

The Undoing of Economic Sanctions: Evidence from the Russia-Ukraine conflict

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Abstract

Economic sanctions aim to pressure target nations or regions to induce policy or regime change. In this paper, we examine the effects of Ukraine’s economic blockade of the anthracite-rich Donbas region, to demonstrate how trade sanctions’ efficacy can be undermined by entrepôt trade. We document that after the blockade was imposed in March 2017, Russia reported a sharp increase in anthracite imports from Ukraine, while Ukraine reported no exports to Russia at all. We interpret this gap in the “mirror statistics” as reflecting a shift in Donbas trade through Russia. Concurrently, Ukraine anthracite imports from Russia increased sharply (from near-zero), suggesting that much of Donbas’ anthracite was reexported back to Ukraine, using Russia as an entrepôt. We provide suggestive evidence that Russia benefited from monopsony rents, buying low-priced anthracite from Donbas while selling back to Ukraine at prices comparable to other export markets. Overall, our findings highlight some of the economic and geographic features that may raise the cost and limit the efficacy of sanctions.

Keywords: Sanctions, Trade, Entrepôt, Minerals, Russia, Ukraine, Conflict

JEL classification: F14; F51; Q34

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1 Introduction

Economic sanctions aim to exert pressure on a target nation or region, with the goal of inducing policy reforms or regime change. Their efficacy depends on the extent to which the target of sanctions (and in particular the targeted elite) faces economic pain as a result. This in turn depends on a number of factors. In the case of trade sanctions, how readily can a sanctioned nation substitute away from needed imports? To what extent do countries imposing sanctions rely on trade with a sanctioned partner? And to what extent may either side rely on entrepôt nations outside of the sanctioning blockade to evade trade restrictions?

In this paper we document the undoing of sanctions against the breakaway Donbas region of the Ukraine, which presents an unusual opportunity to explore the ways in which an economic blockade may be undermined. While it is an unusual case – a splintered region with a geographically adjacent ally, with an economy centered around a single commodity – these distinct features allow us to trace out some of the challenges to successfully imposing economic sanctions more generally. We show evidence that a combination of opportunities for entrepôt trade and economic imperatives led to a de facto reversal of Ukraine’s sanctions. We further provide suggestive evidence that the blockade likely allowed Russian traders to extract monopsony rents from Donbas coal production, while the coal itself was in part resold to Ukraine, which was forced to buy in part because of its power sector’s continued reliance on a particular form of coal.

The events that we study center on Donbas, a region located in eastern Ukraine that borders Russia. Importantly for our purposes, Donbas contains virtually all of Ukraine’s anthracite coal deposits. In February 2014, following the Maidan Revolution that ousted president Viktor Yanukovich, who had promoted closer ties to Russia, pro-Russia protests broke out in Donbas. By May, secessionists had seized government buildings and declared independence from Ukraine. The resulting war between Ukraine and the pro-Russian secessionists continued until the invasion of Ukraine by Russia in 2022. Of particular relevance for the present paper, following a failed truce attempt in March 2017, Ukraine’s government banned trade with the landlocked Donbas.

There are several features of our empirical setting that make it particularly straightforward to trace out the impact of this economic blockade. Most importantly, since Donbas contains almost all of Ukraine’s anthracite deposits, we can attribute any Ukrainian anthracite that is recorded in trade data to the region. Second, since Donbas is surrounded by Ukraine on one side and Russia – which did not support the blockade – on the other, any post-blockade trade in Donbas anthracite would need to go through Russia, making it relatively simple to observe trade displacement via Russia, and infer whether Russia’s increased anthracite access then led to increased exports to Ukraine and/or the rest of the world. Finally, as a case study in the challenges of enforcing sanctions, it is noteworthy that Ukraine had relied on Donbas anthracite for much of its energy needs – while the blockade cut off Donbas from access to markets in Ukraine and beyond, it also meant that Ukraine could no longer purchase internally the coal that had previously fed its power plants, which had been designed specifically to burn anthracite coal. These features are present – albeit to a greater

or lesser degree – in many attempts at economic embargo. Notably, attempts at sanctioning Russia and its elites after its 2022 invasion of Ukraine have been undermined by some of its neighbors, both big and small, which have facilitated trade both into and out of Russia.¹ Similar stories have emerged about a number of earlier efforts at sanctioning both large and small nations, for example against Iran,² against Venezuela,³ and in a much earlier era, against South Africa, sanctions around which there was near-universal unanimity in the global community.⁴ These other cases share with our current study the emphasis on commodity trade involving harder-to-trace output as well as inelastic demand, most notably oil in the most recent embargo against Russia, which again may provide price discounts for purchases by non-sanctioning nations (Adolfson et al., 2023).

Our main empirical analyses use UN Comtrade data, which provides monthly bilateral import-export flows at a highly disaggregated level. These data allow us to study trade in anthracite coal from 2010 until the onset of the Russian-Ukraine conflict in early 2022, to explore the consequences of the blockade.

We first show that reported Ukraine anthracite exports dropped very sharply through the first half of 2014, as secessionists took control of the Donbas region. During this period, it appears that any production was either used or stockpiled internally by Ukraine. As we show, for the anthracite that was exported from Ukraine, a disproportionate share went to Russia.

More interestingly, when the blockade shut off the direct flow of anthracite from Donbas into Ukraine in 2017, we observe a three-fold increase in Russia’s reported imports of Ukrainian anthracite, and also a commensurate increase in Russia’s reported anthracite exports to Ukraine (which had previously not imported anthracite from Russia) and the rest of the world. Ukraine, by contrast, reported no anthracite exports to Russia at all during this period. The divergence between Ukraine-reported exports to Russia and Russia-reported imports from Ukraine indicates that Donbas anthracite exports – no longer controlled by Ukraine – was the source of Russian imports.

The timing of the rise in Russian imports of anthracite and concurrent Russian exports to Ukraine suggests that Ukraine was, in effect, purchasing Donbas anthracite via Russia. We observe a similar shift in trade with other countries – those that previously imported Ukrainian anthracite increased their imports from Russia post-blockade. Overall our analysis provides evidence that Russia served as an entrepôt for the transshipment of Donbas anthracite, including transshipments that ended up in Ukraine, which had imposed the blockade in the first place. These findings are in line with descriptive evidence that Donbas coal was bought by traders just over the border in the Rostov region, and that this coal was in turn sent on to ports near Odessa to be used by Ukrainian power plants (after, some accounts suggest, being mixed in with

¹See, for example, “Russia Sidesteps Western Punishments, With Help From Friends”, *New York Times*, February 1, 2023; “West probes potential sanction dodging as exports to Russia’s neighbours surge”, *Financial Times*, February 23, 2023.

²“China Is Buying the Most Iranian Oil in a Decade, Kpler Says”, *Bloomberg*, August 23, 2023; Turkey Allegedly Had Role in Helping Iran Dodge Sanctions, *VOA*, August 15, 2015.

³“Russian oil firm shuffles Venezuela assets as sanctions bite”, *Reuters*, March 29, 2022.

⁴“South Africa Acts to Bust Sanctions”, *Washington Post*, October 9, 1986.

Russian anthracite to obscure its origin; see International Crisis Group, 2020).

Finally, we provide suggestive evidence on which parties extracted economic benefits from this arrangement. In particular, we proxy for Russian monopsony profits by comparing the price at which Ukraine sold anthracite to Russia to a world price benchmark (i.e., were Ukraine’s exports to Russia under-priced?) and for Russia’s monopoly profits by comparing the price of Russia’s exports to Ukraine to the world price (were Russia’s exports to Ukraine over-priced?). We find monopsony profits increased sharply under the embargo, while monopoly profits are flat or decline. We interpret these patterns as suggestive evidence that Russian traders were able to exploit their monopsonist position to profit from trade with blockaded mines, whereas Russian export prices may have been limited by Ukraine’s possible outside options.

Most directly, our work highlights how economic sanctions can be undermined by displacement and/or illicit trade. Notable contributions include Hsieh and Moretti (2006), which argues that Iraq under-priced oil exports in order to extract kickbacks from trading partners and thus evade the constraints imposed by the Oil for Food Program, and DellaVigna and La Ferrara (2010), which documents positive stock market reactions among arms producers in response to worsening conflicts, even in embargoed countries. More generally, we contribute to the economics literature on the determinants and effects of sanctions. This literature includes theoretical work such as Eaton and Engers (1992) which, relevant for our research, shows how the incidence of costs impact the decision to impose an embargo; notable empirical contributions have explored the determinants (rather than the effects) of sanctions based on terrorism financing (Limodio, 2022), and the consequences of sanctions for the targeted regime (e.g., Marinov, 2005) and citizens in the targeted country (e.g., Daponte and Garfield, 2000).

While these papers detect the *existence* of sanctions evasion, our setting highlights the geopolitical challenges in implementing sanctions if there is incomplete support for a blockade. In our case, we show how sanctions are circumvented as a result of an ally that serves – to its own financial benefit – as an entrepôt for indirect trade. In this sense, our work links to the literature on transshipment in general (e.g., Ganapati et al., 2023), and, in particular, on transshipment as facilitator of illegal or quasi-legal trade flows (Fisman et al., 2008).⁵

Finally, our results highlight the potential relevance of the type of product targeted with sanctions. Given Ukraine’s dependence on anthracite and its difficulties in finding new suppliers, the country was forced to effectively undermine their own blockade, a result that echoes the “backfire effect” found by, for example, Amodio et al. (2020) in the imposition of security-related sanctions on the West Bank and the subsequent increase in violence.

More broadly, our research contributes to the vast literature on natural resources and conflict (Berman et al., 2017, Caselli et al., 2015), which offers abundant evidence on how resource endowments can fuel hostilities within a country. Our findings show how illegal trade helps to sustain a conflict financially,

⁵Given our focus on the impact of conflict on trade within Ukraine specifically, our work also connects to Korovkin and Makarin (2023), who study the impact of the war on interfirm trade.

despite an economic blockade. Turning to wider geopolitical implications, our paper emphasizes the need for broad participation in sanctions in order for them to be effective. This was a central consideration in the case of Donbas, and is also highly relevant for sanctions against Russian oil and gas – ongoing at the time of writing – that has reportedly been purchased in large part by buyers in China and India.⁶

The paper is organized as follows: Section 2 describes the setting and the blockade Ukraine imposed on Donbas, Section 3 describes the data we use in our analysis, Section 4 provides evidence on the role of Russia in helping Donbas circumvent the blockade and on the consequences of the blockade for Ukraine, and Section 5 concludes.

