Asymmetric Trade Costs, Tariffs, and Trade Balance Dynamics

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Abstract

We develop a method to decompose time-varying export and import costs into their common and asymmetric components. Our findings reveal that common shocks to both costs, while affecting overall openness and GDP, have a negligible impact on a country's trade balance. In contrast, the asymmetric shocks—where export costs rise relative to import costs— significantly affect trade balances and exchange rates. This effect operates by temporarily raising the cost of international savings, spurring consumption and investment. We provide robust causal evidence for this mechanism using quasi-experimental variation from large asymmetric trade reforms for a subset of countries. Our analysis leads to a stark conclusion: unilateral tariff hikes are ineffective at reducing trade deficits, as they often generate neutralizing common trade cost movements.
JEL codes: F10, F13, F14, F40, F62

Keywords: import costs, tariffs, trade costs, trade balance, current account, exchange rate

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1 Introduction

Do trade costs affect trade balances and exchange rate dynamics? If so, how? These questions are becoming more relevant in a highly interconnected world, but also staring at the edge of a potential initial phase of globalization reversal (Fajgelbaum et al. 2020; Colantonea et al. 2022; Gopinath et al. 2025). Answering these questions has the potential to improve our understanding of the determinants of the observed prices and allocations across time and space, shedding light on several unexplained puzzles in the literature (Rogoff et al. 2000; Itskhoki et al. 2021). However, it could have first-order implications for the consequences and design of trade policy, beyond its usual impact on cross-country intratemporal allocation of resources (Fitzgerald 2012; Reyes-Heroles et al. 2016; Ostry 1991; Alessandria et al. 2021; Mac Mullen et al. 2023). Despite the centrality of these questions, their answer remains elusive without a clear answer. [1]

We show that changes in trade costs have a direct and economically significant impact on both exchange rates and trade balance dynamics. Specifically, when trade cost changes are asymmetric, differentially affecting export and import costs, they have a material impact on the exchange rate, current accounts, and trade balances; ultimately affecting cross-country savings and investments. Asymmetric trade costs affect the trade balance by temporarily changing the cost of engaging in cross-country savings and investing.

Nonetheless, our results are also consistent with the conventional view that trade costs do not affect cross-country savings and hence exert little effect on trade balances. We find this intuition to hold for a specific case: common trade shock. We find that when trade cost shocks affect export and import costs of a country similarly - common trade shocks -, they affect openness and output, but have little direct impact on trade balances or exchange rates. Hence, our differences with previous empirical findings lie in acknowledging that all trade cost changes are not alike. This partly explains the difficulties that previous empirical work has faced in finding meaningful relationships between trade costs and trade balances.

[1]See for example Costinot et al. 2025; Itskhoki et al. 2024; Boz et al. 2019; Furceri et al. 2022; Fitzgerald 2012; Ostry 1991; Alessandria et al. 2021; Mac Mullen et al. 2023; Boer et al. 2024; Schmitt-Grohé et al. 2025, for opposing views and estimations regarding the relevance and effects of trade costs for trade balances, current accounts, and exchange rate dynamics.

When they fail to properly distinguish between symmetric and asymmetric nature, simple estimation of export or import costs against the trade balance or even the exchange rate is likely to suffer from a measurement error problem, biasing the results towards zero.

To pin down the common and asymmetric component of trade costs, we propose a novel and model-consistent way to estimate the aggregate export and import costs separately for each country using standard intra-temporal conditions common to most models of international trade (Waugh 2010; Eaton et al. 2002; Alessandria et al. 2021; Backus et al. 1993; Armington 1969). Distinguishing between these two is something implausible to estimate using standard approaches (Waugh 2010; Eaton et al. 2002; Head et al. 2001; Yotov 2022). This implausibility is a reflection of the Lerner symmetry and a combination of data used to identify these costs (Lerner 1936). Since export and import costs generate similar allocations in trade flows and terms of trade, we can't separately identify these two using only these data variations. Our solution lies in exploiting final expenditure prices information to separate and identify these two objects properly, since export and import costs generate differences in the real effective exchange rates (REER) (Itskhoki et al. 2025). After we recover the export and import costs separately, we decompose their variation into two underlying components of trade costs: a symmetric (or common) component, affecting both export and import costs simultaneously for a given country; and an asymmetric component, which captures the relative movement of export and import costs.

This distinction between the symmetric and asymmetric components of exports and imports is motivated by the standard theory underlying most of the dynamic models with trade frictions. If preferences are represented by constant elasticity of demand utility functions (CES henceforth), the ratio of export to imports, which is tightly linked to the trade balance and current account (CA, henceforth), is a function of the exchange rate, total expenditures across domestic economy and the rest of the world, terms of trade, and the relative trade wedges between export and import costs -driven by asymmetric trade costs variations- (Backus et al. 1993; Alessandria et al. 2021). Hence, being able to properly distinguish between the asymmetric and common components of these trade costs without assuming one-sided asymmetries is of key importance to get empirical tests closer to theoretical developments (Backus et al. 1993; Alessandria et al. 2021; Mac Mullen et al. 2023).

By proposing an identification for these components, we overcome an empirical obstacle that was present in the literature. Previous studies assume symmetry between exporting and importing costs, as in the seminal work of Head et al. 2001; or only focus on one-sided asymmetric trade costs (Waugh 2010; Eaton et al. 2002; Boz et al. 2019), preventing the empirical treatment from being fully consistent with theoretical predictions of models.

Consistent with the previous statement, we revisit two important theoretical results. First, that common shock does not directly affect the export-import ratio, and hence, they are unlikely to have a direct effect on the trade balance of a country. Second, after a change in the asymmetric component of exports relative to imports, there are only three options: the trade balance adjusts, prices adjust to offset partial equilibrium forces (exchange rate and/or terms of trade adjusts), or both options happens simultaneously.[2] Our empirical findings are consistent with the third option. Asymmetric trade costs affect the real exchange rate. Still, its movements do not fully offset trade costs' impact on the trade balance in the short or medium run, consistently with the low elasticity of trade flows to exchange rate changes (Fitzgerald et al. 2024; Ruhl et al. 2008).

After presenting these theoretical results and deriving our identification strategy, we apply our measures to the data. We perform two main analyses. First, we demonstrate the soundness of our proposed measures by testing them against large, macro-relevant trade policy events. We begin by testing how well our import cost measures capture large variations in tariffs. Estimated import costs should capture all distortions that affect import expenditure relative to domestic ones. These range from tariffs and non-tariff measures, geographical and institutional barriers, to macroeconomic events that affect imports more than domestic expenditures. Hence, while import costs do not necessarily need to follow a close relationship with tariff changes, if they do not, this could suggest some evidence against our proposed measure, especially when focusing on large aggregate tariff changes. We found that our import costs measure tracks relatively well, both overall aggregate tariff changes and large changes.

Then we test the soundness of our asymmetric trade cost measures. For this, we use

[2] In this case, we abstract from the variation in relative expenditures.

data from "The Annual Report on Exchange Arrangements and Exchange Restrictions" (AREAER henceforth) that tracks the exchange rate and trade regimes of all members of the International Monetary Fund. We focus on the restrictions that affect trade. From this dataset, we can capture the number of measures that affect exports and import costs separately. Based on this, we focus on those countries that underwent what we called "Large Asymmetric Trade Policy Events" (LATPE, henceforth), where the number of measures affecting export costs grew relatively more than those affecting imports. We use these events to estimate their impact on our measure of export-to-import costs. Results are as expected. Our measure of export cost relative to import costs increases over time after these events relative to those countries that do not undergo significant changes in the ratio of export to import policy measures.

Having established the soundness of our proposed measure, we look at the dynamic responses of key macroeconomic variables to our estimated trade cost shocks. We start focusing on symmetric trade costs—a common shock affecting both export and import costs. They affect the trade openness of a country, with minimal direct impact on trade balances. In contrast, asymmetric trade costs do affect the exchange rate, the trade balance, and the current account. Both of these effects are consistent with our theoretical results. It also shows that to properly understand the impact of trade cost changes on the trade balance, we need to understand their underlying shock structures. By mixing common or asymmetry of the trade costs, estimates are likely to suffer from measurement error, generating a downward bias in their estimated effects.

Additionally, we show that asymmetric trade costs tend to be, on average, temporary, and present hump shape dynamics. This presents empirical evidence of a new mechanism not yet explored in the literature, which, relatively to the usual one, facilitates trade while also reducing the cost of cross-country savings and loans in response to other shocks (Fitzgerald 2012; Alessandria et al. 2025; Rogoff et al. 2000). Specifically, we find that asymmetric cost shocks directly affect savings and investment incentives: as export costs temporarily increase relative to import costs, cross-country savings become temporarily more expensive, while import-intensive investment goods become cheaper for the domestic economy. Hence, the trade balance reduces, domestic expenditure increases, and the exchange rate depreciates. Output is unresponsive to these shocks. Its behavior resembles the potential dynamics changes through which unilateral tariffs can generate effects on trade balances as discussed in Costinot et al. 2025.

Given these results, we find that trade policy, while potentially not optimal, can affect trade balances and exchange rates over the short and medium term if it can exert changes on asymmetric trade costs. We test this possibility by exploring how tariff changes relate to each of these components. We find that when a country increases tariffs, its export costs also increase, suggesting the existence of retaliatory measures through tariffs and non-tariff measures. Tariff increases mainly affect the common component of trade costs, and hence, while they do affect openness, they are likely ineffective in affecting net exports. Surprisingly, tariffs that decrease are less likely to be retaliated against, and hence they are more likely to generate asymmetric changes.

