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Unfair Bilateral Trade Imbalances

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Abstract

Contrary to the quasi-unanimous academic consensus, we argue that bilateral trade imbalances may be relevant for trade policy. To this end, we employ the workhorse trade model – the gravity equation – as a forensic tool to detect deviations of the actual bilateral trade imbalances from their predicted "fair" counterparts, which are constructed based on fully symmetric bilateral trade costs and while taking into account all country-specific characteristics, such as macroeconomic conditions or comparative advantage. Zooming in on the United States, we find that 92% of the existing U.S. bilateral trade imbalances can be explained without relying on asymmetric bilateral trade costs. Thus, there is little room for non-reciprocal bilateral trade barriers to lead to bilateral trade imbalances. However, we also detect some systematic bilateral trade cost asymmetries between the U.S. and certain countries and industries, which could meaningfully inform bilateral policy discussions.

JEL Classification Codes: F10, F13, F14.
Keywords: Bilateral Trade Imbalances, Structural Gravity, Asymmetric Trade Costs.

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"The policy relevance [of bilateral trade imbalances] is basically nil ... But it might be a good idea to have more research on bilateral trade imbalances."

Paul Krugman

1 Introduction

Due to recent emphasis by U.S. President Trump, *'bilateral trade imbalances'* have gained immense public attention as a motive for trade protection. Consistent with the opening quote by Paul Krugman, many journalists, policy makers, and academic economists have pointed out the fundamental flaw of using bilateral trade imbalances as a motive for trade protection – i.e., bilateral trade imbalances are due to *country-specific* characteristics, e.g., comparative advantage, and macroeconomic factors.[1]

While we are convinced that country-specific characteristics, and comparative advantage in particular, are indeed the main determinants of bilateral trade imbalances, we argue that bilateral trade imbalances could be relevant for trade policy to the extent that they can be used to recover asymmetric bilateral trade costs. To this end, we employ the workhorse trade model, the gravity equation,[2] as a forensic tool to identify what share of the bilateral trade imbalances could at most be due to bilateral trade cost asymmetries (e.g., possible unfair trade policy manipulation) vs. to other factors such as country-specific characteristics, including comparative advantage.

The analysis is developed in three steps. First, we capitalize on the progress in the empirical trade gravity literature to set up an econometric model that predicts bilateral trade imbalances by taking into account all country-specific characteristics and by constraining all bilateral trade costs to be fully symmetric. So, country-specific characteristics are the

[1] To see the problem clearly, consider the fact that most of us are running huge *bilateral deficits* with our doctors, yet we do not want to impose obstacles to trading with them. Despite the huge *bilateral deficit*, such trade is mutually beneficial; in fact, it is vital to us.

[2] As demonstrated by (Arkolakis et al., 2012), the gravity equation is representative of a vast class of trade models. Davis and Weinstein (2002) and MacDonald et al. (2020) question the ability of the gravity model to predict bilateral trade imbalances. However, Felbermayr and Yotov (2021) demonstrate that the gravity equation does predict bilateral trade imbalances very well.

only possible sources for bilateral trade imbalances. Therefore, we label the corresponding bilateral trade imbalances as 'fair'.[3] Then, we compare the predicted 'fair' bilateral trade imbalances with their actual counterparts, the difference being due to bilateral asymmetries only. Finally, we explore possible causes for the deviations of the actual from the predicted/fair trade imbalances.

To perform the analysis, we rely on disaggregated trade data from the *International Trade and Production Database for Estimation* (ITPD-E) of the U.S. International Trade Commission (USITC), which includes raw international and domestic trade data that is suitable for estimation. The ITPD-E is an unbalanced panel dataset that covers more than 200 countries, 170 industries, and a long period of time, 1986-2022. As a result, we generate more than 30,000,000 directional (e.g., Austria to Bulgaria vs. Bulgaria to Austria) trade costs, which may be asymmetric. While this is a potentially valuable database for various purposes (e.g., to study the welfare implications of such trade cost asymmetries), the very large number of estimates that we obtain does not allow us to present and discuss all of our findings. Therefore, motivated by the recent tariffs of President Trump, we focus on a single country – the United States, and we explore several dimensions of the new data.

The key results that emerge from our analysis are as follows. First, even without any bilateral asymmetries, our econometric model predicts the U.S. bilateral trade imbalances remarkably well. The correlation between the actual and predicted 'fair' U.S. bilateral imbalances is 0.985.[4] Moreover, regressing actual on predicted trade imbalances delivers a coefficient estimate of 1.03 and an $R^2 = 0.92$, i.e., our model predicts 92 percent of the variation of the U.S. bilateral trade imbalances. Crucially, since all bilateral trade costs in

[3] Our notion of 'fairness' is narrow in that it only relates to bilateral policies only. With a broader definition, one could characterize multilateral policies – i.e., policies that affect all trade relationships of a country, including with itself – as 'fair' or 'unfair'. E.g., a country could abuse monetary or budgetary policies or regulatory policies to beggar their trading partners. We recognize such possibilities and they are fully controlled for in our econometric model. However, the notion of 'fairness' that we consider is at the bilateral dimension only.

[4] We observe some heterogeneity in the performance of the model across the manufacturing, agriculture, and services sectors, with an excellent fit for manufacturing and agriculture and a slightly lower, but still very good, fit for services.

our model are perfectly symmetric, the main implication of our results is that, on average, even if we were to interpret all bilateral trade costs asymmetries as evidence of 'unfair' policy practices, their quantitative importance is very limited. Second, while the vast majority of the estimates of the bilateral trade imbalances are very close to the actual data, we also detect some discrepancies between the two indexes, and explore whether they are subject to some systematic patterns across countries and industries.

Consistent with current policy relevance and debate, we zoom in on manufacturing and some specific industries (e.g., 'Processed Meat', 'Dairy Products', 'Iron & Steel', 'Motor Vehicles', 'Automobile Bodies', and 'Automobile Parts'), which are viewed as particularly important for the United States. The industry-level estimates confirm our main conclusion that the model predicts the U.S. bilateral trade imbalances very well. However, we also see some systematic deviations of the actual from the predicted trade imbalances, which are due to bilateral asymmetries, either regarding trade costs or preferences. For example, our results suggest that the actual bilateral U.S. trade surpluses in 'Dairy Products' and 'Iron & Steel' are smaller than the values that are predicted by our model. In addition, in the case of 'Iron & Steel', we see some significant (both positive and negative) deviations between the actual and the predicted U.S. trade deficits.