2 Context: the Donbas Conflict

We focus on the case of Donbas, a region in Ukraine which shares economic and cultural ties with Russia (Figure A1). In the mid-eighteenth century the region was part of the Russian empire. By the end of the nineteenth century, almost a third of the population was of Russian ethnicity. Of central importance for our paper, Donbas contains almost all of Ukraine’s anthracite mines, a mineral for which Ukraine is among the major world producers and exporters (Figure A2).

The conflict we study began in February 2014, following the removal of the pro-Russian president, Viktor Yanukovich, and the occupation and subsequent annexation of Crimea by Russia. Pro-Russian protests took place in parts of Ukraine, and in May 2014, Donetsk and Luhansk declared independence from Ukraine and proclaimed themselves the Republic of Donbas. As a consequence, the Ukrainian government in Kyiv lost control of the country’s anthracite which, as noted above, was situated almost entirely in the Donbas region, and specifically in the part held by pro-Russian secessionists.

Conflict erupted between pro-Russian independentist and Ukrainian forces, which continued largely unabated until the Russian invasion of Ukraine in 2022. Returning to the events of 2014, in the months that followed the declaration of independence, representatives of Ukraine, Donbas, Russia and the Organization for Security Co-operation in Europe (OSCE) came to an agreement – the Minsk Protocol – to halt the Donbas conflict. The agreement led to a temporary truce in February 2015, but the lull in conflict was short-lived, and hostilities escalated soon afterward.

In March 2017, in response to the continuing conflict, Ukraine imposed an economic blockade on Donbas, shutting off the transportation of any rail or road cargo to or from the separatist-occupied regions.⁷

In response to the blockade, Donbas separatist forces took over major companies in their region. Most of the affected enterprises were anthracite processors, coal mines, and energy companies that were of strategic

⁶E.g., “India and China snap up Russian oil in April above price cap,” *Reuters*, April 18, 2023.

⁷The sanction was initiated by a group of volunteers – mainly war veterans – who felt that trade with Donbas was morally indefensible, and blockaded the railway connection between Donbas and Ukrainian-controlled territory. The Ukrainian government, in part to avoid any confrontation with the pro-blockade force, imposed the blockade officially (Voytuk, 2019).

importance for the region and were especially important for local employment.

Many of Ukraine’s power plants could burn only anthracite coal.⁸ As a result, the loss of access to Donbas anthracite forced western Ukraine to import anthracite to avoid the risk of power outages. In the short-run, some of this need was filled by imports from South Africa as well as efforts at converting its generating capacity to use other forms of coal. Over the following years, however, Ukraine came to rely increasingly on Russian imports, as its close proximity meant it could be imported at lower cost.⁹ During this period, as suggested by investigative accounts (Warrick and Mufson, June 12, 2020), Russia may have rebranded the coal mined in the Donbas region and sold it to other consumers, including Ukraine, a claim that we will investigate more rigorously in our analysis.

We conclude this section by noting that the blockade made it illegal only for Ukrainian entities to trade with Donbas. While trade with other countries was not banned directly, there was nonetheless broader support amongst European nations in isolating the Donbas separatists (LaBelle, January 6, 2019). Furthermore, given the nationalization of Donbas mines, trade in anthracite was legally ambiguous as it could be labeled post-nationalization as stolen. Finally, much of the trade was executed by companies linked to Serhiy Kurchenko, who was on both US and EU sanction lists (Jack and Herschlag, 2020; OFAC E.O. 13660; UE Implementing Regulation 2018/326). For these various reasons, most nations avoided any trade in Donbas anthracite but, as we will see below, Russia openly reported imports from Donbas, and we will take advantage of this openness in our analysis below.

3 Data

We use official statistics from the United Nations’ Comtrade database to track trade in anthracite and other minerals. The United Nations Statistical Division collects comprehensive information on bilateral trade, including both values and quantities of the products and services exchanged for almost 200 countries. Comtrade provides monthly data at the 6-digit Harmonized System (HS) level. This allows us to identify, to a high level of specificity, trade in anthracite coal (HS code 270111, distinct from non-anthracite coal, HS 270112 and HS 270119) at high frequency.

While the data on export and import values has fewer missing values than that of quantities, we focus on the latter in our main analysis, to remove the effects of price movements that may themselves be caused by the conflict. When quantity values are missing, we make the following imputation: we calculate the median world price of anthracite as the ratio between the values and the quantities reported for anthracite trade overall, and recover the amount traded for the missing country by dividing the reported value for the calculated median world price. Our results, however, do not rely on this imputation and remain unchanged

⁸See, e.g., “Rail blockade by Ukraine patriots creates headache for Kiev,” *Financial Times*, March 8, 2017.

⁹See, e.g., “Ukraine Survives Without Coal From Russia-Controlled Donbas,” *Eurasia Daily Monitor*, 14(67).

when restricting the sample to non-missing values.

Russia does not report any trade in anthracite before 2013. We are therefore constrained in our analysis to set 2013 as the starting period. We implement a difference-in-differences methodology, comparing exports of Ukrainian anthracite to Russia against trade flows of Ukrainian anthracite to other countries. Our assumption is that, had no blockade taken place, the flows of exports to Russia would have followed the same trend as exports to other countries.¹⁰ Given that Donbas declares independence in May 2014, and UN Comtrade provides data at a monthly frequency, we inspect the hypothesis of no pre-trends visually for the 16 months prior to Donbas’s declaration of independence in May 2014.

When Ukraine lost control of Donbas’s anthracite mines in May 2014, it stopped reporting any anthracite exports. We therefore rely on other countries’ imports of anthracite from Ukraine – primarily Russia – to proxy for Ukraine’s export figures. We infer undetected exports from Donbas to Russia based on these data.

4 Evidence on the effects of sanctions

We present three sets of results. First, we show that Russia reports a steadily increasing level of imports from Ukraine following the onset of hostilities, and a corresponding increase in exports once the blockade is imposed in March 2017. We take these patterns as evidence of Russia’s role as an entrepôt for Donbas anthracite. We next document that a large part of Russia’s increased exports go to Ukraine itself, indicating that economic imperative dictated that Ukraine buy anthracite from Russia’s supply that expanded as a result of Ukraine’s own blockade. Finally, we examine how the price at which Russia imported Ukraine’s anthracite and the price at which Ukraine imported Russia’s anthracite compared to the mean world price; we argue that this last set of results will provide suggestive evidence on the economic beneficiaries of sanctions.

4.1 Evidence on Russian anthracite reexports

In this subsection, we compare anthracite trade flows from Ukraine and from Russia to provide evidence of the role of Russia as an entrepôt.

We begin with graphical evidence using the raw data in Figure 1. The left panel plots imports of Ukrainian anthracite as reported by Russia versus imports as reported by the rest of the world. We observe a sharp drop in reported imports of Ukrainian anthracite by the rest of the world, starting in early 2014 with the onset of hostilities. Russia reports a modest rise in 2014, and then a sharp increase – as much as nearly 300 percent – that coincides with the 2017 blockade.

We may compare these patterns describing imports *from* Ukraine to exports reported by Ukraine, Russia, and the rest of the world, which we present in the right panel of Figure 1. The first noteworthy fact is that,

¹⁰In additional analyses below (Appendix F), we further implement a triple-difference analysis to compare anthracite to trade in other minerals.

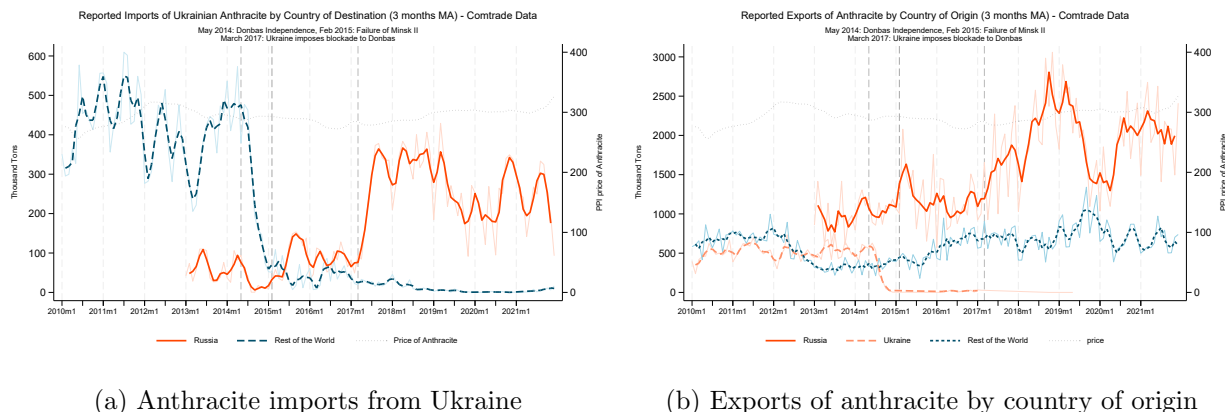


Figure 1: (a) Imports of anthracite from Ukraine: Russia versus other countries; (b) Exports of anthracite by country of origin: Russia, Ukraine and other countries.

while we saw in the left panel that Russia reports substantial imports from Ukraine, particularly after 2014-2017, Ukraine reports near-zero anthracite exports by 2015. The discrepancy, we assert, plausibly corresponds to anthracite that is exported to Russia from Donbas—by 2017, Ukraine’s eastern border was no longer monitored by Ukrainian officials, so that trade that went through it went unreported by Ukraine in the Comtrade data. Interestingly, Russian anthracite exports – also seen in the right panel – increase substantially at roughly the same time that Russia reports higher imports from Ukraine. The rest of the world also reports marginally higher exports between 2014 and 2017, a point we will return to shortly.

