	0.01^{***}
				(0.00)	(0.00)	(0.00)
$\left(\frac{\widehat{\mathtt{crp}}_t}{1+\text{distance}_n}\right)$		-0.24^{***}	-0.29^{***}		-0.25^{***}	-0.30^{***}
		(0.02)	(0.02)		(0.02)	(0.02)
Firm/Ind/Dest FE	✓	✓	✓	✓	✓	✓
# observations	393,954	393,954	393,954	393,923	393,923	393,923

Notes: Robust standard errors are reported in parenthesis and are clustered at the product level. s_t denotes the exchange rate between the Colombian peso and the U.S. dollar. The regression includes quarterly time dummies, three lags of the dependent variable, the log of the oil price, the log of CPI, and real GDP in the destination country. The sample includes all manufactured products excluding oil and metal industries. *, **, and *** indicate significance at 10%, 5% and 1% levels.

First Differences

We estimate the price and volume regressions using a specification in first differences instead of levels. Tables C5 and C6 show the results from estimating the regression with the bilateral exchange rate in first differences. Tables C7 and C8 include the results of the dollar exchange rate regressions.

Table C5: Bilateral Exchange Rate Pass-Through into Δ Unit Values

dependent variable: Δ log unit values in Colombian peso, $\Delta p^{\textbf{peso}}_{izn,t}$						
	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta s_{n,t}$	0.69***		0.64***	0.69***		0.64***
	(0.01)		(0.01)	(0.01)		(0.01)
$\Delta\left(\frac{\widehat{\texttt{crp}}_t}{1+\text{distance}_n}\right)$		0.31***	0.14***		0.31***	0.13***
		(0.01)	(0.01)		(0.01)	(0.01)
Prod-Time FE	✓	✓	✓			
Firm FE	✓	✓	✓			
Destination FE	✓	✓	✓	✓	✓	✓
Firm-Prod-Time FE				✓	✓	✓
# observations	576,142	576,223	576,142	572,834	572,915	572,834

Notes: Robust standard errors are reported in parenthesis and clustered at the product level. *, **, and *** indicate significance at 10%, 5% and 1% levels.

Table C6: Bilateral Exchange Rate Pass-Through into Δ Volumes

dependent variable: Δ log export volumes, $\Delta x_{izn,t}$						
	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta s_{n,t}$	-0.50^{***}		-0.16^{***}	-0.53^{***}		-0.18^{***}
	(0.04)		(0.05)	(0.04)		(0.05)
$\Delta\left(\frac{\widehat{\texttt{crp}}_t}{1+\text{distance}_n}\right)$		-0.97^{***}	-0.92^{***}		-1.01^{***}	-0.94^{***}
		(0.05)	(0.05)		(0.05)	(0.05)
Product-Time FE	✓	✓	✓			
Firm FE	✓	✓	✓			
Destination FE	✓	✓	✓	✓	✓	✓
Firm-Prod-Time FE				✓	✓	✓
# observations	423,105	423,144	423,105	420,177	420,216	420,177

Notes: Robust standard errors are reported in parenthesis and clustered at the product level. The first difference of the CPI and GDP in the importing country, as well as one lag, are also included as controls. *, **, and *** indicate significance at 10%, 5% and 1% levels.

Table C7: Dollar Exchange Rate Pass-Through into Δ Unit Values

dependent variable: Δ log unit values in Colombian peso, $\Delta p_{izn,t}^{\mathbf{peso}}$						
	(1)	(2)	(3)	(4)	(5)	(6)
Δ\$ exchange rate, s_t	0.80***		0.74***	0.73***		0.69***
	(0.014)		(0.014)	(0.022)		(0.022)
$\Delta s_{n,t}$				0.08***	0.51***	0.08***
				(0.018)	(0.013)	(0.018)
$\Delta\left(\frac{\widehat{\text{crp}}_t}{1+\text{distance}_n}\right)$		0.19***	0.09***		0.13***	0.09***
		(0.012)	(0.012)		(0.012)	(0.012)
Firm/Ind/Dest FE	✓	✓	✓	✓	✓	✓
# observations	573,960	573,960	573,960	573,877	573,877	573,877

Notes: Robust standard errors are reported in parenthesis and clustered at the product level. The regression includes quarterly time dummies, the first difference of the log of the oil price, as well as one lag, are included as additional controls. *, **, and *** indicate significance at 10%, 5% and 1% levels.

