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Cost of Conflict: An Analysis of the Costs of Russia's Ongoing Hostilities in the Black Sea Region

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Frontier Europe Initiative

Frontier Europe Initiative explores the Black Sea region as the meeting point of Europe, Asia, and the Middle East. The program examines the growing energy, trade, security, and political relationships and challenges in the Black Sea with the aim of developing greater Western understanding of both the region and the strategic interplay between these issues.

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Contents

Executive summary

Conflicts are enormously destructive. They destroy lives and property, uproot communities, and reduce the economic potential for all involved. This devastation often has an unaccounted cost, both in terms of the obvious direct destruction of lives and assets, as well as the indirect costs that weigh on economies, often for years to come. This is true of all conflicts, and has certainly been true, and visible, during Russia's unjustified and illegal invasions of its neighbors, Georgia and Ukraine.

The question is not whether conflicts have costs — they most certainly do. The question is how to measure these costs. This report seeks, for the first time, to provide an analysis of the costs of Russia's ongoing hostilities in the Black Sea region.

We first conduct a quantitative economic cost analysis of Russia's 2008 invasion of Georgia and ongoing operations and support of separatist rebels in eastern Ukraine since 2014. Specifically, we provide a breakdown of economic costs imposed on Georgia and Ukraine in terms of short- and long-term economic disruptions, loss of territory, destruction of human capital, physical assets and infrastructure, and foreign and humanitarian assistance. We also provide analyses of the direct and indirect military costs of both conflicts on Georgia and Ukraine.

We then offer a brief analysis of the indirect costs of both conflicts on the broader Black Sea region — namely for Bulgaria, Romania, and Turkey — as well as of the costs imposed indirectly on the United States and the EU and NATO communities. Our indirect costs analysis shows that the Transatlantic community continues to face increasing costs as a result of Russia's invasion of Georgia and Ukraine and the militarization of the Black Sea region.

We recognize that quantitative costs of conflict are only part of the story. Of course, there have also been political, social, and security costs for not only Georgia and Ukraine, but also neighboring Black Sea nations and Western partners and allies. However, with much of these costs difficult to measure, this report focuses primarily on the quantifiable, direct costs for Georgia and Ukraine.

The report reveals three key takeaways. The first is the long-term costs imposed by Russian aggression — costs which are felt by the aggressed countries for many years, even after the end of violence. Second, the costs of Black Sea conflicts are multi-faceted in that the region (and beyond) has suffered losses economically, politically, militarily, and societally. And third, local conflicts in the Black Sea are wide-ranging, meaning countries outside the Black Sea, particularly the U.S. and its allies, have borne a significant share of the costs of regional conflict.

It is our hope this report will raise Western awareness that the cost of Russian aggression in Georgia and Ukraine has not just been imposed on the Black Sea neighborhood. There have been enormous political, economic, social, and military burdens placed on Western nations as well (and, of course, on aggressed nations outside NATO). Building Western deterrence is becoming more complicated, more costly, and broader in scope. However, increasing Western presence in the Black Sea region and investing in territorial defense, critical infrastructure development, and societal resilience will help to reduce the future costs that Russia is willing to impose on the region.

Introduction

The Black Sea is one of the world's most important and complex security environments, with active military conflicts, annexed territories, separatist regions, and frozen conflicts. Before the end of the Cold War in 1991, the Black Sea region was dominated by the Soviet Union. In the early 1990s, five newly independent countries emerged: Armenia, Azerbaijan, Georgia, Moldova, and Ukraine. However, these states' sovereignty, independence, and territorial integrity have since been limited by Russian efforts to create "frozen conflicts" in the region. In fact, all the frozen conflicts on the Black Sea's shores remain unresolved.

Three decades later, the Black Sea's volatile security environment has not abated. "Color Revolutions" in Georgia and Ukraine demonstrated the popularity in both countries of Western integration, answered in 2008 with the promise of NATO membership. The situation was exacerbated by Russia's invasion of Georgia in 2008 and Ukraine in 2014. At the same time, Russia has heavily invested in the militarization of the Black Sea, including in its most powerful navy, the Black Sea Fleet.

Despite ongoing aggression in the Black Sea, the West only changed its threat perception of Russia after 2014. The Western response to an increasingly challenging Russia and its militarization of the Black Sea has been limited, largely because NATO still lacks a coherent threat perception of Russia. Western countries have shared some of the costs of Black Sea conflicts through increased military budgets, sanctions, and limited military aid to Ukraine and Georgia. However, Western efforts have proved insufficient in raising the cost of Russian aggression, and Russia has continued pressuring its neighbors and increasing the militarization of the Crimean Peninsula with anti-access/area-denial (A2/AD) capabilities in the Black Sea. Levels of insecurity in the Black Sea region have not been reduced; instead, they have continuously increased over the last decade.

Types of costs

Direct and indirect costs for Georgia and Ukraine

This report analyzes the direct and indirect political, military, economic, and social costs of Russian aggression for Georgia and Ukraine, focusing on both the short and long term.

- **Short term:** We measure immediate loss of output as a result of fighting; destruction of military assets, infrastructure, and other capital; immediate humanitarian and budget assistance to support spending and social programs; and the seizure or expropriation of assets by belligerent actors.
- **Long term:** To supplement our short-term costs, and to provide a more continuous picture of the devastation, we also estimate the long-term impact on output and wealth, starting in

Georgia from the fourth quarter of 2008 and in Ukraine from the second quarter of 2015 and extending to the first quarter of 2019 for both.

Indirect costs for the Black Sea region and the West

The report also provides an overview of the indirect costs of conflict for the broader Black Sea region and the Transatlantic community. While much of this is unquantifiable, it is important to acknowledge the enormous scale of the costs across the economic, military, social, and political spheres.