In Appendix Figure A3, we show that these patterns are unique to anthracite, rather than reflecting a general response of trade in the region to the emerging Donbas conflict. We do so by looking at changes in anthracite trade versus trade in other minerals by Russia and Ukraine.¹¹ In the left panel, we include for comparison Russia’s anthracite imports from Ukraine (which we already saw in Figure 1), which we contrast with imports of other minerals; in the right panel we include Russian anthracite exports, again as a point of comparison to Russian exports of other minerals. To provide a clearer contrast, and to reduce the month-to-month volatility, we focus on quarterly trade figures, and also normalize trade values to 100 in the first observed quarter. The patterns show the distinct time path of anthracite trade specifically. Focusing first on the left panel, Russia reports higher anthracite imports from Ukraine, whereas other mineral imports collectively decline, reflecting increased Russo-Ukrainian hostilities. At the same time, Russian mineral exports remain stable on average over the time period we study, in contrast to the steady increase in anthracite exports. Finally, in Appendix Figure A4 we show these patterns without any normalization, which makes it possible to discern that non-anthracite exports from Ukraine to Russia began to fall even before 2014, and fell to near-zero by 2017.

In a final piece of analysis in this section, we provide evidence that the changes in anthracite trade that

¹¹The other minerals include iron, salt, clays, pebbles, cement, manganese, titanium, peat, coke, coal gas, pitch coke, natural gas, quartz sands, bituminous and petroleum.

we document above – in terms of both Russian imports from Ukraine as well as Russian exports to Ukraine – involve statistically significant shifts after the onset of conflict, relative to trade with other countries, and relative to trade in other minerals.

In our main results, we use a standard difference-in-differences framework, based on the following specification:

$$\log(Imports_{jt}) = \sum_{\substack{t \leq 2019q4 \\ t \geq 2013q1, \neq 2014q1}} \beta_t \times Q_t \times Russia_j + Q_t + \eta_j + \gamma \log(Pop_{jt}) + \delta \log(GDP_{jt}) + \epsilon_{jt} \quad (1)$$

where $\log(Imports_{jt})$ is the logarithm of the quarterly average of imports of anthracite from Ukraine in quarter t by country j . We use a two-way fixed-effects model that includes indicator variables for each quarter (Q_t) and for each importing country (η_j). Finally, we include (time-varying) controls for population and income that are standard in trade models ($\log(Pop_{jt})$ and $\log(GDP_{jt})$; see, e.g., Anderson, 2011). Our main interest is in how imports reported by Russia evolve differentially relative to other countries, as captured by an indicator variable for Russian imports, $Russia_j$, interacted with time dummies, Q_t . The coefficients on these interaction terms, β_t , capture the difference between Russian imports of Ukrainian anthracite versus other countries' imports of Ukrainian anthracite over time. We take as a reference period the second quarter of 2014, when Donbas declared independence from Ukraine.

We use a similar framework to evaluate how Russian anthracite exports from Russia changed after the onset of conflict, as compared to anthracite exports from other countries. In this case, $Russia_j$ indicates that Russia is the source of exports, and η_j is a set of fixed effects for the exports' country of origin. We exclude exports from Ukraine in this case, to avoid overestimating the effect.¹²

We present results from both of these analyses via event plots in Figure 2, which show the interaction term coefficients from Equation (1). In Figure 2a, the point estimates illustrate the differential shift in Russia's reported imports of anthracite relative to other importers of Ukrainian anthracite. As expected given the patterns in the raw data, there is an increase following independence in 2014, and a further sustained increase following the blockade in 2017. For Russian anthracite exports (benchmarked against exporters other than Ukraine), we observe a significant relative increase only after 2017, coinciding with the blockade.

The implied magnitudes in both cases are very large. Given the log scale, the point estimates imply as much as a three-fold relative increase in imports reported by Russia after the blockade was imposed. For Russian exports relative to other anthracite exporters, the implied increase is 50-75% (Figure 2b). Given the baseline rate of Russian anthracite imports of 75-100 thousand tons, and the baseline rate of Russian anthracite exports of 1 million tons, the overall implied changes are 250-300 and 750-900 thousands tons of anthracite respectively. We do not expect these figures to coincide precisely: before the conflict, Ukraine was a net exporter of anthracite, and the gap between the two – approximately 500 thousand tons – is very

¹²Ukrainian exports would enter our control group and, given the lack of reporting from Ukraine over this period as shown in Figure 1b, they would show an artificial decline.

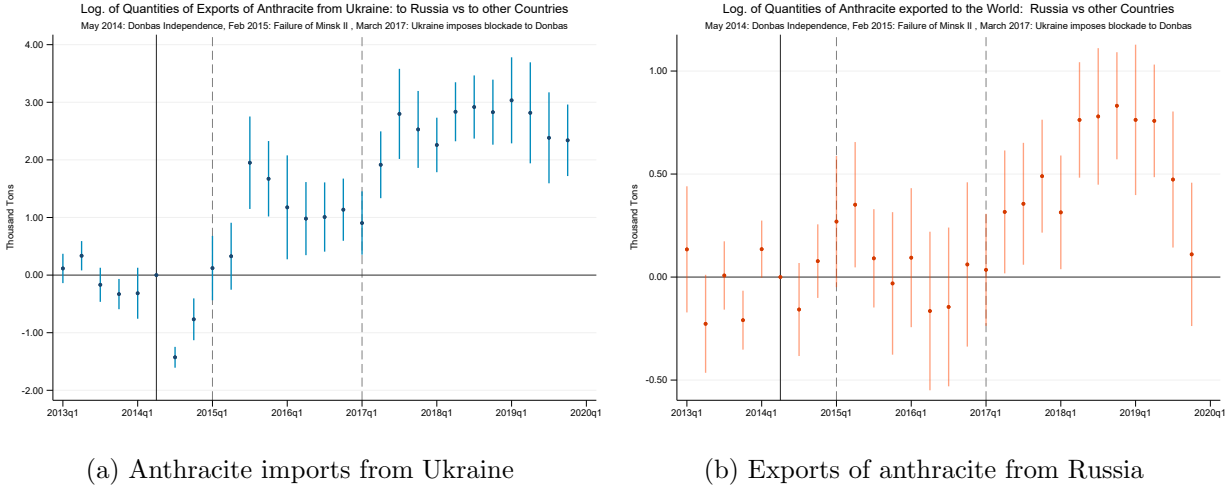


Figure 2: Event study evidence on imports of anthracite from Ukraine (to Russia versus to other countries) and exports of anthracite (from Russia versus from other countries).

close to the decline in Ukraine’s anthracite exports that coincided with the Donbas conflict, as observed in Figure 1.

Finally, to again ensure that we are not picking up general shifts in trade as a result of conflict, we take advantage of our full commodity- and country-level dataset to conduct a triple-difference analysis. Specifically, we augment the above framework to examine whether the observed changes in anthracite trade is different from trade patterns for other commodities. These analyses, which appear in Appendix F, align with the results of our difference-in-difference analyses presented above.

In summary, we find that the blockade led to an increase in Russian imports of anthracite from Ukraine and an increase in exports by Russia. We now explore in greater detail the destinations of Russian exports and also the prices at which trade occurred, to better understand who may have borne the cost of sanctions.

4.2 The blockade’s undoing

As noted earlier, Ukraine’s economy is heavily reliant on coal, and many of its power plants were designed to burn anthracite specifically. In 2013, coal supplied just over 40% of the country’s energy needs (Appendix Figure A5). While this figure declined by several percentage points in the years that followed, coal remained by far its most important energy source (Kostanyan and Remizov, 2017).

Until 2013, most of Ukraine’s coal requirements were fed by domestic production. For example, in 2013 the country reported coal production and consumption of 71 and 78.6 million tons of coal respectively; by 2016 consumption had fallen to just below 60 million tons, but domestic output – in large part because of the loss of Donbas production – dropped below 39 million, requiring a substantial increase in imports.¹³

¹³The lower consumption level had required the imposition of significant limits on electricity use, and there was limited flexibility to manage the shortfall further on the demand side.

Initially, some of the consumption-production gap was filled by South African coal, as reflected by a short-term increase in Ukraine’s reported imports (Appendix Figure A6). However, efforts at filling the gap proved short-lived due to contracting difficulties, high prices, and insufficient port capacity.¹⁴ So, as is already apparent in Figure 3, Ukraine began importing large quantities of Russian-sourced anthracite, which could be delivered to ports near Odessa at relatively low cost. Appendix Figure A7 shows that there was no comparable increase in imports of other commodities from Russia.

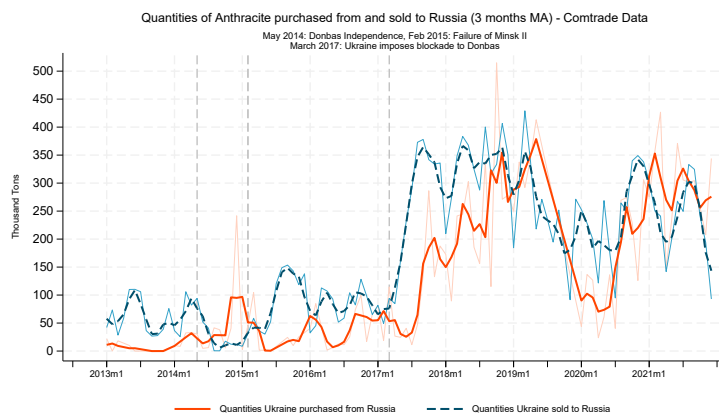


Figure 3: Ukrainian re-imports of anthracite from Russia.