Literature. [To be added]

The remainder of the paper is organized as follows. Section 2 discusses the theoretical framework and the construction of our trade cost measures. Section 3 outlines the data sources and their uses. Section 4 looks at the evolution of the measures over time, and their relationship with different policy events. Section 6 describes our empirical strategy to estimate the measures' impact on different macro variables, discussing our instrumental variable approach in detail. Section 6.2 documents our facts and the relationship between tariffs and the symmetric and asymmetric trade costs measures. Section 7 concludes.

2 Export and import costs measure

In this section, we describe the framework and conditions that can be used to quantify export and import distortions separately. We then proceed to describe the identification assumptions to estimate the common and asymmetric components underlying the export and import costs.

2.1 Framework

Two countries populate the economy: a domestic country, d, and a foreign one, f. In each country, there is a representative consumer with a standard CES utility function, whose international trade incentives are given by goods that are imperfect substitutes as in Anderson 1979. We abstract from production technologies for now, as our results are independent of the determinants of the supply side of the economy.

Trade distortions. There are three sources of trade distortions. The first is a time-varying iceberg cost, $\tau_t^{d,f}$, popularized by Samuelson 1954. The exporter from d needs to produce $\tau_t^{d,f}$ units of goods so that one unit of the good reaches its destination f. The second distortion is a time-varying trade wedge, $\zeta_t^{d,f}$. It measures the difference between the price paid at customs by the importer in country f, relative to the final price at the retailer, denoted by $p_t^{R,d,f}$. The third distortion, the home bias (ω), remains constant over time as it represents agents' preferences, which serves as a demand shifter.

Demand. C^j denotes country $j's$ total expenditure, its associated price is P^j, and the quantities price elasticity is θ. $q_t^{i,j}$ denotes j's demand of goods from country i at time t. The usual argument implies that the demand of a good from i in country j is given by:

$$q_t^{i,j} = (1-\omega)\left(\frac{p_t^{R,i,j}}{P_t^j}\right)^{-\theta} C_t^j$$

Define $p_t^{i,j}$ as the price received by the producer in i when selling to j. By definition of $\zeta_t^{i,j}$, we get that $p_t^{R,i,j} = \zeta_t^{i,j} p_t^{i,j}$. Hence, demand can be written as:

$$q_t^{i,j} = (1-\omega)\left(\frac{\zeta_t^{i,i} p_t^{i,j}}{P_t^j}\right)^{-\theta} C_t^j \tag{1}$$

Trade balance and trade costs. Now we explore how export and import distortions affect cross-country relative prices and quantities, formalized in Lemma 1.

Lemma 1: *When export distortions change relative to import ones, at least one of the following variables adjusts: the exports to import ratio, the exchange rate, the terms* *of trade, or the relative total expenditures. When export and import distortions change symmetrically, these variables are not directly affected.*

Proof see Appendix A.1

The proposition follows from the fact that after re-writing equation (1) using the definitions of iceberg costs and trade wedges, we get that:

$$\ln \frac{exp_t^i}{imp_t^i} = -\theta \ln \frac{\zeta_t^{i,j}}{\zeta_t^{j,i}} - \theta \ln \frac{p_t^{i,j}}{p_t^{j,i}} - \theta \ln \frac{P_t^j}{P_t^i} + \ln \frac{C_t^j}{C_t^i}$$

Note that conditional on terms of trade, exchange rates, and relative expenditure, trade wedges are the only distortion directly affecting the trade ratio. While iceberg costs affect the terms of trade of a country when prices are registered at the border. Of note, the above equation implies that relative iceberg costs can be pinned down from inverting the equation, as all these variables are observables. Of note, inverting this equation only allows us to capture the relative trade wedges, and not the full range of distortions affecting trade flows. The next section proposes an identification for all the trade frictions in the economy.

2.2 Trade cost measures

Lemma 1 highlights the importance of distinguishing between the asymmetric and common components of export and import costs in understanding their impact on trade balance and REER dynamics. We now proceed to develop a sufficient statistic to estimate them in the data. We refer to these statistics as the export cost from d to f as:

$$\text{export costs}_t^{d,f} = \left(\frac{1-\omega}{\omega}\right)^{\frac{1}{1-\theta}} \zeta_t^{d,f} \tau_t^{d,f};$$

and import costs from d to f as

$$\text{import costs}_t^{d,f} = \left(\frac{\omega}{1-\omega}\right)^{\frac{1}{1-\theta}} \zeta_t^{f,d} \tau_t^{f,d} \;;$$

To estimate these trade cost measures, we use the demand intra-temporal conditions.

Denote total expenditure share of country j in goods from i as:

$$\lambda_t^{i,j} = \frac{p_t^{R,i,j} q_t^{i,j}}{P_t^j C_t^j} = (1-\omega)\left(\frac{\zeta_t^{i,j} p_t^{i,j}}{P_t^j}\right)^{1-\theta} \tag{2}$$

Proposition 1. *Regardless of the production function, if the utility is of the CES type, goods are imperfect substitutes, and the price elasticity $\theta > 1$; then the export and import costs for country d to trade with the rest of the world f are given by:*

$$\text{exp cost}_t^{d,f} = \left(\frac{\lambda_t^{d,f}}{\lambda^{d,d}}\right)^{\frac{1}{1-\theta}} \left(\frac{P_t^{f,C}}{P_t^{d,C}}\right) \tag{3}$$

$$\text{imp cost}_t^{d,f} = \left(\frac{\lambda_t^{f,d}}{\lambda^{f,f}}\right)^{\frac{1}{1-\theta}} \left(\frac{P_t^{d,C}}{P_t^{f,C}}\right) \tag{4}$$

Proof see Appendix A.1

Note that the key addition relative to other approaches in the literature is the use of relative prices (Boz et al. 2019; Head et al. 2001; Eaton et al. 2002; Waugh 2010). This is related to the fact that standard models are consistent with the Lerner symmetry (Lerner 1936). Hence, by only focusing on trade allocations, they cannot separately identify export and import costs, as they generate the same trade allocations. Nonetheless, even when Lerner symmetry is valid, the relative price of total expenditure differs, which allows for the identification of export and import costs separately as shown in Proposition 1 (Itskhoki et al. 2025). We clarify their role in the following example.

Identification Example. To clarify how the identification works, consider the case where country d imposes unilateral tariffs on the rest of the world. This change triggers two effects. The first is a direct effect: tariff increases the price paid for the foreign good, $p^{f,d}$, generating a drop in $\lambda^{f,d}$. The second is a general equilibrium effect: the price of total expenditure in d increases relative to the rest of the world, $\frac{P^d}{P^f}$ increases, which also has a direct effect on $\lambda^{f,d}$, but also has an impact on $\lambda^{d,f}$. Hence, if we were to use only the expenditure shares as the proposed statistic to estimate export and import costs separately, we would end up mixing both of these costs. In this example, we will estimate export cost movements when the actual movements are only tariffs.

But, as shown in proposition 1, the above statistic can identify the pure changes in tariffs free of the general equilibrium forces - changes in the relative price of consumption baskets. The reason lies in the second term of each statistic, capturing the relative prices. By multiplying the expenditure share ratio by the changes in relative prices, the general equilibrium effect is canceled out. The term $\left(\frac{\lambda_t^{d,d}}{\lambda_t^{f,f}}\right)^{\frac{1}{1-\theta}}$ is proportional to $\left(\frac{P_t^{f,C}}{P_t^{d,C}}\right)$; it actually moves one-to-one. The same reason explains why country $d's$ tariffs do not affect the estimated export costs, despite these changes clearly affecting P^d.

Hence, without the second term canceling these equilibrium movements, we would confound export and import costs together. For example, our estimated export costs from country d would increase when d imposes unilateral tariffs on the other countries.

Average Trade Costs. Taking the geometric average between exports and imports costs, we end up with the Head-Reis index (HR henceforth) (Head et al. 2001) which measures the average trade cost measure in terms of tariffs equivalence, as shown below:

$$\text{av trade costs}_t = \left(\text{imp cost}_t^{d,f} \text{exp cost}_t^{d,f}\right)^{\frac{1}{2}} = \left(\frac{\lambda_t^{f,d}\lambda_t^{d,f}}{\lambda^{f,f}\lambda^{d,d}}\right)^{\frac{1}{2(1-\theta)}}$$

Note in this case that any change in export or import costs separately would be captured as changes in average costs. So, while the procedure to estimate average trade costs is consistent with our approach, it can't be used to achieve our objective.