- The **economic costs** of Russia's aggression in Georgia and Ukraine span regional infrastructure, trade, energy, and tourism. The Black Sea is home to vital infrastructure connecting Caspian energy to European markets. Much of the infrastructure that facilitates trade has been obstructed or is exposed to obstruction by Moscow. Following Russia's military aggression in 2008 and 2014, Georgia and Ukraine were forced to diversify their energy supplies away from Russia and rely on partners and allies in response to Moscow's energy blackmail. Turkey is following a similar path, but Bulgaria continues to promote Russian energy interests in the region. Meanwhile, economic sanctions imposed by Russia on Black Sea countries have had devastating effects, especially on Ukraine and Georgia. Russia's ongoing militarization and aggression in the region, particularly following the effective closing of the Sea of Azov, has had direct economic consequences not just for Ukraine, but for all Western states dependent on Ukrainian exports. Finally, Russia's increasing militarization of the Black Sea has had significant consequences on tourism across the region, limiting access and affecting infrastructure.
- The **military costs** of Russian aggression on Black Sea nations and NATO members have been both direct and immediate (for example, the confiscation or destruction of military capabilities) and indirect (for example, increased defense budgets and foreign aid requests). Georgia and Ukraine have so far been unable to recoup capabilities or rebuild infrastructure that Russia destroyed. NATO heightened its threat perception of Russia in response to aggression in Georgia and Ukraine, and in 2014, member states committed to spending 2 percent GDP on defense. This substantial indirect military cost adds to the direct costs for America: Since Georgia and Ukraine were attacked, the U.S. has multiplied direct military aid to both countries and invested billions into the defense of the Black Sea as part of the European Deterrence Initiative (EDI). It's worth noting, however, that an overall rise in NATO budgets was not solely the result of Russian aggression in Ukraine. Likewise, EDI funding has been distributed across Eastern Europe, including the Baltic and Black Seas. For this reason, our report does not include these as part of the overall cost of conflict in Georgia and Ukraine. We do, however, detail military aid provided by the U.S. to all its partners in the Black Sea and have added this aid to the Black Sea's cost of conflict analysis.
- The **social costs** of Russia's aggression in Georgia and Ukraine are immeasurable. Military and civilian victims, internally and externally displaced populations, destruction of health and education systems, and suppressed civil society in the occupied territories are some of the most

important social costs inflicted on Georgia and Ukraine. Russia's aggression in Abkhazia, South Ossetia, Crimea, and the Donbas has had long-term social consequences leading to millions of displaced people and the reliance of occupied territories on Georgia for health and education. Most of these regions have also suffered from the growth of extremism following Russian disinformation and hybrid warfare. Finally, Georgia and Ukraine continue to face Russian disinformation campaigns affecting their internal social cohesion. But the social costs extend far beyond Georgia and Ukraine. Russia's willingness to invade sovereign territories in the name of defending its citizens abroad, combined with massive snap exercises and simulated nuclear attacks on both NATO members and partners, have created insecurity across Eastern European societies.

- The **political costs** of conflict in Ukraine and Georgia are unquantifiable and continue to have devastating effects far beyond the region. The Black Sea's Color Revolutions represented the pro-Western, democratic preference of populations in the region. Russia's violent reaction to popular pro-Western orientations of sovereign nations has led to dramatic developments that call into question the West's post-Cold War policy. Russia has attacked and projected force over peoples and territories far beyond its own borders and increasingly close to NATO space. This further blurs the line between the direct cost for the countries NATO does not provide security for and those that the Alliance has been trying to reassure. Furthermore, the indirect costs imposed on the West — that is, Russia's undermining of Western values and principles by questioning the Western order — are also imposing indirect political costs on Black Sea countries. By invading sovereign and independent nations, Russia has forced Georgia and Ukraine into a choice between the East or nothing, effectively cancelling out their desired EU and NATO membership.

Report takeaways

The costs of conflict have been felt long term by the aggressed countries of Georgia and Ukraine, by the Black Sea region, and by the West. The price of territorial integrity, military aggression, and economic, political, and social warfare has been a constant in the Black Sea region since 2008. Across the West, military budgets will remain inflated for the foreseeable future in response to the 2014 Russian aggression against Ukraine. Our findings also show that the cost of aggression in the Black Sea region is rising each year, as Russia continues to subject the region and the West to aggression through hybrid warfare and disinformation.

It is clear, as Secretary of State Antony Blinken recognized during his confirmation hearing, that Georgia and Ukraine have faced Russian aggression and intervention because of their political and public support for Western orientation and integration. Georgia and Ukraine have paid for their Western preference on multiple levels. First, following Russian aggression, the option of Western integration was removed from the table until further notice, imposing insurmountable political, military, economic, and social costs on both countries and effectively removing their independence and sovereignty. Second, both countries suffered massive territorial costs, as Russia effectively stripped them of their territorial integrity. Finally, Russia's actions caused the near collapse of two democracies in Europe's neighborhood.

The Black Sea conflicts also reveal wide-ranging costs across the region and the Transatlantic space. Countries in the region have faced varying direct and indirect costs according to their political preferences and threat perceptions, although Russia's aggression has undoubtedly imposed security costs across the entire region. Beyond the Black Sea, billions of dollars have been spent by Western partners. This includes long-term and massive indirect costs like increased military aid and military budgets, deterrence measures, and the switch of NATO's focus on expeditionary warfare capabilities back to territorial defense. In both conflicts, indirect costs extended beyond the military sphere of security, with the need to entirely restructure regional economies and energy infrastructure. The United States has also shouldered much of the political cost in the West, having been forced to step up its NATO commitments when other partners were reluctant to do so.

Recent developments in Ukraine illustrate how local costs spiral outward to greater Europe and the U.S. In April 2021, Russian forces surged into forward bases near Ukraine's eastern border and in Crimea.[1] The large number of personnel, coupled with the advanced capabilities deployed by Russia, led to fears of imminent escalation of the frozen conflict.[2] The buildup resulted in high tensions for Ukraine and the Black Sea region. However, this tension and calls for preventive action spread to both Europe and the U.S. Leaders in France and Germany conducted high-level diplomatic meetings to encourage de-escalation, while President Joe Biden scheduled in-person visits with both President Vladimir Putin and President Volodymyr Zelensky.[3] The dangerous situation served as a reminder that any regional crisis will inevitably result in significant costs for the West.

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[1] Iulia-Sabina Joja, "Ukraine is an Intractable Problem," *The Hill*, April 25, 2021, https://thehill.com/opinion/international/550125-ukraine-is-an-intractable-problem-made-worse-by-a-lack-of-strategy.

[2] Heather Conley, et al., "Unpacking the Russian Troop Buildup Along Ukraine's Border," *CSIS*, April 22, 2021, https://www.csis.org/analysis/unpacking-russian-troop-buildup-along-ukraines-border.

[3] Aamer Madhani, "Biden Invites Ukrainian President to White House this Summer," *The Globe and Mail*, June 7, 2021, https://www.theglobeandmail.com/world/article-biden-invites-ukrainian-president-to-white-house-this-summer-2/.

Photo by Maksym Voytenko/ Anadolu Agency/ Getty Images

Context

Georgia

Map 1: Russia's invasion of Georgia in 2008.