We take the close correspondence between the post-blockade increase in Russian imports *from* Ukraine and Russian exports *to* Ukraine as strongly suggestive circumstantial evidence that this imported coal was, in effect, blockaded anthracite that was reexported via Russia. Indeed, it is otherwise hard to explain the high volume of bidirectional trade in the same commodity product, given that nearby anthracite sources within Russia had largely been depleted, and that most of Russia’s operating anthracite mines at the time were located in Siberia, at the opposite side of the vast country. While it is in theory possible to discern the source of anthracite based on chemical testing, very little was done to determine the origin of Russia’s exports at an economically significant scale (Warrick and Mufson, June 12, 2020; Belokobylskyi, 02 October, 2017). Also, whether Ukraine was importing Donbas anthracite specifically or simply drawing on its (fungible) expanded supply of anthracite coal derived from Donbas to export to Ukraine, the net economic consequences are identical.

4.3 Economic consequences and the division of rents from the blockade

In our final set of results, we provide suggestive evidence on who benefited from the routing of trade from Donbas to western Ukraine via Russia. Russian traders stood to benefit from both sides of the transaction.

¹⁴See, e.g., “Ukraine power company boss detained over botched coal deal,” *Reuters*, December 5, 2014.

The blockade gave Russia a monopsony position in purchasing anthracite, and given the challenges faced by Ukraine in sourcing anthracite on global markets (described above), Ukraine’s demand for Russian delivery of anthracite may also have been quite inelastic, i.e., Russia may have had a monopoly position in selling to Ukraine.

A natural approach to examining these two possibilities is to compare prices paid for Russian anthracite imports from Donbas and those paid by Ukraine to import anthracite from Russian to a world benchmark price for anthracite. Intuitively, to the extent that Donbas anthracite is sold to Russia at prices below the world benchmark price, it captures monopsony power, since it suggests that Donbas is under-pricing its coal because of difficulties in selling to other export markets. The quantity purchased by Russia times the price gap between the benchmark and Russian purchase price thus measures monopsony rents. Similarly, to the extent that the price Ukraine pays Russia is higher than the benchmark world price, it captures monopoly rents, reflecting, for example, the fact that Ukraine cannot easily source anthracite from other exporters (as evidenced by their failure to contract for delivery from South Africa). The quantity sold by Russia times the price gap between the Russian sale price and the benchmark price gives a measure of monopoly rents.

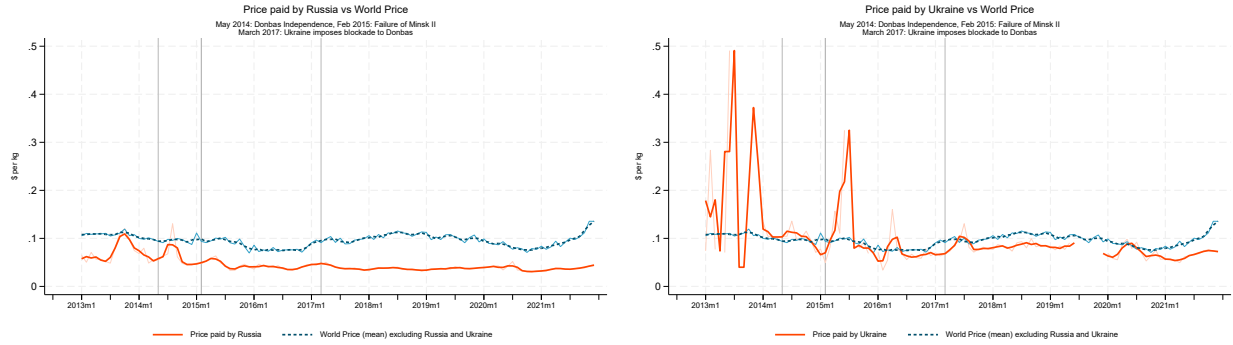
We begin by defining a world (benchmark) price of anthracite as follows:

$$Price_{world,t} = \sum_i w_{it} \frac{value_{it}}{quant_{it}} \quad (2)$$

where $value_{it}$ and $quant_{it}$ are the value and quantity of anthracite that country i reports as exports to the world at time t , and w_{it} is i ’s share of global exports at t .¹⁵

We first provide a simple comparison of the constructed world price with prices of Russian imports from Ukraine and Russian exports to Ukraine. Figure 4 plots Russian purchase price (the price of anthracite paid to Donbas) in the left panel and Russian sale price (the price of anthracite exports to Ukraine) in the right panel. In both cases we include as reference the world anthracite price as constructed above. (In Appendix Figure A12, we show the figure excluding excluding any trade that originated from Russia or Ukraine in calculating the world price, and observe near-identical patterns.) We observe that over our entire sample period (including the pre-conflict period), Russia consistently pays less for anthracite from Ukraine than the world price, but sells to Ukraine at approximately the world price. Moreover, after the blockade, despite the rise in global anthracite prices, the price Russia paid Donbas for anthracite remained low, with the gap between the two widening as a result of higher world prices. By contrast, the price paid by Ukraine for Russian anthracite closely coincides with the world price even after the blockade. We take the patterns in this figure as suggestive evidence that Russian traders extracted monopsony rents as a result of the blockade,

¹⁵We considered other options – notably the Rotterdam price, as suggested by one expert. However, we found that any individual time series was subject to very substantial idiosyncratic fluctuations, which surely obscures the shifts in value that should be attributed prices and quantities that are impacted by the Donbas conflict and the resultant sanctions.



(a) Price paid by Russia vs World Price

(b) Price paid by Ukraine vs World Price

Figure 4: Prices paid by Ukraine and by Russia vs World Price

buying from Donbas at below-market prices. Perhaps because of the availability of alternative suppliers – albeit imperfect substitutes – we see no evidence of monopoly pricing in sales from Russia to Ukraine.

We also note that Figure 4 shows that prices are volatile in the earlier part of the sample. This surely reflects in part the very low trade volume in the pre-embargo years. We return to this point below when we estimate monopsony and monopoly rents.

A natural alternative interpretation for the patterns in Figure 4 is that the large gap in Ukraine’s purchase price – a gap that widened with the blockade – might have a cost-based explanation. This could be the case if the marginal production cost in Donbas’s mines was particularly low, and perhaps even fell during the blockade. Similarly, it is possible that monopoly rents did indeed exist, but are obscured by a marginal cost gap.

To explore the plausibility of cost-based explanations, we implement two “placebo tests” that, we argue, would likely capture differences in extraction and/or transport costs. First, we examine the export prices of anthracite from Ukraine and Russia to other destinations. If the lower anthracite export price we observed earlier is due to lower production cost, then we would expect the export price to be lower for all buyers. As a second approach, we consider trade in iron, the one other commodity for which there is bilateral trade between Russia and Ukraine, to check for the presence of general shifts in border or transportation costs, which we would expect to show up for other commodities traded between the two countries.

Focusing first on exports of anthracite to other destinations, in Figure 5 we plot the price that major importers (defined by imports from Ukraine before Donbas independence) paid for anthracite imports. In each panel we plot the price at which the country imported anthracite from Ukraine (orange solid line) and Russia (blue dashed line). The title of each panel provides the share of imports that came, respectively, from Ukraine and from Russia before independence. As the graphs show, the price of imports of anthracite from Russia and from Ukraine closely track each other in all countries. The gray dotted line, which shows the price at which Russia purchased anthracite from Donbas, consistently lies below the other lines. This result is hard to reconcile with a production cost interpretation, and again lines up with monopsony power as the

Price of imports of anthracite from Ukraine and Russia by country of importers

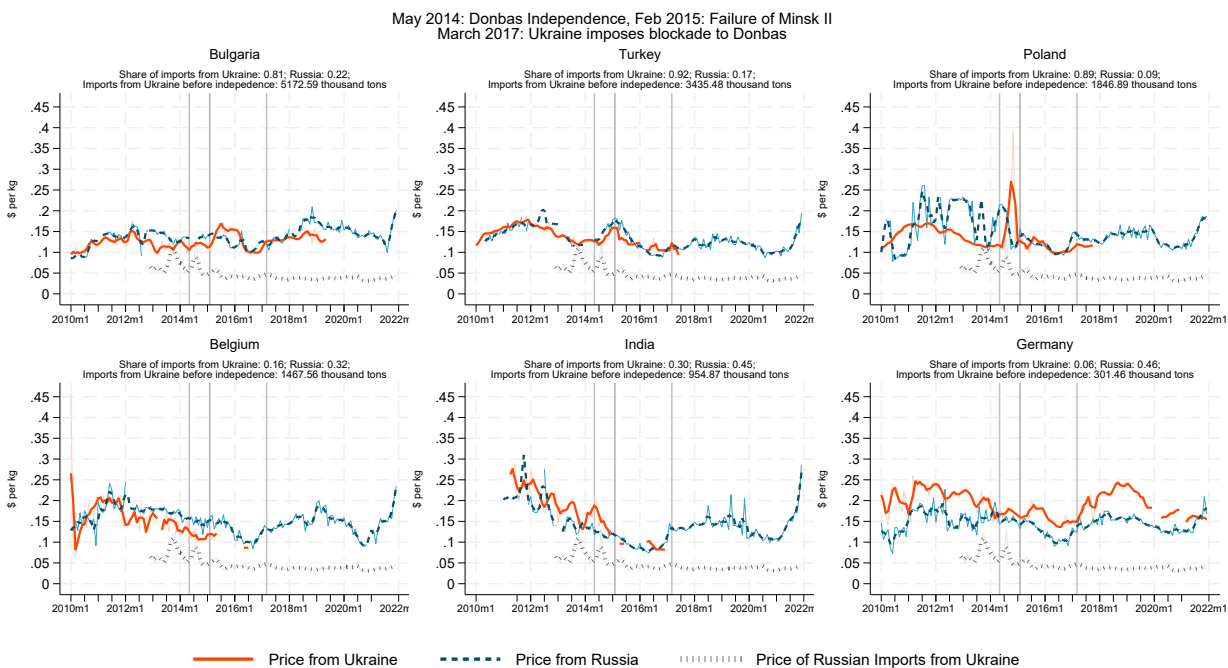


Figure 5: Price of imports from Ukraine versus price of imports from Russia for major pre-independence importers from Ukraine. The gray dotted line is the price of imports from Ukraine to Russia.

primary source of the price gap.