The Asymmetric and Common Components of Trade Costs. Once we have the time series for the evolution of export and import costs separately, we decompose them into two components. One is the common component affecting both exports and imports simultaneously ($\delta_{i,t}^{\mathrm{C}}$) and the other one is an asymmetric component ($\delta_{i,t}^{\mathrm{exp,D}}$ and $\delta_{i,t}^{\mathrm{imp,D}}$) which affects exports and imports separately. To identify these components, we need to add additional structure. Consistent with the trade costs literature, we post the following multiplicative structure:

$$\text{exp costs}_{i,t} = \delta^{\text{C}}_{i,t}\delta^{\text{exp,D}}_{i,t} \qquad ; \qquad \text{imp costs}_{i,t} = \delta^{\text{C}}_{i,t}\delta^{\text{imp,D}}_{i,t}$$

To estimate the common components, we estimate $\delta^{C}_{i,t}$ using common factor analyses over the log of the export and import cost measures for each country. Once we have the components, we use those with the highest positive correlation with each measure as our common component. Note that this does not imply that the common component necessarily changes over time, as they can be estimated to be constant over time. The asymmetric component, whose relevance was already discussed, is fully captured by the export-import cost ratio:

$$\frac{\text{exp costs}_{i,t}}{\text{imp costs}_{i,t}} = \frac{\delta^{\text{exp,D}}_{i,t}}{\delta^{\text{imp,D}}_{i,t}}$$

From now on, unless otherwise stated, we refer to increases in the asymmetric component as the case when export costs increase relative to import costs.

3 Data

3.1 Measuring export and import cost separately

Expenditure share. Using data from the OECD Inter-Country Input-Output Tables (1995-2020), we construct the expenditure share of country d relative to the rest of the world and the expenditure share of the rest of the world in country $d's$ goods. [3]

We define total expenditure as total production minus exports plus imports, as in Waugh 2010. Hence, country $d's$ expenditure share in goods from the rest of the world is given :

$$\lambda^{d,f}_t = \frac{\text{nom. imports}^d_t}{\text{total nom. gross production}^d_t - \text{ nom. exports}^d_t + \text{ nom. imports}^d_t}$$

While the expenditure share in its own goods is given by:

[3] Though the data does not cover all countries in the world, it is unlikely to bias the results as our data covers, on average, 94 percent of the global GDP between 1995 and 2020.

$$\lambda_t^{d,d} = \frac{\text{total nom. gross production}_t^d - \text{ nom. exports}_t^d}{\text{total nom. gross production}_t^d - \text{ nom. exports}_t^d + \text{ nom. imports}_t^d}$$

Price ratio. As discussed in Section 2, our novelty hinges on our ability to identify export and import costs separately. For this, we need to obtain values for the price ratio that are generally unavailable in a consistent cross-sectional way for every period in time. We circumvent this by looking at changes in prices within countries over time. Hence, we construct a time series index that captures the evolution of export and import costs for each country and normalize it to a base year, b. Where f is the rest of the world, our index measures of aggregate export and import costs become:

$$\text{exp cost}_t^d = \frac{\left(\frac{\lambda_t^{d,f}}{\lambda_t^{d,d}}\right)^{\frac{1}{1-\theta}} \left(\frac{P_t^{f,C}}{P_t^{d,C}}\right)}{\left(\frac{\lambda_b^{d,f}}{\lambda_b^{d,d}}\right)^{\frac{1}{1-\theta}} \left(\frac{P_b^{f,C}}{P_b^{d,C}}\right)} * 100$$

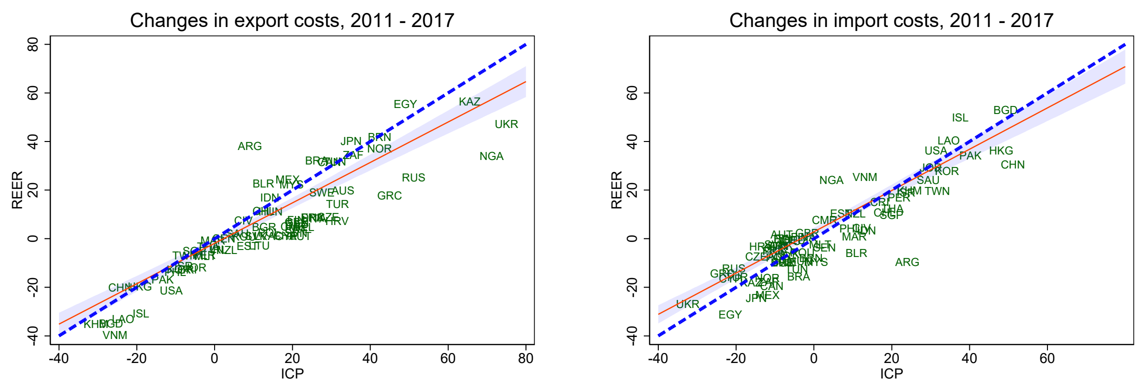
$$\text{imp cost}_t^d = \frac{\left(\frac{\lambda_t^{f,d}}{\lambda_t^{f,f}}\right)^{\frac{1}{1-\theta}} \left(\frac{P_t^{d,C}}{P_t^{f,C}}\right)}{\left(\frac{\lambda_b^{f,d}}{\lambda_b^{f,f}}\right)^{\frac{1}{1-\theta}} \left(\frac{P_b^{d,C}}{P_b^{f,C}}\right)} * 100$$

The above measures can all be empirically constructed from the data. For this, we use the REER data to proxy the relative price changes between a country and the rest of the world. We acknowledge the potential shortcomings of using the REER as a price proxy and test their predictions against other data sources. Specifically, we test how our measures perform using REER relative to the case using the ICP database on prices.

ICP database that collects comparable cross-country data on prices for different industries. The effort in achieving cross-country comparability makes it an ideal measure to proxy for cross-country prices in our current case. Nonetheless, their scattered availability over time would not allow us to carry out our empirical analyses. Hence, we use ICP data to compare the estimated changes in export and import costs using each data set. We find that export and import costs move similarly for each case, as shown in Figure . Section

A.2 of the appendix further discusses other concerns when using REER as a proxy for price changes, as its short-term variations are driven by nominal movements in exchange rates.

Figure 1: Trade cost differences: REER vs ICP



(a) Export costs

(b) Import costs

Note: This figure shows the change in exports and import costs estimated using two different prices. Y-axis uses trade costs using REER as proxy for prices, while X-axis uses the proxy based on the ICP database.

3.2 Other variables

As our objective is to understand the impact of trade costs on the aggregate economy, we also use yearly data between 1995 and 2020, drawing primarily from the IMF WEO database. Specifically, we look at GDP and its expenditure side component, as well as the current account, trade balance, and the terms of trade. Our REER data comes from Darvas 2021. The resulting panel dataset covers 72 countries from 1995 to 2020, mainly limited by our input-output data coverage.

When looking at tariffs and the policy events where we analyze the trade policy effects on the variables of interest, we rely primarily on the IMF's AREAER database and the OECD's Global Revenue Statistics Database. The Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER) is a detailed report produced by the IMF covering the trade and exchange rate policies of its member states. The online available records start in 1999 and are publicly available; we use them to create an index of asymmetric trade restriction policies for each country. The OECD produces the Global Revenue Statistics Database, which contains data on tax revenues collected by 135 countries starting in 1990. We use the tax revenues collected from imports to construct aggregate measures of effective tariffs, which we calculate by dividing them by total imports.

4 Trade Costs over Time and Space

Given the novelty of having cross-country estimates for the common and the asymmetric costs (expressed as the ratio of export and import costs), we start by presenting simple statistics and plots showing their evolution over time.

Common trade cost over time. Figure 2 shows the average common component of trade cost across different regions. Two clear patterns emerge. First, between 1996 and 2008, there has been a clear drop in the common trade costs. For some regions like the United States and Canada, Latin America, and Africa, the drop intensified after 2002, a year after China acceded to the WTO. The second is that we observe a stall in the fall in common trade costs after the global financial crisis. Both the stall and the spike are aligned with the well-documented great trade collapse (Bems et al. 2013), after which we see common trade costs increasing for most regions, especially after 2015.

Figure 2: Evolution of Common Trade Costs by Region

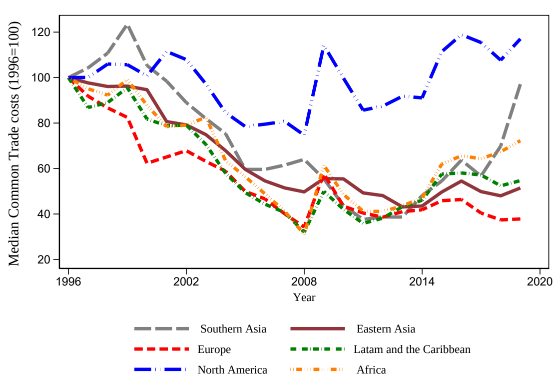
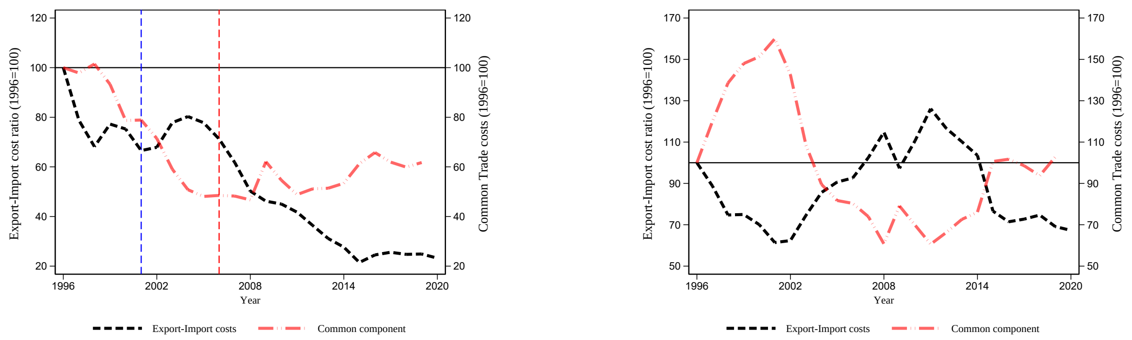


Figure 3 shows the evolution of the common trade cost (dashed-dotted line) and the export-import cost ratio (dashed line) for China. As before, we observe a sharp decline

Figure 3: Asymmetric Trade Costs Dynamics



China USA

in the common trade costs in 1998 and 2001 - marked by the blue vertical line-, and a spike in 2009 during the global financial crisis, and a small upward trend since then in this component. On the contrary, for the export-import cost ratio, we find an initial drop between 1996 and 1998 in the case of China, which then remained relatively constant until 2006, where we see a marked decrease, as depicted by the vertical dashed line. Interestingly, 2006 marked the beginning of the Chinese strategy to substitute imports with domestic production as discussed in Alessandria et al. 2017. This period was also marked by rapid exchange rate appreciation.

