

Predicting Sanctions Busting^{*}

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Abstract

In this paper, we introduce a novel data-driven methodology to detect unusual trade flows. We make use of two hacks of the structural gravity framework that in turn imply minimal data requirements. We apply the methodology to detect and document the extent of sanctions busting in the 2022 Russia sanctions, using monthly trade data. Our results indicate that sanctions busting does occur, but its magnitude is limited. Specifically, we find that the volume of trade facilitated by sanctions busting is not nearly enough to make up for the loss in trade due to sanctions.

Keywords: Sanctions, sanctions busting, trade diversion

JEL Classification: F10, F14, L86, F23

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1 Introduction

On 24th February 2022, Russia invaded Ukraine. With this invasion, the start of the Russia-Ukraine war was marked. Subsequently, the EU imposed sanctions on Russia to cut the economic fuel supporting Russia's war effort.

Since the key objective of economic sanctions is to bleed out the target (here, Russia), a natural question arises. How effective are these sanctions? In this paper, we investigate if Russia has been finding its way around the imposed sanctions, also known as sanctions busting, in the context of the 2022 Russia sanctions. To detect sanctions busting, we marry the workhorse model of international trade, the structural gravity model, with time series tools.

2 Methodology

We make use of the structural gravity model of international trade, which reads as

$$X_{odkt} = \frac{S_{okt}}{\Omega_{okt}} \frac{E_{dkt}}{\Phi_{dkt}} \phi_{odkm}$$

where $S_{okt} = \sum_{\ell} X_{olkt}$, $E_{dkt} = \sum_{\ell} X_{\ell dkt}$,

and $\Omega_{okt} = \sum_{\ell} \frac{E_{\ell kt}}{\Phi_{\ell kt}} \phi_{olkm}$, $\Phi_{dkt} = \sum_{\ell} \frac{S_{\ell kt}}{\Omega_{\ell kt}} \phi_{\ell dkm}$

Using the pre-sanctions data ¹, we estimate the ϕ_{odkm} using a standard PPML estimator, as is common in the related literature, and appropriate fixed effects, i.e.

$$X_{odkt} = \Theta_{okt} \Gamma_{dkt} \phi_{odkm}$$

S_{okt} and E_{okt} represent the sum of all exports/imports). We project their values for the post-sanctions time period using state-of-the-art time series techniques. In the current version, we use Prophet as a time series forecasting tool.² Using the data from these steps, we predict the trade flows for the post-sanctions period. Finally, we compare the predicted and observed trade flows to detect sanctions busting.

¹We use monthly data from 2015 to present for 5000 products between all countries from Comext, Comtrade, and Trademaps.

²Prophet is a time series forecasting tool developed by Facebook.

3 Preliminary Results

As a proof of concept, we have used our methodology to detect sanctions busting in Germany’s exports to Russia. Figure 1 captures the observed total exports. Figure 2 illustrates our predicted estimates with Prophet along side the observed data. As an additional measure, we also predict the bilateral trade flows using the observed data but with the pre-sanctions estimations of ϕ_{odkm} . While the first two figures provide the Germany and Russia’s side of the picture, the subsequent figures, figure 3 to figure 8, are attempt to spot the countries complicit in sanctions busting. Overall, a back-of-the-envelope calculation reveals 15-20 percent re-routing.

4 Conclusion

Our key objective in this paper is to detect sanctions busting in the context of 2022 Russian sanctions.

To detect sanctions busting, we marry the workhorse model of international trade with time-series prediction procedures. The work of Tyazhelnikov et al. (2023) stands next to us. However, they conduct “embargo forensics” using structural gravity but it is a retrospective analysis. Our work contributes by providing a “real-time” detection of sanctions busting.

Overall, our estimates together with a back-of-the-envelope calculation reveals 15-20 percent re-routing. The paper is still a work-in-progress. We aim to conduct our analyses on a more disaggregate data set, i.e., at the product level. We will also onboard other time series prediction tools. Further, we will investigate and compare potential tools to curb sanctions busting in a general equilibrium trade model.