We now turn to trade in iron between Russia and Ukraine. We focus on iron for two reasons. First, it was the only other commodity that was traded bilaterally between the two countries over the period we study; and second, iron extraction and processing was not concentrated in Donbas and, therefore, was not affected by the blockade. Russia therefore should have not been able to exploit its monopsonistic power against Ukraine – if Russia were unwilling to purchase its iron, Ukraine could have targeted buyers in other countries. The left panel of Figure 6 shows the quantities of iron traded between Russia and Ukraine, while the right panel shows the value per unit. While there is a small short-term increase in Russia’s reported iron imports after the blockade’s imposition, there is no clear change in the price at which iron products trade between the two countries.

Given that iron (HS code 72 in comtrade data) includes different subtypes, the aggregates we report in the preceding figure may mask shifts in the type or quality of iron traded. To address this concern, we replicate the graphs above for 4-digit HS subcategories of iron for which there was bilateral trade. These results appear in Appendix Figure A10 and Figure A11; in neither case do we observe any shift in prices around the blockade.

We now turn to estimating the economic rents associated with the importation of Donbas coal, based on

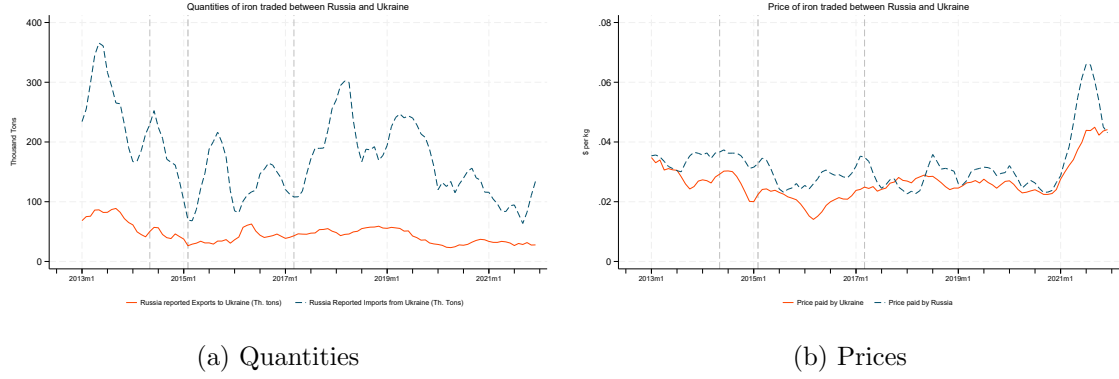


Figure 6: Quantities and value per unit of iron traded between Russia and Ukraine

the price differentials in Figure 4 relative to a world benchmark price. We define monopsony rents as the gap between what Russia pays Ukraine and the world price for anthracite, times the quantity of Ukraine-Russia exports (i.e., the extent to which the purchase is “underpriced”), or:

$$MNPSNY\ Rents_t = (Price_{world,t} - Price_{RUS\ pays\ to\ UKR,t}) \times Quantity_{RUS\ imports\ from\ UKR,t} \quad (3)$$

In a similar way, we define monopoly rents as the gap between what Ukraine pays Russia for anthracite, times the quantity of Russia-Ukraine exports (the extent to which the purchase is overpriced), or:

$$MNPLY\ Rents_t = (Price_{UKR\ pays\ to\ RUS,t} - Price_{world,t}) \times Quantity_{UKR\ imports\ from\ RUS,t} \quad (4)$$

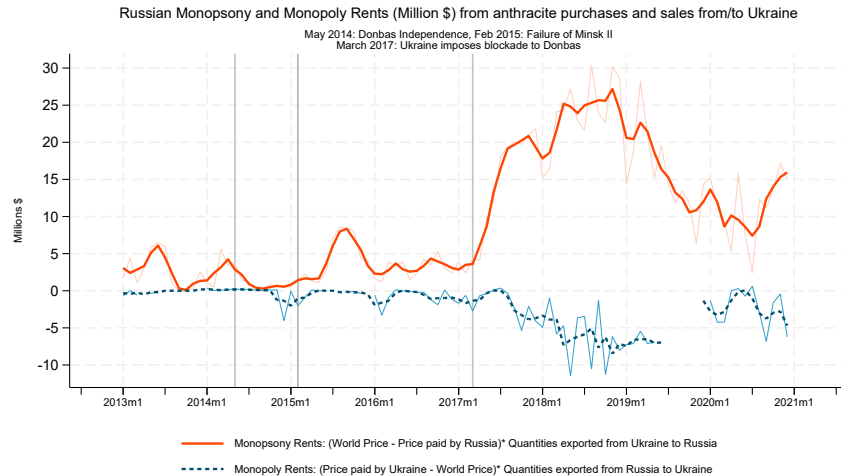


Figure 7: Monopsony vs Monopoly Rents

Figure 7 plots the values of monopsony and monopoly rents over our sample period. As expected given the price gaps we document above, we observe substantial monopoly rents, which increase sharply through a

combination of higher prices and far higher Russian imports after the onset of sanctions. Overall, estimated monopsony rents almost quadruple within a few months after the blockade, with a net increase of more than US\$12 million per month. By contrast, monopoly rents are low or even negative (reflecting possibly low transport costs between Russia and Ukraine, compared to other destinations, though this would also imply that our monopsony estimate is biased downward).

It is beyond the scope of our the data to trace the ultimate owners of the importers that might have benefited from these rents, but we note that there is anecdotal evidence that political connections likely played an important role. Of particular note, in 2018-19, a monopoly on Donbas importation was awarded to Sergey Kurchenko, a close associate of the deposed pro-Russian president of Ukraine, Viktor Yanukovich. Even in earlier years, a company associated with Kurchenko, Gaz Alyans, was among the dominant anthracite importers in Rostov, the Russian province adjacent to Donbas.¹⁶

4.4 Countries substituting Ukraine Imports with Russian Imports

It is possible that the blockade’s negative consequences for Ukraine extend beyond its own consumption needs. We have argued that some of the coal that Donbas sent to Russia ended up back in Ukraine; but it may also have been exported elsewhere, shielded from embargo as a result of being relabeled as sourced from Russia. That is, the blockade forced nations that had previously sourced coal from Ukraine to find alternative supplies, potentially from Russia. This afforded Russia an opportunity to expand its global market share for coal, building on increased supply sourced at low cost from Donbas.

Figure 8 plots the relative share of anthracite imports over time by region of origin. We exclude Russia and Ukraine from the sample of importing countries, to avoid conflating the effect with trade between the two countries. The onset of conflict in 2014 is associated with a sharp decline in global imports from Ukraine. This change was fully compensated by a proportional increase in imports from Russia. Following the blockade, the share of imports from Russia expanded even further, gaining almost 10 additional percentage points against a commensurate loss in the market share from other countries.

We conclude this section by noting that, despite these consequences, the blockade was popular with Ukraine’s citizens (Kostanyan and Remizov, 2017) – if anything, the blockade coincided with a modest increase in the fraction of Ukrainians who felt that the country was headed in the right direction, which was sustained despite the resultant economic hardship.¹⁷ That is, despite the undoing of sanctions which served to benefit Russian traders, the blockade was politically popular, which explains its maintenance despite its lack of efficacy and cost to Ukraine’s own economy.

¹⁶See, e.g., Black Earth, a report from the data analytics NGO, C4ADS. Last accessed October 27, 2023. (Jack and Herschlag, 2020)

¹⁷Public Opinion Survey of Residents of Ukraine, last accessed May 5, 2023.

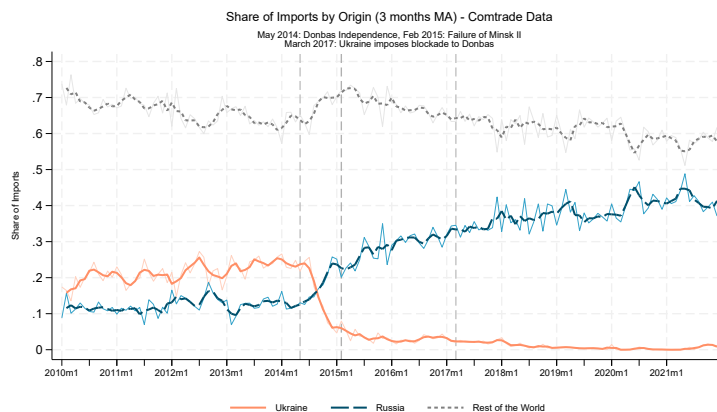


Figure 8: Average share of countries' imports of anthracite by origin.

5 Conclusion

In this paper, we highlight the geopolitical challenges to economic sanctions. We show that the blockade of Donbas by Ukraine led to an increase in anthracite imports by Russia, and a corresponding increase in Russian exports to Ukraine and the rest of the world. Our findings highlight the difficulties in imposing economic costs on a target region. In our case, we emphasize the challenges that result from incomplete participation in the blockade, and when there are difficulties finding alternative sources for the blockaded products. In our case study, we find that the blockade primarily harmed the country imposing sanctions.

We hope that future work may explore – both theoretically and empirically – the broader conditions under which sanctions are likely to impact targeted economies, versus the economies of nations that impose sanctions.

