

Global Trade and the Dollar*

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PRELIMINARY AND INCOMPLETE

Abstract

We document the outsize role played by the U.S. dollar in driving international trade prices and flows. Our analysis is the first to examine the consequences of the dollar's prominence as an invoicing currency using a globally representative panel data set. We establish three facts: 1) The dollar exchange rate quantitatively dominates the bilateral exchange rate in price pass-through and trade elasticity regressions. 2) The cross-sectional heterogeneity in pass-through across country pairs is related to the share of imports invoiced in dollars. 3) Bilateral terms of trade are essentially uncorrelated with bilateral exchange rates. These results imply that the majority of international trade is best characterized by a dominant currency paradigm, as opposed to the traditional producer or local currency pricing paradigms. Our results have implications for expenditure switching, monetary policy spillovers, and the link between exchange rates and inflation.

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1 Introduction

Exchange rate fluctuations impact a country’s trade competitiveness, inflation and output and therefore have important consequences for its welfare and economic policy. It is common practice to estimate this impact by examining the pass-through of *bilateral* exchange rates into export and import prices and volumes. This practice follows naturally from the classic Mundell-Fleming paradigm of sticky prices and producer currency pricing whereby exporting firms infrequently change prices denominated in their home currency. Consequently, the price an importing country faces when expressed in the importing country’s currency fluctuates closely with the bilateral exchange rate. When import prices are aggregated up across exporting countries, the pass-through is estimated using a trade weighted average of the bilateral exchange rates.

Recent evidence questions the Mundell-Fleming assumptions of producer currency pricing as the vast majority of trade is invoiced in a small number of ‘dominant currencies’, with the U.S. dollar playing an outsize role. This is documented in [Goldberg and Tille \(2008\)](#) and more recently in [Gopinath \(2015\)](#). Moreover, these prices are found to be rigid for significant durations in their currency of invoicing, as documented by [Gopinath and Rigobon \(2008\)](#) and [Fitzgerald and Haller \(2012\)](#). In such an environment, the value of a country’s currency relative to the dollar is a primary driver of a country’s import prices regardless of where the good originates from. Similarly, quantities imported depend on the value of a country’s currency relative to the dollar regardless of the originating country. [Casas et al. \(2016\)](#) demonstrate this using a model where trade is denominated in a dominant currency such as the dollar. They also provide evidence that supports this prediction using customs data for Colombia. However, no evidence exists on the consequences of dominant currencies for global trade.

In this paper we examine the implications of dominant currency invoicing for a large number of countries using a novel dataset. To do so, we first construct harmonized annual *bilateral* import and export unit value and volume indices for 55 countries (yielding more than 2,500 dyads) using highly disaggregated UN Comtrade data starting as early as 1989 depending on the country and covering through 2015. In this process we use the methodology developed by [Boz and Cerutti \(2016\)](#), who construct country level indices. These indices are broken down by commodities/noncommodities and also by end use categories. We then merge this dataset with the invoicing data from [Gopinath \(2015\)](#) to relate the degree of sensitivity of a country’s import prices to the invoicing share in dollars.

Our empirical analysis forcefully rejects the Mundell-Fleming benchmark in favor of the

dominant currency paradigm. First, in panel regressions of bilateral trade prices and volumes on bilateral and dollar exchange rates, we find that the dollar exchange rate is the quantitatively important explanatory variable. Second, by interacting the bilateral and dollar exchange rates with the fraction of imports invoiced in dollars (at the importing country level), we show that the heterogeneity in price pass-through across countries is well explained by the propensity to invoice in dollars. Both these facts contradict the Mundell-Fleming model’s emphasis on bilateral exchange rates and producer currency pricing. Third, we find that bilateral terms of trade are essentially uncorrelated with bilateral exchange rates, which (given nominal price stickiness) is inconsistent with either local or producer currency pricing, but consistent with a large fraction of trade being invoiced in dollars. The magnitudes of our results and the global nature of our data set point to the dominant currency paradigm as being a more empirically relevant starting point for theoretical analysis than traditional modeling approaches.

Our exchange rate pass-through analysis appears to be among the first to exploit a globally representative data set on bilateral trade volumes in addition to values. This allows us to distinguish the effects of exchange rates on volumes and prices (more precisely, unit values) at the level of country pairs. We use the cross-sectional richness of our data set to investigate the determinants of differential pass-through, especially as it relates to currency of invoicing. To our knowledge, the only other work that utilizes a similarly rich data set is [Bussière et al. \(2016\)](#), who analyze trade prices and quantities at the product level. The goal of that paper is to quantify the elasticity of prices and quantities to the bilateral exchange rate and check if Marshall-Lerner conditions hold. In contrast, our goal is to understand the prominence of dominant currencies in international trade by comparing the importance of dollar and bilateral exchange rates and by exploiting data on currency invoicing.

The remaining literature on exchange rate pass-through falls into two main camps.¹ First, many papers have used unilateral country-level time series, which limits the ability to analyze cross-sectional heterogeneity and necessitates the use of trade weighted rather than truly bilateral exchange rates (e.g., [Leigh et al., 2015](#)). Second, a recent literature has estimated pass-through into product-level prices, but these micro data sets are only available for a small number of countries (see the review by [Burstein and Gopinath, 2014](#)).