We also analyze the U.S. bilateral trade imbalances with six countries, including Canada, Mexico, China, Japan, Germany, and the UK, which are among the U.S.'s most important trade partners and have recently received special trade policy coverage. Once again, the country-specific analysis confirms the strong fit of the model. However, we also see some pronounced differences between the actual and the predicted trade imbalances for some countries. For example, many of the actual bilateral trade deficits with Canada are larger than the corresponding predicted indexes, while the results are reversed for Germany, where many of the actual trade deficits are smaller than the predicted 'fair' deficits.

Disaggregated analysis of the U.S. trade with each of these countries reveals that there are certain country-industry combinations where bilateral asymmetries in trade costs or preferences (in either direction of the U.S. trade flows) are particularly pronounced. In an attempt to decompose the asymmetries econometrically into time-invariant (e.g., geography) asymmetries vs. time-varying (e.g., policy) asymmetries, we find that a very significant fraction of the bilateral asymmetries that we have detected are due to time-invariant determinants rather than ongoing trade policy manipulation.

The remainder of the paper is structured as follows. Section 2 offers a brief review of the structural gravity model and describes our methods. Section 3 describes the data. Section 4 presents and discusses our findings. Section 5 concludes.

2 Methods

To perform the empirical analysis, we rely on the structural gravity model of Anderson and van Wincoop (2003), which is representative of a large class of trade theories (Arkolakis et al., 2012):[5]

$$X_{ij,t} = \frac{Y_{i,t}E_{j,t}}{Y_t}\left(\frac{t_{ij,t}}{\Pi_{i,t}P_{j,t}}\right)^{-\theta} \qquad \forall i,j,t. \tag{1}$$

Here, $X_{ij,t}$ denotes nominal trade flows from source i to destination j at time t. $Y_{i,t}$ is the value of gross output in origin i at time t, $E_{j,t}$ is the expenditure at destination j at t, and Y_t is the value of world output at t. $\theta > 0$ is the elasticity of trade flows with respect to trade costs. $t_{ij,t}$ denotes the bilateral frictions that act directly on trade flows between i and j at time t, e.g., bilateral distance, sanctions, trade agreements, etc. Finally, $\Pi_{i,t}$ and $P_{j,t}$

[5] We refrain from inserting a potentially asymmetric preference shifter that would be isomorphic to the trade cost term $t_{ij,t}$. Also, for simplicity, we omit sectoral notation. However, consistent with gravity theory, e.g., Anderson and van Wincoop (2004), equation (1) can be derived and estimated at any desired level of aggregation.

are the multilateral resistances (MRs) of Anderson and van Wincoop (2003):

$$(P_{j,t})^{-\theta} = \sum_i \left(\frac{t_{ij,t}}{\Pi_{i,t}}\right)^{-\theta} \frac{Y_{i,t}}{Y_t}, \quad (2)$$

$$(\Pi_{i,t})^{-\theta} = \sum_j \left(\frac{t_{ij,t}}{P_{j,t}}\right)^{-\theta} \frac{E_{j,t}}{Y_t}. \quad (3)$$

Intuitively, the multilateral resistances capture the fact that, all else equal, two countries will trade more with each other the more remote they are from the rest of the world. More importantly for the current purposes, Felbermayr and Yotov (2021) demonstrate that, for given aggregate trade imbalances, the multilateral resistances are exactly the vehicles that allow the structural gravity model to predict the bilateral trade imbalances.[6]

Following the recommendations for gravity estimations from Larch et al. (2025), we translate equation (1) into the following econometric model:

$$X_{ij,t} = \exp[\phi_{i,t} + \psi_{j,t} + \gamma_{ij} + \sum_t \alpha_t \times BRDR_{ij,t} + POLICY_{ij,t} \times \beta] + \epsilon_{ij,t}. \quad (4)$$

The first two terms on the right-hand side of equation (4), $\phi_{i,t}$ and $\psi_{j,t}$, are exporter-time and importer-time fixed effects, respectively, which are motivated by the corresponding exporter-time and importer-time structural terms in equation (1).[7] The next three terms on the right-hand side of equation (4) proxy for the direct bilateral trade frictions, $(t_{ij,t}^{-\theta})$, from equation (1). Importantly, by construction, each of these trade cost proxies, as well as their combination, are perfectly symmetric. Specifically, γ_{ij} is a set of symmetric country-pair fixed effects that will control for and absorb all symmetric time-invariant bilateral trade frictions between any two countries in our sample. $BRDR_{ij,t}$ is a set of border dummy

[6] Several studies have argued that standard gravity forces fail to explain observed bilateral trade balances, dubbing this "The Mystery of the Excess Trade Balances" (Davis and Weinstein, 2002; MacDonald et al., 2020). Felbermayr and Yotov (2021) solve the mystery by uncovering a new property of the multilateral resistances as asymmetric trade costs that translate the aggregate into bilateral trade imbalances.

[7] As demonstrated by Fally (2015), when the model is estimated with the Poisson Pseudo Maximum Likelihood (PPML), which will be our preferred estimator (Santos Silva and Tenreyro, 2006), the estimates of these fixed effects correspond exactly to the corresponding structural terms from equation (1). Thus, if we used the structural terms instead of the fixed effects in our econometric model, our results will be identical.

variables that take a value of one for international trade and zero for domestic trade for each year in our sample. The estimates on these variables will capture any common globalization trends, e.g., improvements in communication, transportation, etc. (Bergstrand et al., 2015). Finally, $POLICY_{ij,t}$ denotes the vector of time-varying policy variables, including regional trade agreements (RTAs), membership in the European Union (EU), membership in the World Trade Organization (WTO), economic sanctions, currency unions, and membership in the OECD. All of these policy variables, as well as their associated estimates, are constrained to have common and symmetric effects across all countries. Thus, as noted earlier, all direct bilateral trade costs in our model are constrained to be perfectly symmetric across any pair of countries in the sample.

