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Abstract

Since the Russian invasion of Ukraine on February 24, 2022, the West has been intensively discussing its support strategy. Hawkish positions of strengthening Ukraine via armaments, financial resources, and sanctions against Russia compete with dovish views of avoiding further escalation of the military and geopolitical conflict. We analyse how international financial markets perceived this news. We create a comprehensive data set of news related to the war and measure reactions of five key financial markets. The results show that stronger support for Ukraine had a positive impact after the first weeks of the war when the Ukrainian position in the war improved, but a negative or at least less positive influence before. Thus, financial markets seem to have perceived support as a risk of further escalation threatening global economic activity in the first phase. However, a hawkish line was a positive signal for financial markets after the change in perceptions.

Keywords: Conflict, Event Study, Financial Markets, News, Russia, Sanctions, Ukraine.

JEL: G14, H56.

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1. Introduction

Since February 24, 2022, the Russian war against Ukraine has dominated the headlines and the international political agenda. From the local nature, which was characteristic for battles through 2014–2022, the events very soon unfolded into a full war. Beyond the tragic local consequences, war, sanctions, and the energy crisis have had an immense impact on the global economy (e.g., Garicano et al. 2022, Guenette et al. 2022). This concerns many sectors such as energy, agriculture, and commodities. For example, energy-intensive manufacturing was immediately affected after the start of the war (Hutter and Weber 2023), prices showed a quick and strong reaction (Ozili 2022), and trade flows were redirected (Hutter et al. 2023). Many Western governments support Ukraine with armaments, financial resources (Antezza et al. 2022), and sanctions against Russia without a direct involvement in the battlefield. In the underlying study, we analyse the stance of economic agents on the war and third-party involvement through the lens of financial markets reactions: in how far have markets valued either stronger Western engagement or conflict avoidance?

News of war events have become important not only locally but also for global financial markets. Empirical evidence shows that conflicts in the world typically impact stock and commodity prices (Schneider and Troeger 2006, Guidolin and La Ferrara 2010). Before the Russian attack in 2022, the Russian-Ukrainian war has been shown to affect Russian and Ukrainian stock markets in 2014 (Hoffmann and Neuenkirch 2017). Indeed, embargoes entailed clear price-increasing and welfare-diminishing effects (Hinz and Monastyrenko 2022). Regarding financial markets, the 2022 Russian war against Ukraine was not an exception. An OECD (2022) paper notices the immediate impact of the invasion causing a sharp rise in commodity prices and severe equity price declines that mainly affected Russian markets, but also several emerging markets. Spillovers also have affected international banks, particularly European banks with substantial exposures to Russia. The volatility was elevated in US equity and commodity markets. Many studies unveil that the effect of geopolitical risk on market prices negatively depends on those markets' distances from the conflict region (Assaf et al. 2023, Federle et al. 2022, Chițu et al. 2022, Hossain and Masum 2022). However, the stock markets and commodities response to the Russian invasion was noticeably smaller compared to the Covid-19 crisis and the Global Financial Crisis (Izzeldin et al. 2023).

The literature features many studies investigating the direct effect of wars on financial markets. In contrast, international (mostly military) aid as a form of a third-party involvement is mainly addressed as determinant for the duration of wars (Shirkey 2012) or in the context of a country's post-war development (Kim 2017). We fill this gap by analysing whether military and financial aid is regarded by the markets as a stabilising force or as a sign of increased probability of war escalation, using the example of the Russian war against Ukraine. To the best of our knowledge, no research has been conducted to separate the effects of international aid or other third-party

involvement on investors' sentiment from other conflict-related news, which is the primary focus and main contribution of our paper.

With regard to the Russian attack, appropriate reactions have been intensely discussed in the West. Concerning financial aid, military aid, and sanctions, typically hawkish and dovish positions have to be distinguished. Our work sheds light on the significance of war-related news for financial markets, especially focusing on such decisions of the West. We uncover in how far specific news are conceived as positive or negative signals from the viewpoint of the world economy. Military aid, financial aid, and sanctions may be seen either as stabilizing the Ukrainian position or as steps of further escalation threatening global economic activity.

We cover five key financial markets, namely US and European stocks (mirroring a "global"/European general business outlook), oil and gas for the energy dimension, and wheat representing agriculture. As an empirical basis, we create a systematic data set on news from Ukraine linked to the Russia-Ukraine war. Our sample period spans from February 24 to July 12, 2022. Besides military aid, financial aid and sanctions, news categories comprise combat escalation, the export situation (concerning agriculture, mining, and logistics), and the local situation (concerning resilience, humanitarian issues, and economic development). The latter categories are crucial for our analysis as control variables. For instance, it is likely that news on sanctions often coincide with escalation, so escalation must be controlled for in order to isolate the effect of sanctions. Our comprehensive news data set allows for such differentiations.

Regarding military aid, financial aid, and sanctions, it is of special interest if perceptions changed over time as the war saw dramatic turns and geopolitical beliefs were re-evaluated. For instance, was adopting a hawkish line seen more critically in the first phase of the war and more positively when Ukraine recorded successes? Preliminary evidence (OECD, 2022) indicates that after an initial deterioration of risk appetite following the Russian invasion of Ukraine, performance of global equity markets and credit market conditions have improved since mid-March. Accordingly, we check for the potential change in perception of the different types of the news over time in the five financial markets by performing automated breakpoint tests.¹

Indeed, we find such a break in different markets mainly after the first six weeks of the war. Market perception varied over time and aid and sanctions were received much more positively in the second subsample. That is, clear support for Ukraine is now a

¹ A related branch of the existing literature examines time-variation in asset price responses. A popular focus hereby is to distinguish the reaction during expansions and recessions (e.g. Andersen et al. 2007) or with a varying degree of volatility in financial markets (e.g. Ehrmann and Fratzscher 2005). Other time patterns, such as a secular decline or a structural break, are also considered in the literature (e.g. Faust et al. 2007, Fratzscher 2009, Ehrmann et al. 2011). An early contribution using a time-varying parameter approach is provided by Cocco and Fischer (1989) and a more general test for time variation is given in Goldberg and Grisse (2013). However, our sample period is too short for these (more sophisticated) methods to detect time variation in the response of financial markets. With less than 100 observations and several categories of war-related news we have to resort to automated structural break tests.

positive sign for international markets, while it was less so in the first weeks when war prospects were worse and support may have been seen as an escalation risk. In a similar vein, Chițu et al. (2022) show that for the first 14 days into the war, the effect of the physical proximity to Kyiv was more visible in stock returns than 40 days into the war. Importantly, our results also confirm that the war and escalation in general had harmful effects on international financial markets. Finally, we document the robustness of our results with respect to an alternative timing of the war-related news and potential non-linearities in the markets' response to these. We also show that it is news about sanctions that matters for markets and not the number of actually sanctioned Russian entities. The same holds for news about combat escalation as compared to actually observed territorial gains or losses.

The remainder of this paper is structured as follows. Section 2 outlines the course of the war and potential breakpoints in detail. Section 3 provides some theoretical background on the financial market reaction to third-party involvement in times of a war and why this reaction might be state-dependent. Section 4 describes the creation of the news data set and the empirical methodology. Section 5 discusses the estimation results. Section 6 concludes.

2. The course of the war

Within our sample period, the course of the war has made an important turn from the fast-paced advance of the Russian forces during the first month to the successful defensive operations of Ukrainian forces and (even) counteroffensive operations later on. Our hypothesis is that the markets' perception of the war also has changed. Accordingly, the reaction on war-related news should be different after a (yet to be determined) breakpoint. A more detailed description and mapping of the course of the war can be found in Annex 2. Additional background information on Western aid and sanctions as well as the economic situation in Ukraine can be found in Annex 3.

The first weeks from February 24 to early April were marked by Russian rapid advance. Within less than a month, Russian troops occupied parts of the Sumy, Chernihiv, and Kyiv regions in the North, Kharkiv, Luhansk, and Donetsk regions in the East, and Zaporizhzhia and Kherson regions in the South. Thereby, Russian forces have occupied the large cities of Kherson and Melitopol, surrounded and captured Mariupol after its 86 days of resistance, and got within several kilometres distance to Kyiv and Kharkiv—two of Ukraine's biggest cities. The prevailing Western perception was that Ukraine's resistance would break within days or weeks from the time when Western intelligence data on a planned invasion was made available in December 2021. The world was preparing to hand over anti-tank guided missiles, such as NLAW and Javelins, to Ukrainian guerrillas.² During that period, a negative and defeatist sentiment

² <https://www.atlanticcouncil.org/blogs/ukrainealert/guerrilla-tactics-offer-ukraines-best-chance-against-putins-invasion-force/>.

predominated: for example, the Institute for the Study of War argued that “Russia will likely defeat Ukrainian regular military forces and secure their territorial objectives at some point in the coming days or weeks if Putin is determined to do so and willing to pay the cost in blood and treasure.”³ However, Ukraine’s successful defence and then counteroffensive in the North in early April has broken this narrative and given a start to the second period, which was and is more optimistic towards Ukraine’s perspectives on the battlefield.

By April 4, Russian troops have been pushed out of the Kyiv region and withdrawn quickly from the Sumy and Chernihiv regions, completely leaving the North. On April 13, the Russian flagman warship Moskva sank, which was even more symbolic given that this ship threatened the Ukrainian defenders during the Russian attack on Snake Island in Ukraine's territorial waters. The slow but steady shift in the global perception of the war and Ukraine’s ability to fight back might be best illustrated by the increasing complexity and firepower of weapons that the West was ready to provide to Ukraine. This is also underscored by Figure 1 that illustrates the search interest of Ukrainian users for certain types of military assistance over time.

A similar shift in the global perception occurred in the economic and political sphere. After several months of fiscal struggles in Ukraine and domestic monetary expansion to cover the gap in the state budget, Western financial aid became more regular and predictable and helped to stabilize the state finances (cf. Antezza et al., 2022). Another important turn for Ukraine was — after some initial scepticism — the acceptance as European Union (EU) candidate country in June.

Regarding economic sanctions on Russia, the US, the EU, and other countries were also moving gradually. The EU has been Russia’s largest economic partner and relied heavily on Russian energy exports (in particular natural gas), whereas the US never had a substantial economic relationship with Russia in the first place (Congressional Research Service 2022). This results in lower (expected) costs of sanctions for the US and might explain that the US launched oil and gas embargo procedures in Senate in early March.⁴ In contrast, the EU has been hesitant and only included a coal embargo into the 5th package of sanctions in early April and a phased-out oil embargo (for maritime supplies) into the 6th package of sanctions in early June.

To summarize, the course of the war changed over time and Western economic and political support for Ukraine (including sanctions on Russia) steadily increased after some initial hesitance. Therefore, one could also expect a shift in financial markets’ perception of war-related news. To check for such a breakpoint in perception during our sample period February–July 2022, one should — based on the considerations

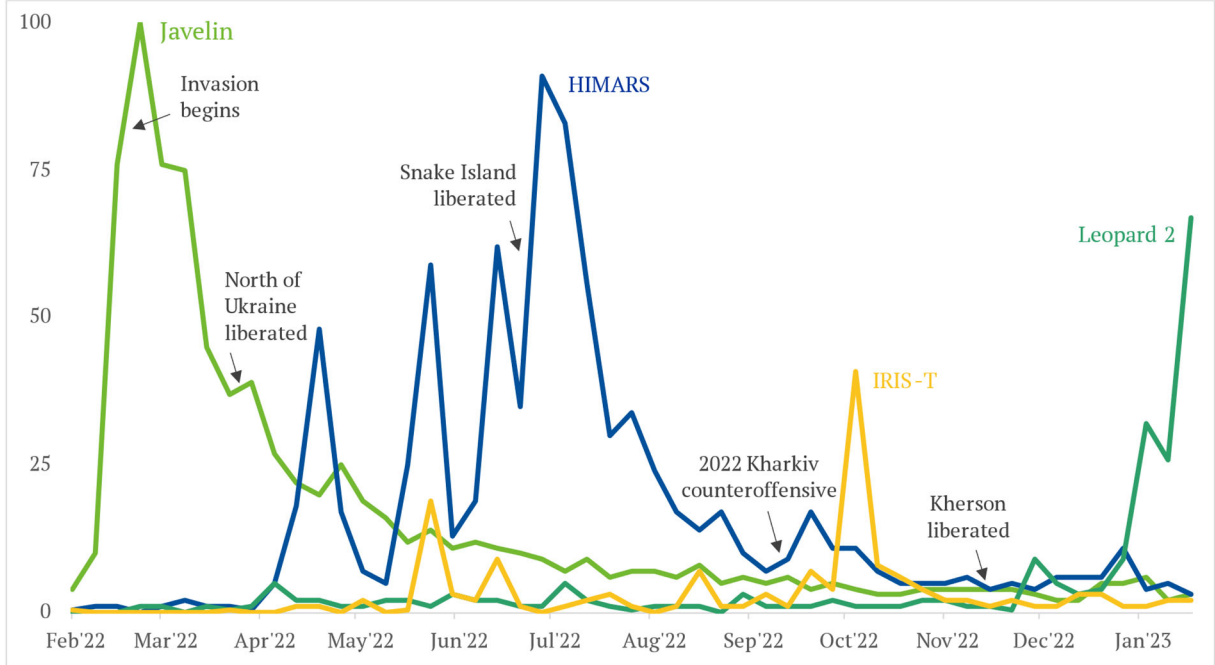
³

<https://www.understandingwar.org/sites/default/files/Ukraine%20Conflict%20Update%208%2025%20FEB.pdf>.

⁴ This resulted in the Ban Russian Energy Imports Act in early April.

above — focus on the period April–May. The automated statistical check for breakpoints (see below in Section 4) confirms this prior.

Figure 1: Search interests of Ukrainian users for certain types of military assistance



Notes: Index is set to 100 for the peak popularity.

Source: Vyshlinsky et al. (2022), updated for 2023 data.

3. Theory: financial markets, war, and third-party involvement

How do financial markets react to third-party involvement in times of war? A theoretical approach to this question naturally begins with price determination in financial markets in general. In our study, this covers the reactions of stock and futures markets. We think of (logarithmic) stock prices ($\log p_t$) as a function (g) of future (discounted) cash flows (CF_{t+1}). The expectations are, in turn, determined by the available information set at time t (I_t):

$$\log p_t = g(CF_{t+1}|I_t) \quad (1)$$

Similarly, the (logarithmic) price of a future ($\log f_t$) results as a conditional expectation (h) of the price of an asset ($\log p_{t+1}$) in period $t+1$ given the available information set at time t (I_t):

$$\log f_t = h(\log p_{t+1}|I_t) \quad (2)$$

Accordingly, changes of the stock price in Eq. (1) and the expected asset price in Eq. (2), that is, the returns, are a function of a change in the information set. Such changes in the information set are driven by news on, for instance, global economic conditions.

Any war-related news might influence the local and global environment and would also affect the returns of stocks and futures (r_t).

The set of war-related news comprises news on third-party involvement, that is, sanctions, military aid, and financial aid. Thus, financial market reactions to such news mirror how agents evaluate the economic and financial consequences of these actions. This evaluation is not necessarily universal but can itself depend on the assessment of the current conflict situation. Hence, it can be subject to state dependence. This assertion can be explained when discussing concretely the nature and potential effects of third-party involvement types.