Rising tensions between Georgia and Russia in 2006 and 2007 started to spill over into the occupied territories of Abkhazia and South Ossetia by late spring and early summer 2008. By early August 2008 — following a series of escalatory measures on both sides, including overflights, exchanges of artillery and gunfire, the use of improvised explosive devices, and the targeting or killing of local security officials — Georgia, and the regions of South Ossetia and Abkhazia, were on the brink of open war.

On the evening of August 7, after multiple attempts to find a diplomatic solution to increasing hostility between Georgian forces and de facto South Ossetian forces, Georgian President Mikheil Saakashvili ordered a large military operation to capture key objectives around the South Ossetian capital of Tskhinvali. This operation was met with resistance from South Ossetian forces as well as fire from Russian air force and artillery units. Beginning on August 8 Russian air forces also began conducting strikes on targets outside of the immediate theater of warfare, including against military targets in Tbilisi and the port of Poti on the Black Sea. In addition, Russia mobilized units in Abkhazia and the Black Sea Fleet.

By August 10, a second front in the war was opened in Abkhazia, as Abkhaz authorities took advantage of the Georgian operation in South Ossetia to seize the strategic Kodori Gorge, which Georgian forces and civilians had retreated from the previous night. Later, on August 10, Russian forces crossed the Georgian-Abkhaz cease-fire line in western Georgia, seizing the towns of Zugdidi and the strategic port of Poti. This was accompanied by Russian movements across the administrative boundaries of South Ossetia and the seizing of the town of Gori. By the time the parties declared a negotiated cease-fire on August 12, Russian forces had reached as far south as Senaki and Poti in western Georgia and were approaching Georgian defensive lines set up near Mtskheta to protect Tbilisi. By August 22, most Russian troops had withdrawn back into South Ossetia and Abkhazia. At present, the regions of South Ossetia and Abkhazia remain occupied by separatist forces controlled by Russia, which continues a policy of passportization of citizens in the occupied territories and borderization of Georgia[4].

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[4] Vladimir Socor, "Russia Launches 'Passportization' in Occupied Ukrainian Donbass (Part One)," Jamestown Foundation, May 1, 2019, https://jamestown.org/program/russia-launches-passportization-in-occupied-ukrainian-donbas-part-one/.

Ukraine

Map 2: Crimean Peninsula, including locations of oil and gas fields, gas pipelines, and drilling platforms.

Russia's presence and keen interest in Ukraine's internal politics and Western orientation have loomed large ever since its independence in 1991. The seeds of the 2014 conflict were planted in 2004 during Ukraine's Orange Revolution. When Ukrainian President Viktor Yanukovych refused to sign an Association Agreement with the European Union in 2013, major public pro-Western protests known as the Euromaidan broke out, prompting him to flee to Russia. Russia quickly responded with a military intervention, first in Crimea and then in Donbas. In the days following Yanukovych's exile, media reports indicated that "little green men" in unmarked Russian Army uniforms were spotted at key positions throughout the Crimea Peninsula. Russian President Vladimir Putin would later admit that efforts to annex Crimea began as part of plans to evacuate Yanukovych.[5]

On February 27, following days of civil unrest between pro- and anti-Russian movements in Crimea, Russian special forces seized key government buildings, including Crimea's parliament and Supreme Council. Russian forces later seized Ukraine's two strategic access points to the peninsula on the Isthmus

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[5] "Putin Says He Decided To Take Crimea Just Hours After Yanukovych's Ouster", *Radio Free Europe/Radio Liberty*, March 9, 2015, https://www.rferl.org/a/russia-ukraine-putin-crimea-decision/26889839.html.

of Perekop and the Chonhar Peninsula, effectively cutting off Crimea from mainland Ukraine. Under effective Russian military control, the Supreme Council of Crimea held a referendum on independence and incorporation into Russia, which was confirmed during a March 16 vote and fully formalized by January 1, 2015.

Map 3: Russia's military aggression in eastern Ukraine.

In the Donbas, Russia attacked directly from land, as well as by empowering separatist movements in the eastern provinces of Donetsk and Luhansk. By April 2014, separatist militias had taken over key administrative and security infrastructure in major towns across eastern Ukraine, including in Donetsk and the port city of Mariupol. These actions led to a widening response by Ukrainian anti-terrorist and security forces, and soon engagements with Russian-supported separatist elements were taking place across the Donbas. Throughout the spring Ukrainian security forces and pro-Kiev militias engaged with fighters from the breakaway regions across a broad front in the Donbas but mainly concentrated around the population centers of Luhansk, Donetsk, Horlivka, Makiivka, and Mariupol.

By June, Russia's involvement was becoming clearer and more brash. Reports from the frontline indicated that a column of Russian tanks and armored personnel carriers was entering Ukrainian territory and that Russia was openly supplying rebels with weapons.[6] On June 30, NATO Supreme Allied Commander for Europe Gen. Philip Breedlove acknowledged that there was a build-up of "about seven-plus [Russia] battalion task groups on the east side of that [the Ukrainian] border, [and] numerous small special operations forces."[7] By mid-July, Moscow's involvement and contribution of equipment, manpower, and expertise was openly apparent after a Russian Buk missile system, operating in separatist-controlled territory, shot down a Malaysian Airlines Boeing 777, killing all 298 passengers and crew.[8] In August, Russian troops were actively supporting an insurgent counter-offensive against Ukrainian forces leading up to the implementation of the ineffective Minsk Protocol cease-fire on September 5, 2014. A more effective ceasefire, the Minsk II, was put into place on February 15, 2015, calcifying the current line of conflict and severely reducing, but not eliminating, the high level of casualties and open warfare seen in 2014. At present, Donetsk and Luhansk continue to be controlled by the respective Russian supported and recognized people's republics, and Russian policies of passportization continue to support integration between the two separatist regions and the Russian Federation.[9]

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[6] Natalia Zinets and Timothy Heritage, "Ukraine Accuses Russia of Letting Rebels Bring in Tanks," *Reuters*, June 12, 2014, https://www.reuters.com/article/us-ukraine-crisis-tanks-idUSKBN0EN1KS20140612.
[7] General Phillip Breedlove, "Department of Defense Briefing," *C-SPAN*, June 30, 2014, https://www.c-span.org/video/?c4526774/user-clip-dod-press-briefing-breedlove-30-06-14.
[8] Dutch Safety Board, "MH17 Crash" (The Hague, The Netherlands: Dutch Safety Board, October 2015). https://www.europarl.europa.eu/cmsdata/92224/Report-mh17-crash-en.pdf.
[9] Vladimir Socor, "Russia Launches 'Passportization'..".