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Appendix - for online publication

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A	Maps	A2
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A Maps



Figure A1: Map of Donbas. Source: *Washington Post*, June 12, 2020



Figure A2: Location of anthracite basins in Ukraine. Source: International Energy Agency, 2012

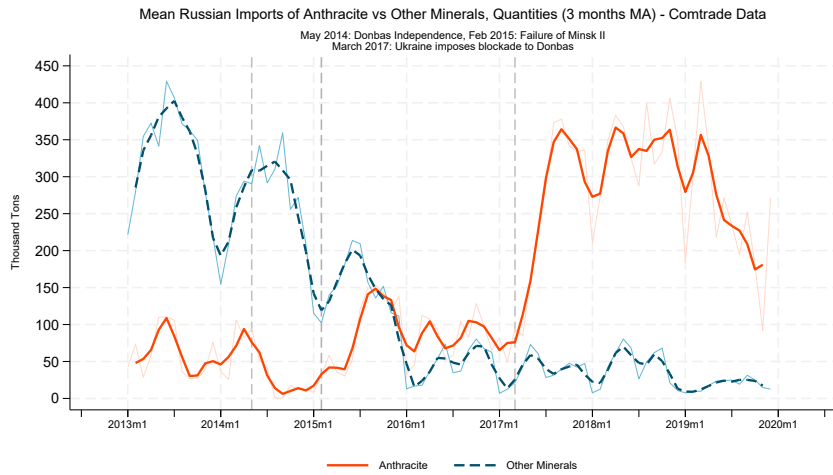
B Descriptive Graphs: Anthracite vs Other Minerals



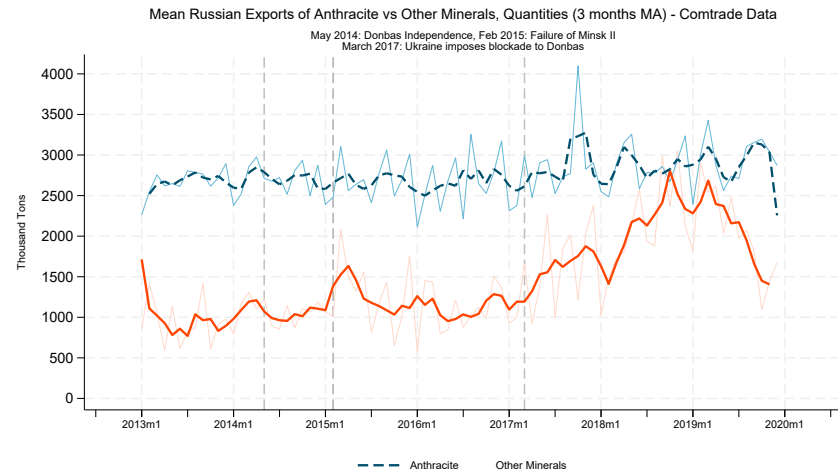
(a) Russian imports from Ukraine

(b) Russian exports to the World

Figure A3: Imports and Exports to and from Russia: anthracite versus other minerals



(a) Russian imports from Ukraine



(b) Russian exports to the World

Figure A4: Imports and Exports to and from Russia: anthracite versus other minerals

C Electricity Sources in Ukraine

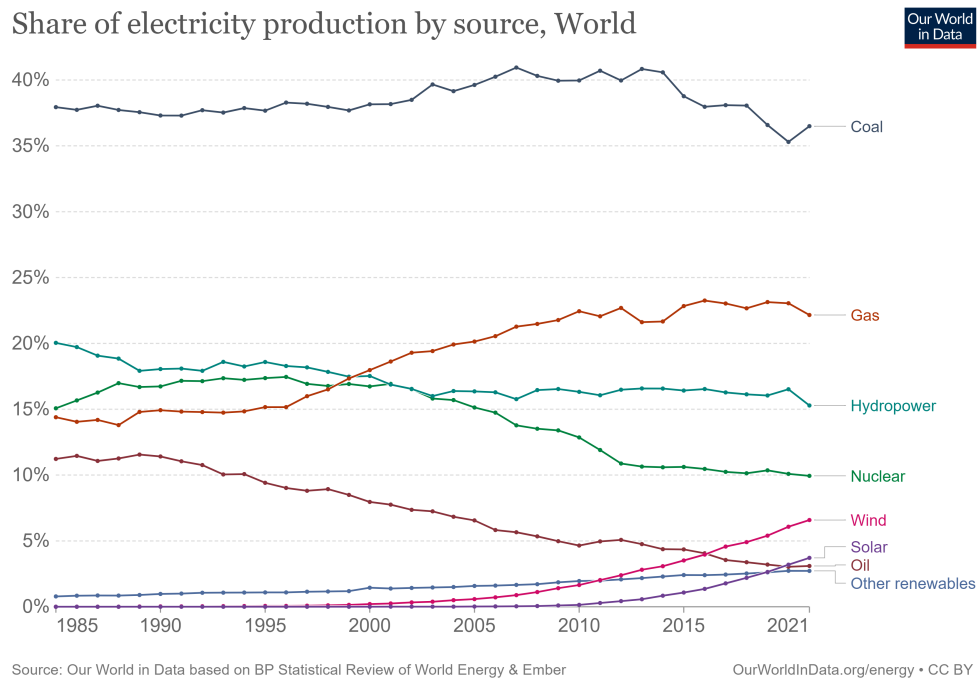


Figure A5: Ukrainian sources of energy over time. The figure is sourced from: “Our World in Data” and is based on BP Statistical Review of World Energy.

D Imports of Anthracite by Origin to Ukraine

Quantities of Ukrainian Imports of anthracite by country of origin
Countries from which Ukraine reported importing between 2010 and 2021
Tons, Moving Average by Quarter