Sanctions (see, e.g., the seminal contributions of Kaempfer and Lowenberg, 1988, 1989, 1992 and Eaton and Engers, 1992) are designed to exert economic pressure, compelling a targeted country to alter its policies. Hufbauer et al. (2009) suggest that the effectiveness of sanctions increases when they inflict significant economic damage.⁵ However, implementing sanctions against large and geopolitically powerful nations poses greater challenges, as they often possess internal resources and diplomatic alliances that can mitigate the impact of being (partly) cut off from international trade and finance. This challenge is exacerbated when the sanctioned country is resource-rich (Newnham, 2011), as it enhances opportunities for circumventing sanctions (Early, 2015) or dissuades other nations from imposing comprehensive measures against a vital trade partner in the first place. Nevertheless, sanctions by a large coalition are more likely to be successful (Kaempfer and Lowenberg, 1998). Yet, multilateral sanctions require consensus of the imposing states, which can be difficult to achieve if the senders have heterogeneous interests.

In the context of financial markets, the standard tools for analysing sanctions, such as the notions of the senders' and the target's (relative) toughness, patience, and suffering (Eaton and Engers, 1992), need to be re-evaluated. For market participants, the actual (ex post) success of sanctions is less important than a real-time assessment of the sanctions' perceived success and the timeframe thereof. This assessment can be state-dependent. For instance, Russia's swift and "successful" intervention in Georgia (2008) and its annexation of Crimea (2014) may have initially led the market to adopt a defeatist view, considering third-party involvement as merely "dragging out the inevitable." However, this perception might have shifted in light of Ukraine's successful defence and counteroffensive in April 2022 (cf. Section 2 and Annex 2). Thus, the market response to news about sanctions becomes particularly intriguing, especially given the perceived conflict situation and the uncertain short-term outcomes of sanctions against a large and geopolitically powerful country like Russia.

Official aid, including government-to-government lending and other forms of funding, is particularly crucial during times of disasters, most notably during conflicts and wars,

⁵ Gutmann et al. (2023) provide an overview of the empirical literature on the consequences of economic sanctions.

where significant surges are observed (cf. Horn et al., 2020). In the case of Ukraine, both military and financial aid emerge as vital lifelines, a notion summarized by Antezza et al. (2022) and subsequently supported by Trebesch et al. (2023). Providing *military aid* to a nation engaged in conflict with a geopolitically powerful adversary presents a dual challenge. On one hand, it carries inherent risks for the providing party (e.g., because of countersanctions; cf. Hedberg, 2018), potentially leading to more short-term uncertainty regarding the outcome of the war and the economic consequences thereof. On the other hand, in the context of aggression, military aid may be seen as serving as a safeguard for long-term peace and the democratic world order, which in turn is beneficial for financial markets. Both perspectives might be reflected in the data and are — similar to sanctions — influenced by the markets’ perceived assessment of the conflict.

Financial aid, in conjunction with military assistance, can support a conflict party and even prevent a collapse of the state in extreme cases. It played a critical role in supporting Ukraine throughout the conflict, covering over one-third of the budget expenditures during the initial months of the war (cf. Vishlinsky et al., 2022). Given that the primary donors — mainly the US and EU member states — acted within the same timeframe, the potential adverse consequences of military or financial support on the internal stability of these donor states could be similar. However, our approach is particularly well-suited to disentangle the (state-dependent) market consequences of different types of aid-related news. Ultimately, financial markets may perceive the impacts of military and financial support differently.

We conclude that the general conflict situation and its assessment will shape agents’ beliefs about the relative advantages and disadvantages of a hawkish or dovish stance of third parties. Formally, this implies that g and h will not be linear in the news terms but involve a particular state dependence. Specifically, we assume that the information set is composed as follows:

$$I_t = \Psi_t \cup \Omega_t \quad (3)$$

where Ψ contains the news and Ω holds the current assessment of the general conflict situation. For illustrative purposes, take Ω as a single binary scalar, where $\Omega = 0$ represents a dovish stance that assigns better prospects to a de-escalation path and $\Omega = 1$ represents a hawkish stance that assigns better prospects to a pushback path. Similarly, take Ψ as a single continuous scalar with the boundary values $\Psi = 0$ representing news on third-party withdrawal and $\Psi = 1$ representing news on strong third-party involvement. Then, we conjecture:

$$\left. \frac{\partial \log g}{\partial \Psi_t} \right|_{\Omega_t=1} > 0 > \left. \frac{\partial \log g}{\partial \Psi_t} \right|_{\Omega_t=0} \quad (4)$$

This means that stock prices will react positively to news on stronger third-party involvement given a hawkish stance and negatively if there is a dovish stance. With the

help of this framework, we infer that measuring a positive reaction to stronger third-party involvement implies a (more) hawkish stance and vice versa.⁶ The same holds with reversed signs for h as war-related news that are assessed as critical for commodity future markets will be connected to positive changes.

In an empirical analysis, the relationship in Eq. (4) can be uncovered by operationalising Eqs. (1) and (2). We describe our concept of measuring war-related news and the empirical approach in the subsequent section.

4. Data and empirical methodology

4.1. Data on war-related news

We construct a comprehensive dataset at the country level, focusing on Ukraine. This dataset spans from February 24 to July 12, 2022, encompassing a wide spectrum of news articles that cover military, local, and international developments. This period was particularly significant, as it witnessed the most pivotal events in the ongoing conflict and significantly shaped financial market perceptions. Subsequently, as the conflict evolved, it transitioned into a more static phase characterized by positional warfare along a relatively stable conflict line. This is also reflected in the lower frequency of news articles with an average of 46 news articles per day in February-March 2022 as compared to 33 in June-July (see also Figure A1.1 in Annex 1). Our research focusses on Western activities (including international support in terms of sanctions, military aid, and financial aid) and we control for news related to Ukraine as a country at war. Accordingly, our focus is not on Russia and its internal military and economic activities. The sole exception constitutes reports detailing sanctions levied against Russia by Western governments.⁷

The news are collected from the Interfax news agency.⁸ We chose Interfax as it is a primary non-governmental source with direct access to a broad range of information related to Ukraine. It is one of the three oldest news agencies in Ukraine, working since 1992. Interfax is beneficiary-owned by its management with no known relations to Russia. The Library of Congress posted Interfax-Ukraine among the top-3 sources of information for economic research about Ukraine.⁹ Interfax-Ukraine is also being used as a primary source of information by Ukrainian investment banks and financial

⁶ See, for instance, Weber (2011) for a comparable modelling of state dependence in expectations.

⁷ Positive or negative news for Russia could be reflected in the opposite news category for Ukraine and therefore already covered by our news indicators. Moreover, Russian stock prices should reflect such news. Accordingly, we conduct a robustness test where we control for news on Russia by including contemporaneous Russian stock returns into our main specification (Eq. (5) below). Our baseline results in Tables 2–6 remain virtually unaffected by the inclusion of this additional covariate (the results are available on request). Hence, we are confident that our results do not suffer from a bias stemming from the omission of Russian news.

⁸ See <https://en.interfax.com.ua/>.

⁹ See <https://guides.loc.gov/ukraine-economy/news>. The other top-2 sources are BNE Intellinews and Economichna Pravda.

journalists writing about Ukraine in international media and as a primary source of information for renowned international media outlets, such as Financial Times, Bloomberg, and Reuters. Interfax-sources news were most often mentioned in the international media, leaving all the remaining Ukrainian agencies far behind.¹⁰ Judging neutrality is a difficult task because any researcher might be influenced by certain view. As an additional evaluation of potential biases in Interfax reports, we conducted a check using AI instruments. While this is also subject to certain weaknesses, it attenuates the risk of human prejudice. As a result, we find that Interfax is reporting on events without introducing personal opinions or biases, the wording usually contains plain facts description, and the sentiment is predominately neutral, which is documented by analysing 10 random news articles using AI to confirm the absence of bias.¹¹

We source our data from the Ukrainian news agency (as opposite to the international source) with the aim of comprehensively encompassing the entire spectrum of events, including those of local significance that often elude international media coverage. Our empirical methodology (see 3.2 below) captures the effects of mechanisms through which these events are transformed into news articles or publications within Western media outlets, consequently amplifying their influence on financial markets. We also expect Interfax to cover the news from abroad relevant to the war in Ukraine. Our data provides evidence that Interfax covers Bloomberg/Reuters items on news of international type, using these agencies as cited sources of information. A caveat of this or any other data source might be that it is not covering all the relevant events in Ukraine. However, given its reputation and detailed coverage of economic and political events, we rely on the assumption that it covers a significant majority of them.

The English-language Interfax Ukraine economic section yields a total of 7,109 news items over that period. We classify the data manually using a two-staged process. First, we assign a “sectoral code” to each news item and, second, we assess the “direction” of the event for each news story. After classifying each news story separately, we do a double-checking process and review each set of news items with a separate sectoral code and direction to ensure these indeed belong to the same group.

¹⁰ See Table A1.1 in Annex 1 that presents an estimate by Google of the coverage of Ukrainian news agencies on major financial websites.

¹¹ The summary from the AI (Chat GPT) is as follows: “In summary, the analysis of these ten news articles revealed a consistent focus on factuality and impartial reporting, minimal biases, a range of sentiments depending on the subject matter.” See Table A1.6 in Annex 1 for more details.

Table 1: News items breakdown into categories

Category	Description	# of items
Combat De-Escalation	Military topic, articles pointing towards potential de-escalation: Russia retreat, international negotiation missions coming to Ukraine, foreign embassies returning to Ukraine, diplomatic negotiations ongoing or planned in Ukraine or abroad, including political statements of top-level politicians, refugees coming back to Ukraine	182
Combat Escalation	Military topic, articles pointing towards war escalation: combat actions, damages, military-caused ecological threats, war crimes, civilian losses, refugees fleeing the country	575
More Military Aid/UA Strength	Military topic, articles pointing towards a strengthening of the military capacity of Ukraine: military aid from abroad, large donations to the military from Ukrainian and/or Western companies or individuals, weapon procurement	294
Less Military Aid/UA Weakness	Military topic, articles indicating a weakening of military capacity of Ukraine: statements on weakening of support of Ukraine from the West, destruction of military production assets in Ukraine etc.	13
Humanitarian Aid	Humanitarian aid to refugees and internally displaced people, local and international (no direction assigned)	154
Export News Positive	Positive developments in agriculture, metals/mining as major exporting industries and in logistics as a major physical exports bottleneck: better access to sea ports and railway transportation, strong corporate results, access to finance etc.	278
Export News Negative	Negative developments in agriculture, metals/mining as major exporting industries and in logistics as a major physical exports bottleneck: seaports blockade, railway transportation bottlenecks, damage inflicted by the Russian military aggression, weak corporate results etc.	232
More Financial Aid/Support	More foreign non-military support: financial aid, supportive statements, EU integration perspective strengthening	506
Less Financial Aid/Support	Less foreign non-military support: financial aid irregularities and delays, EU scepticism on behalf of the member states etc.	25
Stronger Sanctions	Strengthening of sanctions, multinational companies leaving Russia	663
Weaker Sanctions	Weakening of sanctions or sanctions evasion/exempts, multinational companies continuing working in Russia	96
Local News Resilience	Local news on resilience and growth: less restriction, better public policies, more sustainable currency and public finance situation, better public access to job market and services like education, healthcare etc.	838
Local News Fragility	Local news on fragility: economic and financial crisis, worse public access to services, more restrictive government policies, weaker currency, riskier situation in public finance, corruption issues etc.	515
Total		4371

Notes: Some examples for the coding procedure can be found in Annex 1, Tables A1.2 and A1.3. The full representation of the categories can be found in Annex 1, Table A1.4 and A1.5.

Our approach to classifying the news items includes a breakdown along the following lines (see Table 1 above).¹² The framework enables us to distinguish between local and international types of news articles, which might have a different mechanism of impact on markets decision-making. In addition, it separates military developments from both local and international news into a separate group of articles to check if the frontline developments exert a stronger impact on market participants' decisions as compared to the rest of the information. We encoded military news as [1], local news as [2], and international news as [3] (1st code symbol). Additionally, within each overarching category 1, 2, or 3, further subsegments are delineated (indicated by the 2nd code symbol).

For the 1st category (military-related events), we differentiate between three subsets: (1) combat-related articles, pointing out at escalation or de-escalation of the war, including the international diplomatic de-escalation efforts and embassies personnel either leaving Kyiv or coming back within diplomatic missions; (2) military aid and weapons supplies indicating the ability of Ukraine to sustain a longer-term war effort; (3) news articles on humanitarian aid supplies, internally displaced people and war refugees, which are not included into any of the above categories, but might be relevant for the markets as an indicator of the unfolding crisis. For the 2nd category (local non-military news), we separate export-related articles from other local news on economics and governance.¹³ The 3rd category (international non-military news) includes articles on financial (non-military and non-humanitarian) aid to Ukraine and sanctions imposed on Russia or other types of international pressure like multinationals leaving Russia.

Following the identification of the appropriate category, we assign a binary direction indicator (the third code symbol) to each news item. This mechanism enables us to capture the underlying sentiment or trajectory of unfolding events. This process involves first identifying two mutually exclusive directions within the relevant subcategory set, for instance, increase vs. decrease in aid provided, stronger sanctions vs. sanctions evasion, exemptions or the absence of sanctions in some particular area, the escalation of war vs. the potential for the de-escalation or a prospect of peace negotiations. Subsequently, on an item-by-item basis, we analyse and classify the news articles based on its content as belonging to the one or the other direction. Our choice of the directions approach instead of using a positive/negative sentiment detection (e.g., positive or negative for returns) is justified by the nature of our research question: We analyse how international financial markets perceive news in a particular area and

¹² A more detailed representation of the categories can be found in Annex 1, Tables A1.4 and A1.5.

¹³ Our initial approach included more refined categories like public economic policies and general economic developments, access of the population to goods and services, business news, and also a sectoral news breakdown (agriculture, metals and mining, logistics, other business sectors), which can be found in Annex A, Table A 1.4 and in the accompanying dataset. However, in an effort to conserve degrees of freedom, we merged these finer categories and classified the news as either export-related or non-export related.

determine the change of this sentiment during the period of our study. Examples of this classification process can be found in Annex 1, Tables A1.2 and A1.3.

We select all news items that belong to these categories and sorted out unrelated items (e.g., local public events announcements, occasional news from unrelated foreign countries, data on market quotations of bonds, interest rates etc.) and the items without a clear direction or with very minor, virtually absent implications (outdated news items based on pre-war press releases, politicians' encouragements and biddings, and other irrelevant or minor news). The final news items set contains 4,371 news items. Figure A1.1 in Annex 1 shows the distribution of news over time, which features a slight downward trend. Naturally, there was a lot of reporting at beginning of the war. However, there is still noticeable coverage in the month of June, which was quieter in terms of Russian or Ukrainian advances (cf. Annex 2) with 730 items (as compared to 1,217 items in February). Plausibly, we find a relatively low number of news on less military aid and less financial aid. The low number does not invalidate these variables, but of course, sample variation increases for them. Still, we will find statistically significant effects, but the high variation has to be taken into account when interpreting sometimes comparatively high coefficient values.