5 Trade Policy and Trade Costs Measures

We now proceed to analyze the extent to which our estimated trade costs correlate with macro trade policy. [4] Nonetheless, here, our interest lies in the within-country-time variation. There are main motivations behind this analysis. First, by exploiting macro-relevant trade policy changes, we can test the soundness of our measure. Second, understanding whether trade policy tools affect common or asymmetric trade costs will significantly impact the scope of trade policy objectives.

We begin by examining how large tariff changes are captured by our measures, and

[4]It is worth noting that several papers have found that substantial variation in the cross-sectional variation in trade costs might not be directly related to trade policy (**waugh2010international; jacks2008trade**).

then we focus on trade policy events that influence both export and import costs, thereby affecting their ratio.

5.1 Tariffs and Import costs & Asymmetric trade costs

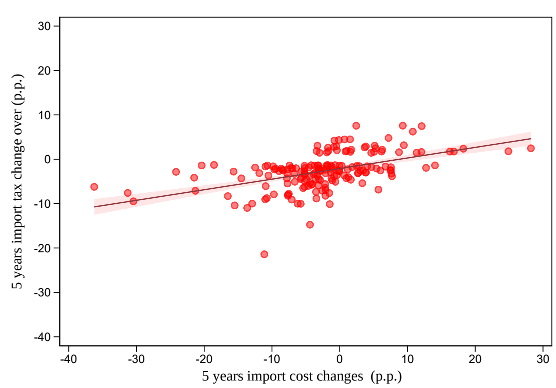
Effective Tariff Measure. To be consistent with the import cost measures, we focus on effective tariffs defined as follows:

$$\text{Effective Tariff}_{i,t} = \frac{\text{Government Revenue from Imports}_{i,t}}{\text{Total Imports}_{i,t}} \tag{5}$$

Government customs revenues come from the OECD's Global Revenue Statistics Database. Because import costs can be affected by tariffs but also by other events, we focus on the countries for which we observe an absolute change larger than the 75th percentile of the distribution.

Tariffs and Import costs relationship. Figure 4 shows the relationship between effective tariffs and import changes over our whole sample. Two results stand out. First, there is a strong and significant positive relationship between tariffs and import costs. Second, the changes in import costs tend to be much smaller than those in effective tariffs. Suggesting that other non-tariff measures might be negatively correlated with tariff changes.

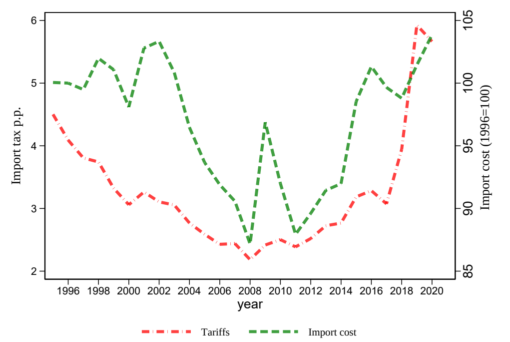
Figure 4: Import costs vs tariffs changes during large tariff changes



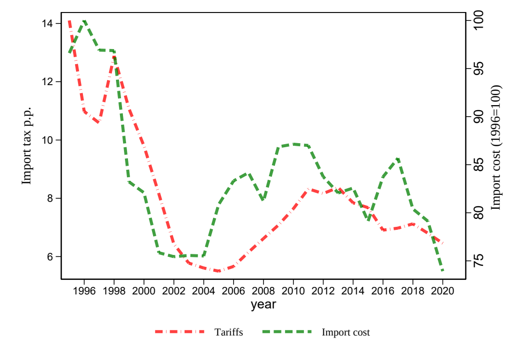
Note: The figure shows the five year cumulative percentage point change for each country in import tariffs (Y-axis) vs the changes in import costs for the same window. Confidence intervals are constructed at the 90% level.

Import costs also capture the specific event well, as shown in Figure 5. Figure A.3 of the appendix shows additional events for those countries with data availability that also underwent large tariff changes. Hence, we can conclude that import costs do a surprisingly good job in tracking down effective tariffs evolution for these cases.

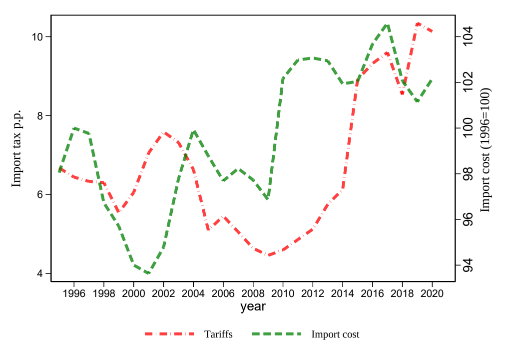
Figure 5: Effective tariffs vs import costs



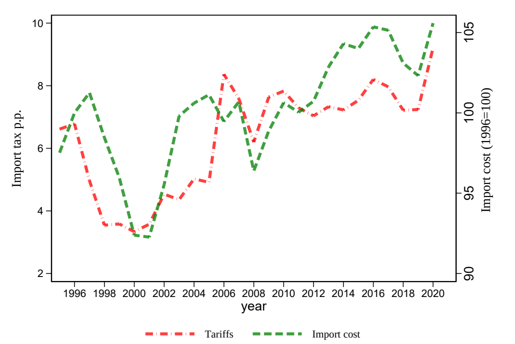
USA



Brazil



Australia



New Zealand

Note: We show the evolution of effective tariffs versus the evolution of import costs for a subset of those countries that went over a cumulative effective tariffs increase of at least two p.p. in four years. Effective tariffs are defined as government revenues from imports over total imports. Import costs are defined by equation 14.

5.2 Large Asymmetric Trade Policy Events

We now proceed to examine policy events where policy changes are likely to affect export and import costs differentially. We called these events Large Asymmetric Trade Policy Events (LATPE). We aim to generate two objectives. First, these events provide a natural test for the soundness of our measures of asymmetric trade costs. Second, they are likely to work as causal evidence based on quasi-experimental policy variation of trade cost shocks on the macroeconomic variables.

To find such events, we use the Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER) database from the IMF. The AREAER database spans from 1999 to 2022. It provides information on exchange rate restrictions, monetary frameworks, arrangements for payments and receipts, procedures for resident and nonresident accounts, the operation of foreign exchange markets, and controls on international trade.[5] These measures are a binary variable documenting the existence of such policies.

We focus on the variables grouped under sections (VIII) Exports and Export Proceeds, and (VII) Imports and Import Payments. The variables under the export category group contain five binary variables capturing the distortion to exports due to the existence of: (1) Repatriation requirements; (2) Financing requirements; (3) Documentation requirements; (4) Export licenses; and (5) Export taxes. For import distortions the following categories are measured (1) Foreign exchange budget; (2) Financing requirements for imports; (3) Documentation requirements; (4) Import licenses and other non-tariff measures; (5) Import taxes and/or tariffs; (6) State import monopoly.[6] For each country-year pair we use these categories to construct a variable capturing the total number of policies distorting export ($N_{i,t}^{exp}$), and imports ($N_{i,t}^{imp}$). We then construct the ratio of measures affecting exports and imports:

$$\text{Exp-Imp pol.}_{i,t} = \frac{1 + N_{i,t}^{exp}}{1 + N_{i,t}^{imp}}$$

[5] See more details here.

[6] This is similar to the methodology of Estefania-Flores et al. 2024, but focuses only on trade measures

We defined LATPE as those events where ΔExp-Imp measures is above the 75th percentile of the distribution. The events are captured by a dummy, $I_{i,t}^{LATPE}$ that is equal to one if at time T there is a large asymmetric trade policy event, and for $h > 0$ if ΔExp-Imp measures$_{i,T+h} \geq 0$. The dummy is equal to zero when ΔExp-Imp measures$_{i,t} \leq 0$. If for a year T, ΔExp-Imp measures$_{i,T} < 0$, then $I_{i,t}^{LATPE} = 0$ for all $t \geq T$, until another LATPE is registered for a country. Hence, the treatment case is treated as a non-absorbing event. This latter group works as our control group for the following analyses.