The importance of the dollar in world trade makes policies originating in the U.S. have asymmetrically large spillovers across countries. A strong or weak dollar can have important

¹The trade gravity equation literature frequently uses extensive bilateral data sets, but the data is on trade values without distinguishing between prices and volumes (see the review by [Head and Mayer, 2015](#)).

implications for cyclical world trade. We aim to quantify these effects. [More on policy implications.]

2 Data

The core of our data set consists of panel data on bilateral trade values and volume from Comtrade. To this global data set we append macroeconomic aggregates from the World Bank’s World Development Indicators and currency invoicing shares from [Gopinath \(2015\)](#).

Comtrade. UN Comtrade provides detailed customs data for a large set of countries at HS 6-digit product level with information about the USD value, quantity, and weight of imports and exports. This dataset makes it possible to compute volume changes over time for each product, and use the value data to infer unit values. Once unit values are calculated, we compute Laspeyres, Paasche and Fisher indices, both in their fixed base and chained forms to aggregate up from the product level.² We conduct this exercise at annual frequency for which the database has good coverage.

The biggest challenge for constructing price and volume indices using customs data is the so-called unit value bias. Unit values, calculated simply by dividing observed values by quantities, are not actual prices. Even at the narrowly defined product categories at 6-digit product level, there is likely to be a wide range of products whose prices may not be moving proportionately. The implication is that if there are shifts in quantities traded within the narrowly defined product categories, unit values would be influenced even when there may not be any price movement. This creates a bias that the employed methodology takes a stab at correcting for by eliminating products whose unit values have a variance higher than a threshold. Further details of this method, including the strategy for dealing with outliers and missing values, is discussed in ongoing work by [Boz and Cerutti \(2016\)](#).

In the final stage, we compare our unit value indices to those provided by the BLS for the U.S., the only country, to our knowledge, that collects import price indices based on price surveys by origin. As shown in [Appendix A.2](#), this comparison for the U.S. suggests that working with unit values is acceptable as the growth rates of the two series are broadly aligned for most trading partners. Additionally, [Boz and Cerutti \(2016\)](#) find favorable results when comparing country-level indices with those from the WTO and IMF World Economic Outlook.

²We use chained Fisher indices in the analysis that follows.

World Development Indicators. We obtain annual data on exchange rates, producer price indices (PPIs), and real GDP from the World Bank’s World Development Indicators (WDI) database. The exchange rate is the World Bank’s “alternative conversion factor” series (PA.NUS.ATLS), which corrects for redenominations and currency substitution. Producer prices are given by the wholesale price index (FP.WPI.TOTL). Real GDP is measured at market prices in constant U.S. dollars (NY.GDP.MKTP.KD).

Dollar invoicing share. For currency invoicing shares we use the data set constructed by [Gopinath \(2015\)](#) that builds on the work of [Goldberg \(2013\)](#), [Goldberg and Tille \(2009\)](#), and [Ito and Chinn \(2013\)](#).

3 Panel regressions

In this section we show that our global trade dataset is consistent with the dominant currency paradigm: The U.S. dollar plays an outside role in driving international trade prices and quantities. We run fixed effects panel regressions at the dyad (country pair) level with exchange rates as the independent variable, and either prices, terms of trade, or volumes as the dependent variables. In all cases we find that bilateral (importer vs. exporter) exchange rates matter substantially less than the exchange rate vis-à-vis the U.S. dollar.

All specifications below use Fisher price indices, data for non-commodity goods only, and the preferred outlier truncation technique of [Boz and Cerutti \(2016\)](#). In [Appendix A.3](#) we show that our results are robust to alternative choices.

3.1 Exchange rate pass-through

We first examine the pass-through of bilateral and dollar exchange rates to bilateral trade price indices. Define p_{ij} to be the log price of goods exported from country i to country j measured in currency j , e_{ij} to be the log bilateral exchange rate between country i and country j expressed as the price of currency i in terms of currency j , and $e_{\$j}$ to be the log price of a U.S. dollar in currency j . We estimate the following specifications,

$$\Delta p_{ij,t} = \lambda_{ij} + \delta_t + \sum_{k=0}^2 \alpha_k \Delta e_{ij,t-k} + \gamma' \Delta X_{i,t} + \varepsilon_{ij,t} \quad (1)$$

$$\Delta p_{ij,t} = \lambda_{ij} + \delta_t + \sum_{k=0}^2 \alpha_k \Delta e_{ij,t-k} + \sum_{k=0}^2 \beta_k \Delta e_{\$j,t-k} + \gamma' \Delta X_{i,t} + \varepsilon_{ij,t} \quad (2)$$

$$\begin{aligned} \Delta p_{ij,t} = & \lambda_{ij} + \delta_t + \sum_{k=0}^2 \alpha_k \Delta e_{ij,t-k} + \sum_{k=0}^2 \eta_k \Delta e_{ij,t-k} \times \text{Inv}S_j \quad (3) \\ & + \sum_{k=0}^2 \beta_k \Delta e_{\$j,t-k} + \sum_{k=0}^2 \zeta_k \Delta e_{\$j,t-k} \times \text{Inv}S_j + \gamma' \Delta X_{i,t} + \varepsilon_{ij,t} \end{aligned}$$

where λ_{ij} and δ_t are dyadic and time fixed effects, respectively. $X_{i,t}$ are other controls, namely the change in the log producer price index of the exporting country i measured in currency i (and two lags).