4.2. Empirical methodology and financial market data

The econometric concept to test Eq. (4) builds on operationalising Eqs. (1) and (2). We employ the news indicators as key explanatory variables in a set of linear regressions and amend the information set by standard factors. The general specification is as follows:

$$r_t = \alpha + \beta_1 r_{t-1} + \beta_2 i_{t-1} + \gamma X_t + \varepsilon_t \quad (5)$$

r_t is the return of a financial series of interest, α a constant term, r_{t-1} the lagged return to control for market persistence, i_{t-1} the change in the US three-month T-bill to proxy for changes in the global monetary policy environment (following, e.g. Hayo and Kutan 2005, Fender et al. 2012), X_t the vector of war-related news described in Section 4.1, and ε_t is the error term. Eq. (5) is estimated with least squares and heteroskedasticity- and autocorrelation robust standard errors.¹⁴

As financial series, we utilize the returns of the S&P 500 for the US as the leading global stock market and of the Eurostoxx 50 . Returns of ICE Brent Futures and Dutch TTF Natural Gas 1 Month Gas Futures cover the main energy markets, whereas returns of Chicago SRW Wheat Futures are included to account for the agricultural sector.¹⁵ In

¹⁴ Our sample is too short for a successful GARCH modelling approach. Indeed, GARCH(1,1) estimations do only converge for a part of the market considered in this paper. In addition, our breakpoint analysis is unfeasible with such an approach given the limited number of observations at hand.

¹⁵ Data is obtained from Bloomberg or the Wall Street Journal. For the very few missing values in the Eurostoxx 50 series, we used linear interpolation. Controlling for these imputed values with the help of dummy variables does not have a qualitatively relevant effect on our results.

particular, the choice of wheat futures is motivated by the role of Ukraine as major supplier of these goods, whereas both energy series are accounted for because of Russia's role in their supply.

All series are close-to-close returns and trading stops at 4:00 pm Eastern Time for all markets except the Eurostoxx, which closes at 6:00 pm Central European Time. This corresponds to a 7:00 pm Kyiv time closure of the Eurostoxx 50 and an 11:00 pm Kyiv time closure of all other markets. Almost all news items on Interfax are published before 7:00 pm Kyiv time. Hence, the news enters Eq. (5) on the day of its publication. News items that were published on a non-trading day were moved to the next trading day.

As we conjecture a potential change in the perception of war-related news by financial markets over time, we estimate Eq. (5) for the full sample period (February 24 to July 12) and test for a structural break. In our automated breakpoint detection procedure, we restrict the subsamples to a minimum of 30 observations, which yields a total of 35 potential breakpoints. We then estimate two separate models for the subsamples that generate the lowest joint residual sum of squares (RSS). Figure A4.1 in Annex 4 plots the RSS with the endpoint of the first subsample on the x-axis. Interestingly, in these separate test for different markets, we get very similar break point results: In the case of the Eurostoxx 50 (April 7), oil (April 6), gas (April 6), and wheat (April 8), the first subsample ends right after the liberation of Northern Ukraine. For the S&P 500 (16 May), we detect the breakpoint at a later time, that is, after the start of the Ukrainian counteroffensive north and east of Kharkiv. This rather late break date for S&P 500 compared to the other markets appears to be driven by days with multiple news in the same category. When we use a concave function of the news variable (i.e. a log plus one transformation; see Section 5.3 and Table A4.5), the break date results as early as April 12. In all cases, the RSS decreases by at least 24 percent when allowing for different coefficients across subsamples.¹⁶ Hence, this procedure reveals changes in financial markets' response to war-related news.

Table A4.1 in Annex 4 shows descriptive statistics for the five financial market return series (also split into two subsamples based on the test procedure outlined above). On average, we observe negative returns for both stock market series with no noticeable differences across the subsamples. In the case of oil and wheat futures, however, the returns are — on average — positive in the first subsample and negative in the second period. This is indicative of the steep increase in the prices of these goods at the beginning of the war and the later observed normalization tendency. In the case of gas futures, Table A4.1 shows an increase in both subsamples, reflecting the tight

¹⁶ This is also reflected in significant Chow tests (at the ten percent level) in all markets except the S&P 500. The $\chi^2(16)$ test statistics are as follows: S&P 500: 19.68 [p-val. 0.24], Eurostoxx 50: 25.14 [0.07], oil: 32.61 [0.01], gas: 45.57 [0.00], wheat: 24.70 [0.08]. As shown in Table 2 below, the estimation results for the S&P 500 returns show breaks in some of the coefficients, but a joint test of the 16 coefficients does not reject the null hypothesis of no structural break.

conditions in this market ever since the start of the Russian invasion (which relaxed only later in the year). Turning to the volatility of the series, we find a lower standard deviation in the second subsample for the Eurostoxx, oil futures, gas futures, and wheat futures, which, however, is not resembled in the S&P 500. These patterns are confirmed by the time series plots in Figure A4.2, which further underline the need to analyse potential differences in the financial markets' perception of the war over time. However, it remains to be seen if the descriptive differences in the financial market return series can be explained by a change in the response to the war-related news over time.

Finally, we would like to emphasize that our analysis is based on a couple of assumptions. First, we assume that there are no missing third-party factors correlated with the explanatory news variables. This assumption can be justified as the war in the Ukraine is the overarching topic in the first half of 2022 in international politics and financial markets. Developments, such as the rapid changes in energy markets, were driven by the war events. In addition, we control for changes in the global monetary policy environment. Second, it is typically the unexpected component of an event that should actually matter for financial market participants. In an ideal world, we would extract such a news component from market expectations as it is done in the literature on macroeconomic news or monetary policy decisions (following, e.g., Ehrmann and Fratzscher 2004, 2005) and their impact on financial markets. However, in the absence of such a series, we consider the actually observed news as second-best proxy. Nevertheless, it has to be mentioned that the number of news items for a given topic on a given day might serve as a good indicator for the intensity of news in that category.

5. Estimation results

5.1. Main results

Tables 2–6 show the results of Eq. (5) for both stock return series as well as the returns of oil, gas, and wheat futures. All left-hand side variables are measured in percent. Hence, the coefficients represent the effects of an additional item in a news category in percentage points. We focus on the variables related to the research question, that is, those reflecting Western support for Ukraine (military aid, financial aid, and sanctions).

News on *more military aid* leads to a decrease in S&P returns in the full sample period and the first subsample (columns 1 and 2 of Table 2) and an increase in wheat futures in the first subsample (column 1 of Table 6). The latter effect corroborates the discussions of a potential shortage in the worldwide wheat supply, particularly during the early phase of the war. In a similar vein, news on *less military aid* leads to higher Eurostoxx returns (column 2 of Table 3) in the first subsample and lower US returns in the second subsample (column 3 of Table 3). Opposing signs for the first and second subsample can also be observed for gas futures where less military aid for Ukraine was

appreciated by participants in the first subsample, but lead to higher returns in the second one (columns 2 and 3 of Table 5). Lastly, wheat futures decreased after that type of news when considering the full sample period and — to a larger extent — in the first subsample (columns 1 and 2 of Table 6). The same pattern, even though not statistically significant, emerges for more military aid in the gas market and less military aid in the oil market.

News on *more financial aid* is found to decrease US stock returns in the first subsample (column 2 in Table 2) and European stock returns when considering the full sample period (column 1 in Table 3). The latter effect appears to be driven by the first subsample, where the coefficient is less precisely estimated, though. Still, these results resemble the response to military aid news as financial markets prefer less support in the first subsample and more support in the second subsample. However, for the remaining markets, estimation uncertainty for the financial aid effects is large. These less distinct results as compared to those for military aid indicate a clear pecking order in terms of the markets' response to different aid categories.

News on *stronger sanctions* generally leads to higher stock returns (columns 1–3 in Table 2 and Table 3). This mirrors a hawkish line, since overall business evaluation improves despite the fact the sanctions regularly imply also restrictions for domestic firms. News on *weaker sanctions*, which might be seen as a relief for the strained energy market, is reflected in lower gas returns in both subsamples (columns 2 and 3 of Table 5). This type of news is also associated with higher wheat returns (column 1 of Table 6), most likely because of the difficulties in exporting Ukrainian wheat; these might be seen as further increasing if the West takes a lenient view on Russia in terms of sanctions. The positive effect of sanctions is stronger for US stocks in the second subsample, which resembles the hypothesized more hawkish stance of market participants during that phase. Similarly, the beneficial effect of weaker sanctions in the gas market can be particularly observed in the first subsample, reflecting the more dovish market stance at that time, and not so much in the second subsample. A similar, albeit insignificant, pattern can be observed for the results of oil futures. Finally, it has to be noted that the response of European stock returns appears to be odds with the interpretation of a more dovish stance of financial markets in the first subsample and a more hawkish one in the second subsample. The fact that this is the single exception calls for a closer analysis. Indeed, we find that the result can be explained by the much earlier breakpoint as compared to the S&P 500. A re-estimation of the Eurostoxx 50 models when forcing the first subsample to end on May 16 (i.e., the same endpoint as for the S&P 500) yields the following coefficients for stronger sanctions: 0.169** (0.078) for the first subsample and 0.283* (0.149) for the second subsample. Hence, these results are also in line with the pattern of a more hawkish stance in the second subsample.

Table 2: Results for S&P 500 returns

	(1) Full Sample	(2) Until May 16	(3) From May 17
Lag(S&P 500 Returns)	0.042 (0.102)	0.062 (0.158)	0.006 (0.193)
Lag(3-M T-Bill Change)	-1.229 (2.108)	-2.409 (5.021)	3.253 (3.172)
Combat De-Escalation	0.033 (0.060)	0.019 (0.067)	0.468 (0.518)
Combat Escalation	-0.044 (0.032)	-0.055* (0.032)	-0.320* (0.173)
More Military Aid/UA Strength	-0.190** (0.080)	-0.258** (0.114)	-0.033 (0.181)
Less Military Aid/UA Weakness	0.427 (0.501)	0.955 (0.630)	-1.529* (0.758)
Humanitarian Aid	-0.099 (0.127)	0.039 (0.128)	-1.345** (0.531)
Local News Resilience	0.035 (0.043)	0.055 (0.047)	0.112 (0.117)
Local News Fragility	0.125** (0.061)	0.079 (0.080)	0.075 (0.103)
Export News Positive	-0.040 (0.083)	0.039 (0.126)	-0.176 (0.144)
Export News Negative	-0.054 (0.095)	-0.049 (0.112)	0.063 (0.189)
More Financial Aid/Support	-0.115 (0.076)	-0.226*** (0.078)	0.024 (0.132)
Less Financial Aid/Support	0.202 (0.270)	0.141 (0.382)	-0.163 (0.410)
Stronger Sanctions	0.140*** (0.042)	0.143*** (0.049)	0.399** (0.162)
Weaker Sanctions	-0.072 (0.165)	-0.172 (0.223)	0.203 (0.446)
Constant	-0.266 (0.607)	0.263 (1.027)	-1.158 (1.046)
Observations	94	57	37
R ²	0.202	0.345	0.456

Notes: Table shows the results for a least squares estimation of Eq. (5) with heteroskedasticity and autocorrelation-robust standard errors in parentheses. ***/**/* indicate significance at the 1%/5%/10% level, respectively. Figure A4.1 shows the results for the breakpoint tests.

Table 3: Results for Eurostoxx 50 returns

	(1) Full Sample	(2) Until April 7	(3) From April 8
Lag(Eurostoxx 50 Returns)	0.036 (0.095)	0.189 (0.228)	0.072 (0.135)
Lag(3-M T-Bill Change)	-0.037 (2.296)	-9.760 (8.136)	1.874 (2.594)
Combat De-Escalation	-0.004 (0.069)	0.026 (0.114)	-0.202 (0.203)
Combat Escalation	-0.139* (0.071)	-0.157** (0.056)	-0.126 (0.085)
More Military Aid/UA Strength	-0.053 (0.076)	-0.546 (0.335)	0.041 (0.093)
Less Military Aid/UA Weakness	0.816 (0.611)	3.786** (1.323)	-0.011 (0.455)
Humanitarian Aid	-0.094 (0.141)	-0.051 (0.276)	-0.246 (0.183)
Local News Resilience	0.006 (0.041)	-0.318* (0.179)	0.061 (0.051)
Local News Fragility	0.036 (0.077)	0.273 (0.322)	-0.018 (0.079)
Export News Positive	0.015 (0.078)	0.298 (0.489)	-0.028 (0.088)
Export News Negative	-0.126 (0.106)	-0.262 (0.216)	-0.035 (0.137)
More Financial Aid/Support	-0.171** (0.075)	-0.292 (0.252)	-0.094 (0.095)
Less Financial Aid/Support	0.292 (0.356)	-0.266 (0.436)	0.523 (0.497)
Stronger Sanctions	0.165** (0.067)	0.335*** (0.097)	0.113* (0.067)
Weaker Sanctions	-0.001 (0.221)	0.411 (0.417)	0.121 (0.234)
Constant	0.625 (0.642)	1.287 (1.367)	0.104 (0.744)
Observations	94	31	63
R ²	0.247	0.668	0.193

Notes: Table shows the results for a least squares estimation of Eq. (5) with heteroskedasticity and autocorrelation-robust standard errors in parentheses. ***/**/* indicate significance at the 1%/5%/10% level, respectively. Figure A4.1 shows the results for the breakpoint tests.

Table 4: Results for Brent futures returns

	(1) Full Sample	(2) Until April 6	(3) From April 7
Lag(Brent Fut. Returns)	-0.036 (0.093)	-0.169 (0.281)	-0.025 (0.117)
Lag(3-M T-Bill Change)	-8.774 (6.446)	-10.595 (16.801)	-6.182 (7.460)
Combat De-Escalation	-0.347** (0.141)	-0.693* (0.363)	-0.054 (0.347)
Combat Escalation	0.213 (0.165)	0.030 (0.184)	0.707*** (0.213)
More Military Aid/UA Strength	0.022 (0.195)	-0.120 (0.891)	0.008 (0.181)
Less Military Aid/UA Weakness	0.183 (1.070)	-3.760 (3.035)	1.135 (0.751)
Humanitarian Aid	0.136 (0.279)	0.237 (0.648)	-0.127 (0.294)
Local News Resilience	-0.019 (0.077)	0.601 (0.535)	-0.075 (0.074)
Local News Fragility	-0.111 (0.155)	-2.029* (0.958)	-0.020 (0.168)
Export News Positive	0.041 (0.154)	-1.659 (1.261)	0.165 (0.151)
Export News Negative	0.259 (0.207)	1.832* (0.953)	0.086 (0.258)
More Financial Aid/Support	-0.018 (0.154)	0.106 (0.546)	-0.245 (0.184)
Less Financial Aid/Support	-0.384 (0.865)	-0.355 (2.312)	1.172 (0.829)
Stronger Sanctions	-0.184 (0.189)	-0.196 (0.298)	-0.126 (0.134)
Weaker Sanctions	0.643 (0.454)	-1.440 (1.212)	0.656 (0.442)
Constant	0.107 (1.443)	7.499** (3.441)	-1.464 (1.856)
Observations	94	30	64
R ²	0.153	0.508	0.366

Notes: Table shows the results for a least squares estimation of Eq. (5) with heteroskedasticity and autocorrelation-robust standard errors in parentheses. ***/**/* indicate significance at the 1%/5%/10% level, respectively. Figure A4.1 shows the results for the breakpoint tests.