The empirical analysis proceeds in four steps. First, we estimate specification (4) for each industry in our data. Then, we use our estimates to predict the bilateral trade flows between all countries in our sample. Third, we use the predicted trade values to construct bilateral trade imbalances. Fourth, we compare the predicted vs. actual bilateral trade imbalances, and we analyze the potential differences between them. Importantly, our model accounts fully and perfectly for all country-specific characteristics as well as all symmetric bilateral trade frictions. Thus, by construction, any deviation of the actual from the predicted trade imbalances that we observe can only be due to bilateral asymmetries, i.e., asymmetries in the direct bilateral trade frictions, $(t_{ij,t}^{-\theta})$, or asymmetric bilateral preferences.

3 Data

To perform the empirical analysis, we rely on the latest edition of the *International Trade and Production Database for Estimation* (ITPD-E) (Borchert et al., 2020; Larch et al., 2025), which includes raw international and domestic trade data that is suitable for estimation and covers more than 200 countries, 170 industries, and a long period of time, 1986-2022. Given the purpose of our project, and to avoid dealing with the split of many countries in the late

1980s and early 1990s, we limit our estimating sample to start in 1992. Moreover, for the main analysis, we will focus on manufacturing.

The data on the time-varying bilateral policy variables come from a series of sources. Specifically, we use data on membership in the European Union (EU) and membership in the World Trade Organization (WTO) from the *Dynamic Gravity Dataset* (DGD) of the USITC (Gurevich and Herman, 2018), membership in Regional Trade Agreements (RTAs) from Egger and Larch (2008), economic sanctions from the *Global Sanctions Database* (Felbermayr et al., 2020; Syropoulos et al., 2024), and currency unions from de Sousa (2012). Finally, we construct our own dummy variable for membership in the OECD.

4 Empirical Findings

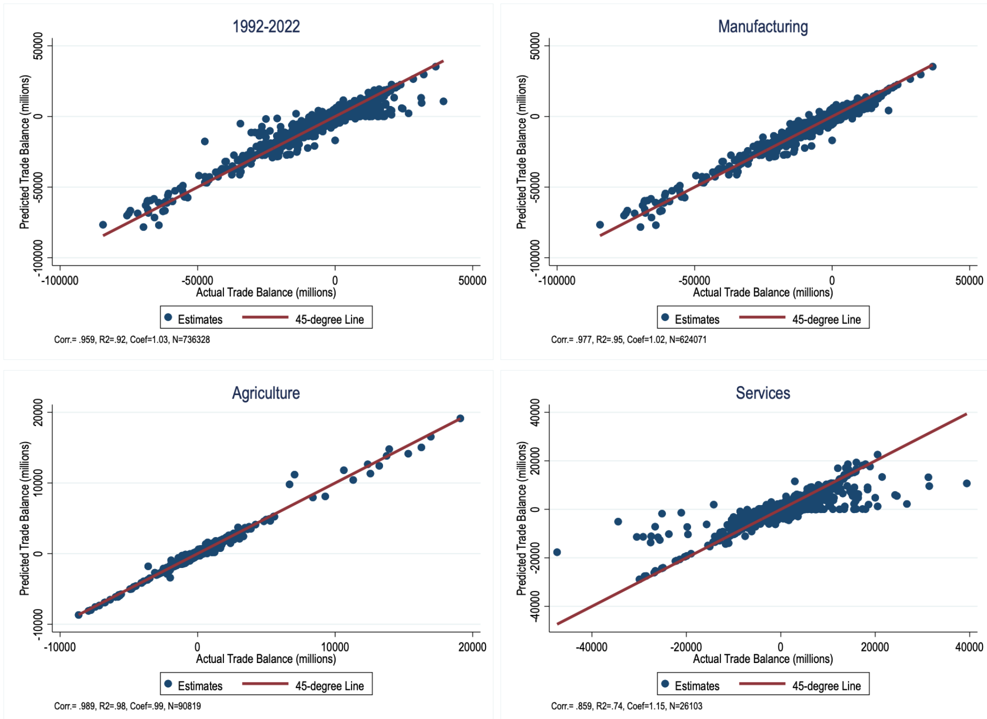
We generate more than 30,000,000 directional and possibly asymmetric trade costs. While this is a potentially valuable database, the very large number of estimates does not allow us to present all of our findings. Therefore, for the main analysis, we focus on a single country – the United States – and we explore several dimensions of the new data.[8]

4.1. Bilateral U.S. Imbalances by Sector and Industry. The top-left panel of Figure 1 scatter plots 736,328 observations of actual vs. predicted U.S. bilateral trade balances with each trade partner and for each product and all years (1992-2022) in our sample along with a 45-degree line.[9] We draw two conclusions based on it.

First, our econometric model predicts the U.S. bilateral trade imbalances remarkably well. The correlation between the actual and predicted U.S. bilateral imbalances is 0.985. Moreover, regressing the actual on the predicted trade imbalances delivers a coefficient estimate of 1.03 and an $R^2 = 0.92$, i.e., our model predicts 92 percent of the variation of the U.S. bilateral trade imbalances. Crucially, all bilateral trade costs in our model are perfectly symmetric! Thus, the main implication is that, on average, there is not much evidence and

[8]The focus on the U.S. is motivated by the recent tariffs of President Trump.
[9]In Figure 5 of the Appendix, we show that the fit of our model remains very similar for specific years.

Figure 1: Actual vs. Predicted U.S. Bilateral Trade Balances, 1992-2022



Note: This figure reports the predicted vs. actual bilateral trade balances of the United States. The top-left panel plots the actual vs. predicted U.S. bilateral trade balances with each trade partner and for each product and all years (1992-2022) in our sample along with a 45-degree line. The top-right panel reports the U.S. bilateral trade balances for manufacturing, while the bottom two panels report results for agriculture and services. See text for further details.

room for bilateral asymmetries in U.S. trade flows, whether they are generated by unfair trade-cost manipulation, biased preferences, or other factors. Second, while the vast majority of the estimates are clustered on the 45-degree line, we do see some deviations, which are of particular interest to us, and below we will explore whether they are subject to some systematic patterns across countries and industries.