Estimation and results. Once we have constructed the dummy capturing these events, we proceed to estimate a local projection diff-in-diff approach as in Dube et al. 2023.[7] With the treatment and non-treatment dummy, we estimate the following equation:

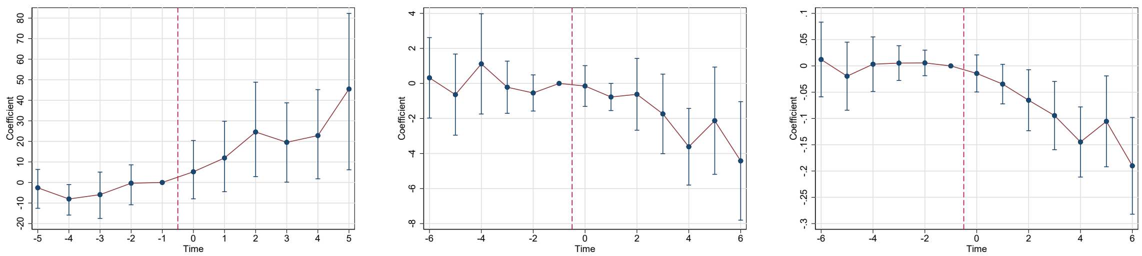
$$\Delta_h Y_{i,t} = \beta^h \Delta I_{i,t}^{LATPE} + \Gamma_h' \mathbf{X}_{i,t} + \gamma_t + \gamma_i^{GFC} + \epsilon_{i,t+h} \text{ for h} = \{-5, .., 0, .., 5\} \tag{6}$$

Where $\Delta_h Y_{i,t} = Y_{i,t+h} - Y_{i,t-1}$; $\mathbf{X}_{i,t}$ is set of controls until time t which includes the log of domestic to foreign expenditure, REER, terms of trade, and its four year lags, and four years lags of the dependent variable; γ_t denotes year fixed effects, while γ_i^{GFC} is a dummy variable in 2009 interacted with a dummy foe eac country, that absorbe any variation driven by the global financial crises.

Figure 6 shows the results of these policy events on the asymmetric trade costs changes (panel a), the ratio of trade balance over GDP (panel b), and on the log change of the trade ratio (panel c). Three results stand out. First, there are no significant pre-trends before the policy changes, which alleviates the concerns that the LATPE is a response to the ongoing macroeconomic conditions in the economy. Second, the estimated asymmetric trade cost increases as expected, validating our estimated measures. Specifically, four years after the change, the asymmetric trade costs increased by almost 40 percent. Third, both the trade balance as a percentage of GDP and the trade ratio drop by four percentage points and 15 percent, respectively. These changes are qualitatively and quantitatively consistent with the facts presented in section 6.2, providing quasi-experimental evidence for the soundness

[7]Since our events are staggered over different points in time, for which LP-DiD using local projections diff in diff has several methodological advantages over standard events in our case, as discussed by Dube et al. 2023.

Figure 6: Event study results



(a) Assymetric trade costs (b) Trade balance over GDP (c) Log trade ratio

Note: The figure shows the results of estimation of local projection diff-in-diff detailed in equation (6). Events are defined as Large Asymmetric Trade Policy (LATPE) as detailed in section 5.2. Controls include the log of domestic to foreign expenditure, REER, terms of trade, and their four-yearar lags. Standard errors are clustered at the origin country level.

of our asymmetric trade cost measures, and of our previous results. We will proceed in the next section to explore their relationship with other macro-variables for a wider set of countries.

6 Trade Costs Macroeconomic Impact

We now turn to estimating the impact of trade cost changes on different macroeconomic variables for our full set of countries. We begin by describing our empirical strategy, and then we present our results.

6.1 Estimation Approach

We use a local projection method to assess the dynamic effects of trade costs on different economic indicators following Jordà 2023:

$$\Delta_h \ln Y_{i,t+h} = \beta^h \ln \left(\text{trade costs}_{i,t}\right) + \Gamma_h' \mathbf{X}_{i,t} + \gamma_t + \gamma_i^{GFC} + \epsilon_{i,t+h} \quad \text{for h=\{1,..,10\}} \ , \qquad (7)$$

where $\Delta_h \ln Y_{i,t+h}$ represents the change in the dependent variable Y between year t and year $t+h$. The coefficients of interest are $\{\beta^h\}_{h=1}^{10}$, which captures the cumulative elasticity or semi-elasticity of Y to changes in the trade costs. We will use both the common trade costs and the asymmetric trade costs.

Motivated by Lemma 1, the vector $\mathbf{X}_{i,t}$ includes the following controls: terms of trade, real effective exchange rates, and relative expenditure; all of them between the domestic economy i and the rest of the world. The vector also includes up to 4 lags of all these variables, and from one to four year lags of the independent and the dependent variable in all cases. Additionally, we include year fixed effects γ_t to address common shocks that affect all countries within a particular year.[8]

Bartik Instruments. We construct a Bartik instrument to address concerns about endogeneity. [9] We denote the country-specific instrument as $z_{i,t}$, which is constructed using a leave-one strategy over the sectoral trade costs as follows. First, we construct the sector-specific, country-independent trade costs as the average trade costs for each sector, for the rest of the world, as:

$$\widehat{cost}_{i,s,t}^{export} = \sum_{n \neq 1}^{N-1} cost_{n,s,t}^{export} \frac{1}{N-1} \tag{8}$$

and

$$\widehat{cost}_{i,s,t}^{import} = \sum_{n \neq 1}^{N-1} cost_{n,s,t}^{import} \frac{1}{N-1}, \tag{9}$$

Where for each year the respective export and import costs for sector s are averaged out across $N-1$ countries, as the country of interest, i, is left out.

Then, we use the sector-specific trade costs weighted by sector s's share across country i's total exports or imports in the 5 years before. The weighted trade costs are then summed across all sectors. Lastly, we take the ratio of export costs to import costs to create the instrument $z_{i,t}$:

$$z_{i,t} = \frac{\sum_s \frac{export_{i,s,t-5}}{export_{i,t}} \cdot \widehat{cost}_{i,s,t-5}^{import}}{\sum_s \frac{import_{i,s,t}}{import_{i,t-5}} \cdot \widehat{cost}_{i,s,t-5}^{export}} \tag{10}$$

[8] Given the high levels of reactivity during the GFC of the trade costs, we include a dummy - equal to one during the GFC in 2009 and zero otherwise- interacted with a categorical variable for each country, denoted by γ_i^{GFC}. This captures the differential response to the GFC in each country, thereby preventing bias in our results due to the specificity of this economic event.

[9] If we assume the model specification in section 2 to be correct, our out-of-trade cost measures are already independent of any other changes than trade distortions contemporaneously affecting exports and imports, like changes in productivity, price movements, exchange rates, or total expenditure.

Note that we are using the import costs of other countries to map to country i's export cost, and vice versa for import costs.[10]

Using the constructed instrument, we estimate the first-stage least squares regression:

$$\ln(\text{trade costs}_{i,t}) = \beta^{IV} \ln z_{i,t} + \Gamma_h' \mathbf{X}_{i,t} + \gamma_t + \gamma_i^{GFC} + \epsilon_{i,t+h} \tag{11}$$

The rest of the variables in the first stage are the same as previously described. A more in-depth discussion on the robustness of our constructed instruments can be found in Section A.3

6.2 The Facts

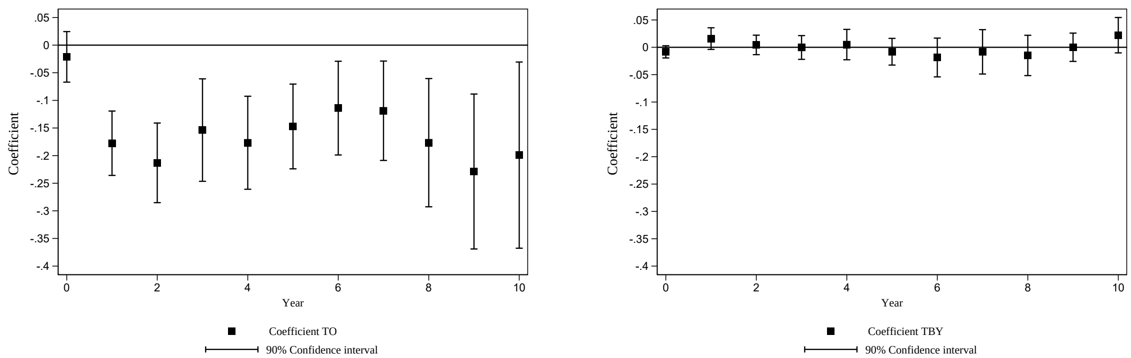
We now present our empirical findings using the above specification. First, we focus on the impact of common trade costs, for which we do not use an IV approach. Then, we turn to the relevance of asymmetric trade costs for openness and the trade balance. We highlight five key findings.

Fact 1: Common trade costs affect openness but not trade balances. Panel (a) of Figure 7 reveals that common trade costs alter trade openness significantly and almost permanently, acting as barriers to both exports and imports as expected. However, this downward effect is not reflected in the trade balance, as seen in panel (b). Hence, while common costs impede overall trade volumes, their direct effect on the trade balance is almost null, consistent with the extended view that trade costs are unlikely to have effects on cross-country savings and investments.

Fact 2: Asymmetric trade costs are dynamic. Panel (a) of Figure 8 presents the results using asymmetric trade cost measures as independent variables and the dependent variable. This allows us to understand its dynamics. By construction, the estimated effect is equal to one on impact. Asymmetric trade costs continue rising for the first two years, but taper off and decline afterwards, converging to zero by the fifth year. An increase in

[10]This obeys the result that country i's export costs are the same as the rest of the world import cost when buying from i.