Table 5: Results for gas futures returns

	(1) Full Sample	(2) Until April 6	(3) From April 7
Lag(Gas Fut. Returns)	-0.081 (0.171)	-0.350 (0.203)	0.025 (0.200)
Lag(3-M T-Bill Change)	18.377 (15.921)	-29.519 (57.242)	20.988* (10.900)
Combat De-Escalation	0.208 (0.330)	-0.626 (0.809)	-0.643 (0.687)
Combat Escalation	-0.047 (0.700)	-0.534 (0.638)	0.385 (0.472)
More Military Aid/UA Strength	-0.167 (0.512)	3.295 (2.279)	-0.174 (0.328)
Less Military Aid/UA Weakness	0.748 (2.922)	-18.043* (8.440)	4.350*** (1.469)
Humanitarian Aid	-0.129 (1.036)	2.049 (2.109)	0.054 (0.527)
Local News Resilience	0.208 (0.239)	3.831** (1.526)	0.006 (0.151)
Local News Fragility	0.018 (0.392)	-7.308** (2.514)	0.101 (0.257)
Export News Positive	-0.664* (0.398)	-3.108 (3.743)	-0.513* (0.285)
Export News Negative	0.689 (0.625)	6.548*** (2.069)	-0.077 (0.453)
More Financial Aid/Support	0.221 (0.333)	-2.368 (1.476)	0.270 (0.240)
Less Financial Aid/Support	-1.591 (1.542)	0.804 (4.313)	-0.467 (1.118)
Stronger Sanctions	-0.006 (0.539)	-0.187 (0.853)	-0.155 (0.232)
Weaker Sanctions	-1.634 (1.260)	-8.824** (3.899)	-1.692** (0.778)
Constant	0.078 (3.905)	10.180 (7.291)	1.299 (2.349)
Observations	94	30	64
R ²	0.088	0.548	0.240

Notes: Table shows the results for a least squares estimation of Eq. (5) with heteroskedasticity and autocorrelation-robust standard errors in parentheses. ***/**/* indicate significance at the 1%/5%/10% level, respectively. Figure A4.1 shows the results for the breakpoint tests.

Table 6: Results for wheat futures returns

	(1) Full Sample	(2) Until April 8	(3) From April 11
Lag(Wheat Fut. Returns)	0.079 (0.138)	0.069 (0.222)	-0.005 (0.181)
Lag(3-M T-Bill Change)	2.382 (4.602)	9.273 (22.442)	-0.797 (4.505)
Combat De-Escalation	-0.313** (0.130)	-0.532 (0.362)	0.567 (0.340)
Combat Escalation	0.105 (0.132)	0.076 (0.142)	0.281 (0.239)
More Military Aid/UA Strength	0.321 (0.216)	1.942* (1.058)	-0.039 (0.169)
Less Military Aid/UA Weakness	-2.380** (1.195)	-7.779** (2.951)	-0.741 (0.967)
Humanitarian Aid	0.143 (0.394)	0.997 (0.791)	0.078 (0.302)
Local News Resilience	-0.027 (0.095)	0.589 (0.724)	-0.126 (0.096)
Local News Fragility	-0.148 (0.139)	-0.961 (1.156)	-0.102 (0.123)
Export News Positive	-0.052 (0.216)	0.236 (1.436)	0.056 (0.190)
Export News Negative	0.493* (0.255)	1.345 (0.968)	0.275 (0.275)
More Financial Aid/Support	0.117 (0.141)	-0.086 (0.778)	-0.064 (0.123)
Less Financial Aid/Support	-0.742 (0.831)	0.323 (1.379)	-1.098 (0.742)
Stronger Sanctions	0.001 (0.124)	-0.309 (0.261)	-0.093 (0.132)
Weaker Sanctions	1.043** (0.502)	0.708 (1.710)	0.708 (0.528)
Constant	-2.569 (2.100)	-6.684 (5.919)	-0.410 (1.797)
Observations	94	32	62
R ²	0.212	0.495	0.268

Notes: Table shows the results for a least squares estimation of Eq. (5) with heteroskedasticity and autocorrelation-robust standard errors in parentheses. ***/**/* indicate significance at the 1%/5%/10% level, respectively. Figure A4.1 shows the results for the breakpoint tests.

5.2. Control variables

In a second step, we look into the response to other war-related news, such as combat (de-)escalation including the humanitarian situation, export-related news, and the domestic economic and political situation. Controlling for these variables is important for a clear answer to our research question since there might be correlation patterns

(e.g. between conflict escalation and sanctions) that could confound our results. Indeed, an estimation of Eq. (5) without these categories (not shown, but available on request) yields a (much) worse fit as the one reported in Tables 2–6 and sometimes also (substantial) differences in the estimates for news on military aid, financial aid, and sanctions.¹⁷

In general, news on *combat escalation* is bad news for stocks markets as indicated by the decline in US and European returns (columns 2 and 3 in Table 2 and columns 1 and 2 in Table 3) and for oil futures as reflected in the rise of returns during the second subsample (column 3 in Table 4). For the latter market, we also observe a decrease in returns after news on combat *de-escalation* (columns 1 and 2 in Table 4). A similar easing of the strained conditions can be found for wheat future returns (column 1 in Table 6). In the case of news on *humanitarian aid*, we only find a significant negative response of US stock returns in the second subsample (column 3 of Table 2). Hence, conflict escalations (including a larger need for humanitarian aid) is bad for financial markets, whereas de-escalation is appreciated.

Turning to *exports*, we find a decrease in the returns of gas futures in the first subsample and the full sample period (columns 1 and 3 of Table 5) after positive news. In addition, we detect an increase in the returns of oil futures and gas futures in the first subsample (column 2 of Table 4 and Table 5) and wheat futures when considering the full sample period (column 1 of Table 6) after *negative* news. Accordingly, commodity markets are positively (negatively) affected if there are fewer (more) restrictions to the worldwide supply of goods.

Lastly, we look into the response of financial markets to other domestic economic and political news. *Local news* pointing towards a more *resilient* Ukraine leads to lower European stock returns and an increase in gas futures in the first subsample (column 2 of Table 3 and Table 5). In a similar vein, we observe higher stock returns in the US (column 1 in Table 2) as well as lower returns of oil and gas futures in the first subsample (column 2 in Table 4 and Table 5) after *local news* indicating a more *fragile* Ukraine. These results fit the financial markets' response to Western news: signs of a resilient Ukraine were not appreciated during the first phase of the war.

The most important take away from the results of the controls, however, is that our key findings hold when accounting for a broad set of war-related news. We can conclude that financial markets had a more dovish stance during the first phase of the war and a more hawkish later on, while conflict and escalation in general had harmful effects on international financial markets over the full sample period. Lastly, our results are not confounded by other export-related news or domestic economic and political news.

¹⁷ When comparing the full sample estimations with and without the other war-related news, the R² is 34–63 percent lower in the models that only focus on “Western” news. In addition, the effects of, for instance, more military aid, more financial aid, and stronger sanctions would be underestimated (in absolute terms) in the stock return models when not controlling for the other news categories.

Thus far, we did not put much emphasis on the interpretation of the absolute size of the news effects. As an illustration, one might resort to the response of the S&P 500 to news about stronger sanctions. During the full sample period, an additional item in that category leads to an increase of 0.14 percentage points (pp). The corresponding effects in the first and second subsamples are 0.14 pp and 0.40 pp, respectively. These figures can be put into context by looking into the frequency of news items in Table 1 and the standard deviation of the financial series in Table A4.1. This underscores that the response to war-related news does not only feature a structural break over time. In addition, the estimated effects are of economic relevance.

In view of Eqs. (1) and (2), the effects of Western support mirror the economic effects of aid and sanctions expected in the markets. Our results establish that this expectation changed with shifts in the course of the war. This underlines that market reactions to political measures are contingent on the current economic and political situation. Once the conditions for Ukrainian endurance had improved, markets expected more beneficial effects from further support relative to a weakening in a more dovish stance. Such a state-contingency should be taken into account when analysing the consequences of conflict-related measures, but also more broadly of economic policy.

5.3. Robustness tests

Next, we explore the robustness of our results along different dimensions. First, we test if our timing of war-related news is appropriate and allow all news items to enter Eq. (5) contemporaneously and additionally with a lag of one day. Given the large number of categories, this procedure is only feasible for the full-sample estimations. Table A4.2 compares the adjusted R² and the Bayesian Information Criterion (BIC) for the models in Tables 2–6 and models where we additionally include the lagged news variables. All augmented models are worse in these two statistics and an exclusion restriction on all lagged terms cannot be rejected at the 10 percent level. The only exception is the Eurostoxx 50 where the adjusted R² of the augmented model is higher and the exclusion restriction is rejected (while the BIC is still worse when compared to the more parsimonious specification). The results of the larger model (available on request) indicate that the coefficients in column 1 in Table 3 are virtually unchanged by the additional regressors. In addition, the first lag of more (less) financial aid is found to be significantly negative (positive). Accordingly, these results fit in the general pattern of the full-sample market response to news (cf. Section 5.1).

Second, we test if our results remain robust once we control for the change in Ukrainian territory occupied by Russian forces. For this purpose, we create an indicator for occupied territory based on the maps provided by @War_Mapper on Twitter (cf.

Annex 2) and include its daily change as additional covariate into Eq. (5).¹⁸ The results can be found in Table A4.3. They leave the point estimates of the news indicators for conflict (de-)escalation and their standard errors virtually unchanged. In addition, the indicator for occupied territory is significant only in the first subsample of the Eurostoxx 50 and the gas futures estimations. The positive coefficient on the stock market and the negative effect on gas futures are consistent with the general picture that financial markets perceived a quick Russian advancement not as a bad signal early in the war. To summarize, the results are reassuring in that our news variables retain the major effect even when controlling for the actual course of the war.

Third, in a similar exercise, we explore if our results for the response to news on sanctions hold when additionally controlling for actual sanctions that came into effect (cf. Figure A3.1). Accordingly, we augment Eq. (5) by the logarithm of the cumulative number of actually sanctioned Russian entities. The results can be found in Table A4.4 and indicate that controlling for actual sanctions does not crowd out the effect of the news variables. The Eurostoxx 50 in the second subsample is the only exception; however, we only observe a minor change in the market response in this case. Finally, we find the number of sanctioned entities to be significant just once. Hence, it is indeed news on sanctions that matters for markets and not the number of sanctioned entities.

Fourth, we re-estimate Eq. (5) using the broader Eurostoxx 600 as indicator of European stock returns. The results in Table A4.5 are very similar to those in Table 3, again with the response to sanctions in the second subsample being the only minor exception. In addition, the structural break in the Eurostoxx 600 (April 11) can be found at almost the same day as for the Eurostoxx 50 (April 7). Hence, the result patterns for European stocks can be found in a narrow and a broad stock index.

Fifth, in Figures A1.1 and A3.2 a downward trend in the number of news is visible. We do not suspect the news variables to pick up a mere trend in the markets because the constants in the different subsamples would absorb different levels. Nevertheless, in a robustness check we include linear time trends. Indeed, these trends are never significant in the full sample or the subsamples. The breakpoints and coefficients change only marginally (results available upon request).

Sixth, we add market volatility as a potentially important factor in Eq. (5). For that purpose, we calculate a standard volatility proxy for each series based on the square root of the unweighted moving average of the squared returns over the past 22 trading days (not including the contemporaneous value). However, the additional variables are

¹⁸ Colour filters were applied to each daily map and adjusted according to their individual characteristics to accurately determine the areas of territory under Ukraine's control, those under occupation prior to February 24, 2022, and areas newly occupied during the period of this study. In those instances where pixel colour data on borders made filter attribution impossible, these were classified as "others" and allocated to the newly occupied and Ukraine-controlled territory on a proportional basis. The same methodology was applied to a small number of pixels for which the filter had automatically attributed the colour to both territories. The variable is available in the news dataset.

not significant and the baseline results (breakpoints and coefficients) change only marginally.

Finally, we consider potential non-linearities in the response of financial markets to news. It might be the case that markets respond differently to a change from, say, zero items to one in a given variable as opposed to a change from five to six. We impose such a concave pattern by applying a log plus one transformation to all news variables and re-estimate Eq. (5).¹⁹ By the same token, this robustness check would account for the fact that multiple news in one category on the same day may be linked or relate to the same event, such that weighting these down might be appropriate. Table A4.6–A4.10 show the results. Interestingly, all structural breaks (including the one for S&P 500) are now found in early- to mid-April, that is, right after the liberation of Northern Ukraine. In addition, the general pattern for the “Western support” variables is replicated when accounting for potential non-linearities. Markets appreciated a more dovish stance during the first phase of the war and a more hawkish stance later on.

To summarize, our results are robust to an alternative timing of the war-related news, using a broader European stock index, and potential non-linearities in the markets’ response to news. We also show that it is news about sanctions that matters for markets and not the number of actually sanctioned Russian entities. The same holds for news about combat escalation as compared to actually observed territorial gains or losses.

6. Conclusions

Since Russia began the war against Ukraine on February 24, 2022, the West has been intensively discussing its support strategy. Hawkish positions of strengthening Ukraine via armaments, financial resources, and sanctions against Russia compete with dovish views of avoiding further escalation of the military and geopolitical conflict. News from the war became a dominating factor for international politics and the world economy. Using the example of the Russian war against Ukraine, the underlying study analyse whether military and financial aid as third-party involvement is regarded by the markets as a stabilising force or as a sign of increased probability of war escalation.

For this purpose, we created a comprehensive data set of news related to the war in Ukraine. We focus on decisions of the West, that is, military aid, financial aid, and sanctions. Further news categories comprise combat escalation, the export situation, and the local situation. This enables us to control for these variables and to separate the effects of third-party involvement. Building on this data, we measure reactions of

¹⁹ Recent research (e.g., Cohn et al 2022) proposes Poisson-type models for a non-linear estimation of count data in finance. Such an approach would be more appropriate as compared to the log plus one transformation conducted in our robustness test. However, given the limited number of observations at hand (in particular, in the subsamples), a Poisson pseudo-maximum likelihood estimation is not feasible with our dataset at hand.

international financial markets to this news. We cover five key financial markets, namely US and European stocks, oil and gas for the energy dimension, and wheat representing agriculture.

The results show that stronger support for Ukraine had a positive impact after the first weeks of the war when the Ukrainian position in the war improved, but a negative or at least less positive influence before. Thus, financial markets seem to have perceived support as a risk of further escalation threatening global economic activity in the first phase. However, a hawkish line was a positive signal for financial markets after the change in perceptions. This means that clear support for Ukraine has been viewed as stabilizing business prospects and relaxing the situation in strained energy and commodity markets. Importantly, the results also confirm that the war and escalation in general had harmful effects on international financial markets.

Our results are robust to an alternative timing of the war-related news and potential non-linearities in the markets' response to these. We also show that it is news about sanctions that matters for markets and not the number of actually sanctioned Russian entities. The same holds for news about combat escalation as compared to actually observed territorial gains or losses. Finally, our paper provides novel insights with respect to time-variation in asset price responses to news. While the existing literature finds such variation due to business cycles, financial market turbulences, and other secular trends (cf. footnote 1), we additionally provide evidence for the market perception of conflicts in this context.