Table C8: Dollar Exchange Rate Pass-Through into Δ Volumes

dependent variable: Δ log export volumes, $\Delta x_{izn,t}$						
	(1)	(2)	(3)	(4)	(5)	(6)
Δ\$ exchange rate, s_t	-0.26***		-0.06	-0.16		0.01
	(0.057)		(0.059)	(0.095)		(0.095)
$\Delta s_{n,t}$				-0.13	-0.05	-0.07
				(0.082)	(0.051)	(0.082)
$\Delta\left(\frac{\widehat{\text{crp}}_t}{1+\text{distance}_n}\right)$		-0.13***	-0.64***		-0.62***	-0.64***
		(0.259)	(0.051)		(0.051)	(0.051)
Firm/Ind/Dest FE	✓	✓	✓	✓	✓	✓
# observations	421,252	421,252	421,252	421,212	421,212	421,212

Notes: Robust standard errors are reported in parenthesis and are clustered at the product level. The regression includes quarterly time dummies, the first difference of the log of the oil price, the log of CPI and real GDP in the destination country, as well as one lag. *, **, and *** indicate significance at 10%, 5% and 1% levels.

Annual Data

We estimate the pass-through and volume regressions using annual data instead of quarterly observations. Tables C9 and C10 present the effects on unit values and volumes for the bilateral exchange rate, while Table C11 displays the corresponding estimates for the dollar exchange rate.

Table C9: Annual Bilateral Exchange Rate Pass-Through into Unit Values

dependent variable: log unit values in Colombian peso, $p_{izn,t}^{\textbf{peso}}$						
	(1)	(2)	(3)	(4)	(5)	(6)
$s_{n,t}$	0.69***		0.54***	0.66***		0.52***
	(0.01)		(0.01)	(0.01)		(0.01)
$\left(\frac{\widehat{\text{crp}}_t}{1+\text{distance}_n}\right)$		1.52***	1.16***		1.47***	1.13***
		(0.02)	(0.02)		(0.02)	(0.02)
Prod-Time FE	✓	✓	✓			
Firm FE	✓	✓	✓			
Destination FE	✓	✓	✓	✓	✓	✓
Firm-Prod-Time FE				✓	✓	✓
# observations	998,225	998,604	998,225	904,539	904,915	904,539

Notes: Robust standard errors are reported in parenthesis and clustered at the product level. *, **, and *** indicate significance at 10%, 5% and 1% levels.

Table C10: Annual Bilateral Exchange Rate Pass-Through into Volumes

dependent variable: log export volumes, $x_{izn,t}$						
	(1)	(2)	(3)	(4)	(5)	(6)
$s_{n,t}$	-0.10^{***}		-0.08^{***}	-0.13^{***}		-0.10^{***}
	(0.01)		(0.01)	(0.01)		(0.01)
$\left(\frac{\widehat{\texttt{crp}}_t}{1+\text{distance}_n}\right)$		-0.24^{***}	-0.20^{***}		-0.29^{***}	-0.24^{***}
		(0.02)	(0.02)		(0.03)	(0.03)
Product-Time FE	✓	✓	✓			
Firm FE	✓	✓	✓			
Destination FE	✓	✓	✓	✓	✓	✓
Firm-Prod-Time FE				✓	✓	✓
# observations	451,672	451,778	451,672	434,139	434,243	434,139

Notes: Robust standard errors are reported in parenthesis and clustered at the product level. One lag of the dependent variable are included in the regressions but not reported. The log of CPI and GDP in the importing country are also included as controls. *, **, and *** indicate significance at 10%, 5% and 1% levels.