The next three panels in Figure 1, i.e., top-right, bottom-left, and bottom-right, report estimates for manufacturing, agriculture, and services, respectively. The model predicts the U.S. bilateral trade imbalances for each sector very well; however, we also observe some heterogeneity across the three sectors. The R^2 and coefficient estimate from a regression of the actual on the predicted imbalances for manufacturing are 0.95 and 1.02, respectively. The performance of the model is even better for agriculture ($R^2 = 0.98$ and coefficient estimate

0.99) but a bit worse for services ($R^2 = 0.74$ and coefficient estimate 1.15).

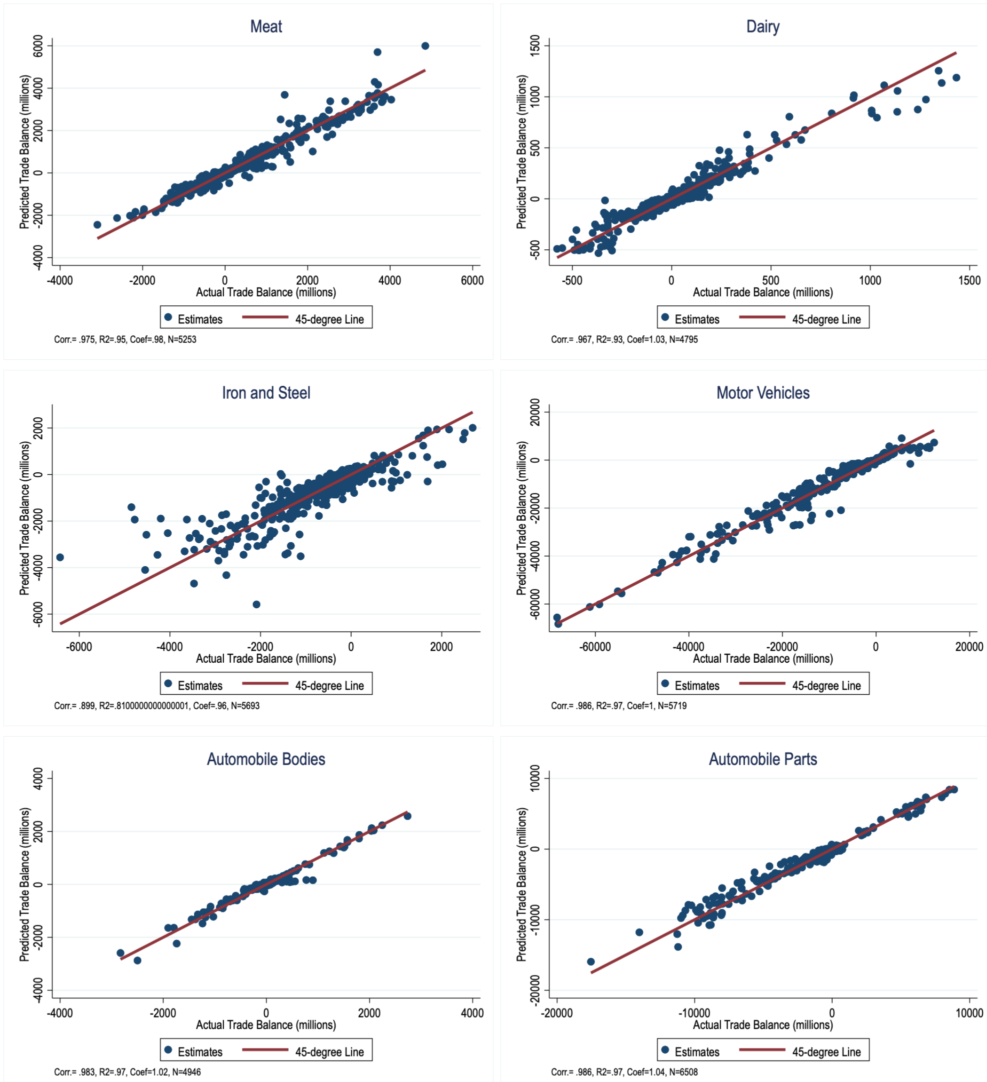
Our estimates imply that some of the actual bilateral U.S. trade deficits for services are larger than the corresponding deficits, while some of the actual bilateral U.S. surpluses are smaller than the corresponding predicted values. By construction, this suggests bilateral trade cost asymmetries. However, our results for services may be driven by the quality of the services trade data.[10] Therefore, and consistent with current policy relevance, for the rest of the analysis, we will focus on the manufacturing sector.

Figure 2 zooms in on six industries that are viewed as particularly important for the United States. Specifically, it plots the actual vs. predicted U.S. bilateral trade imbalances for 'Processed Meat', 'Dairy Products', 'Iron & Steel', 'Motor Vehicles', 'Automobile Bodies', and 'Automobile Parts'. The industry-level estimates in Figure 2 confirm our main conclusion that the model predicts the U.S. bilateral trade imbalances quite well and that there is not much evidence for unfair bilateral trade-cost manipulation and asymmetries. However, we do see some observations that are off the 45-degree line, and below we will explore whether such deviations are systematic.

4.2. Bilateral Imbalances by Country. Figure 3 reports the U.S. bilateral trade imbalances with six countries, which are among the U.S. most important trade partners and have recently received special trade policy coverage, including Canada, Mexico, China, Japan, Germany, and the UK. Once again, Figure 3 confirms the strong fit of the model. However, we also see that many observations are off the 45-degree line. Three countries stand out. First, many of the actual bilateral trade deficits with Canada are larger (in absolute value) than the corresponding predicted indexes. Second, the plot is reversed for Germany, where many of the actual trade deficits are smaller than the predicted deficits. Finally, in the case of the UK, we see significant deviations for both the deficits and surpluses. Specifically, most

[10]For instance, consider U.S.-U.K. services trade in 2022. According to the U.S. Bureau of Economic Analysis, the U.S. had a small trade surplus amounting to 5 bn. USD, while the U.K. Office of National Statistics reported a surplus for the U.K. about 10 times as big in the same year. This is a recurring problem that suggests the presence of substantial measurement error. See ONS (Office of National Statistics) for a discussion on the year 2023.