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Annex 1: The procedure for news item categorization

Table A1.1: Coverage of Ukrainian news agencies on major financial websites

	Bloomberg.com	Reuters.com	FT.com
Interfax-Ukraine	189	1910	48
BNE Intellnews	4	0	2
Economichna Pravda	0	0	0
Ukrainian news	45	309	43
Ukrainska Pravda	81	375	46
Liga Net	40	7	1
Ukrinform	37	91	26
UNIAN	58	256	3

Notes: Table shows an estimate by Google of the number of pages that match the search query of major Ukrainian news agencies on financial websites (e.g., “Interfax-Ukraine” site: Bloomberg.com).

Table A1.2: Examples of the news item classification

Headline	Date	Code	Direction
Estonia allocates EUR 200,000 for emergency assistance to Ukrainian residents affected by war, - MFA	2/24/2022	13	2
Mobile operators, Ukrtelecom agree to provide communication to Ukrainians even if no funds on their accounts	2/24/2022	22	1
National security services to turn off all state registers until situation in Ukraine stabilizes, number of documents in Diia not to be available - Digital Transformation Ministry	2/24/2022	21	2
Zelensky speaks with Trudeau about imposition of additional tough sanctions against Russia	2/24/2022	32	0
Britain bans Aeroflot flights - Johnson	2/24/2022	32	1

Notes: After classifying each news story separately, we do a double-checking process and review each set of news items for a separate sectoral code and direction to ensure these belong to the same group.

Table A1.3: Example of the double-check for military escalation news and for news on logistical problems

Headline	Date	Code	Direction
Air threat declared in Kyiv, residents asked to go to shelters - Kyiv City Administration	2/24/2022	11	2
Active battles continue in Hostomel near Kyiv, there is danger of landing of Russian forces in govt quarter of Kyiv, - advisor Podoliak	2/24/2022	11	2
Rada to consider issues of general mobilization, defense procurement on Thursday, - MP Rudyk	2/24/2022	11	2
Russia inflicts over 30 strikes on civilian, military infrastructure as of 13.00, - AFU General Staff	2/24/2022	11	2
Arestovych warns of possibility of further shelling, including Kyiv	2/24/2022	11	2
Bulk carrier NAMURA QUEEN on fire due to missile strike in Pivdenny seaport	2/25/2022	25	2
UIA suspends flights until Feb 27 inclusively	2/25/2022	25	2
Ferrexpo sends force majeure notices to customers due to suspension of shipments at port	2/25/2022	25	2
Moldova suspends railway communication with Ukraine	2/25/2022	25	2
Shurma urges citizens to pay with payment cards due to difficulties with cash delivery	3/1/2022	25	2

Notes: In each case, we access not only a headline, but a text within the news item, which was not represented in the tables above for the sake of brevity.

Table A1.4: Detailed classification of news items

CAT	Description
111	Military, de-escalation (Russian retreat, international missions coming, embassies returning, diplomatic negotiations ongoing, refugees coming back)
112	Military, escalation (combat actions, damages, military-caused ecological threats, war crimes, civilian losses, refugees fleeing the country)
121	More military aid (military aid from abroad, large donations to the military, weapon procurement)
122	Less military aid (statements on weakening of support of Ukraine from the West, destruction of military production assets in Ukraine etc.)
131	Humanitarian aid to refugees and internally displaced people, local and international
211	Local news on resilience and growth, less restrictions, better public policies, more sustainable currency and public finance situation
212	Local news on fragility, crisis, worse public access to services, more restrictive government policies, weaker currency, riskier situation in public finance, corruption issues
221	Better public access to commercial goods and services, housing, job market and public services like education, healthcare etc.
222	Worse public access to commercial goods and services, housing, job market and services like education, healthcare etc.
231	Agriculture: positive developments (sewing campaign, access to credit, positive corporate news)
232	Agriculture: negative developments (damages and losses, lack of access to resources etc.)
241	Metals and mining: positive developments (positive corporate news)
242	Metals and mining: negative developments (damages, negative corporate news)
251	Logistics: positive developments (better railway logistics, opening of the sea corridor, better access to Danube ports, EU transport network integration)
252	Logistics: negative developments (damages and losses to infrastructure, Russia blocking sea ports, decline on goods transporting etc.)
261	Other business news: positive developments
262	Other business news: negative developments
311	More foreign non-military support (incl. financial aid and EU integration)
312	Less foreign non-military support negative (incl. financial aid irregularities, delays, EU skepticism etc.)
321	Strengthening of sanctions, multinational companies leaving Russia
322	Weakening of sanctions, multinational companies working in Russia, sanctions evasion

Table A1.5: Formulas for the merger of CATs (Table A1.4) into categories (Table 1)

Category	Formula
Combat De-Escalation	= 111
Combat Escalation	= 112
More Military Aid/UA Strength	= 121
Less Military Aid/UA Weakness	= 122
Humanitarian Aid	= 131
Local News Resilience	= 211 + 221 + 261
Local News Fragility	= 212 + 222 + 262
Export News Positive	= 231 + 241 + 251
Export News Negative	= 232 + 242 + 252
More Financial Aid/Support	= 311
Less Financial Aid/Support	= 312
Stronger Sanctions	= 321
Weaker Sanctions	= 322

Table A1.6. Summary on 10 random Interfax articles sentiment and bias as reported by Chat GPT AI (chat.openai.com)

Inquiry:

I will give you 10 random news articles, could you please do the following:
 analyse the sentiment, name it and give the 1-10 estimation of how biased the text is, 1-10 estimation of how emotional the text is and estimation of how present the sentiment is vs the plain facts statement.
 I will be sending them in separate messages.
 Please summarise in the end, mentioning the number of articles you've analysed, their factuality, biases, and sentiment.

Answer (summary):

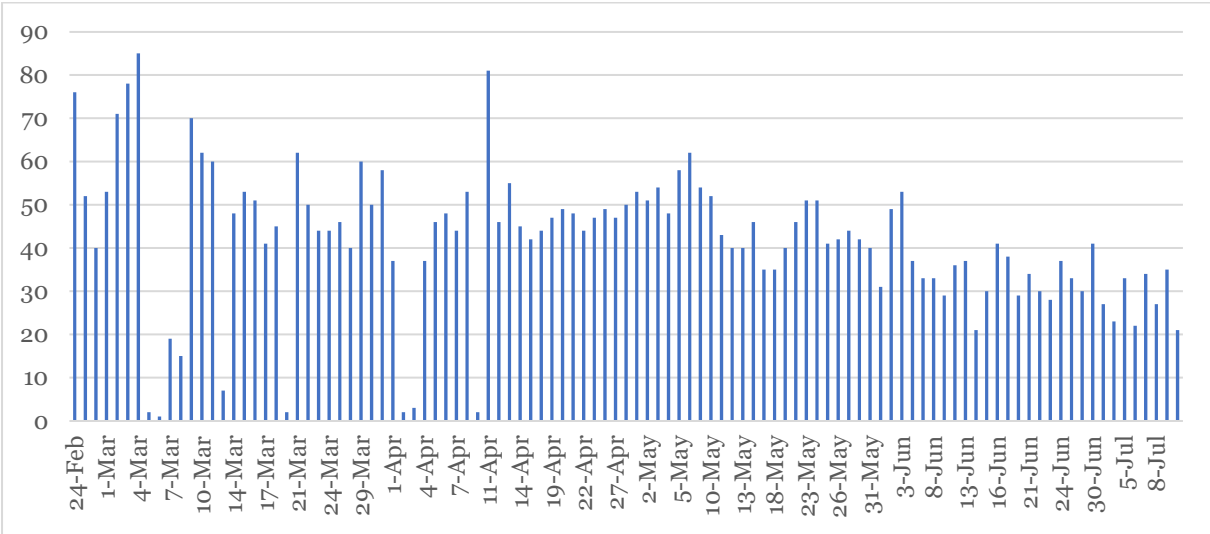
In the analysis of the ten news articles provided, several key aspects have been assessed, including factuality, biases, sentiment, and adherence to academic language norms. These ten articles were evaluated for their adherence to factual reporting, biases introduced by the authors, and the sentiment conveyed in the text.

Factuality: All ten articles maintained a high degree of factuality, predominantly presenting factual information and news updates. They reported on various topics, including political decisions, economic developments, and social issues, and their content was consistent with the factual nature of news reporting. There were no instances of false information or misinformation observed in these articles.

Biases: The articles displayed minimal biases, maintaining a neutral and objective tone in line with typical news reporting. Any biases present were subtle and did not significantly influence the overall narrative. The articles refrained from favoring any particular perspective or opinion, adhering to journalistic standards of impartiality.

Sentiment: The sentiment observed in these articles varied depending on the subject matter. Some articles conveyed positive sentiment when reporting on favorable developments or achievements, while others reported on challenges or crises with a more neutral or somber tone. However, none of the articles exhibited extreme or emotionally charged sentiment. The sentiment was generally reflective of the events and circumstances being reported.

Figure A1.1: Frequency of news



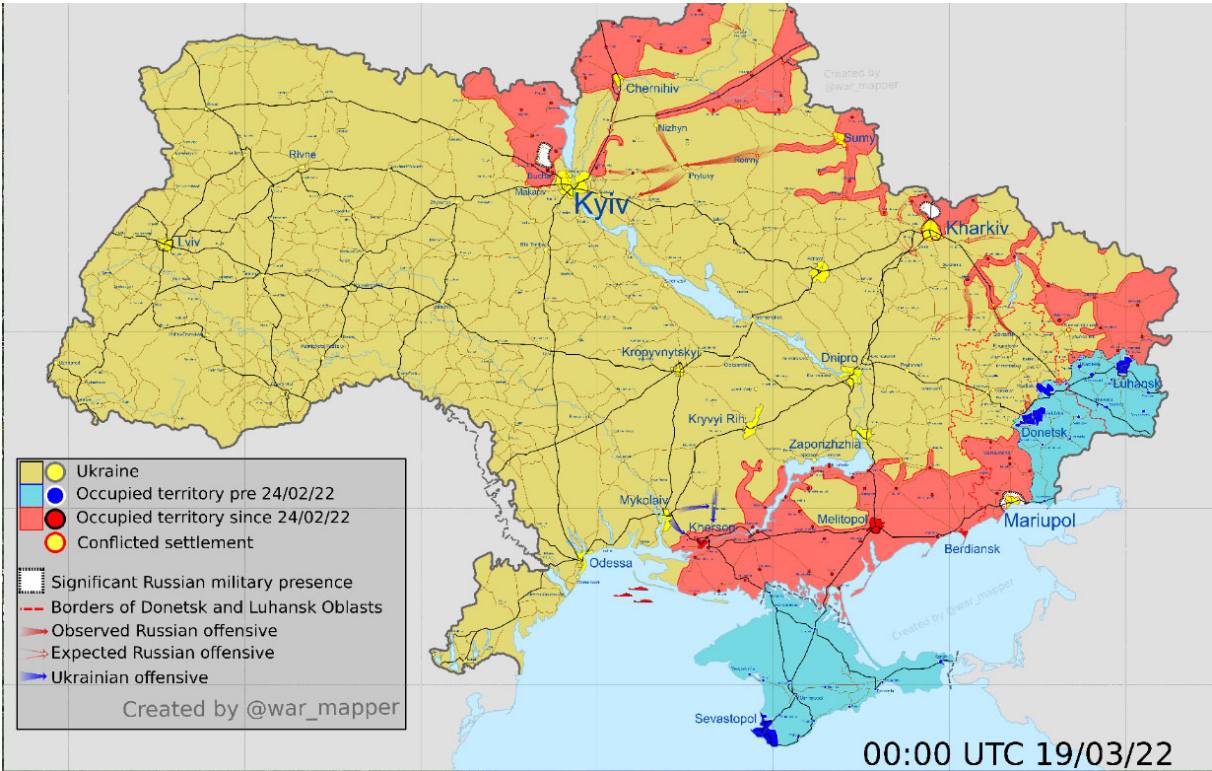
Source: Interfax.

Annex 2: The course of the war in maps

To follow the course of the war in maps, we use the @War Mapper as a source of daily updates. The information on which the mapping is based is collected from open sources and provides an approximation of the course of the war.

Russia invaded Ukraine on February 24, 2022. The invasion begun with missile strikes on the entire country. The ground offensive was rapid, and within less than a month Russian troops occupied parts of the Sumy, Chernihiv, and Kyiv regions in the North, Kharkiv, Luhansk, and Donetsk regions in the East, and Zaporizhzhia and Kherson regions in the South. Thereby, Russian forces have occupied the large cities of Kherson and Melitopol, surrounded and captured Mariupol after its 86 days of resistance, and got within several kilometres distance to Kyiv and Kharkiv – two of Ukraine’s biggest cities as shown in Figure A2.1.

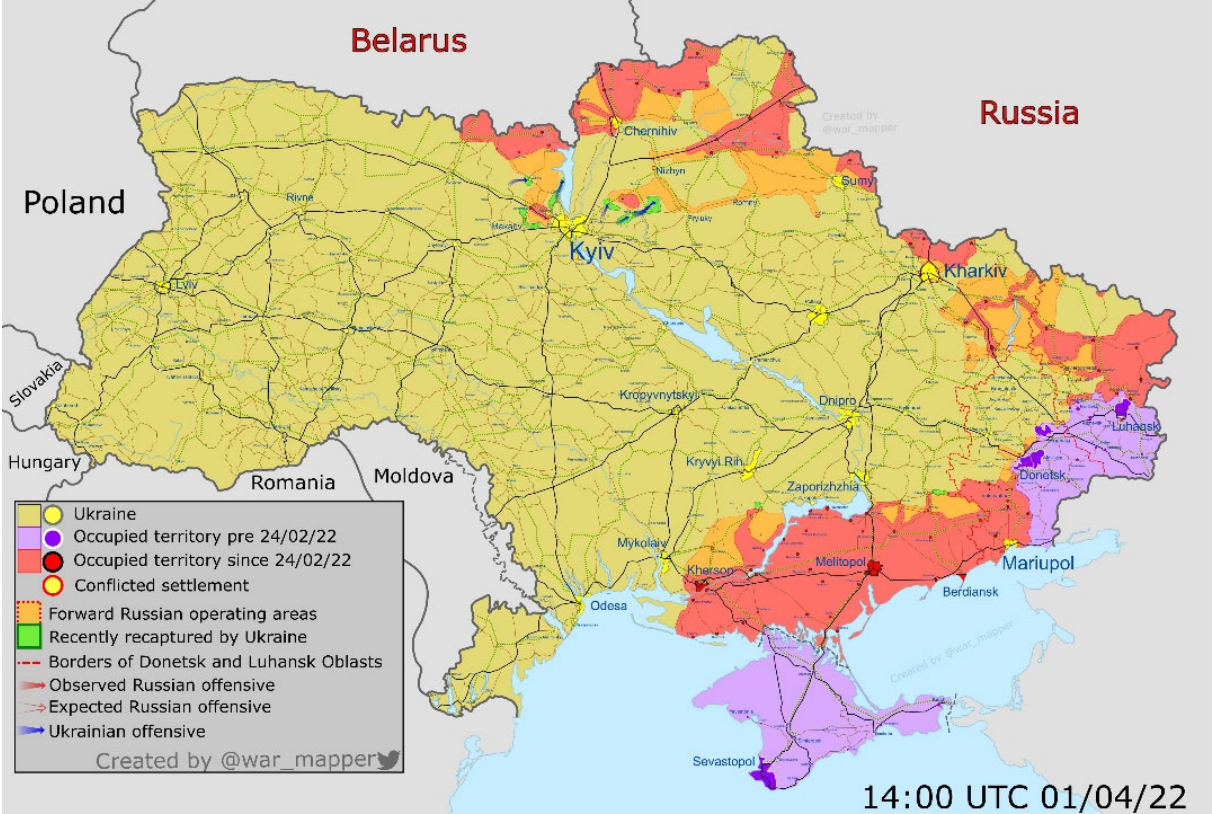
Figure A2.1: Situation on the ground as of March 19, 2022



Source: @war_mapper.