For reference, we first consider the specification without the dollar exchange rate as an explanatory variable. Regression Eq. (1) is a standard pass-through regression where bilateral import prices are regressed on bilateral exchange rates. The estimates from such a regression are reported in columns (1) and (4) of Table 1. Column (1) uses import prices of country j originating from country i as reported by country i , and column (4) uses prices reported by country j . Under perfect construction, these two should be the same, but that is not the case in practice. However, we obtain similar estimates for pass-through. According to these estimates, when country j 's currency depreciates relative to country i by 10%, import prices in country j rise by 8%, suggestive of close to complete pass-through at the one year horizon.³ The second and third lags are economically less important.

Our main result in this section establishes the dominance of the dollar over bilateral exchange rates in predicting trade price movements. Columns (2) and (5) report estimates from regression Eq. (2). As is evident, including the dollar exchange rate sharply reduces the relevance of the bilateral exchange rate. It knocks the coefficient on the bilateral exchange rate from 0.80 down to 0.32 in the case when exporter-reported prices are used, and from 0.76 to 0.16 when importer-reported prices are used. Instead, almost all of the effect is absorbed by the dollar exchange rate. Notice that, due to our inclusion of time fixed effects, the apparent dominance of the dollar cannot be an artifact of special conditions that may apply in times when the dollar appreciates or depreciates against *all* other currencies, for example due to global recessions or flight to safety in asset markets.

The cross-dyad heterogeneity in pass-through coefficients is well explained by the propensity to invoice imports in dollars. Columns (3) and (6) interact the dollar and bilateral

³With year fixed effects this should be interpreted as fluctuations in excess of world annual fluctuations.

exchange rates with the share of invoicing in dollars at the importer country level, as in regression Eq. (3). Notice that we do not have data on the fraction of *bilateral* trade invoiced in dollars, so we use the importer’s country-level share as a proxy. As expected, the import invoicing share plays an economically and statistically significant role for the dollar pass-through. Depending on whether we use prices reported by exporters or importers, the regression results indicate that increasing the dollar invoicing share by 10 percentage points causes the contemporaneous dollar pass-through to increase by about 3 percentage points. In Section 4 below we further quantify the importance of the dollar invoicing share for explaining the cross-sectional variation in pass-through.

3.2 Terms of trade volatility

The previously established fact that prices respond to the dollar exchange rate but not the bilateral exchange rate implies that the terms of trade should not respond to the bilateral exchange rate (Gopinath, 2015; Casas et al., 2016). We now test this hypothesis directly in our data by relating bilateral terms of trade to bilateral exchange rates. In this subsection, a cross-sectional unit is defined to be an *unordered* country pair, so that all trade flows between two countries i and j are associated with the cross-sectional unit $\{i, j\}$. Define the bilateral log terms of trade $tot_{ij} = p_{ij} - p_{ji} - e_{ij}$, a unitless quantity (i.e., the terms of trade equal the ratio of export and import price indices measured in the same currency). Moreover, let ppi_{ij} denote the log ratio of PPI in country i divided by PPI in country j , with indices expressed in the same currency.

We consider the following regressions:

$$\Delta tot_{ij,t} = \lambda_{ij} + \delta_t + \sum_{k=0}^2 \alpha_k \Delta e_{ij,t-k} + \varepsilon_{ij,t}, \quad (4)$$

$$\Delta tot_{ij,t} = \lambda_{ij} + \delta_t + \sum_{k=0}^2 \alpha_k \Delta e_{ij,t-k} + \sum_{k=0}^2 \beta_k \Delta ppi_{ij,t-k} + \varepsilon_{ij,t}, \quad (5)$$

where λ_{ij} and δ_t are dyadic and time fixed effects. Regression Eq. (4) relates the growth rate of the bilateral terms of trade to the growth rate of the bilateral nominal exchange rate (and two lags). If exporting firms set prices in their local currencies (producer currency pricing, PCP) and prices are sticky, the contemporaneous exchange rate coefficient α_0 should equal 1. On the other hand, if exporting firms set prices in the destination currency (local currency pricing, LCP) and prices are sticky, the contemporaneous exchange rate coefficient should