Table C11: Dollar Exchange Rate Pass-Through: Annual Sample

dependent variable	**log of unit values,** $p_{izn,t}^{\textbf{peso}}$		**log of export volumes,** $x_{izn,t}$	
	(1)	(2)	(3)	(4)
s_t	0.81***	0.80***	0.11***	0.08***
	(0.02)	(0.02)	(0.01)	(0.01)
$s_{n,t}$		0.01***		0.04***
		(0.00)		(0.00)
$\left(\frac{\widehat{\texttt{crp}}_t}{1+\text{distance}_n}\right)$	0.60***	0.60***	−0.56***	−0.56***
	(0.03)	(0.03)	(0.03)	(0.03)
Firm/Ind/Dest FE	✓	✓	✓	✓
# observations	984,485	984,112	443,196	443,087

Notes: Robust standard errors are reported in parenthesis and clustered at the product level. s_t denotes the exchange rate between the Colombian peso and the U.S. dollar. Columns (1) and (2) include the log of the oil price as additional control. Columns (3) and (4) include one lag of the dependent variable, the log of the oil price, and the log of the CPI and GDP in the importing country. *, **, and *** indicate significance at 10%, 5% and 1% levels.

Firm Characteristics Subsample

When merging the firm-level customs data with the Orbis database containing firm's characteristics, we lose observations because the Orbis identifiers were changed and we can no longer match the firm's tax ID with those identifiers. As a consequence of this, we have information up to 2019. In Tables C12 and C13, we check the robustness of our baseline regressions using the restricted sample of firms that we can merge with Orbis and find consistent results.

Table C12: Bilateral Exchange Rate Pass-Through: Firm Characteristics Sample

dependent variable	**log of unit values, $p^{\textbf{peso}}_{izn,t}$**			**log of export volumes, $x_{izn,t}$**		
	(1)	(2)	(3)	(4)	(5)	(6)
$s_{n,t}$	0.68***		0.65***	−0.07***		−0.08***
	(0.01)		(0.01)	(0.01)		(0.01)
$\left(\frac{\widehat{\texttt{crp}}_t}{1+\text{distance}_n}\right)$		0.93***	0.81***		-0.26***	-0.26***
		(0.02)	(0.02)		(0.02)	(0.02)
Product/time FE	✓	✓	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓	✓	✓
Destination FE	✓	✓	✓	✓	✓	✓
# observations	1,299,410	1,299,842	1,299,410	307,598	307,627	307,598

Notes: This table shows the unit values and volume regression results from a subsample for which we have firm characteristics information. Robust standard errors are reported in parenthesis and clustered at the product level. The volume regressions include as additional controls three lags of the dependent variable, the log of CPI, and GDP in the importing country (not reported). *, **, and *** indicate significance at 10%, 5% and 1% levels.

Table C13: Dollar Exchange Rate Pass-Through: Firm Characteristics Sample

dependent variable	**log of unit values,** $p^{\mathbf{peso}}_{izn,t}$		**log of export volumes,** $x_{izn,t}$	
	(1)	(2)	(3)	(4)
s_t	0.96***	0.95***	−0.09***	−0.10***
	(0.02)	(0.02)	(0.02)	(0.02)
$s_{n,t}$		0.01***		0.02***
		(0.00)		(0.00)
$\left(\frac{\widehat{\texttt{crp}}_t}{1+\text{distance}_n}\right)$	0.65***	0.65***	−0.29***	−0.29***
	(0.02)	(0.02)	(0.02)	(0.02)
Firm/Ind/Dest FE	✓	✓	✓	✓
# observations	1,290,124	1,289,697	306,856	306,827

Notes: Robust standard errors are reported in parenthesis and clustered at the product level. Columns (1) and (2) include quarterly time dummies and the log of the oil price as additional controls. Columns (3) and (4) include quarterly time dummies, three lags of the dependent variable, the log of the oil price, the log of CPI, and real GDP in the destination country. *, **, and *** indicate significance at 10%, 5% and 1% levels.