After the initial shock, Ukrainian defence improved and then the situation slowly started to reverse. On April 1, the War Mapper reported that Ukraine has retaken a significant number of settlements to the east and west of Kyiv, which is shown by the green areas (Figure A2.2).

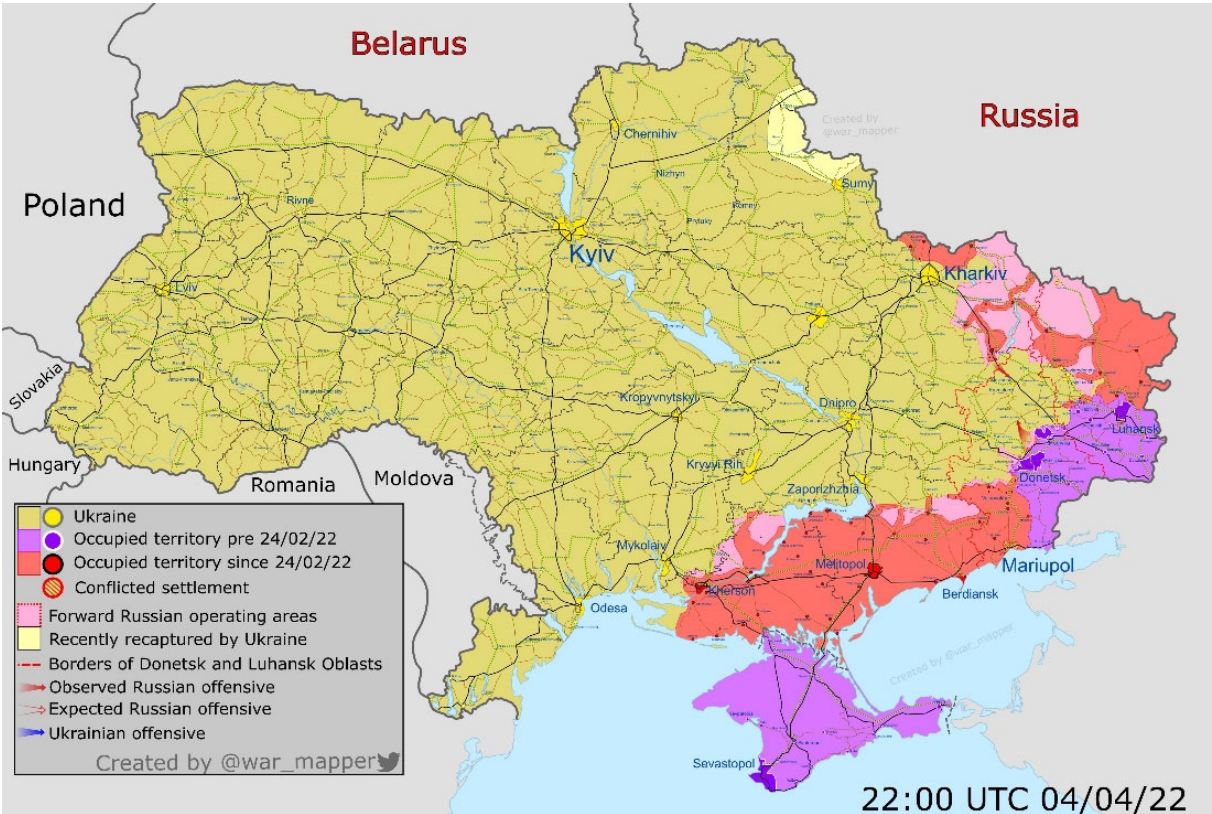
Figure A2.2: Situation on the ground as of April 1, 2022



Source: @war_mapper.

By April 4, Russian troops have been pushed out of the Kyiv region and withdrawn quickly from the Sumy and Chernihiv regions, completely leaving the North as shown in Figure A2.3. On April 13, the Russian flagman warship Moskva sank, which was even more symbolic given that this ship threatened the Ukrainian defenders during the Russian attack on Snake Island in Ukraine's territorial waters. However, the Russian offensive in the East and South continued, and Ukraine was defending its positions against the prevailing troops of the aggressor.

Figure A2.3: Situation on the ground as of April 4, 2022

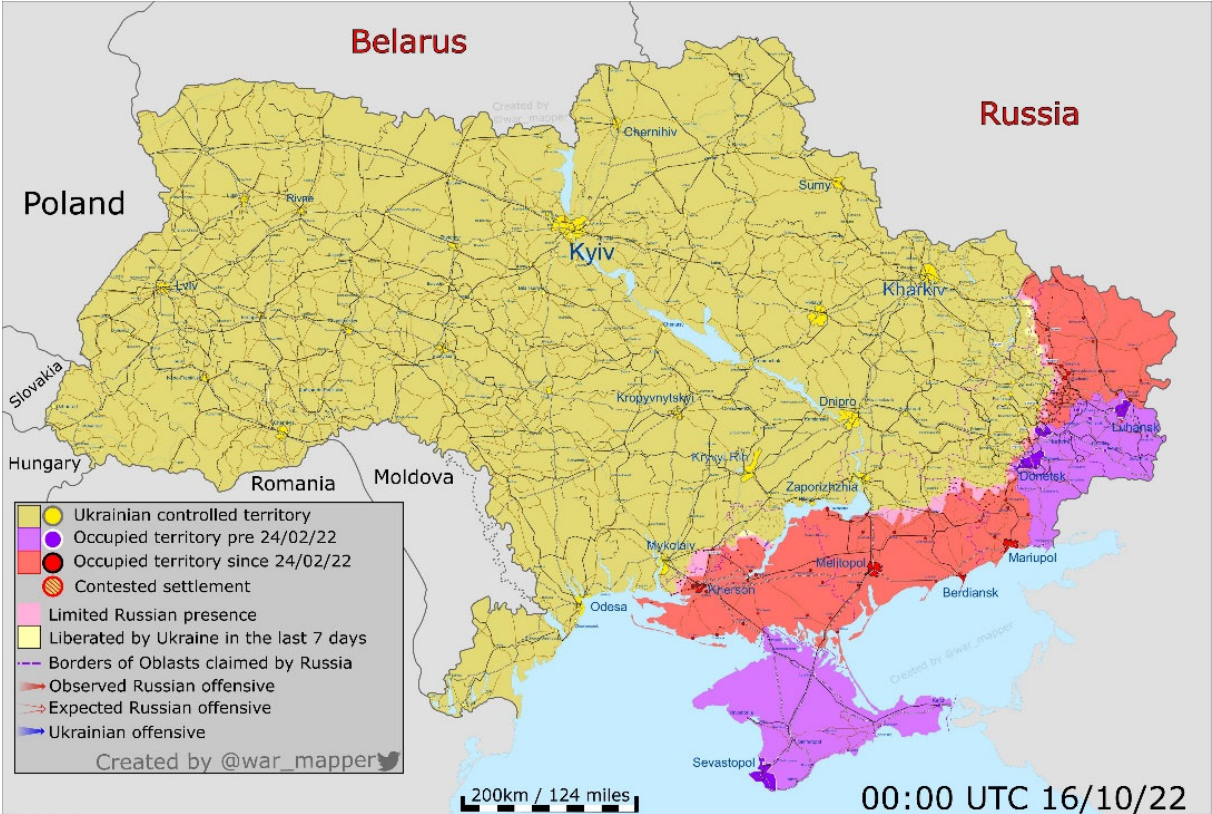


Source: @war_mapper.

The second major shift in the war course began on May 3, when Ukraine carried out counteroffensive operations in the direction of Stary Saltiv near the city of Kharkiv, the second largest Ukrainian city after the capital city Kyiv. The battles were ongoing in the area with a slow but steady success of the Ukrainian side. The heart territories of the Kharkiv region were liberated by end-May. However, Russian troops were still remaining in northern borderline villages and the eastern part of the region.

Another massive Ukrainian Eastern counteroffensive started in early September. By mid-September, the vast majority of the Kharkiv region was liberated. The counteroffensive operations continued further to the cities of Iziium and Lyman, south of Kharkiv, two of the key strongholds of the eastern front. During the next month Ukraine managed to advance slowly but steadily until mid-October (Figure A2.4), when it was being unable to move the frontline further. The position war in the east has started.

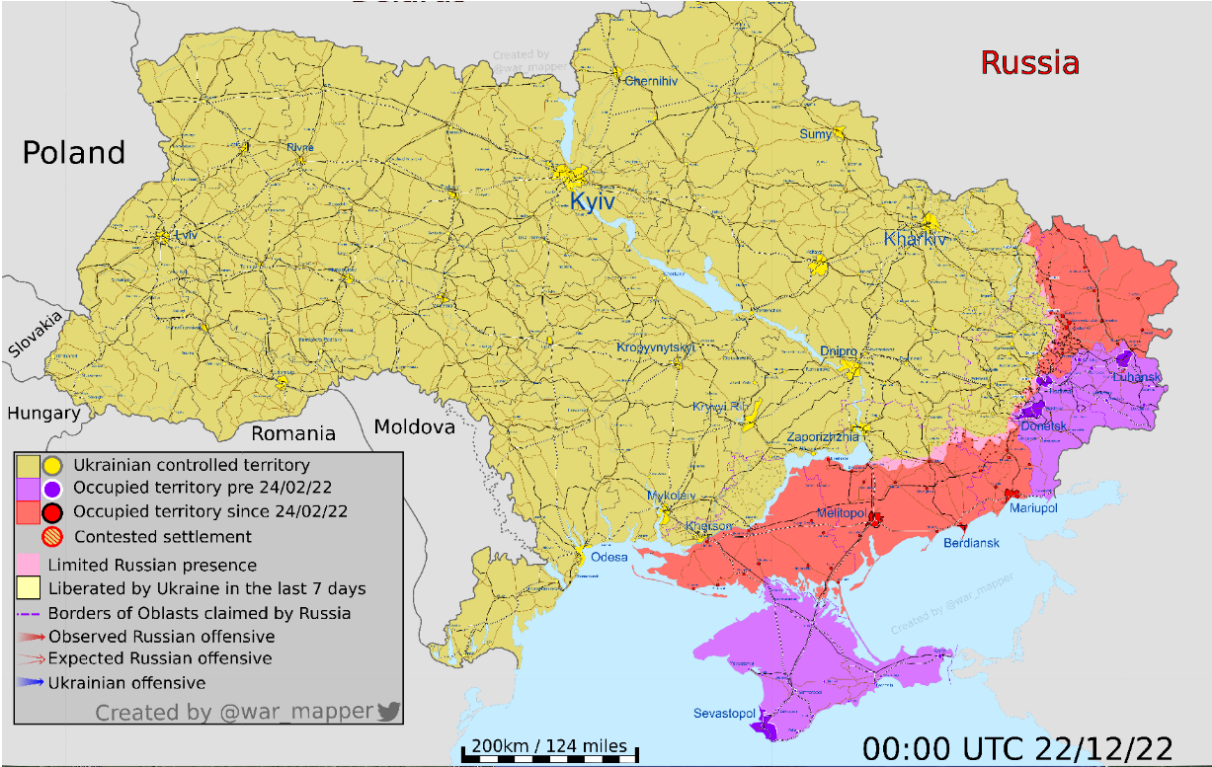
Figure A2.4: Situation on the ground as of October 16, 2022



Source: @war_mapper.

The southern counteroffensive operation did not start before early November, when the rapid advance of Ukrainians allowed to liberate several villages within days and get close to the city of Kherson, a major occupied southern city. On November 12, Kherson was liberated and Russian troops were completely pushed out to the left bank of the Dnieper River.

Figure A2.5: Situation on the ground as of December 22, 2022



Source: @war_mapper.

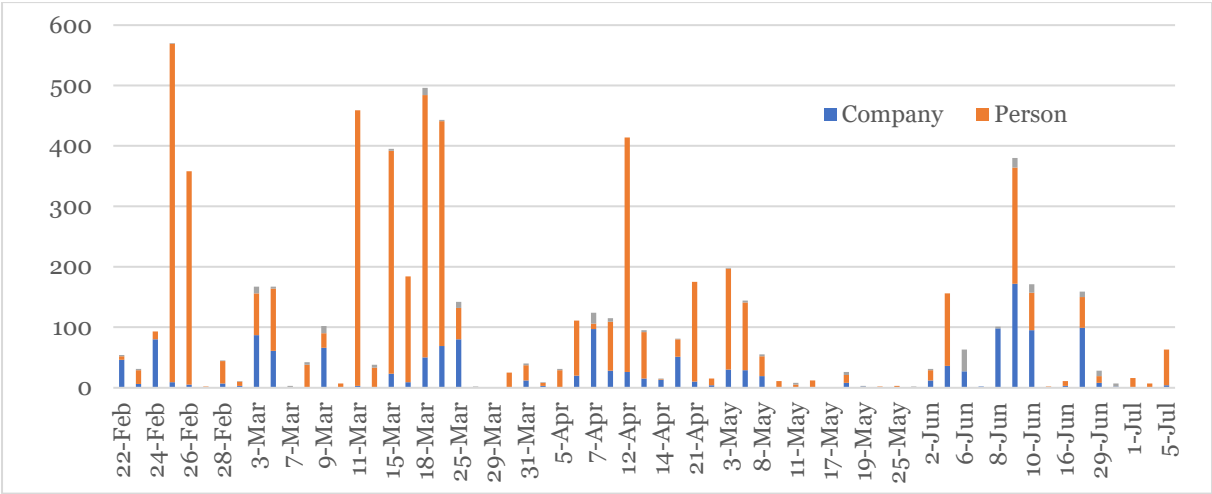
Closer to the end of the year, being unable to advance on the ground, Russia has changed its strategy to air strikes against civilian targets, such as the Ukrainian electricity infrastructure. Whereas the maps show no significant progress of each side, Russian drones and missiles have damaged or destroyed approximately 30-50 percent of Ukrainian electricity distribution capacities since mid-October, leaving the population and businesses without electricity and also without heating and water supply during the winter months.

This is the most recent update on the situation as of end-December 2022 (Figure A2.5). The source of the maps is https://mobile.twitter.com/war_mapper.