EXCHANGE RATE PASS-THROUGH INTO PRICES

VARIABLES	(1) export $\Delta p_{ij,t}$	(2) export $\Delta p_{ij,t}$	(3) export $\Delta p_{ij,t}$	(4) import $\Delta p_{ij,t}$	(5) import $\Delta p_{ij,t}$	(6) import $\Delta p_{ij,t}$
$\Delta e_{ij,t}$	0.801*** (0.0113)	0.315*** (0.0127)	0.318*** (0.0177)	0.757*** (0.0132)	0.164*** (0.0126)	0.209*** (0.0169)
$\Delta e_{ij,t-1}$	0.0762*** (0.00675)	0.115*** (0.0133)	0.126*** (0.0206)	0.0674*** (0.00818)	0.0521*** (0.0123)	0.0270* (0.0154)
$\Delta e_{ij,t-2}$	0.0113** (0.00489)	-0.0656*** (0.0114)	-0.0863*** (0.0147)	0.0306*** (0.00608)	-0.0727*** (0.0127)	-0.0721*** (0.0167)
$\Delta e_{ij,t} \times InvS_j$			-0.0152 (0.0230)			-0.0841*** (0.0240)
$\Delta e_{ij,t-1} \times InvS_j$			-0.0156 (0.0260)			0.0319 (0.0232)
$\Delta e_{ij,t-2} \times InvS_j$			0.0205 (0.0156)			-0.000922 (0.0164)
$\Delta e_{\$,t}$		0.656*** (0.0142)	0.522*** (0.0274)		0.781*** (0.0143)	0.565*** (0.0283)
$\Delta e_{\$,t-1}$		-0.128*** (0.0146)	-0.118*** (0.0290)		-0.0737*** (0.0157)	0.0844*** (0.0276)
$\Delta e_{\$,t-2}$		0.0857*** (0.0124)	0.143*** (0.0227)		0.104*** (0.0146)	0.117*** (0.0259)
$\Delta e_{\$,t} \times InvS_j$			0.196*** (0.0320)			0.348*** (0.0326)
$\Delta e_{\$,t-1} \times InvS_j$			-0.0145 (0.0353)			-0.185*** (0.0358)
$\Delta e_{\$,t-2} \times InvS_j$			-0.0716*** (0.0261)			-0.0495* (0.0290)
Exp. PPI	yes	yes	yes	yes	yes	yes
Time FE	yes	yes	yes	yes	yes	yes
R-squared	0.411	0.447	0.507	0.356	0.398	0.515
Observations	45,945	45,945	33,291	46,820	46,820	34,513
Number of dyads	2,611	2,611	1,867	2,647	2,647	1,900

Table 1: The first (resp., last) three columns use Comtrade data reported by exporting (resp., importing) countries. Standard errors clustered by dyad (country pair). *** p<0.01, ** p<0.05, * p<0.1.

be -1 . However, if most prices are invoiced in U.S. dollars and are sticky in nominal terms, the coefficients α_k should be close to zero. Regression Eq. (5) adds lags 0–2 of the growth rate of the ratio of PPI in the two countries as an additional control, since firms’ optimal reset prices should fluctuate with domestic cost conditions.

In line with the dominant currency paradigm, we find that bilateral exchange rates are virtually uncorrelated with bilateral terms of trade. The results of the panel regressions are shown in Table 2. If we do not control for relative PPI, the regression results indicate that the contemporaneous effect of the exchange rate on the terms of trade is negative, in direct contradiction of PCP. While the negative sign is consistent with LCP, the magnitude is not, as the 95% confidence interval equals $[-0.11, -0.07]$ for data reported by exporters, and $[-0.05, -0.02]$ for data reported by importers.⁴ The coefficients on the first and second lags have opposite sign of the contemporaneous coefficient but are very small in magnitude. When controlling for relative PPI, the point estimates of the coefficients on the bilateral exchange rate shrink further toward zero, and confidence intervals on these coefficients remain narrow. Hence, the results lend strong support to the prediction of the dominant currency paradigm: Terms of trade are unresponsive to bilateral exchange rates.

3.3 Trade volume elasticity

Having demonstrated the outsized role of the U.S. dollar in determining international relative prices, we now investigate the relative importance of bilateral and dollar exchange rates in determining bilateral trade volumes.

Table 3 shows the results from panel regressions of trade volume on bilateral and dollar exchange rates. Let y_{ij} denote the log volume of goods exported from country i to country j . Our volume regressions take the same form as in the price pass-through regressions Eqs. (1) to (3), except that the dependent variable is now the log growth rate $\Delta y_{ij,t}$ of bilateral trade volumes, and the extra controls $X_{j,t}$ (here indexed by j rather than i) consist of the log growth rate of real GDP (and two lags) for the importing country j .

The volume regressions underline the dominant role played by the U.S. dollar. As in the case of the price pass-through regressions, adding the dollar exchange rate to the volume regressions knocks down the coefficient on the bilateral exchange rate by a substantial amount. The contemporaneous elasticity for the dollar exchange rate is around -0.2 across specifications and data sources, while the elasticity for the bilateral exchange rate is an

⁴Attenuation bias is not a worry in this context, since the explanatory variables of interest (exchange rates) are precisely measured, except perhaps for time aggregation issues at the annual frequency.