Figure 7: Common Trade Cost Shocks



(a) Trade openness

(b) Trade balance

Note: The figure shows the results of the estimation of equation (7) for two dependent variables: trade openness (in log values) and the trade balance (as a share of GDP) in panels (a) and (b), respectively. Controls include - except when used as a dependent variable-: the terms of trade, real effective exchange rates, relative expenditures between country i and the rest of the world, its 4 years lagged, and up to 4 years' lagged values for the dependent and independent variable.

the asymmetric trade cost shock makes exporting temporarily more expensive relative to importing. Hence, asymmetric trade costs make engaging in cross-country savings, through net export changes, relatively and temporarily more expensive for the domestic economy than for the rest of the world.

Fact 3: Asymmetric trade costs shocks depreciate the real effective exchange rate. Panel (b) of Figure 8 illustrates the dynamic effects of asymmetric trade costs on the REER. An increase in the export-import trade cost ratio depreciates the currency on impact, as this ratio indicates that tradables become relatively cheaper for foreign countries, increasing consumption prices relative to the rest of the world. Consistent with Fact 1, this depreciation lasts between 3 and 5 years, after which the REER returns to its initial level shortly after the trade shock dissipates. This result is important as it shows the potential validity of the usual argument that trade costs affect REER, which, according to the standard argument, in turn offsets the trade balance effects triggered by changes in trade costs. The next fact shows that despite the REER effects, trade shocks still have meaningful impacts on the trade balance and current account.

Fact 4: Asymmetric trade costs shocks reduce the trade balance and the

trade ratio. Panels (c) and (d) of Figure 8 depict the dynamic effects of asymmetric trade costs on the trade ratio and the trade balance over GDP. The estimations indicate that a one percent rise in asymmetric trade costs is associated with a 1.3 percent decrease in the export-import ratio and a drop of approximately four percentage points in the trade balance. The intuition behind these results can be understood in light of the previous finding: as asymmetric trade costs rise, they temporarily increasing the cost of engaging in cross-country savings, prompting agents to postpone savings and anticipate expenditures, ultimately reducing the trade balance.

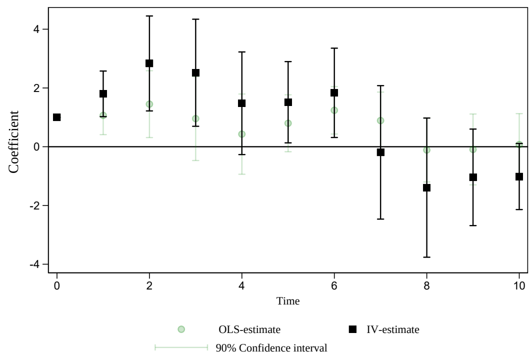
Fact 5: Asymmetric trade costs shocks' effects on the current account balance are driven by demand changes. Figure 9 illustrates the dynamic effects of asymmetric trade costs on the current account, real GDP, private consumption, and investment. In line with previous findings, the current account balance declines following an asymmetric trade cost shock. Notably, GDP remains largely unaffected, while both consumption and investment rise. These results suggest that asymmetric trade cost shocks influence the current account by altering the relative costs of savings and investment, without affecting total output.

6.3 Tariffs changes: common or asymmetric trade costs changes?

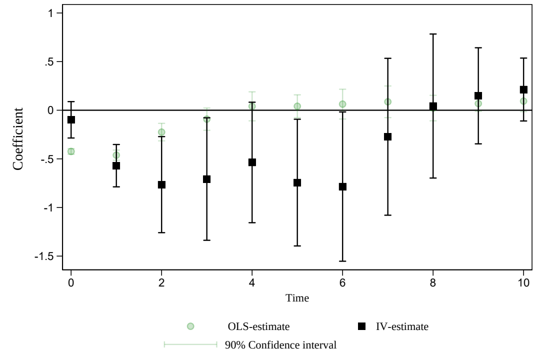
Having established the relevance and different macroeconomic implications of common and trade costs. Now we turn back to analyzing tariffs. The reason is that, abstracting from the government's revenue effects, tariff changes impact aggregate international allocation only if they alter trade costs. Hence, we now focus on the tariff'siff's relationship with the common and asymmecomponentsonent of trade costs. As explained, whether tariffs induce symmetric or asymmetric trade cost adjustments is crucial for understanding their effects on the trade balance and other variables.

Estimation of tariffs and import cost relationships. To analyze the relationship between trade costs and import costs systematically, we estimate the following equation in

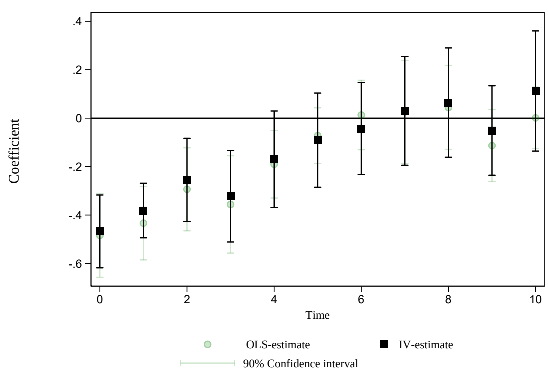
Figure 8: Asymmetric Trade Cost Shocks



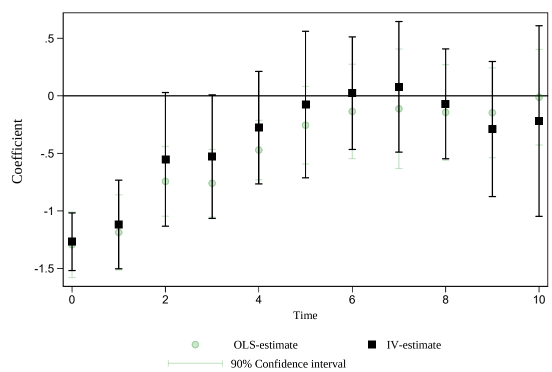
(a) Log Exp-imp trade cost ratio



(b) Log REER



(c) Trade balance over GDP



(d) Log export import ratio

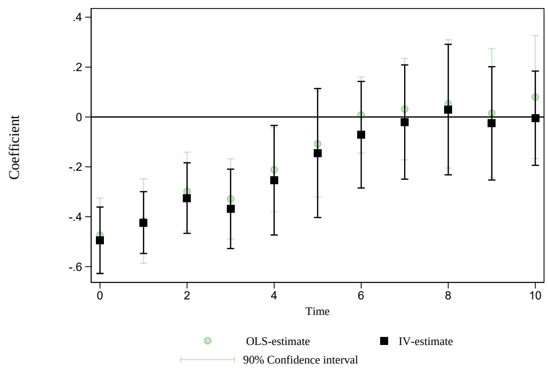
Note: The figure shows the results of estimation of equation (7) . Two estimates are presented for each case: those instrumented in black and those without instrumentation in green. Controls include - except when used as dependent variable-: the terms of trade, real effective exchange rates, relative expenditures between country i and the rest of the world, its 4-year lag, and up to 4 years' lagged values for the dependent and independent variable. Standard errors are clustered at the origin country level.

yearly changes:

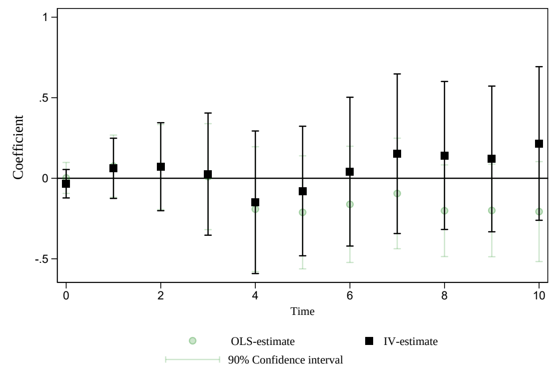
$$\begin{aligned}\Delta(\text{Trade costs}_{i,t}) = \beta_1 \Delta \text{Effective tariffs}_{i,t} + \beta_2 \mathbf{I}_{tariffsi,t>0} \times \Delta \text{Effective tariffs}_{i,t} + \\ + \beta_3 \mathbf{I}_{tariffsi,t>0} + \beta_{\mathbf{4}} \Delta X_{i,t} \alpha_t + \epsilon_{i,t}\end{aligned} \tag{12}$$

Where $\mathbf{X}_{i,t}$ includes: terms of trade, real effective exchange rates, relative expenditures between country i and the rest of the world, up to 4 years' lagged values for the depen-

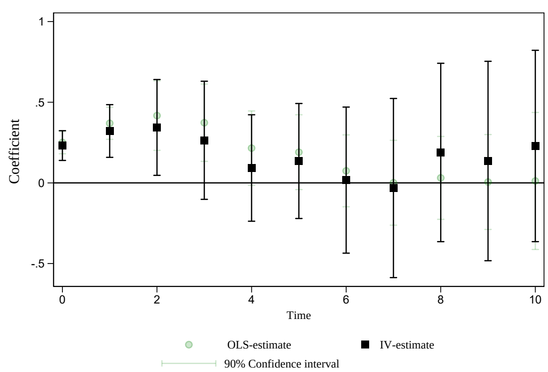
Figure 9: Asymmetric Trade Cost Shocks and Current account



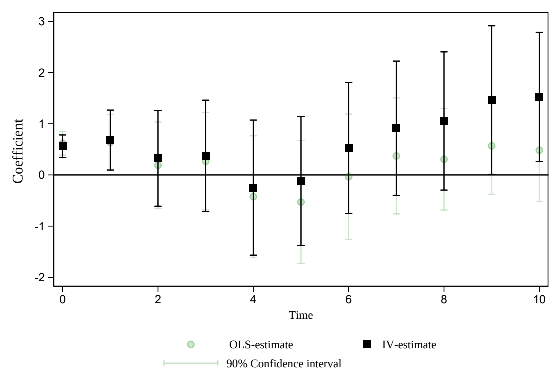
(a) Current account over GDP



(b) Log GDP



(c) Log Consumption



(d) Log Investment

Note: The figure shows the results of estimation of equation (7) . Two estimates are presented for each case: those instrumented in black and those without instrumentation in green. Controls include - except when used as dependent variable-: the terms of trade, real effective exchange rates, relative expenditures between country i and the rest of the world, its 4-year lag, and up to 4 years' lagged values for the dependent and independent variable. Standard errors are clustered at the origin country level.

dent variable, and effective tariffs as before. α_t denotes year-fixed effects. We are mainly interested in β_1, capturing the relationship between effective tariffs, and β_2 capturing the differential response of trade costs to effective tariffs changes, when the tariffs changes are positive - captured by the dummy variable $\mathbf{I}_{tariffsi,t>0}$.