Annex 3: Background information on Western aid and sanctions and the economic situation in Ukraine

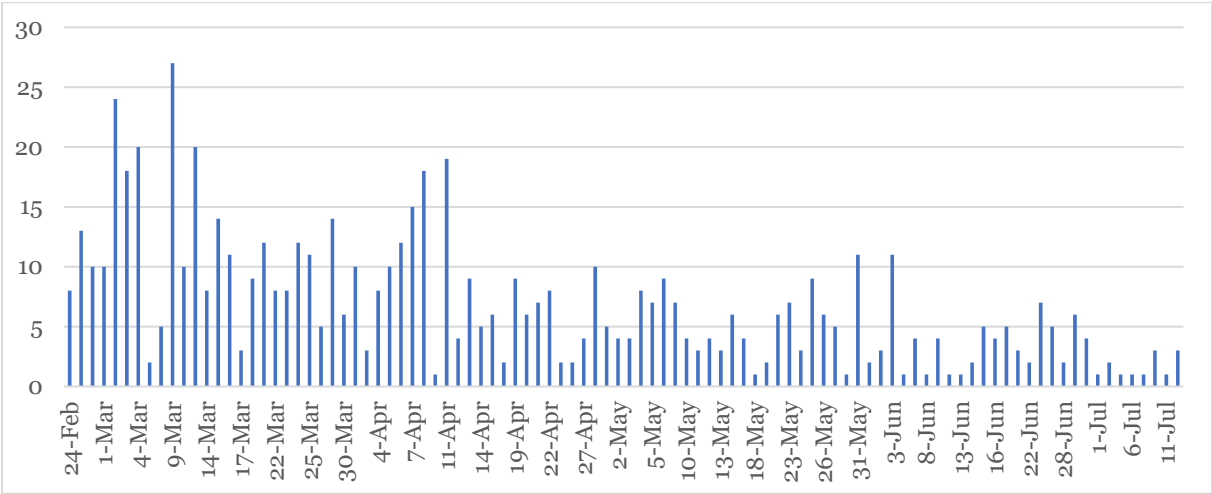
Sanctions. Days after the start of Russia’s invasion, many Russian entities and individuals got sanctioned by the EU, US, and other authorities. Russian banks got banned from SWIFT, companies, in particular those connected to the airspace or military industry, faced trade restrictions, maritime cargo traffic suffered from sanctions on cargo ships, and assets of Russian oligarchs and politically-exposed persons were seized or frozen. Further waves of sanctions followed shortly thereafter. Figure A3.1 shows the number of Russian entities being sanctioned by Western authorities. Figure A3.2 shows — for comparison — the frequency of sanctions-related news in our dataset.

Figure A3.1: Number of Russian entities sanctioned



Source: correctiv.org sanctions tracker.

Figure A3.2: Frequency of sanctions-related news

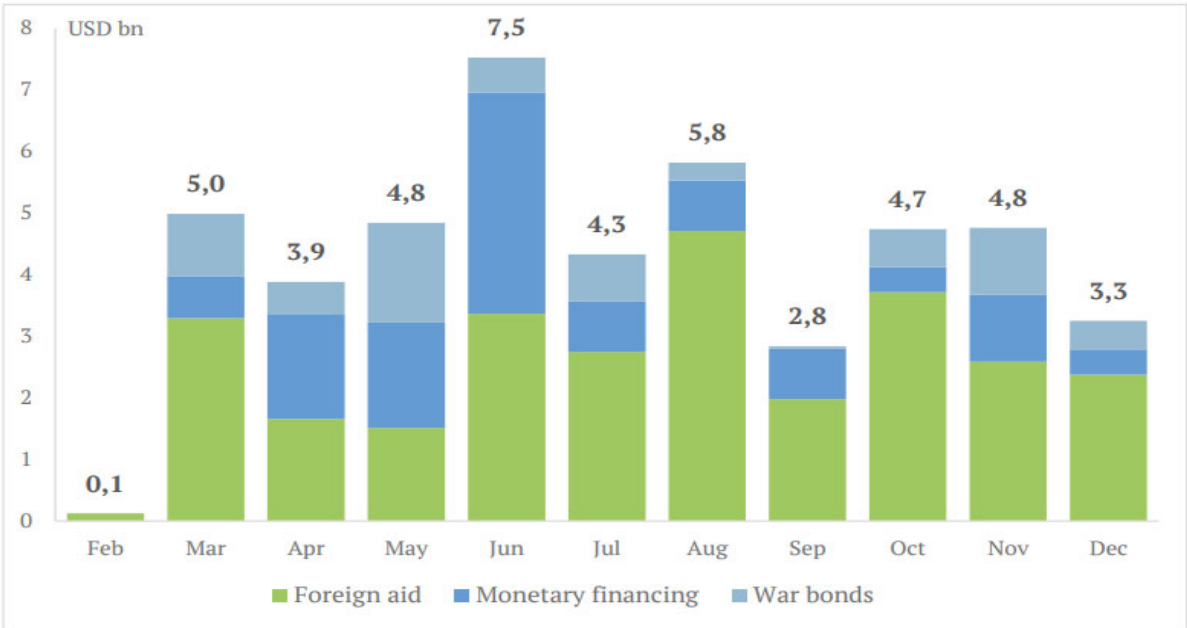


Source: Interfax.

The EU has been Russia’s largest economic partner and relied heavily on Russian energy exports (in particular natural gas), whereas the US never had a substantial economic relationship with Russia in the first place (Congressional Research Service 2022). This results in lower (expected) costs of sanctions and possible countersanctions (cf. Crozet and Hinz 2020) for the US and might explain that the US launched oil and gas embargo procedures in Senate in early March. The signing of the Ban Russian Energy Imports Act prohibited the imports of Russian oil, gas, and coal into the US since early April. In contrast, the EU has been hesitant and only included a coal embargo into the 5th package of sanctions in early April and a phased-out oil embargo (for maritime supplies) into the 6th package of sanctions in early June.

Financial aid and other forms of support for Ukraine. War on a state's territory usually brings economic collapse. Indeed, this was expected of Ukraine at the beginning of the war. However, despite the unprecedented disruption in March, the government and the National Bank of Ukraine managed to maintain economic stability under extremely difficult conditions. Ukraine has survived economically and financially thanks to the lifeline provided by its Western partners. Initially, the financial assistance was not regular and was not enough to cover the budget gap. Therefore, a large share of expenditures was financed by the central bank, putting pressure on the currency and driving local prices upwards. After the first successes on the battlefield, Western financial aid became more regular and predictable, covering a substantial part of the budgetary needs as illustrated in Figure A3.3.

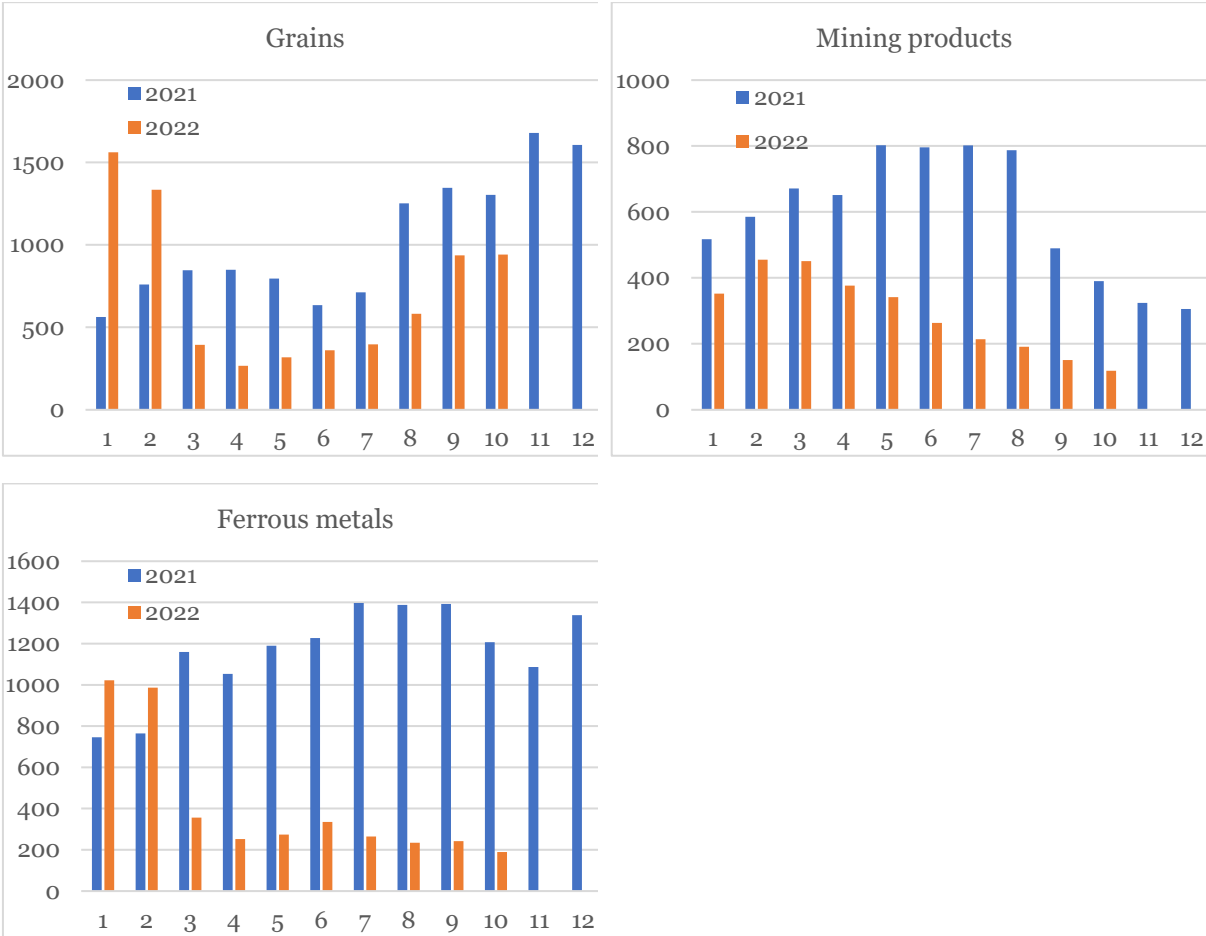
Figure A3.3: Ukraine’s state budget funding sources in 2022 (in bn \$)



Source: Vyshlinsky et al. (2022).

Other equally important forms of support were the EU accession negotiations, the temporary elimination of all the trade barriers for Ukrainian goods by the EU, United Kingdom, and other countries, and integration into European electricity and transport networks. Ukraine’s President signed the application for EU membership on February 28, 2022. On March 1, the European Parliament voted in favour of a resolution calling on the EU to work towards granting Ukraine the status of an EU candidate. On June 9, the European Parliament recommended granting the country candidate status, followed by the European Commission on June 17. Finally, on June 24 the European Council published the corresponding decision about Ukraine’s EU candidacy.

Figure A3.4: Ukrainian exports in 2021 and 2022 (in mn USD)



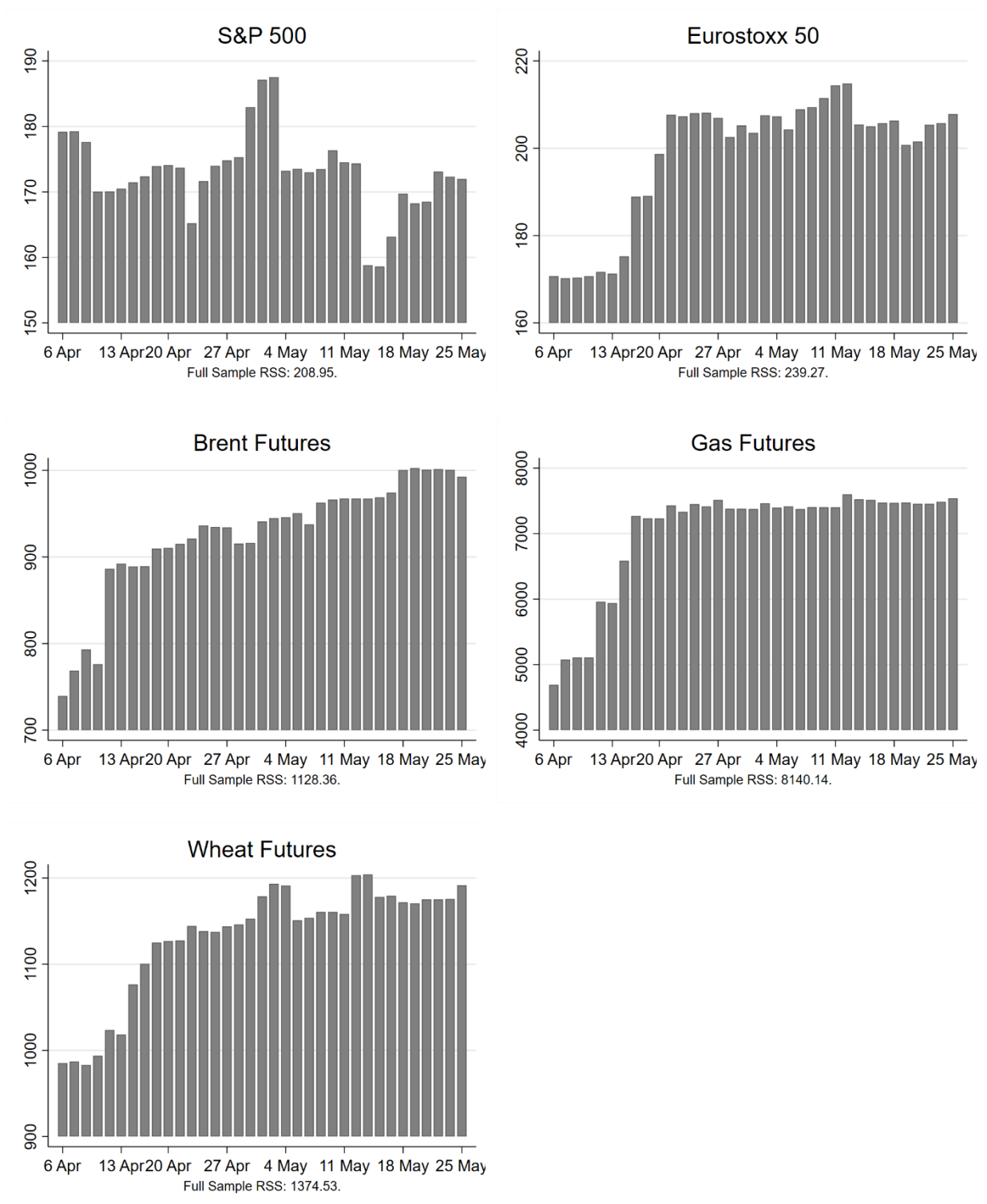
Source: State Statistics Service of Ukraine.

Ukrainian economy and international trade flows. Ukrainian GDP dropped by approximately 30 percent in 2022 due to the war and fixed assets losses (not including damages inflicted by the shelling of the civilian energy infrastructure) are estimated at USD 136 bn as of November 2022. Some of the damages were also important for international trade. Before the war, Ukraine had two major industries whose dynamics might be important for global market prices: agriculture and the metals & mining

industry. Among the major goods are wheat, with an 8.4 percent share in world exports in 2021, and iron ore with a 3.1 percent share. During the war, both industries were damaged heavily and the export flows were cut by a seaport blockade in the Black Sea and the Sea of Azov, disrupting the global value chains and the market supply. On July 22 (i.e. after the sample period of this paper), the so-called “Grain Corridor” agreement was signed in Turkey, allowing maritime transportation of Ukrainian grain. The (huge) drops in exports due to the war are also visualized in Figure A3.4 above.