TERMS OF TRADE AND EXCHANGE RATES

VARIABLES	(1) export $\Delta tot_{ij,t}$	(2) export $\Delta tot_{ij,t}$	(3) import $\Delta tot_{ij,t}$	(4) import $\Delta tot_{ij,t}$
$\Delta e_{ij,t}$	-0.0881*** (0.00941)	0.0121 (0.0127)	-0.0369*** (0.00863)	0.00938 (0.0130)
$\Delta e_{ij,t-1}$	0.0157 (0.0102)	-0.0126 (0.0169)	0.0447*** (0.0104)	-0.0167 (0.0157)
$\Delta e_{ij,t-2}$	0.0269*** (0.00875)	-0.00807 (0.0105)	0.00174 (0.00788)	0.00710 (0.00877)
$\Delta ppi_{ij,t}$		0.239*** (0.0246)		0.0340 (0.0260)
$\Delta ppi_{ij,t-1}$		0.0605** (0.0257)		-0.131*** (0.0263)
$\Delta ppi_{ij,t-2}$		-0.0687*** (0.0195)		-0.0511** (0.0212)
Time FE	yes	yes	yes	yes
R-squared	0.007	0.015	0.008	0.011
Observations	22,928	18,757	24,270	19,847
Number of dyads	1,322	1,172	1,347	1,200

Table 2: The first (resp., last) two columns use Comtrade data reported by exporting (resp., importing) countries. Standard errors clustered by dyad (country pair). The number of dyads is about half that in [Table 1](#) since here the two ordered country tuples (i, j) and (j, i) are collapsed into one cross-sectional unit $\{i, j\}$. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

order of magnitude smaller. The data point to an interesting reversal in the years following the contemporaneous effect, whereby imports actually tend to increase one year after a ceteris paribus depreciation of the importer currency rate vis-à-vis the dollar. Unlike the price pass-through regressions, the interactions of exchange rate changes with the importer's dollar invoicing share are mostly insignificant here.

4 Hierarchical Bayesian analysis

In this section we quantitatively assess how much of the cross-sectional variation in exchange rate pass-through is due to the U.S. dollar's dominance as invoicing currency. The theoretical framework underlying the dominant currency paradigm predicts that pass-through from bilateral exchange rates to prices or quantities should vary across countries depending on the share of imports invoiced in U.S. dollars. The panel regressions in the previous section indicate that this interaction effect is statistically and economically significant. In this section we directly estimate how important the interaction effect is relative to unobserved factors affecting the cross-sectional heterogeneity of pass-through. To optimally exploit the geographical and temporal richness of our data set, we employ a Bayesian hierarchical panel data model with cross-sectionally varying slopes.

[To be completed.]

5 Discussion and policy implications

[To be completed.] [Future research: role of USD over time, role of euro].

TRADE ELASTICITY WITH RESPECT TO EXCHANGE RATE

VARIABLES	(1) export $\Delta y_{ij,t}$	(2) export $\Delta y_{ij,t}$	(3) export $\Delta y_{ij,t}$	(4) import $\Delta y_{ij,t}$	(5) import $\Delta y_{ij,t}$	(6) import $\Delta y_{ij,t}$
$\Delta e_{ij,t}$	-0.148*** (0.0148)	-0.0384** (0.0180)	0.0171 (0.0403)	-0.119*** (0.0139)	-0.0310* (0.0160)	-0.0765* (0.0403)
$\Delta e_{ij,t-1}$	0.0755*** (0.0148)	0.00728 (0.0198)	-0.0682 (0.0485)	0.0757*** (0.0126)	-0.00245 (0.0165)	0.00742 (0.0354)
$\Delta e_{ij,t-2}$	0.0416*** (0.0102)	0.0128 (0.0141)	0.0495 (0.0311)	0.0393*** (0.00919)	0.0235** (0.0115)	0.00410 (0.0241)
$\Delta e_{ij,t} \times InvS_j$			-0.0606 (0.0655)			0.118* (0.0684)
$\Delta e_{ij,t-1} \times InvS_j$			0.0976 (0.0746)			-0.0433 (0.0640)
$\Delta e_{ij,t-2} \times InvS_j$			-0.0441 (0.0494)			0.0419 (0.0428)
$\Delta e_{\$j,t}$		-0.237*** (0.0294)	-0.188*** (0.0587)		-0.186*** (0.0250)	-0.140** (0.0600)
$\Delta e_{\$j,t-1}$		0.148*** (0.0278)	0.359*** (0.0666)		0.168*** (0.0248)	0.221*** (0.0635)
$\Delta e_{\$j,t-2}$		0.0542*** (0.0201)	-0.114** (0.0580)		0.0365* (0.0198)	0.111** (0.0525)
$\Delta e_{\$j,t} \times InvS_j$			-0.0104 (0.0906)			-0.0903 (0.0871)
$\Delta e_{\$j,t-1} \times InvS_j$			-0.244** (0.100)			-0.0465 (0.0922)
$\Delta e_{\$j,t-2} \times InvS_j$			0.192** (0.0797)			-0.0952 (0.0706)
Imp. GDP	yes	yes	yes	yes	yes	yes
Time FE	yes	yes	yes	yes	yes	yes
R-squared	0.073	0.075	0.084	0.069	0.071	0.074
Observations	50,761	50,761	36,757	52,272	52,272	38,582
Number of dyads	2,773	2,773	1,982	2,807	2,807	2,014

Table 3: The first (resp., last) three columns use Comtrade data reported by exporting (resp., importing) countries. Standard errors clustered by dyad (country pair). *** p<0.01, ** p<0.05, * p<0.1.