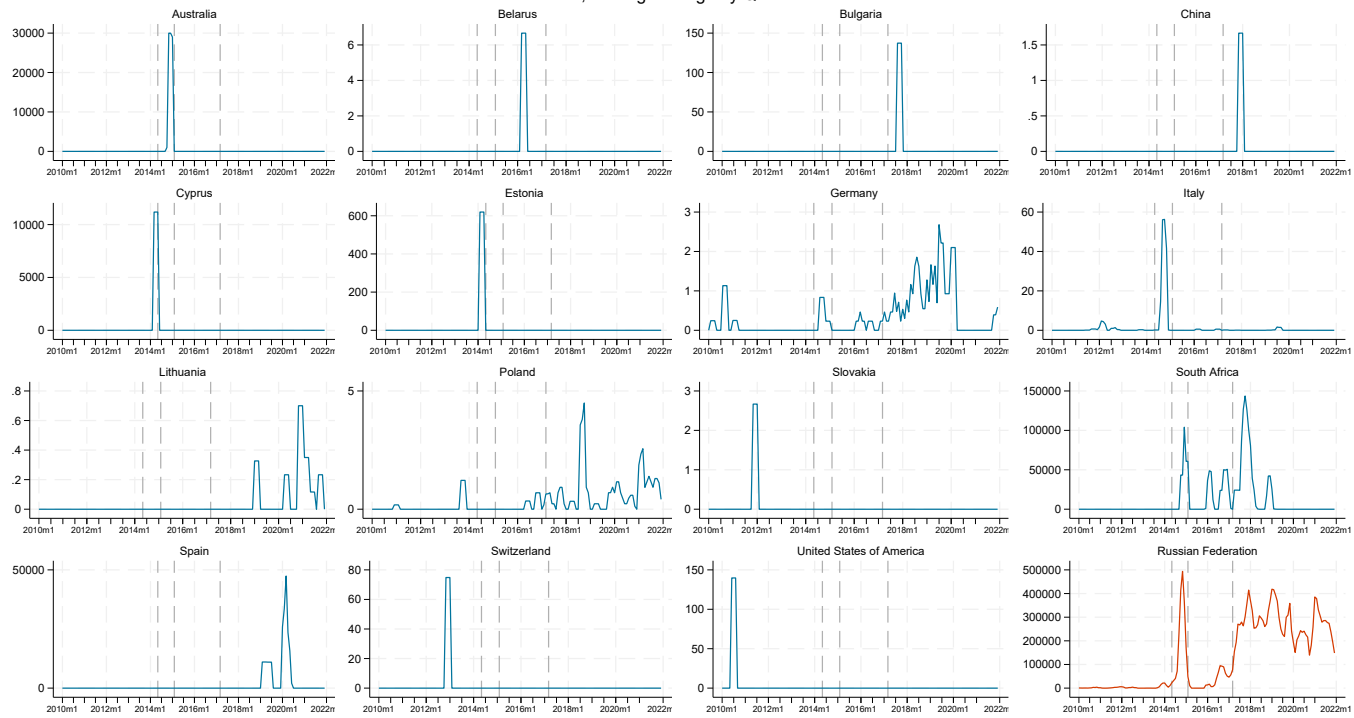


Figure A6: Ukrainian reported imports of anthracite by country of origin

E Bilateral Trade with Russia by Commodity

Quantities of Ukrainian Exports and Imports to and from Russia by mineral

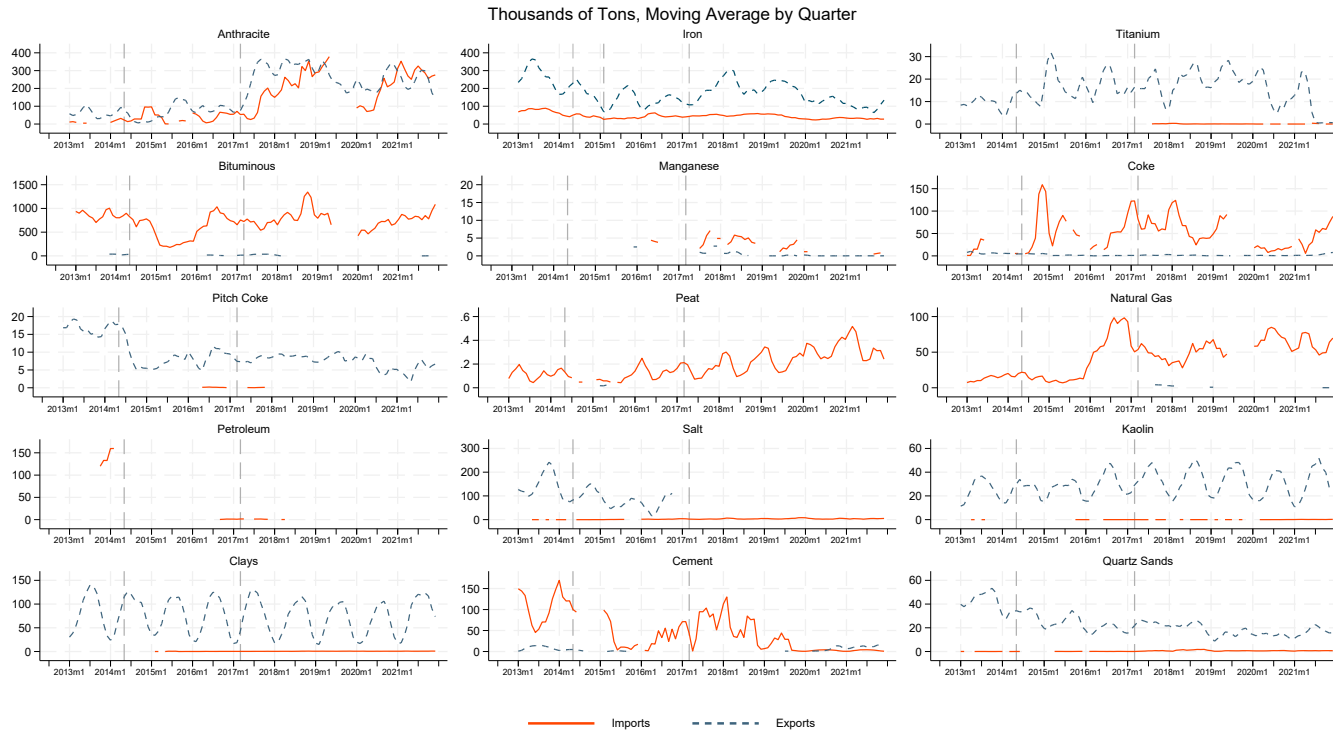


Figure A7: Imports and Exports between Ukraine and Russia by commodity

F Triple Difference

To ensure that the patterns shown in Figure 2 do not capture a general shift in trade amidst the turbulence created by the Donbas conflict but they rather capture a peculiar pattern in anthracite trade, we extend the diff-in-diff analysis to multiple minerals to run a triple-difference analysis respectively for: I) imports of anthracite from Ukraine versus imports of other minerals from Ukraine and II) exports of anthracite from Russia versus exports of other minerals from Russia.

Specifically, we estimate the following equation for imports:

$$\log(Imports_{mjt}) = \sum_{\substack{t \leq 2019q4 \\ t \geq 2013q1, \neq 2014q1}} \beta_t \times Q_t \times Russia_j \times Anthracite_m \quad (5)$$

$$\theta_{tj} + \kappa_{mt} + \lambda_{mj} + \epsilon_{mjt}$$

where $\log(Imports_{mjt})$ is the logarithm of the quarterly average of imports of mineral m from Ukraine to country j in quarter t . We include a set of fixed effects for: quarter by importing country θ_{tj} , quarter by mineral κ_{mt} and importing country by mineral λ_{mj} . We are interested in how Russia-reported ($Russia_j$) imports of anthracite ($Anthracite_m$) evolved over time (Q_t) relative to other countries and commodities. The coefficients β_t estimate the difference between Russian imports of anthracite versus other countries' imports of anthracite, and versus other countries' and Russian imports of other commodities from Ukraine. We take as a reference period the second quarter of 2014, when Donbas declared independence from Ukraine.

We next run an event study as in Equation 5 using as dependent variable the quarterly mean of the exports of minerals from each country to the rest of the world:

$$\log(Exports_{mjt}) = \sum_{\substack{t \leq 2019q4 \\ t \geq 2013q1, \neq 2014q1}} \beta_t \times Q_t \times Russia_j \times Anthracite_m \quad (6)$$

$$\theta_{tj} + \kappa_{mt} + \lambda_{mj} + \epsilon_{mjt}$$

In Figure A9, we plot the coefficients of these estimate.

These figures reveal patterns that are very similar to those in our difference-in-differences approach.

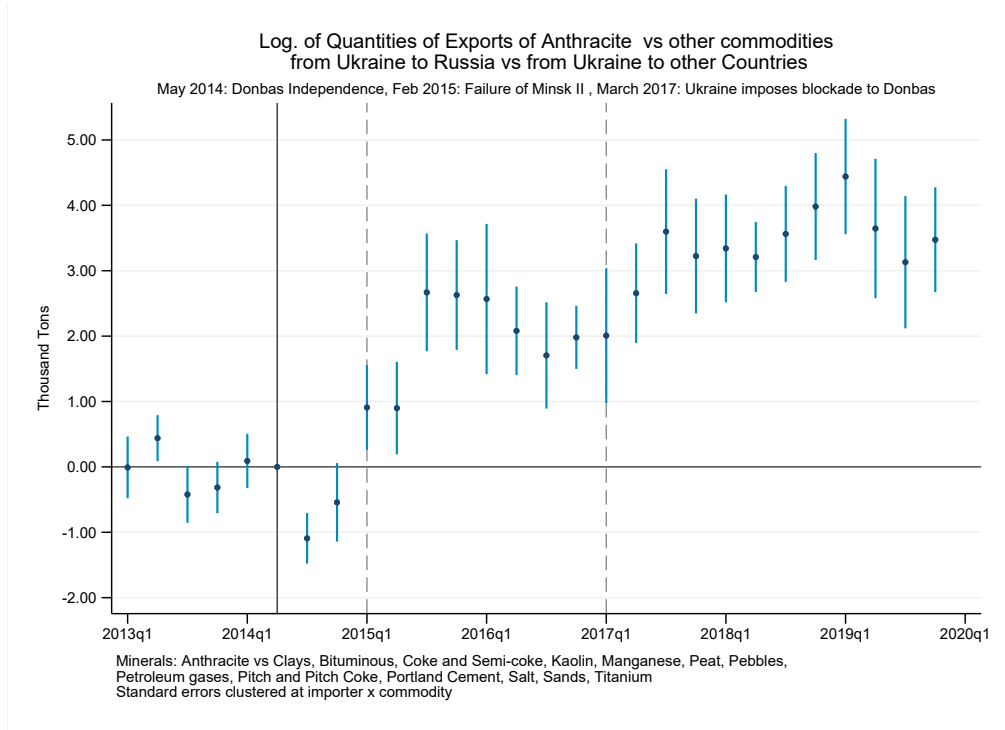


Figure A8: Triple-Difference event study evidence on imports of anthracite from Ukraine (to Russia versus to other countries, anthracite versus other minerals).

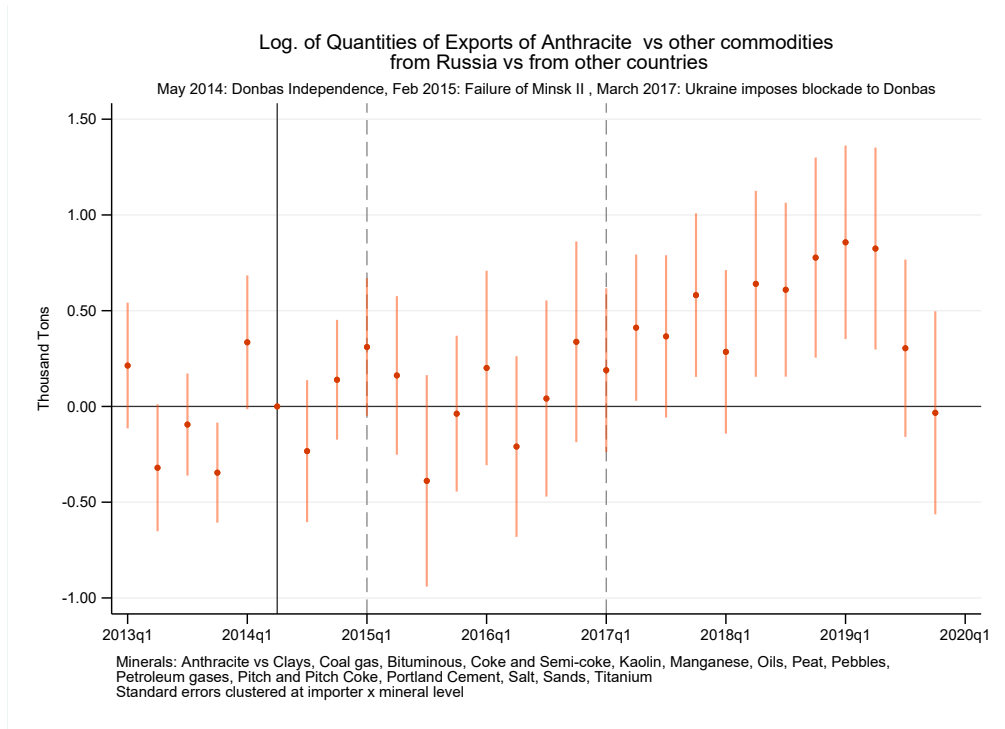


Figure A9: Triple-difference event study evidence on exports of anthracite from Russia ((versus from other countries, anthracite versus other minerals)

G Trade in Iron between Ukraine and Russia

The panels of Figure A10 show the pattern in the trade of subcategories of iron (HS 4 digit categories) between Ukraine and Russia over the period of study. The panels of Figure A11 plot the value per unit over time of the same subcategories. As both figures show, the value per unit of the subcategories of iron change following the blockade.