Annex 4: Data and results appendix

Figure A4.1: Results of breakpoint tests



Notes: Figure shows the residual sum of squares of both subsamples with the endpoint of the first subsample on the x-axis.

Figure A4.2: Time series plots of financial market series



Notes: Figure shows the returns (in %) of the five financial series over time. The vertical lines correspond to the breakpoints found in Figure A4.1.

Table A4.1: Descriptive statistics of financial market returns

	Full Sample			First Subsample			Second Subsample		
	Mean	SD	#	Mean	SD	#	Mean	SD	#
S&P 500	-0.11	1.68	94	-0.09	1.61	57	-0.13	1.79	37
Eurostoxx 50	-0.14	1.85	94	-0.14	2.46	31	-0.14	1.48	63
Brent Futures	0.03	3.79	94	0.14	5.06	30	-0.02	3.06	64
Gas Futures	0.62	9.80	94	0.56	15.31	30	0.64	5.81	64
Wheat Futures	0.04	4.32	94	0.59	6.32	32	-0.25	2.81	62

Notes: Table shows the mean, standard deviation (SD), and number of observations (#) for the full sample period (February 24 to July 12, 2022) and split into two subsamples based on the breakpoint test results shown in Figure A4.1. The endpoints of the first subsample are as follows: 16 May (S&P 500), April 7 (Eurostoxx 50), April 6 (Brent Futures and Gas Futures), and April 8 (Wheat Futures).

Table A4.2: Inclusion of lagged war-related news

	S&P 500	EStoxx 50	Brent	Gas	Wheat
Adjusted R ²	0.048	0.103	-0.010	-0.088	0.061
... incl. lagged news	0.037	0.128	-0.110	-0.106	-0.060
BIC	414.5	427.3	573.1	758.8	591.6
... incl. lagged news	453.4	459.4	618.6	788.6	638.0
Test of Restrictions	18.20	24.57	12.87	13.78	5.33
... $\chi^2(13)$	[0.15]	[0.03]	[0.46]	[0.39]	[0.97]

Notes: Table shows the adjusted R² and the BIC of the baseline estimations from Tables 2–6 and the corresponding values for models where additionally lagged war-related news are included into Eq. (5). In addition, test statistics for a joint exclusion of the lagged war-related news are displayed alongside p-values in brackets.

Table A4.3: Results controlling for the change in occupied territory

	(1)	(2)	(3)
S&P 500	Full Sample	Until May 16	From May 17
Combat De-Escalation	0.038 (0.062)	0.026 (0.071)	0.462 (0.533)
Combat Escalation	-0.045 (0.032)	-0.054 (0.032)	-0.324* (0.168)
Change in Occupied Territory (%)	0.067 (0.085)	0.073 (0.112)	1.346 (9.920)
Observations	94	57	37
R ²	0.203	0.347	0.456
Eurostoxx 50	Full Sample	Until April 7	From April 8
Combat De-Escalation	0.013 (0.070)	0.060 (0.104)	-0.210 (0.209)
Combat Escalation	-0.142** (0.070)	-0.156** (0.056)	-0.126 (0.085)
Change in Occupied Territory (%)	0.229 (0.217)	0.403* (0.218)	1.486 (3.419)
Observations	94	31	63
R ²	0.260	0.721	0.195
Brent Futures	Full Sample	Until April 6	From April 7
Combat De-Escalation	-0.346** (0.146)	-0.758* (0.355)	-0.053 (0.361)
Combat Escalation	0.213 (0.165)	0.018 (0.190)	0.708*** (0.215)
Change in Occupied Territory (%)	0.025 (0.454)	-0.513 (0.516)	-0.221 (10.556)
Observations	94	30	64
R ²	0.153	0.529	0.366
	Full Sample	Until April 6	From April 7
Combat De-Escalation	0.058 (0.354)	-0.959 (0.745)	-0.586 (0.728)
Combat Escalation	-0.010 (0.697)	-0.584 (0.639)	0.381 (0.468)
Change in Occupied Territory (%)	-2.176 (1.325)	-3.006* (1.526)	-23.114 (20.308)
Observations	94	30	64
R ²	0.127	0.627	0.282
Wheat Futures	Full Sample	Until April 8	From April 11
Combat De-Escalation	-0.372*** (0.122)	-0.636* (0.344)	0.586* (0.344)
Combat Escalation	0.108 (0.128)	0.063 (0.140)	0.280 (0.238)
Change in Occupied Territory (%)	-2.467 (2.081)	-5.281 (5.986)	-0.423 (1.829)
Observations	94	32	62
R ²	0.241	0.551	0.272

Notes: Table shows selected results for a least squares estimation of Eq. (5) with heteroskedasticity and autocorrelation-robust standard errors in parentheses, controlling for changes in the share of Ukrainian territory occupied by Russian forces. ***/**/* indicate significance at the 1%/5%/10% level, respectively. Full tables are available on request.

Table A4.4: Results controlling for the cumulative number of sanctioned entities

	(1)	(2)	(3)
S&P 500	Full Sample	Until May 16	From May 17
Stronger Sanctions	0.143*** (0.048)	0.153*** (0.055)	0.421** (0.182)
Weaker Sanctions	-0.075 (0.165)	-0.197 (0.227)	0.232 (0.465)
Log(Cumulative Sanctioned Entities)	0.009 (0.037)	0.030 (0.048)	0.141 (0.528)
Observations	94	57	37
R ²	0.202	0.352	0.458
Eurostoxx 50	Full Sample	Until April 7	From April 8
Stronger Sanctions	0.182*** (0.068)	0.330*** (0.098)	0.075 (0.067)
Weaker Sanctions	-0.014 (0.220)	0.413 (0.431)	0.070 (0.226)
Log(Cumulative Sanctioned Entities)	0.048 (0.043)	0.065 (0.087)	-0.280 (0.207)
Observations	94	31	63
R ²	0.259	0.675	0.215
Brent Futures	Full Sample	Until April 6	From April 7
Stronger Sanctions	-0.208 (0.192)	-0.210 (0.303)	-0.190 (0.122)
Weaker Sanctions	0.666 (0.466)	-1.380 (1.264)	0.608 (0.464)
Log(Cumulative Sanctioned Entities)	-0.066 (0.094)	-0.127 (0.232)	-0.390 (0.383)
Observations	94	30	64
R ²	0.158	0.514	0.376
Gas Futures	Full Sample	Until April 6	From April 7
Stronger Sanctions	-0.150 (0.520)	-0.271 (0.750)	0.074 (0.297)
Weaker Sanctions	-1.508 (1.240)	-8.140** (3.377)	-1.554* (0.816)
Log(Cumulative Sanctioned Entities)	-0.406 (0.288)	-1.393* (0.688)	1.402 (1.008)
Observations	94	30	64
R ²	0.116	0.640	0.278
Wheat Futures	Full Sample	Until April 8	From April 11
Stronger Sanctions	-0.029 (0.127)	-0.316 (0.270)	-0.143 (0.143)
Weaker Sanctions	1.071** (0.503)	0.706 (1.752)	0.656 (0.538)
Log(Cumulative Sanctioned Entities)	-0.080 (0.158)	0.100 (0.258)	-0.414 (0.519)
Observations	94	32	62
R ²	0.218	0.498	0.281

Notes: Table shows selected results for a least squares estimation of Eq. (5) with heteroskedasticity and autocorrelation-robust standard errors in parentheses, controlling for the cumulative number of sanctioned entities (cf. Figure A3.1). Coefficient of Log(Cumulative Sanctioned Entities) indicates the response of market returns (in pp) to a 10 percent increase in the variable. ***/**/* indicate significance at the 1%/5%/10% level, respectively. Full tables are available on request.

Table A4.5: Results for Eurostoxx 600 returns

	(1) Full Sample	(2) Until April 11	(3) From April 12
Lag(Eurostoxx 600 Returns)	0.063 (0.106)	0.126 (0.293)	0.116 (0.144)
Lag(3-M T-Bill Change)	0.082 (2.185)	-4.915 (6.506)	1.992 (2.698)
Combat De-Escalation	-0.002 (0.049)	0.028 (0.092)	-0.186 (0.167)
Combat Escalation	-0.094* (0.051)	-0.109** (0.040)	-0.096 (0.070)
More Military Aid/UA Strength	-0.043 (0.062)	-0.391 (0.226)	0.030 (0.087)
Less Military Aid/UA Weakness	0.573 (0.457)	2.548** (0.961)	-0.001 (0.404)
Humanitarian Aid	-0.096 (0.101)	-0.132 (0.186)	-0.248 (0.167)
Local News Resilience	0.002 (0.033)	-0.230* (0.128)	0.054 (0.042)
Local News Fragility	0.011 (0.061)	0.275 (0.246)	-0.032 (0.070)
Export News Positive	0.007 (0.065)	0.161 (0.290)	0.000 (0.080)
Export News Negative	-0.100 (0.091)	-0.286 (0.169)	-0.014 (0.121)
More Financial Aid/Support	-0.114* (0.059)	-0.082 (0.181)	-0.048 (0.090)
Less Financial Aid/Support	0.241 (0.302)	-0.261 (0.338)	0.410 (0.436)
Stronger Sanctions	0.114** (0.046)	0.206** (0.079)	0.080 (0.075)
Weaker Sanctions	0.020 (0.169)	0.346 (0.335)	0.151 (0.204)
Constant	0.584 (0.518)	0.965 (1.217)	-0.079 (0.662)
Observations	94	33	61
R ²	0.217	0.574	0.182

Notes: Table shows the results for a least squares estimation of Eq. (5) with heteroskedasticity and autocorrelation-robust standard errors in parentheses. ***/**/* indicate significance at the 1%/5%/10% level, respectively.

Table A4.6: S&P 500: Log + 1 specification for war-related news

	(1) Full Sample	(2) Until April 12	(3) From April 13
More Military Aid/UA Strength	-0.047 (0.029)	-0.146** (0.061)	-0.046 (0.044)
Less Military Aid/UA Weakness	0.044 (0.081)	0.179* (0.103)	-0.078 (0.094)
More Financial Aid/Support	-0.079** (0.036)	-0.133** (0.047)	-0.085 (0.065)
Less Financial Aid/Support	0.027 (0.050)	0.020 (0.081)	-0.022 (0.074)
Stronger Sanctions	0.134*** (0.042)	0.228** (0.092)	0.194*** (0.060)
Weaker Sanctions	-0.004 (0.037)	-0.041 (0.054)	0.048 (0.048)
Observations	94	34	60
R ²	0.218	0.512	0.326

Notes: Table shows selected results for a least squares estimation of Eq. (5) with heteroskedasticity and autocorrelation-robust standard errors in parentheses. Coefficients of war-related news indicate the response of market returns (in pp) to a 10 percent increase in the variables. ***/**/* indicate significance at the 1%/5%/10% level, respectively.

Table A4.7: Eurostoxx 50: Log + 1 specification for war-related news

	(1) Full Sample	(2) Until April 6	(3) From April 7
More Military Aid/UA Strength	0.007 (0.030)	-0.069 (0.110)	0.024 (0.035)
Less Military Aid/UA Weakness	0.127 (0.100)	0.564** (0.206)	-0.009 (0.070)
More Financial Aid/Support	-0.082** (0.040)	-0.084 (0.117)	-0.073 (0.050)
Less Financial Aid/Support	0.050 (0.050)	-0.060 (0.098)	0.068 (0.066)
Stronger Sanctions	0.104** (0.043)	0.188 (0.142)	0.099** (0.038)
Weaker Sanctions	0.044 (0.047)	0.244* (0.118)	0.034 (0.038)
Observations	94	30	64
R ²	0.207	0.604	0.257

Notes: Table shows selected results for a least squares estimation of Eq. (5) with heteroskedasticity and autocorrelation-robust standard errors in parentheses. Coefficients of war-related news indicate the response of market returns (in pp) to a 10 percent increase in the variables. ***/**/* indicate significance at the 1%/5%/10% level, respectively.

Table A4.8: Brent futures: Log + 1 specification for war-related news

	(1) Full Sample	(2) Until April 6	(3) From April 7
More Military Aid/UA Strength	0.033 (0.067)	-0.195 (0.304)	-0.006 (0.066)
Less Military Aid/UA Weakness	0.025 (0.177)	-0.433 (0.395)	0.130 (0.125)
More Financial Aid/Support	0.048 (0.072)	0.244 (0.196)	-0.153 (0.097)
Less Financial Aid/Support	-0.040 (0.115)	-0.028 (0.387)	0.153 (0.115)
Stronger Sanctions	-0.122 (0.091)	-0.211 (0.264)	-0.037 (0.071)
Weaker Sanctions	0.120 (0.080)	-0.267 (0.226)	0.163* (0.087)
Observations	94	30	64
R ²	0.193	0.571	0.420

Notes: Table shows selected results for a least squares estimation of Eq. (5) with heteroskedasticity and autocorrelation-robust standard errors in parentheses. Coefficients of war-related news indicate the response of market returns (in pp) to a 10 percent increase in the variables. ***/**/* indicate significance at the 1%/5%/10% level, respectively.

Table A4.9: Gas futures: Log + 1 specification for war-related news

	(1) Full Sample	(2) Until April 6	(3) From April 7
More Military Aid/UA Strength	-0.097 (0.161)	0.023 (0.725)	-0.115 (0.121)
Less Military Aid/UA Weakness	-0.039 (0.444)	-1.648* (0.845)	0.552** (0.261)
More Financial Aid/Support	-0.041 (0.222)	-0.664 (0.509)	0.034 (0.152)
Less Financial Aid/Support	-0.362 (0.254)	-0.188 (0.719)	-0.001 (0.188)
Stronger Sanctions	0.076 (0.241)	0.408 (0.759)	0.032 (0.171)
Weaker Sanctions	-0.413* (0.245)	-1.831** (0.698)	-0.304** (0.146)
Observations	94	30	64
R ²	0.132	0.695	0.222

Notes: Table shows selected results for a least squares estimation of Eq. (5) with heteroskedasticity and autocorrelation-robust standard errors in parentheses. Coefficients of war-related news indicate the response of market returns (in pp) to a 10 percent increase in the variables. ***/**/* indicate significance at the 1%/5%/10% level, respectively.

Table A4.10: Wheat futures: Log + 1 specification for war-related news

	(1)	(2)	(3)
	Full Sample	Until April 8	From April 11
More Military Aid/UA Strength	0.096 (0.075)	0.646** (0.275)	-0.022 (0.062)
Less Military Aid/UA Weakness	-0.308* (0.176)	-0.963** (0.406)	-0.191 (0.165)
More Financial Aid/Support	0.048 (0.094)	-0.012 (0.266)	-0.098 (0.082)
Less Financial Aid/Support	-0.121 (0.143)	0.055 (0.309)	-0.179 (0.134)
Stronger Sanctions	0.021 (0.096)	-0.424* (0.237)	-0.007 (0.082)
Weaker Sanctions	0.128 (0.094)	0.270 (0.268)	0.146 (0.091)
Observations	94	32	62
R ²	0.174	0.515	0.276

Notes: Table shows selected results for a least squares estimation of Eq. (5) with heteroskedasticity and autocorrelation-robust standard errors in parentheses. Coefficients of war-related news indicate the response of market returns (in pp) to a 10 percent increase in the variables. ***/**/* indicate significance at the 1%/5%/10% level, respectively.