Figure 2: Actual vs. Predicted U.S. Bilateral Trade Balances, Selected Industries



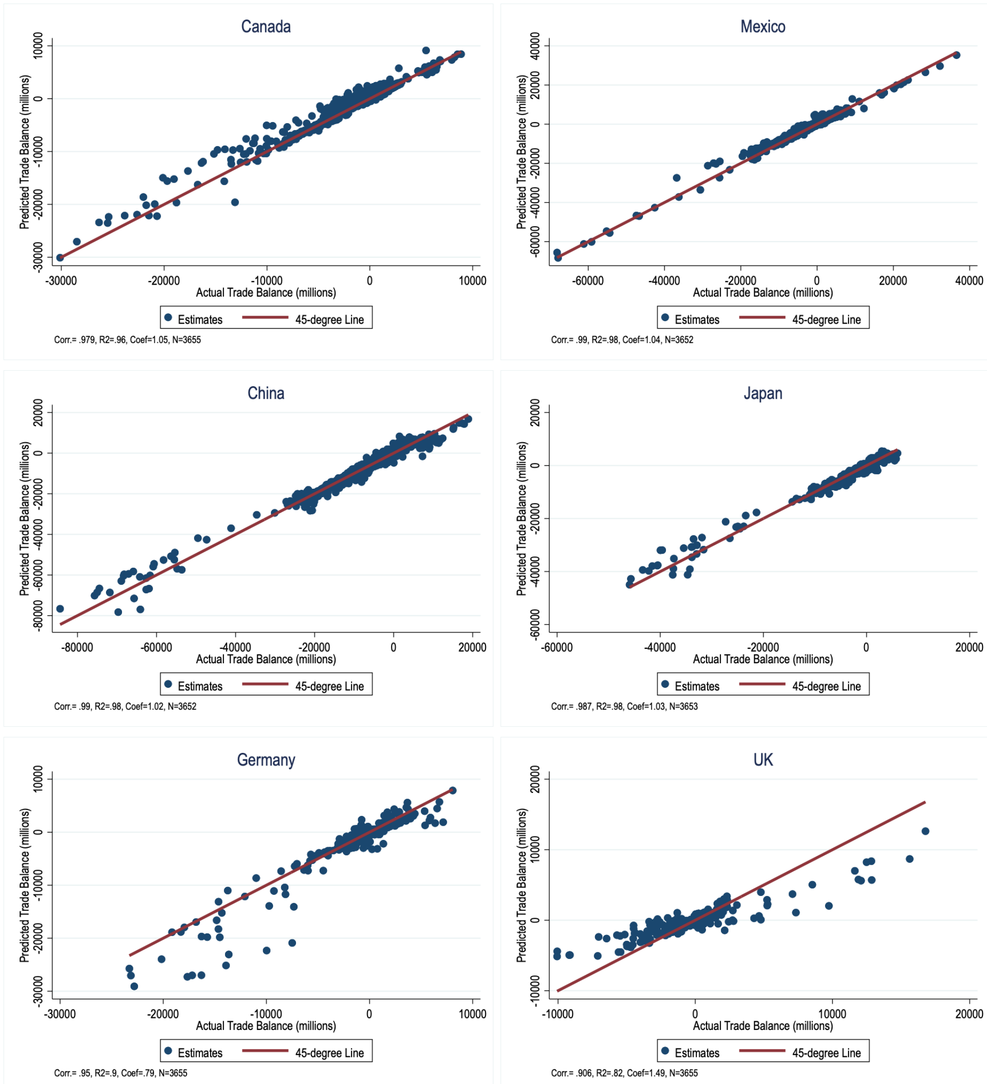
Note: This figure reports the predicted vs. actual bilateral trade balances of the United States along with 45-degree lines for six key industries, including 'Processed Meat', 'Dairy Products', 'Iron & Steel', 'Motor Vehicles', 'Automobile Bodies', and 'Automobile Parts'. See text for further details.

of the predicted deficits are smaller than the actual ones, but we also see that some of the predicted surpluses are smaller than the actual ones.

Figure 4 aggregates the industry-level U.S. bilateral trade deficits for the manufacturing sector and reports the actual and predicted trade imbalances for the 30 countries with which the U.S. has the largest deficits.[11] The countries on the X-axis are ordered based on the size

[11]For clarity, we do not include China in Figure 4. However, we note that the U.S. manufacturing trade deficit with China (390 billion) is smaller than the predicted deficit (470 billion).

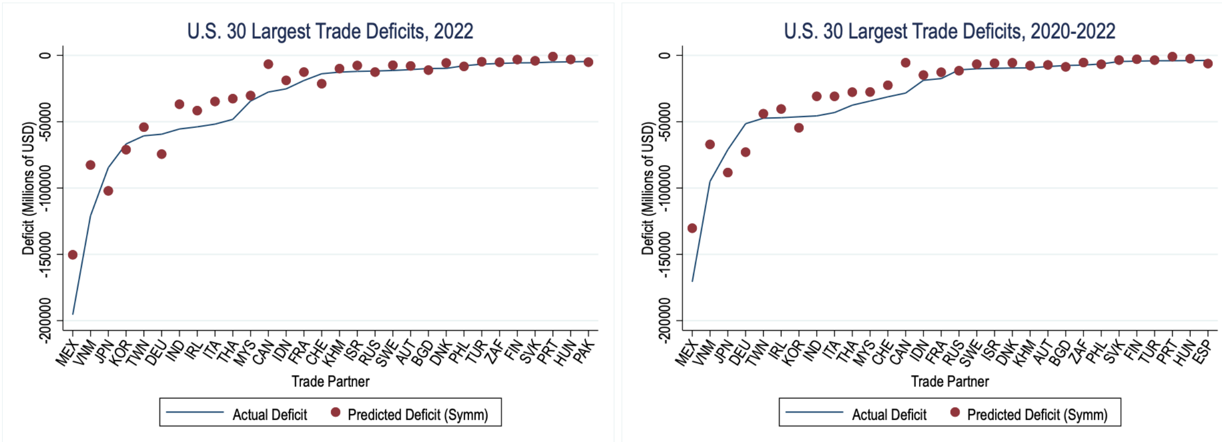
Figure 3: Actual vs. Predicted U.S. Bilateral Trade Balances, Selected Countries