Quantities of Ukrainian Exports and Imports of Iron subcategories to and from Russia
Sample: Subcategories of iron traded bilaterally

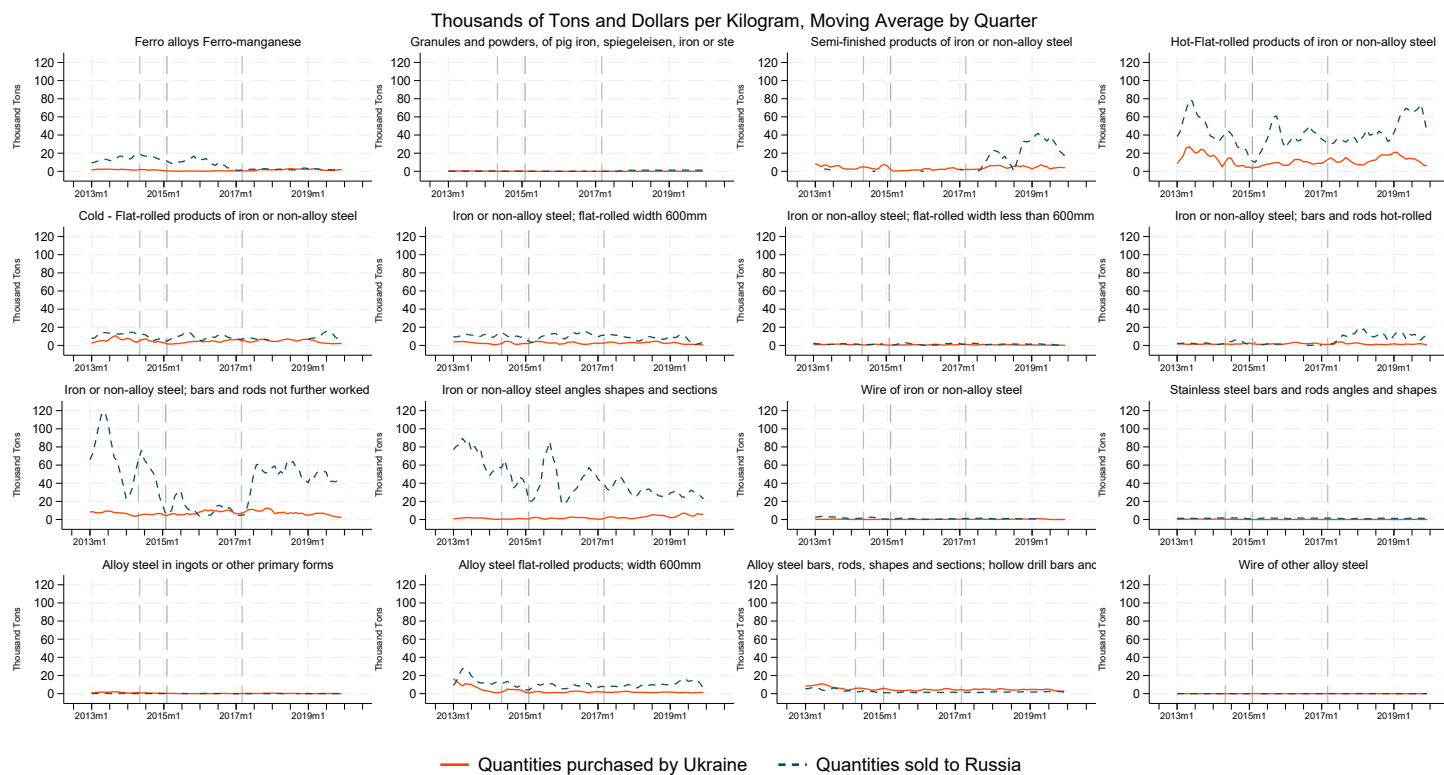


Figure A10: Quantities of subcategories (HS - 4 digits) of iron traded between Ukraine and Russia.

Prices of Ukrainian Exports and Imports of Iron subcategories to and from Russia
 Sample: Subcategories of iron traded bilaterally

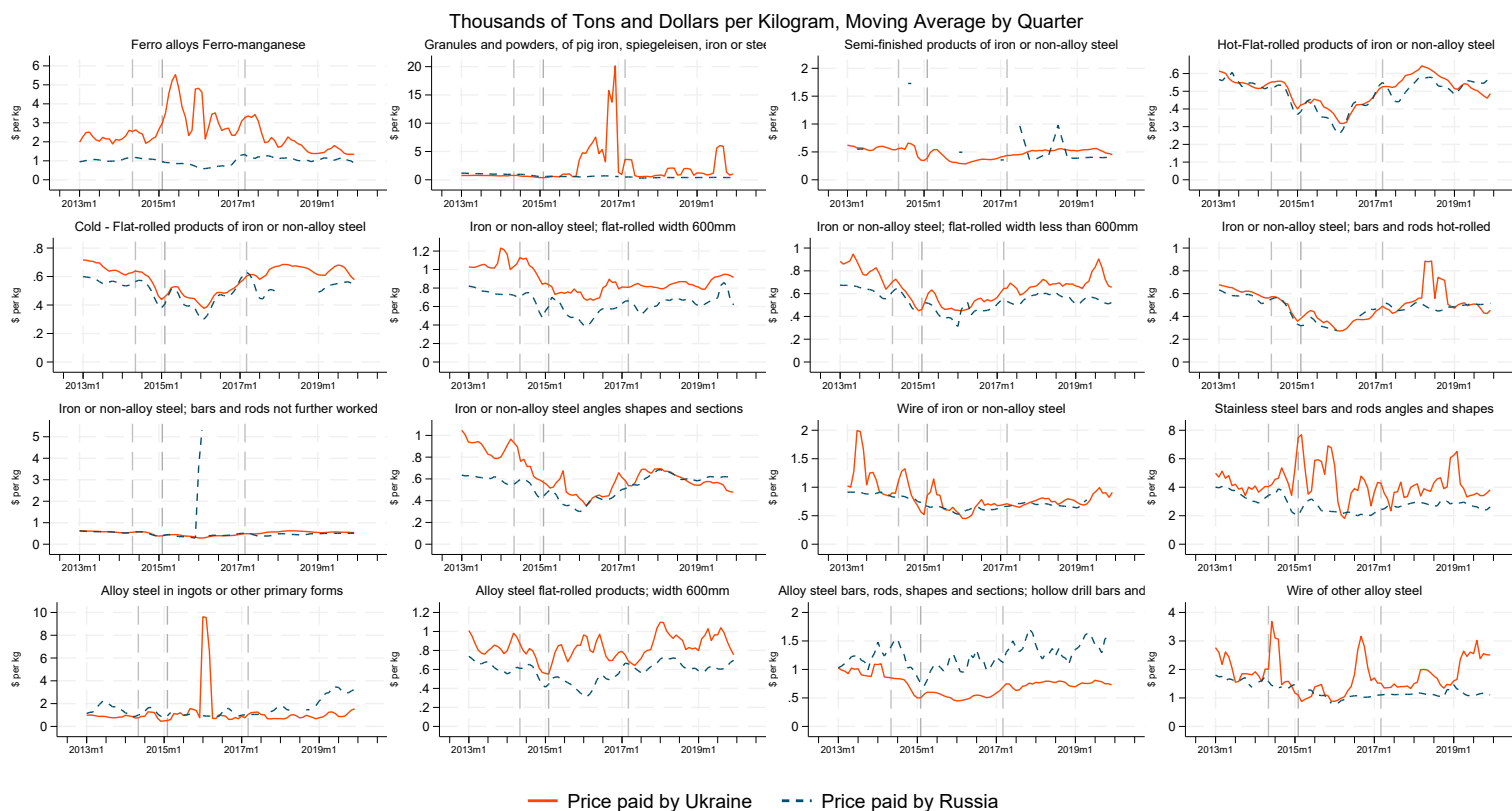


Figure A11: Value per unit of subcategories of iron traded between Ukraine and Russia.

H Exclude Russia and Ukraine from world price

The left panel of Figure A12 shows the difference between the price Russia paid to Ukraine for anthracite and the world price; the right panel plots the price Ukraine paid to Russia for anthracite and the world price.

We exclude the values of the exports from Russia or Ukraine when computing the world price. That is:

$$Price_{world,t} = \sum_{j \neq Russia, Ukraine} w_{jt} \frac{value_{jt}}{quant_{jt}} \quad (7)$$

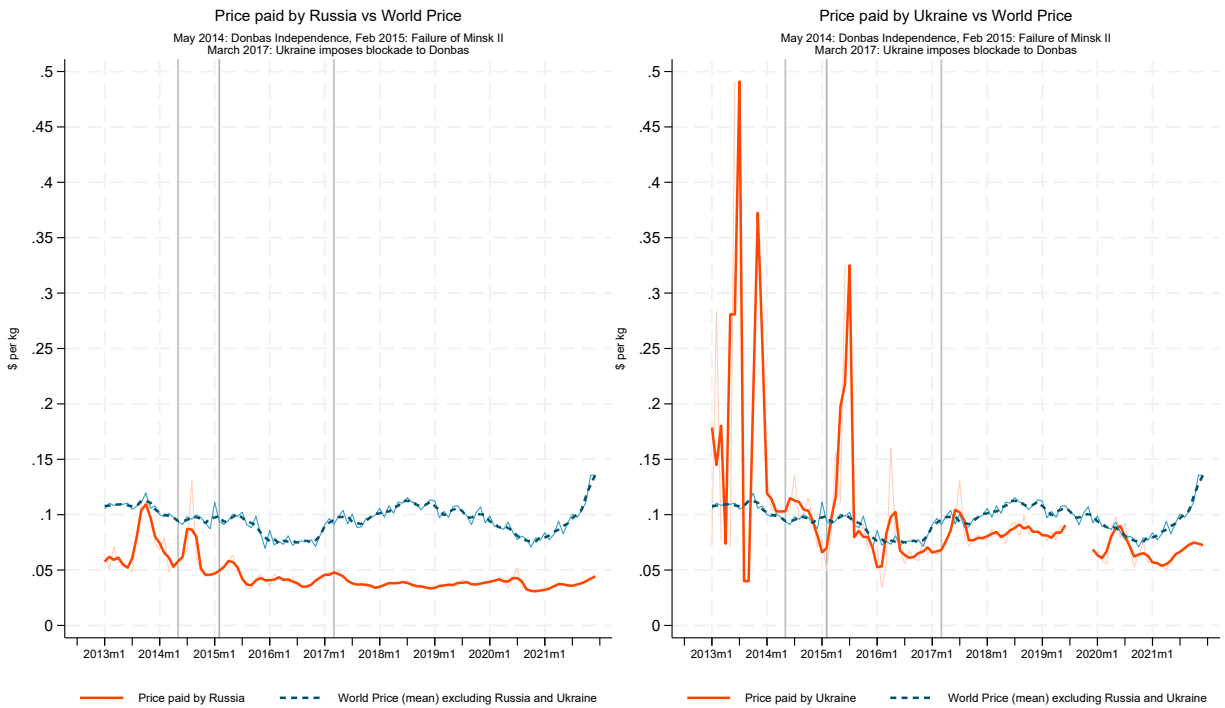


Figure A12: Monopsony vs Monopoly Prices