Two results stand out from the estimation. First, Import costs co-move positively with changes in tariffs. Regardless of the direction of tariff movements, changes in tariffs

Table 1: Tariffs and trade costs relationship

Panel 1: Import costs

	Δ Import costs	Δ Import costs	Δ Import costs
Δ Tariffs	2.917***	2.897***	1.034***
	(0.300)	(0.313)	(0.151)
N	1037	1037	649
R^2	0.084	0.111	0.941

Panel 2: Exp-Imp cost ratio

	Δ Exp-Imp cost	Δ Exp-Imp cost	Δ Exp-Imp cost
Δ Tariffs × $I_{\Delta \text{Tariffs} \leq 0}$	-5.020***	-5.375***	-1.837***
	(0.716)	(0.733)	(0.360)
Δ Tariffs × $I_{\Delta \text{Tariffs} > 0}$	-1.643	-2.137	0.923
	(1.424)	(1.433)	(0.518)
N	1037	1037	649
R^2	0.052	0.085	0.942
Year FE	-	✓	✓
Controls	-	-	✓

Note: The Table presents the results of estimating equation 12. The first panel uses only yearly import cost changes as dependent variables, the second uses the export-import cost ratio changes. Controls include the terms of trade, real effective exchange rates, relative expenditures between country i and the rest of the world, its 4-year lagged value, and up to 4 years' lagged values for the dependent and independent variables.

are positively associated with changes in import costs, as shown in Panel 1 of Table 6.3. Specifically, a one p.p. change in effective tariffs is associated with a 1.03% change in import costs, after controls and year fixed effects are added (column 3 in Panel 1), consistently with Figure 4.

Second, Export costs increase only when tariffs are increased. Export costs for country i increase when the country increases effective tariffs to the rest of the world, as shown by the difference in estimates between the first and second row of Panel 2 in table 6.3. The first row shows that the export-import cost ratio is statistically significant and negatively associated with tariff changes when tariffs are reduced (row 1), but that the relationship lacks statistical significance when tariffs are increased (row 2), suggesting that export costs are likely to compensate for the import cost movement.

7 Conclusion

We examine how changes in trade costs affect the trade balance and exchange rates. We propose a novel empirical way to estimate export and import costs separately, and estimate their underlying common and asymmetric cost components. Our empirical findings indicate that common trade costs have a significant impact on trade openness, but they exert a limited direct effect on trade balance ratios. Conversely, we find that asymmetric trade costs play a crucial role in shaping both trade balances and exchange rates. Importantly, most of these effects are driven by asymmetric trade costs, which increase expenditure without significantly affecting output. Asymmetric trade costs shocks act as a temporary barrier to engaging in cross-country savings.

We also found that trade policy can be used to target both the common and asymmetric trade costs effectively. Nonetheless, our evidence also suggests that using tariffs to reduce trade balances is likely ineffective, due to the retaliations through both tariffs and non-tariff responses from destination countries.

Going forward, our estimation method for trade costs can have numerous potential applications. The measures can be applied to understand how trade costs behave differently between developed and developing economies. They can also be used to understand the role of trade costs in explaining trade flows that are lowly responsive to exchange rate movements, and to explore their role in facilitating or depriving risk sharing across countries.

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A Appendix

A.1 Appendix: Proofs

Lemma 1: *When export distortions change relative to import ones at least, without affecting domestic price of the goods, at least one of the following variables should adjust: the exports to import ratio, the exchange rate, the terms of trade, or the relative total expenditures. When export and import distortions change symmetrically these variables are unaffected.*

Proof:

Re-writing equation (1) implies that the log ratio of exports to imports is given by:

$$\ln \frac{exp_t^i}{imp_t^i} = -\theta \ln \frac{\overbrace{\zeta_t^{i,j}\tau_t^{i,j}}^{\text{exp. costs}}}{\underbrace{\zeta_t^{j,i}\tau_t^{j,i}}_{\text{imp. costs}}} - \theta \ln \frac{p_t^{i,i}}{p_t^{j,j}} - \theta \ln \frac{P_t^j}{P_t^i} + \ln \frac{C_t^j}{C_t^i}$$

Taking total differences, let $\Delta \frac{p_t^{i,i}}{p_t^{j,j}} = 0$. Note that this implies that:

$$\Delta \ln \frac{\overbrace{\zeta_t^{i,j}\tau_t^{i,j}}^{\text{exp. costs}}}{\underbrace{\zeta_t^{j,i}\tau_t^{j,i}}_{\text{imp. costs}}} = -\Delta \ln \frac{exp_t^i}{imp_t^i} + \Delta \ln \frac{P_t^j}{P_t^i} + \Delta \ln \frac{C_t^j}{C_t^i} = 0$$

Let $\ln \frac{\zeta_t^{i,j}\tau_t^{i,j}}{\zeta_t^{j,i}\tau_t^{j,i}} \neq 0$ and assume that:

$$\ln \frac{exp_t^i}{imp_t^i} = 0; \;\ln \frac{P_t^j}{P_t^i} = 0 \;; \ln \frac{C_t^j}{C_t^i} = 0$$

By previous condition, we have that:

$$\ln \frac{\zeta_t^{i,j}\tau_t^{i,j}}{\zeta_t^{j,i}\tau_t^{j,i}} = 0$$

which is a contradiction.

Proposition 1. *Regardless of the production function, if the utility is of the CES type, goods are imperfect substitutes, and the price elasticity $\theta > 1$; then the export and import costs given by the following equations capture all the trade distortion in the economy:*

$$\text{exp cost}_t^{d,f} = \left(\frac{\lambda_t^{d,f}}{\lambda^{d,d}}\right)^{\frac{1}{1-\theta}} \left(\frac{P_t^{f,C}}{P_t^{d,C}}\right) \tag{13}$$

$$\text{imp cost}_t^{d,f} = \left(\frac{\lambda_t^{f,d}}{\lambda^{f,f}}\right)^{\frac{1}{1-\theta}} \left(\frac{P_t^{d,C}}{P_t^{f,C}}\right) \tag{14}$$

Proof:

By equation 2 we have that:

$$\lambda_t^{i,j} = (1-\omega)\left(\frac{\zeta_t^{i,j} p_t^{i,j}}{P_t^j}\right)^{1-\theta}$$

Using that $p_t^{i,j} = \tau_t^{i,j} p_t^{i,i}$, we obtain that the previous equation is equal to:

$$\lambda_t^{i,j} = (1-\omega)\left(\frac{\zeta_t^{i,j} \tau_t^{i,j} p_t^{i,i}}{P_t^j}\right)^{1-\theta}$$

Hence we get that the ratio of expenditures share is equal to:

$$\frac{\lambda_t^{i,j}}{\lambda_t^{i,i}} = \frac{(1-\omega)}{\omega} \frac{\left(\frac{\zeta_t^{i,j} \tau_t^{i,j} p_t^{i,i}}{P_t^j}\right)^{1-\theta}}{\left(\frac{\zeta_t^{i,i} \tau_t^{i,i} p_t^{i,i}}{P_t^i}\right)^{1-\theta}}$$

After imposing that $\zeta_t^{i,i} = 1; \tau_t^{i,i} = 1$, we get that

$$\frac{\lambda_t^{i,j}}{\lambda_t^{i,i}} = \frac{(1-\omega)}{\omega} \frac{\left(\frac{\zeta_t^{i,j} \tau_t^{i,j}}{P_t^j}\right)^{1-\theta}}{\left(\frac{1}{P_t^i}\right)^{1-\theta}} = \frac{(1-\omega)}{\omega} \left(\zeta_t^{i,j} \tau_t^{i,j}\right)^{1-\theta} \left(\frac{P_t^i}{P_t^j}\right)^{1-\theta}$$

Define *export costs* $\equiv \left(\frac{(1-\omega)}{\omega}\right)^{\frac{1}{1-\theta}} \zeta_t^{i,j} \tau_t^{i,j}$. Then we get that:

$$\text{export costs}_{i,t}^{(1-\theta)} = \frac{\lambda_t^{i,j}}{\lambda_t^{i,i}} \left(\frac{P_t^j}{P_t^i} \right)^{1-\theta}$$