Note: This figure reports the predicted vs. actual bilateral trade balances of the United States along with 45-degree lines for six key trade partners, including Canada, Mexico, China, Japan, Germany, and the UK. See text for further details.

of their actual manufacturing surplus with the U.S.. The left panel is based on data for 2022, while the right panel is based on average data for the period 2020-2022. The results in the two panels of Figure 4 are similar. They reveal the following. First, even though the figure does not capture this very clearly, the underlying data reveals that the actual trade deficits are larger than the corresponding predicted trade deficits for 23 of the 30 countries, i.e., for 77 percent, i.e., the U.S. bilateral trade costs on exports are larger than the corresponding

Figure 4: The 30 Largest Bilateral Trade Deficits of the U.S.



Note: This figure reports the actual vs. predicted U.S. trade imbalances in manufacturing for the 30 countries with which the U.S. has the largest deficits. The countries on the X-axis are ordered based on the size of their actual manufacturing surplus with the U.S.. The left panel is based on data for 2022, while the right panel is based on average data for the period 2020-2022. See text for further details.

trade costs on imports.[12]

Second, on average, the difference between the actual and the predicted trade deficits in Figure 4 is negative, i.e., the actual deficits are larger than the predicted ones. However, third, it is relatively small, i.e., 1.5 billion. Fourth, there are several countries with more pronounced differences between the actual and the predicted trade deficits. Specifically, Mexico, Vietnam, Canada, India, and Italy are the five countries with the largest negative gap between actual vs. predicted deficits, i.e., with bilateral trade cost asymmetries in favor of these countries' exports, while the largest positive differences, i.e., with bilateral trade cost asymmetries in favor of U.S. exports, are for trade with Germany, Japan, Korea, Spain, and Bangladesh.

4.3. Bilateral Imbalances by Industry and Country. Next, we zoom in on specific industry-country combinations. Our estimates appear in Table 1, which reports three-year averages over the period 2020-2022.[13] All numbers are in millions of U.S. dollars. For transparency and consistency with the previous analysis, we report all estimates for the

[12] A similar pattern is observed with the disaggregated, i.e., country-industry, estimates.

[13] Inspection of the data for individual years (instead of using three-year averages, as we do in Table 1) reveals similar patterns and confirms our findings.

six products from Figure 2 and the six countries from Figure 3. However, to simplify the discussion, we focus on the results in Panel D – 'Motor Vehicles'.

A comparison between the results for 'Motor Vehicles' from column (3), which lists the actual trade imbalances, and column (4), which lists the trade imbalances that are predicted from specification (4), captures the four possible cases of trade cost asymmetries. The first case is Canada, where the U.S. has a bilateral surplus; however, according to our estimates, the U.S. bilateral surplus in 'Motor Vehicles' with Canada should be significantly larger, e.g., the U.S. exports less to Canada than it should. Thus, from the U.S. perspective trade in 'Motor Vehicles' with Canada could be viewed as 'unfair' because the U.S. trade surplus is smaller than it should be when bilateral trade costs are perfectly symmetric.

The second case is China, where, once again, the U.S. has a bilateral trade surplus. This time, however, according to our estimates, the U.S. bilateral surplus in 'Motor Vehicles' with China should be much smaller, e.g., the U.S. exports more than it should. Thus, from the perspective of China trade in 'Motor Vehicles' with the U.S. could be viewed as 'unfair' because the U.S. trade surplus is larger than the corresponding 'fair' surplus when bilateral trade costs are perfectly symmetric. In other words, the bilateral trade costs in 'Motor Vehicles' between China and the U.S. favor U.S. exports.[14]

The third case is illustrated by trade with Germany and Mexico. The United States runs trade deficits with both of these countries. However, according to our estimates, these trade deficits should be larger than they are. Thus, from the perspective of Germany and Mexico, trade in 'Motor Vehicles' with the United States could be viewed as 'unfair' because the U.S. trade deficit is smaller than it should be when bilateral trade costs are perfectly symmetric, i.e., there are asymmetries in the bilateral trade costs between U.S. and Germany and between U.S. and Mexico, which are in favor of U.S. exports to each of these countries.

[14] Note, as mentioned in the Introduction, countries could engage in 'unfair' policies, e.g., using subsidies, that are multilateral rather than bilateral in nature. Our methodology fully controls for such practices (i.e., with the country-time fixed effects), however, we do not/cannot identify their impact. Moreover, if such practices do exist, they are unlikely to be dealt with successfully at the bilateral level.

Table 1: U.S. Trade Imbalances. Selected Countries and Industries, 2020-22.