Photo by Vyacheslav Argenberg

Cost of conflict analysis

This report is the first attempt to comprehensively assess the cost of Russia's conflicts in Georgia and Ukraine. Russia's invasion of Georgia in 2008, its annexation of Crimea in early 2014, and its invasion and ongoing support of the conflict in eastern Ukraine have had significant negative impacts on citizens of these areas. In addition, these conflicts have spilled over to affect the broader macroeconomic potential of their countries and, to a lesser extent, the region as a whole.

Previous researchers have done excellent work in seeking to measure the destruction, both civilian and military, and economic impacts that these conflicts have had on the societies they affected. Several such attempts have sought to measure the destruction of real assets, such as military hardware, buildings, roads, and other infrastructure; humanitarian efforts and emergency relief spending; broader implications for potential economic growth; or the destruction of the economic potential of occupied territories. These assessments take numerous methodological approaches, and their authors should be praised for their theoretical contributions and on-the-ground assessments of the damage and recovery needs. This report relies heavily on many of these assessments, and seeks to unify them, and other reporting on the conflicts, as best as possible in order to provide a clear estimate of the costs.

Previous researchers have adopted a few different approaches to measuring the cost of the conflict. One approach is to take an accounting of the costs of conflict by estimating the damage to infrastructure, the value of lost and seized assets, the financial cost of military campaigns and operational losses, and the social cost of remediating the population directly impacted by the violence. These approaches have been undertaken by academics, humanitarian organizations, military analysts, and international financial institutions, often with the purpose of identifying and measuring the destruction to support rebuilding.

A second approach is more theoretical and involves assessing the long-term effect of lost output and wealth destruction as a result of conflict. This approach is inherently more challenging and requires researchers to make qualitative judgements on the performance of an economy in a hypothetical future in which the conflict did not exist and to measure the difference against its actual output. One common approach, spearheaded by Collier and Hoeffler[10] and Collier et al (2003), uses regression analysis to determine the costs of civil wars on economic growth. A second approach, based on pioneering work by Abadie and Gardeazabal[11] on the Basque conflict in Northern Spain, has been to create a synthetic

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[10] Paul Collier and Anke Hoeffler, "Greed and Grievance in Civil War," (May 1, 2000), Available at SSRN: https://ssrn.com/abstract=630727.

[11] Alberto Abadie and Javier Gardeazabal, "The Economic Costs of Conflict: A Case-Control Study for the Basque Country" *National Bureau of Economic Research*, (September 1, 2001) https://doi.org/10.3386/w8478.

version of the affected economy prior to the conflict, estimate output for this synthetic economy, and then compare this to the actual economy's real output. Using this method, for example, Bluszcz and Valente[12] estimate that the war in Donbas cost the Ukrainian economy 15.1 percent of gross domestic product (GDP) annually between 2013 and 2017. Finally, another approach is to use a combination of methods. Havlik et. al[13], among others, have provided estimates specific to the Ukraine conflict. Their estimates measure physical capital, human capital, and environmental costs using novel data sets from eastern Ukraine and find costs to be as much as $21.7 billion.

In this analysis, we identify two types of costs associated with the conflicts in Ukraine and Georgia. First, we measure the short-term costs of the conflict, both direct and indirect. We define the short-term costs as those occurring during the immediate outbreak of large-scale military activities and lasting until the primary cessation of those activities. This includes the immediate loss of output as a result of fighting; destruction of military assets, infrastructure, and other capital; immediate humanitarian and budget assistance to support spending and social programs; and the seizure or expropriation of assets by belligerent actors. We account for these costs using estimates from international bodies, public statements from government sources, reporting from humanitarian organizations, and other publicly available sources.

Short-term costs	
Georgia August 7 to August 22, 2008	**Direct** • Real output measured against long-run average quarterly seasonally adjusted output • Damage and losses to government and social infrastructure, housing, energy, and transport • Military assets destroyed **Indirect** • International aid and budget support • Humanitarian assistance and housing
Ukraine	

[12] Julia Bluszcz and Marica Valente, "The War in Europe: Economic Costs of the Ukrainian Conflict." SSRN Scholarly Paper (Rochester, NY: Social Science Research Network, May 1, 2019), https://doi.org/10.2139/ssrn.3392199.

[13] Peter Havlik, Artem Kochnev, and Olga Pindyuk, "Economic Challenges and Costs of Reintegrating the Donbass Region in Ukraine." *The Vienna Institute for International Economic Studies* no. 477 (2020): https://wiiw.ac.at/p-5351.html.

February 20, 2014 to February 15, 2015	• Miscellaneous foreign assistance

Table 1: Direct and indirect short-term costs for conflict in Georgia and Ukraine.

Long-term costs	
Georgia Quarter 4 2008 to Quarter 1 2019	**Output** • Estimate of potential gross domestic product versus actual gross domestic product **Wealth** • Estimate of potential total wealth versus actual total wealth **Human capital** • Measurement of human capital using conflict deaths and the World Bank's wealth accounts
Ukraine Quarter 2 2014 to Quarter 1 2019	

Table 2: Direct and indirect long-term costs for conflict in Georgia and Ukraine.

In the case of Georgia, this period includes what is largely considered to be the start of the war, the Georgian offensive into Tskhinvali beginning on the night of August 7, 2020 and ends with the Russian withdrawal back over the administrative boundaries of Abkhazia and South Ossetia on August 22, 2008. Within this period, most fighting occurred during what is now often referred to as the Five Day War of August 7 to 12.

For Ukraine, assigning the short-term costs to a period is more challenging considering the ongoing nature of the conflict. However, the bulk of the fighting, destruction and death, at least in the short term, occurred during the period beginning with the *de facto* Russian annexation of Crimea on February 20, 2014 and ending with the imperfect Minsk II Agreement, which was implemented at midnight on February 15, 2015.

To supplement our short-term costs, and to provide a more continuous picture of the devastation, we also estimate the long-term impact on output and wealth, starting in Georgia from the fourth quarter of 2008 and in Ukraine from the second quarter of 2015 and extending to the first quarter of 2019 for both.