A Appendix

A.1 Country summary statistics

Table 4 lists summary statistics on the number of observations for the 55 countries in our merged Comtrade/WDI dataset. The table also lists the share of imports invoiced in U.S. dollars for the 39 countries for which we observe this measure (cf. [Gopinath, 2015](#)).

A.2 Comparison of Comtrade and BLS price series for the U.S.

Here we compare our unit value indices to survey price indices from the U.S. Bureau of Labor Statistics. The BLS provides U.S. import price indices by locality of origin for Canada, E.U., France, Germany, U.K, Latin America, Mexico, Pacific Rim, China, Japan, ASEAN, Asia Near East, and Asian Newly Industrialized countries. As these price indices are constructed from surveys, their comparison with our unit value based indices can help gauge the effectiveness of our techniques to deal with the unit value bias and other potential mismeasurement inherent in customs data.

To arrive at comparable series, in this subsection we follow BLS' methodology and use *Laspeyres* indices of *total* (commodity and non-commodity) goods prices from our data set. For regions with multiple countries, we aggregate country level growth rates using Comtrade import values with a two year lag. Still, the series are not fully comparable because BLS' preferred price basis is f.o.b. (free on board) while import values recorded at customs are c.i.f. (cost, insurance and freight), and not all countries included in BLS regions are in our database.

Our indices constructed from Comtrade unit values track the BLS import price indices fairly well, as shown in [Figs. 1](#) and [2](#). These figures compare the linearly detrended logged indices, since our regressions use log growth rates and absorb any disparity in average growth rates in the intercept. The growth rates of our indices for Canada, Japan, Mexico, and the aggregated Latin America and Asia Near East match those of BLS remarkably well. The comparison with some Asian countries suggests that a unit value bias may still be present, causing the unit value series to be somewhat more volatile than the BLS price series. Nevertheless, for every country group and individual country except Germany, the correlation coefficient between the Comtrade and BLS growth rates is high. Finally, the match for European countries seems acceptable, with the year 2008 being an exception. A closer inspection of the case of Germany reveals that a couple of products (transport vehicles)

COUNTRY SUMMARY STATISTICS

Country	As exporter		As importer		
	#dyads	avg T	#dyads	avg T	InvS
<i>Africa</i>					
Algeria	20	14.2	49	21.1	
Egypt	54	20.4	52	21.6	
South Africa	54	15.0	53	14.7	
<i>Americas</i>					
Argentina	54	21.8	52	21.8	0.88
Brazil	54	24.2	53	23.1	0.84
Canada	54	24.4	54	24.1	0.75
Chile	52	20.9	50	22.0	
Colombia	53	19.5	52	21.4	0.99
Mexico	54	23.4	52	23.3	
United States	54	24.0	54	23.5	0.93
Venezuela	21	10.9	48	19.9	
<i>Asia</i>					
China	54	23.7	54	22.6	
Hong Kong	54	23.2	52	22.5	
India	54	25.3	53	24.4	0.86
Indonesia	54	23.9	52	23.0	0.81
Israel	53	21.5	51	21.3	0.73
Japan	54	25.6	52	25.5	0.71
Kazakhstan	39	14.6	52	18.2	
Malaysia	54	24.1	53	23.4	
Philippines	54	22.1	50	21.5	
Saudi Arabia	50	20.1	53	21.2	
Singapore	54	24.7	51	24.0	
South Korea	54	25.0	52	24.6	0.81
Thailand	54	24.5	53	24.5	0.79
Turkey	54	24.4	54	23.9	0.59
Vietnam	54	19.3	49	19.0	

(continued on next page)

COUNTRY SUMMARY STATISTICS (CONTINUED)

Country	As exporter		As importer		
	#dyads	avg T	#dyads	avg T	InvS
<i>Europe</i>					
Austria	54	23.1	52	23.0	0.06
Belgium	54	15.9	53	15.9	0.14
Czech Republic	54	20.6	53	21.3	0.19
Denmark	54	22.3	52	24.4	0.25
Estonia	47	17.9	52	19.3	0.34
Finland	54	25.6	52	25.0	0.42
France	54	23.1	54	22.7	0.21
Germany	54	23.3	54	23.0	0.23
Greece	54	23.0	51	23.6	0.40
Hungary	54	23.6	52	22.6	0.27
Ireland	54	23.4	53	22.5	0.23
Italy	54	23.1	54	22.5	0.29
Lithuania	53	17.3	50	18.9	0.51
Luxembourg	54	15.8	51	14.0	0.16
Netherlands	54	23.7	54	23.2	0.37
Norway	54	23.1	52	23.0	0.21
Poland	54	22.9	52	22.3	0.30
Portugal	54	24.9	53	24.8	0.22
Romania	54	22.6	52	21.4	0.31
Russia	54	21.4	52	21.0	
Slovak Republic	54	20.7	51	20.4	0.12
Slovenia	54	21.1	52	20.7	0.20
Spain	54	24.8	54	24.9	0.35
Sweden	54	23.7	54	23.1	0.25
Switzerland	54	25.6	54	25.1	0.13
Ukraine	53	19.3	52	19.8	0.75
United Kingdom	54	23.4	54	23.3	0.47
<i>Oceania</i>					
Australia	54	25.1	52	25.2	0.53
New Zealand	54	22.7	50	24.0	

Table 4: Summary statistics for countries in the merged Comtrade/WDI sample. #dyads: number of non-missing dyads that the country appears in. avg T : average number of years per dyad that the country appears in; a dyad-year observation is counted if at least one UVI or volume observation is reported by the exporter or importer, and exchange rate data exists for both countries. InvS: share of imports invoiced in U.S. dollars.

with large import shares experienced substantial unit value decreases that year according to Comtrade, leading our indices to decline while the BLS index shows an increase.