(1) Industry Description	(2) ISO3	(3) Actual	(4) Predicted	(5) Asymmetry	(6) Time
A. Processed meat	CAN	-1,165	-1,182	-1,098	-952
	CHN	3,080	3,975	4,275	3,366
	DEU	17	-24	7	34
	GBR	-21	14	-18	-32
	JPN	2,777	2,482	2,390	2,501
	MEX	1,532	1,364	1,335	1,332
B. Dairy products	CAN	45	65	88	64
	CHN	368	498	527	473
	DEU	-47	-48	-51	-61
	GBR	-32	-19	-24	-41
	JPN	214	210	222	205
	MEX	798	651	649	773
C. Iron and steel	CAN	-3,727	-1,103	-1,802	-2,325
	CHN	-1,248	-3,472	-3,083	-1,815
	DEU	-1,404	-1,049	-1,300	-1,324
	GBR	-448	-424	-360	-421
	JPN	-1,514	-2,226	-2,157	-1,862
	MEX	965	675	1,505	1,144
D. Motor vehicles	CAN	367	3,610	89	147
	CHN	7,818	2,014	7,660	8,493
	DEU	-10,373	-22,096	-18,161	-13,786
	GBR	-6,322	-2,400	-4,870	-5,267
	JPN	-33,457	-29,512	-32,806	-34,839
	MEX	-60,743	-61,030	-61,523	-61,226
E. Automobile bodies	CAN	1,966	1,963	1,985	1,937
	CHN	-1,756	-2,110	-2,126	-2,026
	DEU	-69	-218	-291	-288
	GBR	51	46	48	27
	JPN	-94	-53	-58	-82
	MEX	-1,908	-1,735	-1,853	-1,867
F. Parts for automobiles	CAN	738	1,262	1,348	1,081
	CHN	-8,865	-10,523	-12,412	-11,556
	DEU	-4,839	-4,200	-3,921	-4,858
	GBR	-52	-153	56	111
	JPN	-7,806	-8,509	-8,552	-8,036
	MEX	-14,140	-12,375	-12,708	-12,926

Notes: This table reports the U.S. bilateral trade imbalances with selected countries and industries. Column (1) lists the industries. Column (2) lists the countries. Column (3) reports the actual trade imbalances. Column (4) includes the predicted trade imbalances that are obtained with fully symmetric trade costs. The predicted trade imbalances in Column (5) are obtained with asymmetric time-invariant trade costs. Finally, the results in column (6) are obtained with asymmetric trade costs that also vary along three 10-year intervals in our sample. See text for further details.

Finally, the last case is illustrated by trade with Japan and the UK. The United States also runs trade deficits in 'Motor Vehicles' with these two countries. However, this time, the actual deficits are significantly larger as compared to those predicted by our model. Thus, from the U.S. perspective trade in 'Motor Vehicles' with Japan and the UK could be viewed as ‘unfair’ because the U.S. trade deficit is larger than it should be when bilateral trade costs are perfectly symmetric, i.e., there are asymmetries in the bilateral trade costs between U.S. and Japan and between U.S. and the UK, which are in favor of the exports from each of these countries to the United States.

4.4. Discussion and Mechanisms. The main conclusion from the analysis in the previous subsection is that, even though most of the U.S. bilateral trade imbalances are not due to bilateral trade cost asymmetries, there are certain country-industry combinations where bilateral asymmetries (in either direction of the U.S. trade flows) are particularly pronounced. These asymmetries could be due to geography, asymmetric transportation costs, (non-homothetic) preferences, and, most importantly for policy discussions, due to the manipulation of bilateral trade costs. Decomposing the possible reasons for the trade cost asymmetries is beyond the scope of our analysis, and it would require additional theoretical modeling and new data. Nevertheless, we do attempt to decompose the asymmetries econometrically into time-invariant (e.g., geography) asymmetries vs. time-varying (e.g., policy) asymmetries.

To this end, we proceed in two steps. First, we allow for time-invariant asymmetries by replacing the symmetric country-pair fixed effects from specification (4) with asymmetric/directional country-pair fixed effects, which control for and absorb all time-invariant bilateral trade cost asymmetries. Thus, by construction, the resulting econometric model allows for time-invariant trade cost asymmetries. This analysis leads to two main conclusions. First, as expected, we find that the overall fit of our model improves further. Specifically, the correlation, R^2, and regression coefficient between the actual and predicted trade imbalances are 0.98, 0.97, and 1.003, respectively. Based on this, we conclude that a significant fraction of the bilateral asymmetries that we have detected are due to time-invariant determinants or forces that entered before the period of investigation.

This conclusion is reinforced by the results in column (5) of Table 1, where we report country-industry trade imbalances that are obtained from the specification that allows for time-invariant trade cost asymmetries. For example, in the case of China and 'Motor Vehicles', we see that the large gap between the actual and predicted trade imbalances is almost completely eliminated once we allow for time-invariant trade cost asymmetries. We also see from column (5) that the gap between the actual and predicted trade imbalances in 'Motor Vehicles' remains large in the case of U.S. trade with the UK, i.e., time-invariant trade cost asymmetries are not enough to explain this gap. Finally, in the case of Mexico, the gap has widened when we fully account for time-invariant trade cost asymmetries.

In our last experiment, we also allow for time-varying asymmetries econometrically by using asymmetric-interval-pair fixed effects, which vary across the three intervals (1992-2002, 2002-2012, and 2012-2022) in our sample. The fit of the model improves further – the correlation, R^2, and regression coefficient between the actual and predicted trade imbalances are 0.97, 0.94, and 0.97, respectively. However, as can be seen in column (6) of Table 1, where we report our new predicted country-industry trade imbalances, some asymmetries remain large (e.g., with Germany, Mexico, and the UK), while others are even reversed (e.g., with China and Japan).

5 Conclusions

We propose and implement methods to detect bilateral trade cost asymmetries from a combination of structural gravity theory and data on actual bilateral trade imbalances. Our main findings can be summarized as follows. First, we find that 92% of the U.S. bilateral trade imbalances can be explained with perfectly symmetric bilateral trade costs and country-specific characteristics, including aggregate output, expenditure, and the multilateral resistance terms. Thus, on average, there is little evidence for asymmetric bilateral trade costs or any unfair manipulation of bilateral trade costs. Second, we detect some systematic asymmetries (in each direction of trade flows) in the bilateral trade costs for key industries between the U.S. and several of its most important trade partners. Third, some of these asymmetries are time-invariant, i.e., due to forces that did not act during the 31 years of investigation in our study (1992-2022), however, others are time-varying and remain large.

We see several possible uses and extensions of our methods. First, subject to minimum data requirements and due to the attractive properties of the structural gravity model, our methods are very easy to apply at any level of aggregation. Thus, they can be readily used to detect trade cost asymmetries for various countries, products, and industries. Second, since our estimating equation is part of the structural gravity system, which is representative of a wide class of trade models and used routinely to obtain welfare effects, our methods can be extended to study the importance of bilateral trade cost asymmetries for welfare and terms of trade calculations. Third, if one believes that the source of the systematic trade cost asymmetries that we obtain is indeed unfair trade cost manipulation, then, in combination with structural gravity theory, one could translate these trade cost asymmetries into 'fair' tariff equivalents. Finally, from a broader perspective, we believe that, since the structural gravity model is so good in capturing the bilateral trade imbalances, there is great potential of nesting it within a macroeconomic model that determines the aggregate trade imbalances at the country-level.