As mentioned earlier, previous researchers have already attempted to provide estimates of the overall output costs of the conflict in Ukraine using a synthetic control method to estimate the economies theoretical output versus its actual output. We take a much simpler approach. Instead of modeling a more dynamic and theoretical economy, we simply project the past economic growth trajectory prior to the conflict forward, and measure this against actual outcomes. We do the same with wealth, using Credit Suisse's Global Wealth Databook, and we combine these two measures together with an estimate of the loss of human capital using a value of human capital from the World Bank's Wealth Accounts. Because this method is simpler, it has obvious inferential challenges. As a result, we do not try to make a judgement as to how much the output gap is directly related to the conflict. Through this analysis, we are simply trying to establish an estimated upward bound based on previous growth trends. Obviously, other factors like the global financial crisis of 2008-09 and macroeconomic mismanagement by policymakers can and do have an effect on output relative to long-term trends. However, in the cases of both Georgia and Ukraine, output and wealth creation trajectories were significantly affected in the years following the conflict, and neither has returned to its long-run trend.[14]

Breaking the economy's back: The effects of the Russo-Georgia War

Georgia's economic geography is particularly vulnerable to conflict in Abkhazia and South Ossetia. The primary east-west highway, which runs down the backbone of the country and connects the capital of Tbilisi in the east, home to a third of Georgia's population, to the Black Sea in the west, runs within 10 miles of South Ossetia's administrative boundary. Along this highway, and along the rail and pipelines that run parallel, food, consumer products, oil, steel, and other raw materials flow to and from Georgia and the region's southern and eastern population centers and to border crossings with Turkey and ports on the Black Sea. Any shutdown of this vital artery has devastating effects on the supply chains that cross Georgia and the goods and raw materials that are consumed or produced by Georgian companies and individuals.

As a result of these realities and the overall destruction caused by both Russian and Georgian forces in South Ossetia and Abkhazia, the economic and physical damage from the conflict was immense relative to the size of Georgia's economy. We estimate that Georgia's short-term loss of output from the conflict

[14] More information about our methodology can be found in the Methodological Annex.

amounts to $185.9 million relative to long-run output trends, and that the destruction of real assets and the money allocated for rebuilding and humanitarian needs by international organizations and allies amounted to $6.3 billion. As a result, the immediate short-term impact of the conflict totals nearly $6.5 billion. Overall, we estimate that the long-term impact on Georgia's economy was as much as $20 billion considering the conflict's effects on output, wealth creation, and human capital between 2008 and 2019.

Short-term economic costs

The Russian invasion of Georgia in 2008 affected the short-term economy in three serious ways. First, the conflict — in particular the Black Sea blockade, seizure of Poti by Russian forces, and closure of the east-west highway — caused a severe supply shock that limited the economy's access to basic goods, spurred inflation, and undermined overall growth. Second, the conflict itself caused enormous destruction of physical infrastructure. In these terms, the conflict damaged not only military hardware, but apartment blocks, bridges, port facilities, schools, and government offices. This destruction necessitated both international support and increased spending to address internally displaced persons and other social disruptions. Finally, the hostilities undermined consumer and investor confidence that had short-term, but noticeable, effects on the banking industry. These impacts were separate, and distinct from, the impacts that the economy encountered in the fourth quarter of 2008 as a result of the global financial crisis.

Supply shocks and growth hardships

Prior to the beginning of the war in August 2008, Georgia's economy was one of the fastest growing in the world. Following the economic and political reforms that stemmed from the "Rose Revolution" in 2003, Georgia's economy grew at over 9 percent between 2005 and 2007, reaching a high of 12.6 percent in 2007, making it one of the 10 fastest economic growth rates among the world's non-oil producing markets.

Figure 1: Georgia's growth prior to the conflict in 2008.

This strong performance continued in the first half of 2008, with output expanding by 9.1 percent in the first quarter and 8.3 percent in the second. While the International Monetary Fund (IMF) projected economic growth to contract slightly in 2008 below the 2007 peak, growth was still estimated to reach 9 percent in 2008 and 2009.[15]

Narrower monthly indicators paint a further picture of the upward trajectory of Georgia's economy prior to the open conflict. Imports and exports grew steadily through the spring of 2008 and commercial lending grew by almost 20 percent in the first half of the year. Meanwhile, strong foreign investment inflows continued to support growth, with total foreign direct investment increasing by over 35 percent in the first half of the year, reaching nearly $1 billion.[16] Readouts from the National Bank of Georgia Monetary Policy Committee support this overall assessment. At their last two meetings prior to the

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[15] "IMF World Economic Outlook (WEO)" *International Monetary Fund*, (April 2008), https://www.imf.org/en/Publications/WEO/Issues/2016/12/31/Housing-and-the-Business-Cycle.
[16] "Annual Report" National Bank of Georgia (2008), https://www.nbg.gov.ge/uploads/publications/annualreport/2008/annual_report_2008_eng.pdf.

conflict in June and July 2008, committee members took no policy actions, noting that overall macroeconomic trends were in line with expectations.[17]

Figure 2: Index of growth in commercial bank loans in Georgia, January 2008 to January 2009 (January 2009 = 1).

However, with the beginning of hostilities in the early summer and the outbreak of war in August, this momentum was severely undermined. Cracks began to become apparent by June, when imports fell 6 percent and commercial credit growth began to plateau, perhaps as a result of the low intensity hostility already occurring at that time in Abkhazia and later in South Ossetia. However, the outbreak of the war on August 7 marked the beginning of a series of military actions that would essentially shut down the normal functioning of the economy and the internal movement of goods and people. Following Georgia's troop movement around Tskhinvali on the morning of August 8, Russian forces responded

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[17] "Decision of the Monetary Policy Committee of the National Bank of Georgia Held on June 25," *National Bank of Georgia*, June 2008, https://www.nbg.gov.ge/index.php?m=340&newsid=772.

with air strikes, first against targets in central Georgia near the vital east-west highway, and later against military installations in and around Tbilisi. This was preceded by increasing Russian intervention on the ground and action against Georgian armed forces in and around Tbilisi.