5 Figures

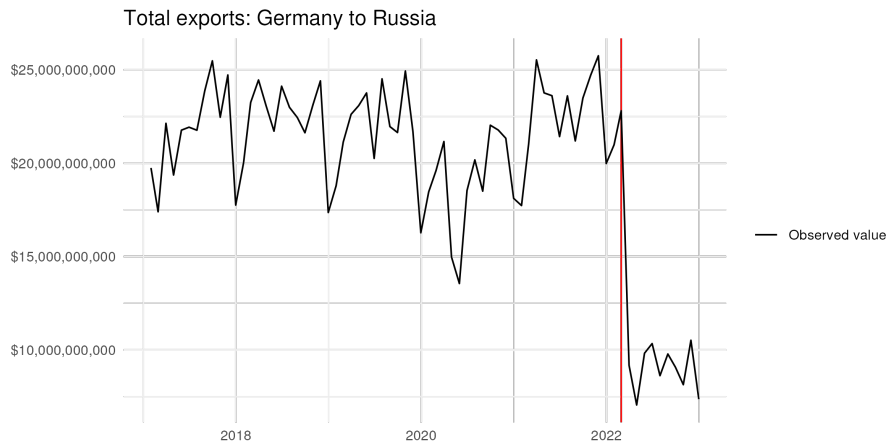


Figure 1: Exports from Germany to Russia

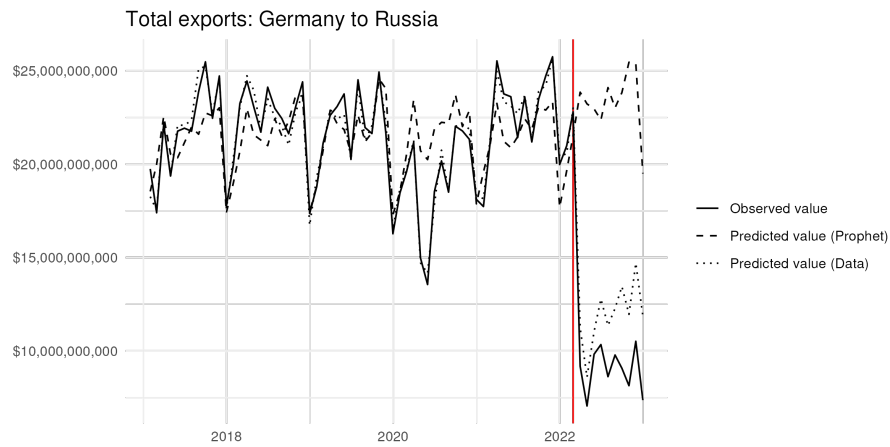


Figure 2: Exports from Germany to Russia

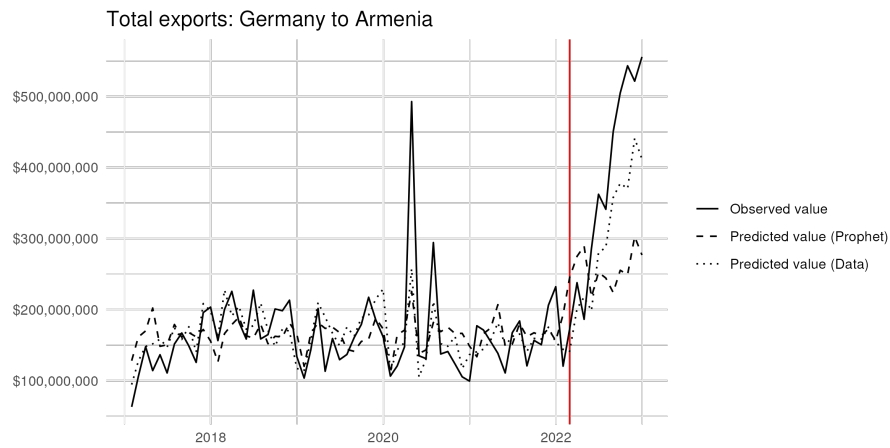


Figure 3: Exports from Germany to Armenia

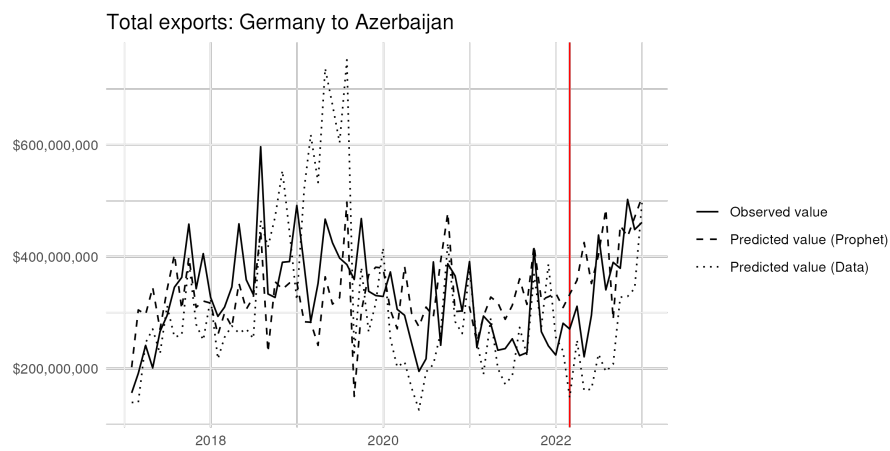


Figure 4: Exports from Germany to Azerbaijan

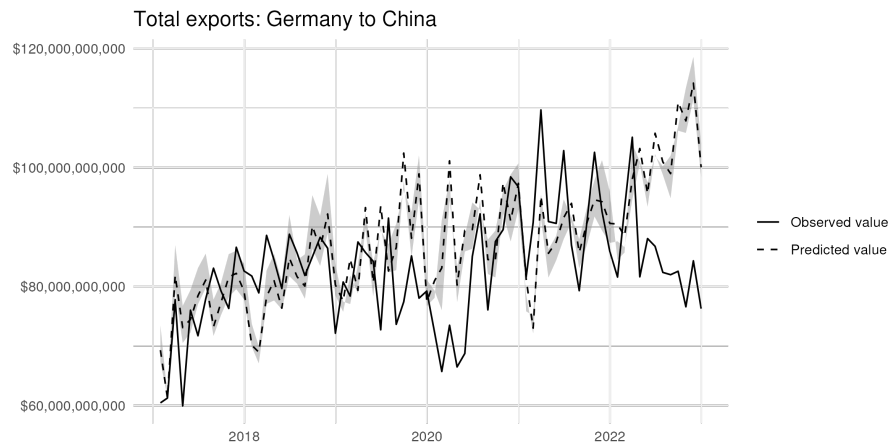


Figure 5: Exports from Germany to China