References

Anderson, James E. and Eric van Wincoop, "Gravity with Gravitas: A Solution to the Border Puzzle," *American Economic Review*, 2003, *93* (1), 170–192.

— **and** — , "Trade Costs," *Journal of Economic Literature*, 2004, *42* (3), 691–751.

Arkolakis, Costas, Arnaud Costinot, and Andrés Rodriguez-Clare, "New Trade Models, Same Old Gains?," *American Economic Review*, 2012, *102* (1), 94–130.

Bergstrand, Jeffrey H., Mario Larch, and Yoto V. Yotov, "Economic Integration Agreements, Border Effects, and Distance Elasticities in the Gravity Equation," *European Economic Review*, 2015, *78*, 307–327.

Borchert, Ingo, Mario Larch, Serge Shikher, and Yoto Yotov, "The International Trade and Production Database for Estimation (ITPD-E)," *International Economics, https://doi.org/10.1016/j.inteco.2020.08.001*, 2020.

Davis, Donald R. and David E. Weinstein, "The Mystery of the Excess Trade (Balances)," *American Economic Review*, May 2002, *92* (2), 170–174.

de Sousa, José, "The Currency Union Effect on Trade is Decreasing Over Time," *Economics Letters*, 2012, *117* (3), 917–920.

Egger, Peter H. and Mario Larch, "Interdependent Preferential Trade Agreement Memberships: An Empirical Analysis," *Journal of International Economics*, 2008, *76* (2), 384–399.

Fally, Thibault, "Structural Gravity and Fixed Effects," *Journal of International Economics*, 2015, *97* (1), 76–85.

Felbermayr, Gabriel, Aleksandra Kirilakha, Constantinos Syropoulos, Erdal Yalcin, and Yoto V. Yotov, "The Global Sanctions Data Base," *European Economic Review*, 2020, *129* (C).

— **and Yoto V. Yotov**, "From Theory to Policy with Gravitas: A Solution to the Mystery of the Excess Trade Balances," *European Economic Review*, 2021, *139* (C).

Gurevich, Tamara and Peter Herman, "The Dynamic Gravity Dataset: 1948-2016," 2018. USITC Working Paper 2018-02-A.

Larch, Mario, Serge Shikher, and Yoto Yotov, "The International Trade and Production Database for Estimation - Release 3 (ITPD-E-R03)," Working Papers 202524, Center for Global Policy Analysis, LeBow College of Business, Drexel University May 2025.

MacDonald, Ms. Margaux, Mr. Roberto Piazza, Johannes Eugster, and Ms. Florence Jaumotte, "Are Bilateral Trade Balances Irrelevant?," IMF Working Papers 2020/210, International Monetary Fund September 2020.

ONS (Office of National Statistics), "UK trade with the United States: 2023. A closer look at the goods and services the UK trades with the United States.," Article, Office of National Statistics 2025.

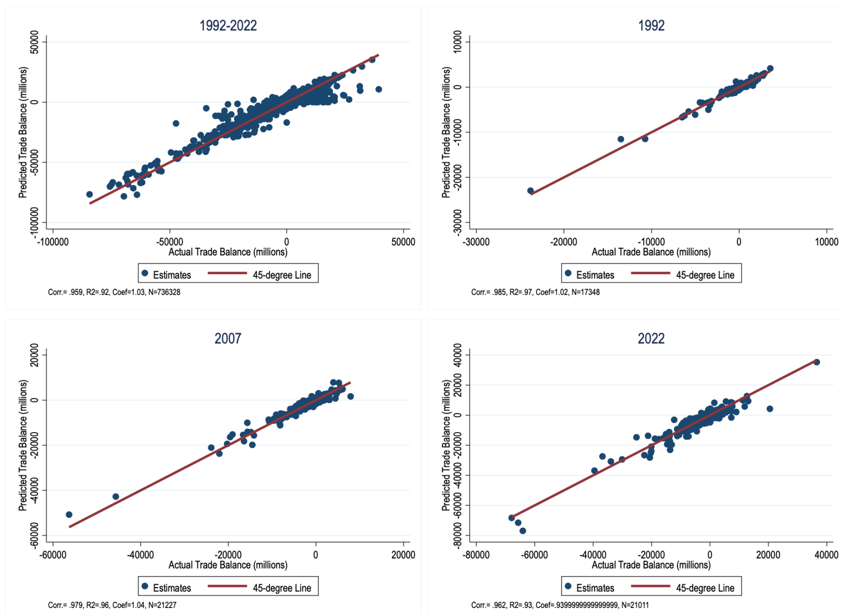
Santos Silva, João M.C. and Silvana Tenreyro, "The Log of Gravity," *Review of Economics and Statistics*, 2006, *88* (4), 641–658.

Syropoulos, Constantinos, Gabriel Felbermayr, Aleksandra Kirilakha, Erdal Yalcin, and Yoto V. Yotov, "The Global Sanctions Data BaseâRelease 3: COVIDâ19, Russia, and Multilateral Sanctions," *Review of International Economics*, February 2024, *32* (1), 12–48.

Appendix

Figure 5 presents estimates for the first, middle, and last year in our sample. For comparison, the top-left panel replicates the estimates from the top-left panel of Figure 1. The results in Figure 5 confirm the excellent fit of our model for specific years.

Figure 5: Actual vs. Predicted U.S. Bilateral Trade Balances Over Time



Note: This figure reports the predicted vs. actual bilateral trade balances of the United States. The top-left panel plots the actual vs. predicted U.S. bilateral trade balances with each trade partner and for each product and all years (1992-2022) in our sample along with a 45-degree line. The remaining three panels present estimates for the first, middle, and last year in our sample.