With Georgia's military operation against Tskhinvali underway, Russia responded not only with support on the ground in South Ossetia, but also with military movements and activity in Abkhazia. On the morning of August 9 Russia's Black Sea Fleet set up a "maritime security zone" along the Abkhaz coast stretching to the port of Poti to deny the area, and Georgia's largest port, to international maritime movements.[18] The next day, August 10, Russian and Abkhaz forces crossed the cease-fire line between Georgia and Abkhazia, seizing Zugdidi, Senaki and later Poti on August 12. Their seizure of Poti shut down and caused minor damage to the port facilities and resulted in the destruction of significant components of the Georgian Navy. Russia's opening of a second front in the conflict, in western Georgia, its blockade of the Georgian coast, and its seizure of Poti effectively shut off Georgia's access to international maritime shipping and essential imported goods. On August 10, Georgian authorities indicated that wheat and fuel shipments were being blocked from import.[19]

Meanwhile, as fighting escalated on the western front, Georgian forces were being pushed back forcibly from their positions around Tskhinvali beginning in the evening of August 8 and continuing into August 9. By August 10, Russia had repelled most Georgian troops from South Ossetia, and by August 11 Georgian army units were withdrawn from Gori to begin setting up a strategic defensive position outside Tbilisi. With this withdrawal, Russian forces crossed the administrative demarcation of South Ossetia and took the strategic town of Gori, on the east-west highway, on August 12. This effectively cut the country in two, isolating Georgia's main population centers in the east and west.

The effect of the blockade, Russian capture of Poti, and closure of the east-west highway due to military operations significantly reduced the movement of goods from east to west and severely disrupted economic activity. In August, total international trade (imports plus exports) fell by over 30 percent and stayed below pre-war levels through the rest of the year.[20] Meanwhile, the disruption of transit links between east and west caused shortages in food and essential goods, leading to inflation. In 2008, the price of cooking oil, bread, and flour, essential components of the Georgian diet, rose by over 20 percent.[21]

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[18] "Independent International Fact-Finding Mission on the Conflict in Georgia" *Council of the European Union*, (2009): 212.
[19] "Day-by-Day: Georgia-Russia Crisis," BBC, August 21, 2008, http://news.bbc.co.uk/2/hi/europe/7551576.stm.
[20] By October 2008, the effects of the global financial crisis were fully setting in, and this can be seen in the trade data. In November 2008, total trade fell again and disproportionally hit exports as global demand fell.
[21] "Annual Report," 11.

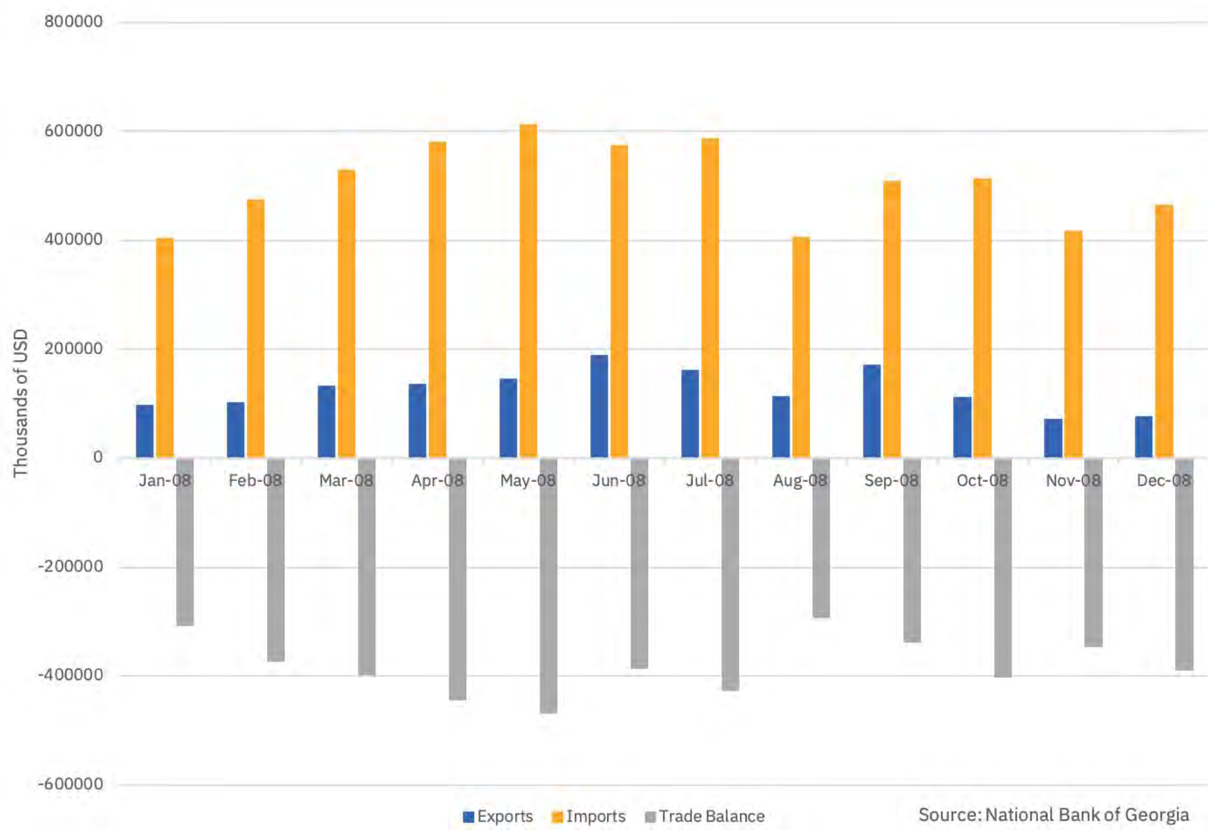

Figure 3: Georgian foreign trade (January to December 2008).

The disruption of transit links also undermined growth in one of the most critical and fastest growing sectors of the economy. The conflict's proximity to the east-west highway, the South Caucasus Railway, and the ports of Poti, Supsa, and Kulevi disrupted trans-Caucasus transit and closed or disrupted operations at the ports of Batumi, Poti, and Kuveli. While only one of Georgia's three oil and gas pipelines was fully operational at the time of the conflict for reasons unrelated to these hostilities, evacuations and work stoppages at the ports of Batumi and Kuveli limited exports of energy products.[22] While the growth rate of transit services expanded by 14.4 percent in 2007, the August conflict caused a contraction of 10.1 percent. This brief disruption in transit links, for only a few days in some cases, lowered overall GDP by 0.8 percent.[23]

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[22] Mamuka Tsereteli, "The Impact of the Russia-Georgia War on the South Caucasus Transportation Corridor" *The Jamestown Foundation*, March 2009: 9. https://jamestown.org/report/the-impact-of-the-russia-georgia-war-on-the-south-caucasus-transportation-corridor/.
[23] "Annual Report," 10.