A.3 Robustness checks: panel regressions

In this section we show that our panel regression results are robust to a number of deviations from the baseline specifications in [Section 3](#): the price index definition, the outlier truncation technique, and using total goods indices rather than non-commodity. [To be completed.]

COMTRADE AND BLS IMPORT PRICE INDICES FOR U.S.: COUNTRY GROUPS

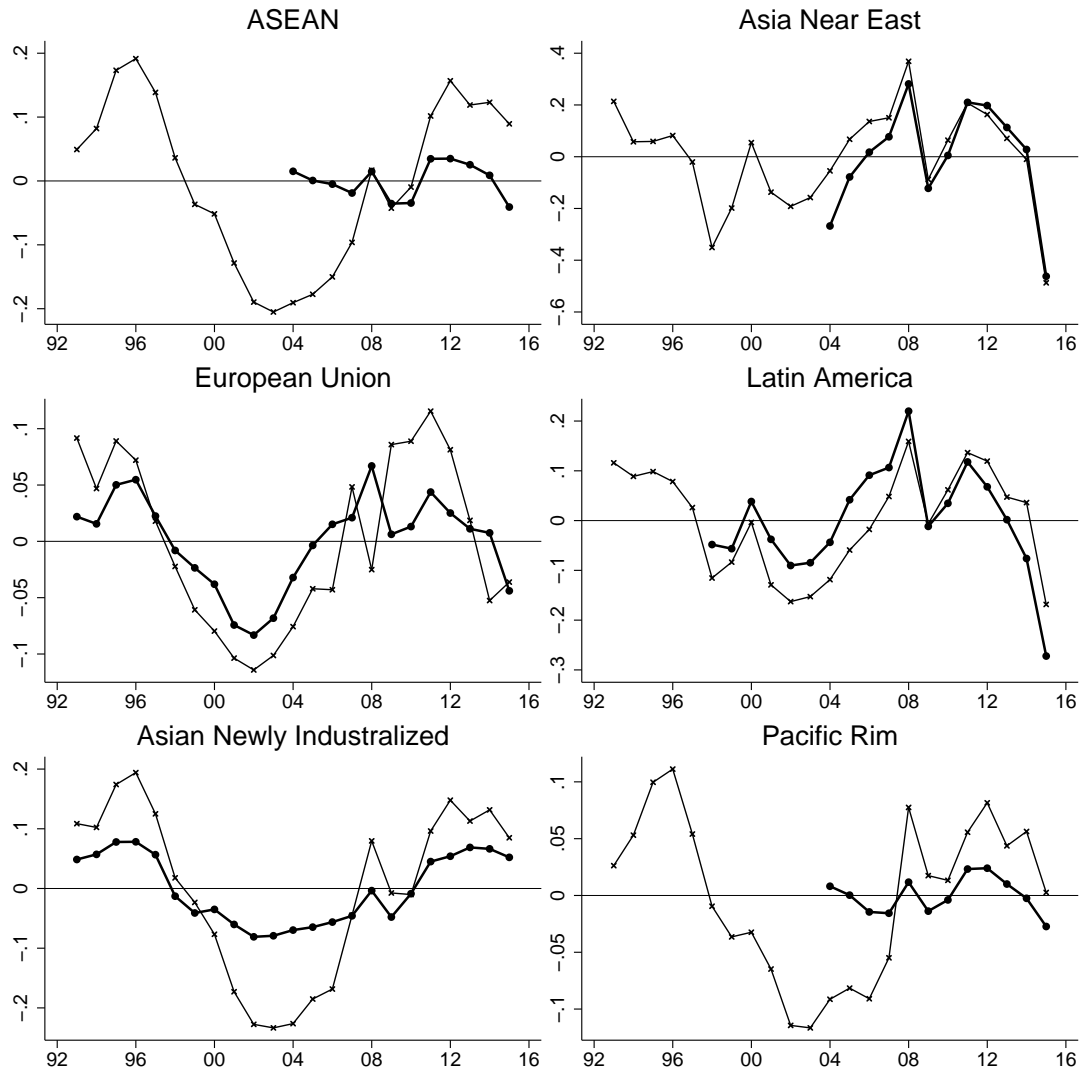


Figure 1: Comparison of BLS Locality of Origin import price indices (thick lines, circles) with our constructed Comtrade analogues (thin lines, crosses). Plotted indices are logged and linearly detrended. The Comtrade sample does not cover all countries in the BLS country groups, cf. [Table 5](#).