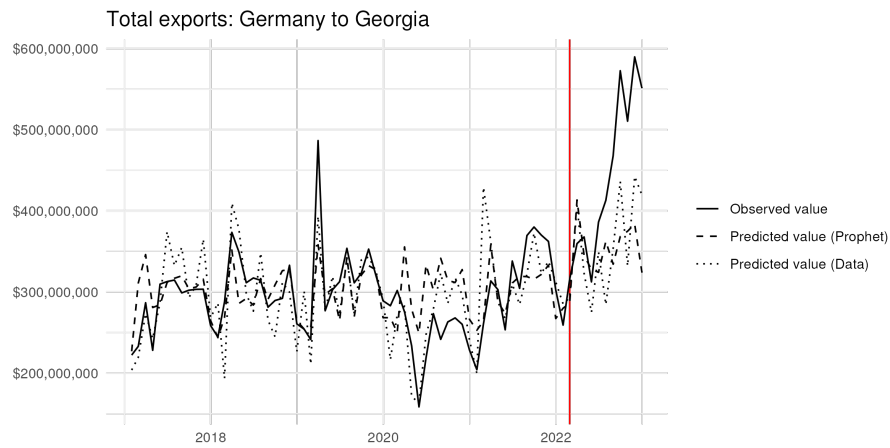


Figure 6: Exports from Germany to Georgia

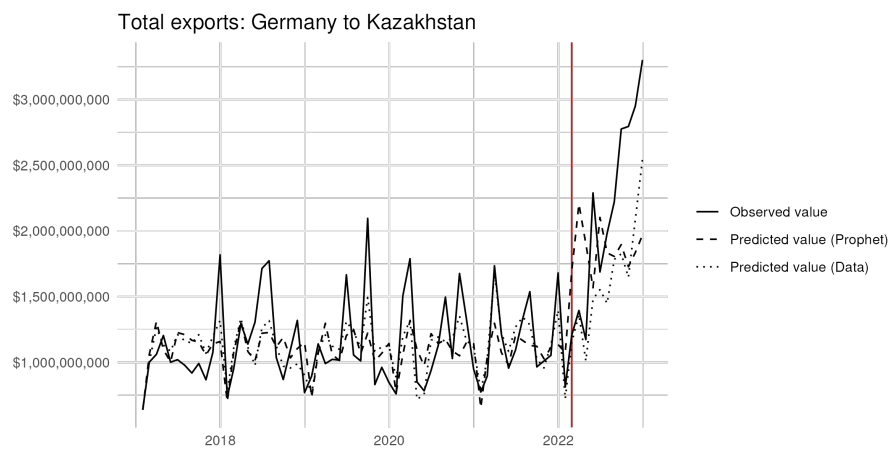


Figure 7: Exports from Germany to Kazakhstan

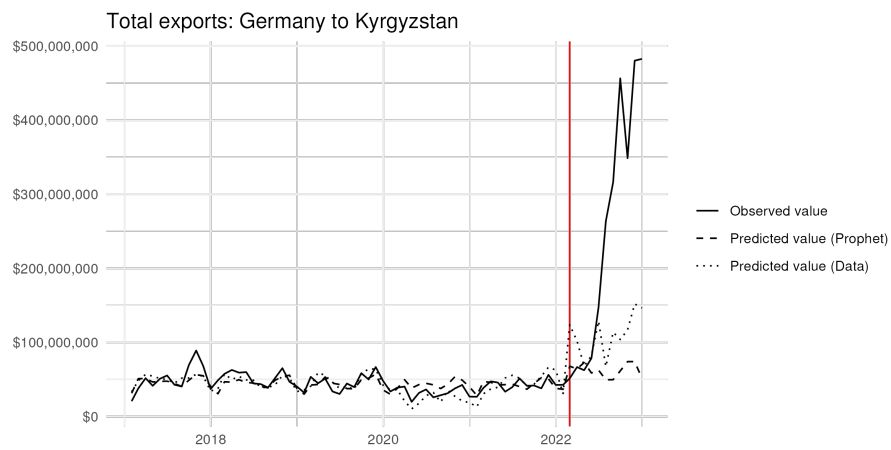


Figure 8: Exports from Germany to Kyrgyzstan

References

Tyazhelnikov, Vladimir, John Romalis, and Yongli Long, “Russian Counter-Sanctions and Smuggling: Forensics with Structural Gravity Estimation,” June 2023. Working Paper.