The conflict also put pressure on the banking system. As Russian troops advanced, Georgian account holders began to withdraw their savings to protect their assets.[24] In August alone, deposits fell by over $150 million, or 45 percent. Meanwhile, many deposit holders converted their deposits into dollars, a process that accelerated through the global financial crisis. These actions caused an acute financing shortage, which the National Bank of Georgia responded to during its August meeting and at an emergency meeting in September by lowering its prime interest rate and taking actions to increase liquidity.[25]

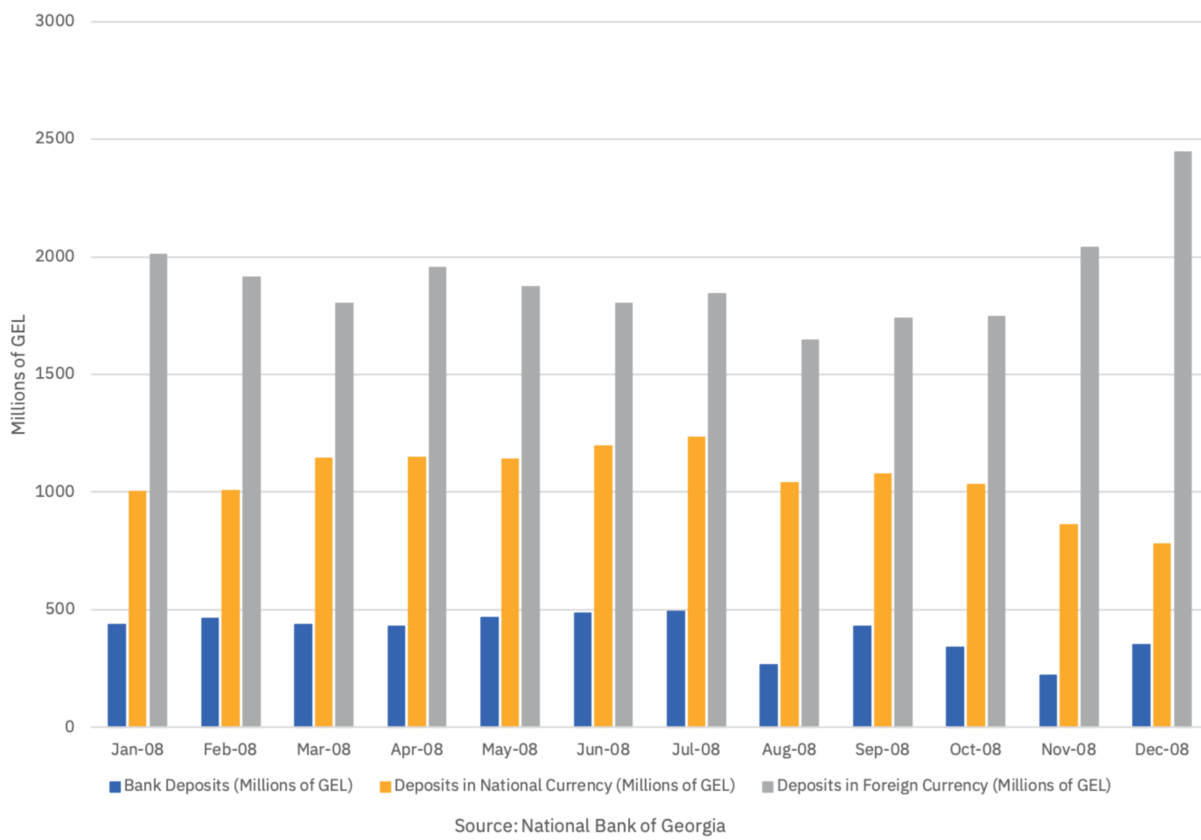

Figure 4: Domestic and foreign money supply (2008).

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[24] Vladimir Papava, "Post-War Georgia's Economic Challenges," *Central Asia-Caucasus Institute*, November 26, 2008, https://www.cacianalyst.org/publications/analytical-articles/item/11742-analytical-articles-caci-analyst-2008-11-26-art-11742.html?tmpl=component&print=1.
[25] "Annual Report," 27.

Loss of life and destruction of capital

This overall disruption of the economy was coupled with severe damage to physical assets in and around the conflict zone, as well as the loss of life and military hardware. At first, artillery fire, and later active fighting, caused damage and destruction to Tskhinvali in South Ossetia and Georgian villages along the line of separation.

As a result of the shelling and conflict, Ossetian authorities reported that 26 municipal buildings and 231 homes were destroyed, and hundreds more damaged. In addition, numerous churches, schools, and public facilities were damaged. Damage is estimated at 10 billion rubles, or about $400 million at the time.[26] Satellite assessments of Tskhinvali and the surrounding Ossetian and Georgian villages by UNOSAT, the UN satellite office, indicated that 12 percent of the buildings in the area were destroyed by the conflict, totaling 794 structures. Overall, 16 percent of buildings in the area were either severely damaged or destroyed, a figure that equates to 1,050 buildings.[27]

Further estimates of damage and rehabilitation costs in Georgia's *de jure* territory are much more transparent because of needs assessments conducted by international bodies in preparation for a donor conference in February 2009. Total immediate damage and shortfalls, including support for internally displaced persons and infrastructure repairs, was valued at $368.5 million in 2008.

As with all wars, loss of life was also a tragic reality in this conflict, one that ultimately has long-term consequences for the communities and families affected. Estimates of the total loss of life, both civilian and military, range from 612 to 816. Georgian Ministry of Defense reports that 169 service members lost their lives,[28] and sources indicate that up to 67 Russian military personnel perished. In addition, as many as 43 South Ossetian and Abkhaz troops and irregulars died in the conflict.[29] On the civilian side, as many as 589 Georgian[30] and South Ossetian[31] civilians are recorded as having died. Most of these fatalities occurred in South Ossetia or during the fighting in central Georgia. Lack of Georgian resistance on the western front limited fatalities.

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[26] Batradz Kharebov, "Economic Rehabilitation of South Ossetia: Current Problems and Development Strategy," in *Georgian-South Ossetian Conflict: Researching Peace* (Georgian Foundation for Strategic and International Studies; George Mason University; 2011).
[27] "Village Damage Summary: Kekhvi to Tskhinvali, South Ossetia, Georgia," *NOSAT* 1:48500, (August 29, 2008).

[28] "List of Casualties among the Georgian Military Servicemen," *Georgian MOD*, June 7, 2012, https://web.archive.org/web/20120607052439/http://www.mod.gov.ge/index.php?page=-10&Id=31&lang=1.
[29] Anton Lavrov, "Russian and Allied Losses," in *Tanks of August* (Moscow, Russia: Center for Analysis of Strategies and Technologies, 2010), 130-35.
[30] "List of Casualties among the Georgian Military Servicemen." 2012.
[31] "Deceased Victims List," Ossetia-war.com, May 11, 2009, https://web.archive.org/web/20090511232012/http://www.ossetia-war.com/dvlist.