COMTRADE AND BLS IMPORT PRICE INDICES FOR U.S.: INDIVIDUAL COUNTRIES

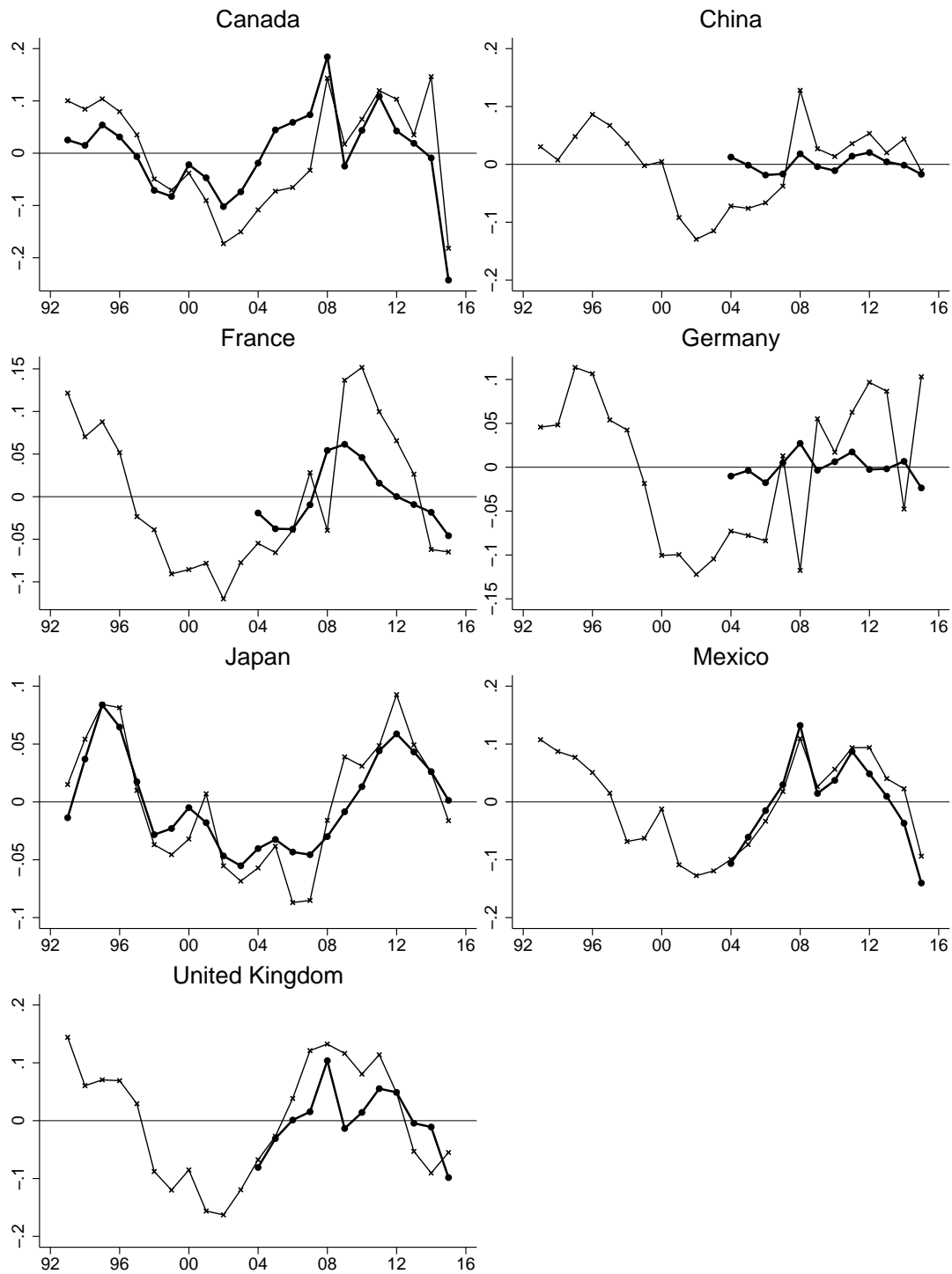


Figure 2: Comparison of BLS Locality of Origin import price indices (thick lines, circles) with our constructed Comtrade analogues (thin lines, crosses). Plotted indices are logged and linearly detrended.

BLS COUNTRY GROUPS

BLS group	Country ISO codes
ASEAN	BRN* IDN KHM* LAO* MMR* MYS PHL SGP THA VNM*
Asia Near East	ARE* BHR* IRN* IRQ* ISR JOR* KWT* LBN* OMN* QAT* SAU SYR* YEM*
European Union	AUT BEL BGR* CYP* CZE DEU DNK ESP EST FIN FRA GBR GRC HRV* HUN IRL ITA LTU LUX LVA* MLT* NLD POL PRT ROU SVK SVN SWE
Latin America	ARG BRA CHL COL MEX VEN (plus other unspecified Central American, South American, and Caribbean countries*)
Asian New. Ind.	HKG KOR SGP TWN
Pacific Rim	AUS BRN* CHN HKG IDN JPN KOR MAC* MYS NZL PHL PNG* SGP TWN

Table 5: Definition of BLS country groups in [Fig. 1](#). Countries marked with an asterisk (*) are not available in the Comtrade sample.

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