Define import costs as *import costs* $\equiv \left(\frac{\omega}{1-\omega}\right)^{\frac{1}{1-\theta}} \zeta_t^{j,i} \tau_t^{j,i}$. Note that by previous argument we have that:

$$\frac{\lambda_t^{j,i}}{\lambda_t^{j,j}} = \frac{1-\omega}{\omega} \frac{\left(\frac{\zeta_t^{j,i}\tau_t^{j,i}}{P_t^i}\right)^{1-\theta}}{\left(\frac{1}{P_t^j}\right)^{1-\theta}} = \frac{(1-\omega)}{\omega} \left(\zeta_t^{i,j}\tau_t^{i,j}\right)^{1-\theta} \left(\frac{P_t^j}{P_t^i}\right)^{1-\theta}$$

So we get that estimated import costs are:

$$\text{import costs}_{i,t}^{(1-\theta)} = \frac{\lambda_t^{j,i}}{\lambda_t^{j,j}} \left(\frac{P_t^i}{P_t^j} \right)^{1-\theta}$$

A.2 Appendix: Validation of price data

We find the REER to be a proper measure of cross-country aggregate price changes, as shown in Figure A.2. There, we plot the export and import cost changes predicted by the measure using the REER and the measure using the relative prices of countries' total expenditure provided by the ICP data.[11] Despite the presence of some statistical outliers, the strong correlation across the two measures provide enough confidence in using REER as an appropriate proxy. Figure A.1 in the appendix A.4 shows a similar plot but only looks at prices from the tradable sectors. [12]

Despite the good fit of using REER for relative aggregate prices, there are concerns that should be kept in mind. One of our concerns is that the variation in REER can be driven by financial changes affecting the nominal exchange rate (Itskhoki et al. 2021). While this would be a relatively large concern in the short run, we use yearly frequency where the high-frequency movements driven by financial changes are less likely relevant, as noted in

[11] We plot the changes for the years available in the ICP data.

[12] From all sectors available, we discard the following sectors, as they were deemed to be non-tradable: communication, restaurants and hotels, net purchases abroad, construction, and changes in inventories.

Table A.1: Instrument soundness

Panel 1: First stage

	ln(exp-imp trade cost ratio)	-
$ln(Z_{i,t})$	0.290***	
	(0.032)	
N	367	
Controls	✓	
R^2	0.99	

Panel 2: Export & Import

	Export	Import
Industry export instrument	0.139***	-0.020***
	0.009	.003
Industry import instrument	-0.159***	.059***
	.012	.007
N	376	376
R^2	0.472	0.503

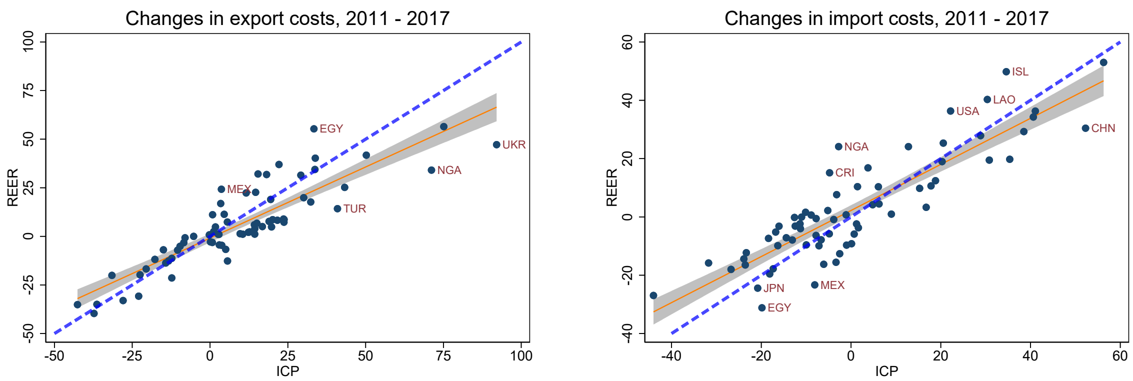
Mac Mullen et al. 2023 and Rabanal et al. 2015. A second concern is that non-tradable goods may drive the variations in the real exchange rate. Nonetheless, non-tradable goods have been estimated to account for little variation on the REER for several countries (Engel 1999). Figure A.1 shows the case where on tradables are used to construct prices based on the ICP data.

A.3 Appendix: Instrument validation

We cluster standard errors at the country level, in which case we find the F-test for the instrument to be around 80, as shown in panel 1 of Table A.1. Panel 2 shows how the industry-level export and import costs properly maps to the estimated export and import costs used to compute the the exp-imp trade cost ratio that we instrumented, as we would expect.

A.4 Appendix: Figures

Figure A.1: Trade cost differences: REER vs ICP

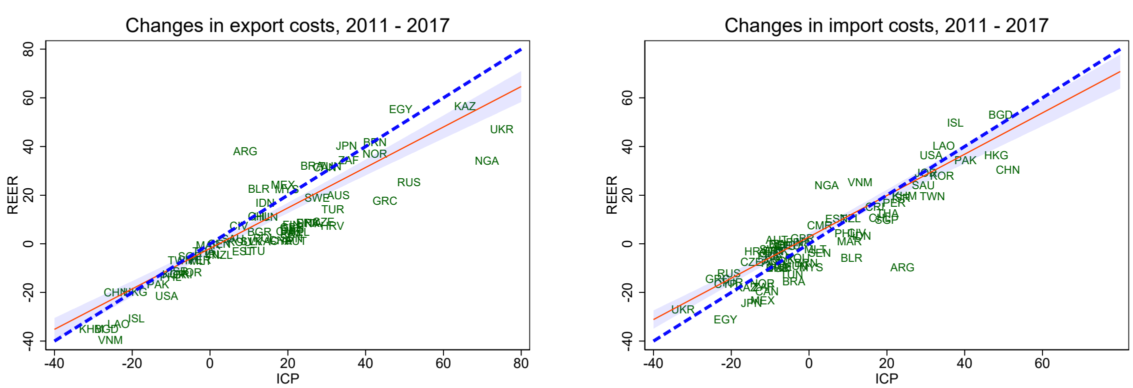


Export costs

Import costs

Note: This figure shows the change in exports and import costs estimated using two different prices. Y-axis uses trade costs using REER as proxy for prices, while X-axis uses the proxy based on only tradable goods for the ICP database.

Figure A.2: Trade cost differences: REER vs ICP

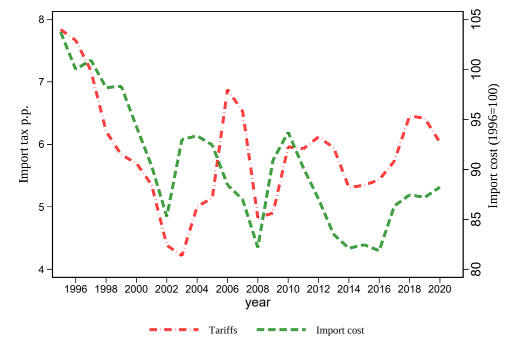


(a) Export costs

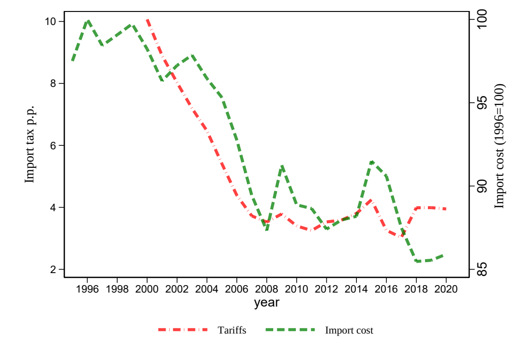
(b) Import costs

Note: This figures shows the the change in exports and import costs estimated using two different prices. Y-axis uses trade costs using REER as proxy for prices, while X-axis uses the proxy based on ICP database.

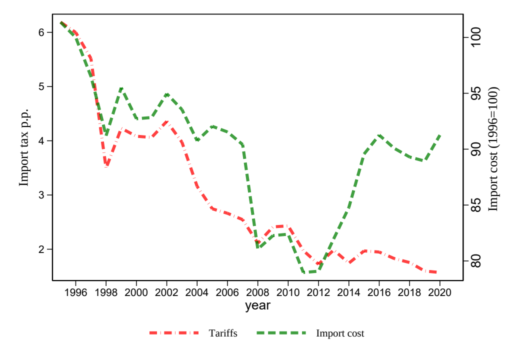
Figure A.3: Effective tariffs vs import costs



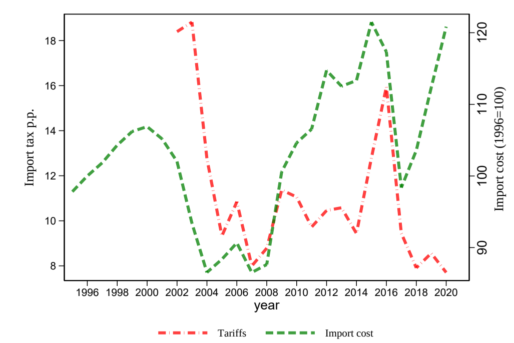
South Africa



Tunisia



Korea



Egypt

Note: We show the evolution of effective tariffs versus the evolution of import costs for a subset of those countries that went over an cumulative effective tariffs increase of at least 2 p.p. in four years. Effective tariffs are defined as government revenues from imports over total imports. Import costs are defined by equation 14.