	Immediate damage and reconstruction costs, 2008 (USD)	Types of damage
Energy	$12 million	Repairing damaged power transformer and switchgear; re-networking displaced populations
Transport	$61 million	Repairing road damage; rebuilding damaged airport infrastructure; bridge and rail spur repair
Employment	$4.5 million	Microfinance for SMEs to assist with economic disruption
Agriculture	$28 million	Input procurement for fall planting season; water and food for human and animal consumption
Health	$28.9 million	Reestablishment of health and emergency medical services; repair to damaged health infrastructure
Education	$19.1 million	Damage and loss of equipment; repair of core infrastructure; psychosocial needs
Social protection	$46 million	Priority food and cash transfers; targeted social assistance; medical assistance

Table 3: Types of damage and costs as a result of the Five Day War.

Direct and indirect military costs

Direct military costs for Georgia were significant but largely contained to the five-day period of fighting. Much of Georgia's military capabilities were lost during the Abkhazia conflict of 1992-93 (and after its independence in 1991). From 2003, Georgia embarked on a path toward Euro-Atlantic integration, increasing its defense budget to 9 percent of GDP in an effort to consolidate its military and make a series of major acquisitions. Russia's invasion of Georgia in 2008 cost the country 20 percent of its territory, its already limited naval force, and most of its air force. It is impossible to quantify the total value of military loss, given the Georgian government has never published a comprehensive assessment, but based on open sources we are able to estimate it at a minimum of $143 million (see Table 4).

Since 2014, Georgia has maintained its military spending at the NATO requirement of 2 percent of GDP (Table 7). Military losses caused by Russia forced Georgia to restructure its armed forces and implement "total defense" through a civil defense system.[32] The restructure also forced Georgia's remaining naval forces to be integrated with its coast guard, and air force to be integrated with its land forces. Georgia was also not able to afford any major military acquisitions in the years following the 2008 war. U.S. military aid to Georgia has varied greatly from year to year since 2008, proving mostly insufficient in helping Georgia's much needed military modernization process (see Table 8).

While Georgia's military losses amount to $143 million, the costs inflicted by Russia in just five days of conflict on a small country are insurmountable. We were able to track and calculate most, but not all, of the military assets lost and their values based on open sources. As shown in Table 4, the greatest military losses consisted of armored vehicles ($57 million), air defense ($41 million), and helicopters (at least $24 million, possibly more than double this amount). The massive military costs that were inflicted over a period of just five days show how vulnerable countries are in terms of military assets to an attack by Russia.

The consequences of the military asset losses suffered by Georgia have been long term. First, because Georgia was forced to radically restructure its armed forces following the war. And second, because Georgia was unable to replace most of the assets lost, despite its military budget of over 2 percent of GDP over the last decade and is unlikely to be able to do so in the years to come.

Asset category	**Asset type**	**Units lost**	**Cost of lost assets in 2010 (USD)**
Small arms	M-4 Rifle	764	$509,791
Small arms	M-40 MG	28	$235,553
Small arms	AK-74	754	$1,883,839
Infantry Fighting Vehicle	BMP-2	5	$3,021,999
IFV	Cobra	3	$1,706,537
IFV	HUMVEE	4	$865,870
Main Battle Tank	T-72	18	$18,472,630
MBT	T-55	47	$33,763,860

[32] Georgia's armed forces reform was based on the "total defense" concept, modelled on the example of the Baltic states, and consists of creating an active reserve force on voluntary basis (including a regular armed forces reserve, a territorial army reserve, and specialized reserves) and a mobilization component based on conscription. The development and training of reserve forces that can be quickly mobilized in the event of war is a concept that is gradually being implemented across Eastern Europe in response to Russian aggression.

Self-Propelled Gun	Dana 155mm	4	NA
Towed Artillery	Various	20	$15,393,860
UAV	Various	NA	NA
Air Defense	Buk-M1	2	$41,050,280
Air Defense	Osa-AK/AKM	5	NA
Transport Aircraft	An-2	3	NA
Helicopter	Mi-14BT	1	NA
Helicopter	Mi-24B	1	$12,000,000
Helicopter	Mi-24	1	$12,000,000
Helicopter	Mi-24V	1	NA
Navy	Missile Boat	1	NA
Navy	Amfibia	9	NA
Radar	36D6-M Fixed	1	NA
Radar	P-180U	1	$2,324,300
Total			**$143,228,519**

Table 4: Georgian military assets lost or destroyed during Russia's invasion[33]

[33] The above "Units Lost" were compiled primarily from the following sources: Koba Liklikadze, "Lessons and Losses of Georgia's Five-Day War," *Jamestown Fdn.*, September 26, 2008, https://jamestown.org/program/lessons-and-losses-of-georgias-five-day-war-with-russia/; and Ruslan Pukhov ed., "The Tanks of August," *Center for Analysis of Strategies and Technologies,* 2010, http://www.cast.ru/files/The_Tanks_of_August_sm_eng.pdf. The approximate costs of replacement units were compiled from various open sources, including the following websites: https://www.defenceturkey.com/en/content/p-180u-and-mars-l-radar-purchase-from-ukraine-and-turaf-pyas-project-4061; https://www.deagel.com/Combat%20Aircraft/Mi-24/a000751; http://edition.cnn.com/2011/US/01/27/army.vehicle.costs/; https://www.forbes.com/sites/niallmccarthy/2017/03/30/the-cost-of-an-ak-47-on-the-black-market-across-the-world-infographic/?sh=2b3875e77442.

The economic consequences of the war

The combination of these factors — the seizing of the economy, the loss and damage to infrastructure, and the social damage — added up to short-term costs that have persisted for years to come.

As previously mentioned, Georgian GDP was expected to expand by nearly 9 percent in 2008, and the evidence shows that, with real first and second quarter growth at nearly 9 percent, the economy was on track to match this expectation. However, because of the war's severe disruption to both the internal economy, banking system, consumer and investor confidence, and normal functioning of society, growth took a severe hit in the third quarter of 2008. Readouts of third quarter GDP indicate that it declined 8.6 percent from first quarter GDP on a seasonally adjusted basis. Overall, we calculate that this cost the economy $185.9 million, or about 1.64 percent of annual GDP. This, coupled with the physical and capital damage and reallocation of external resources to support the Georgian economy, added an additional $6.3 billion in costs.

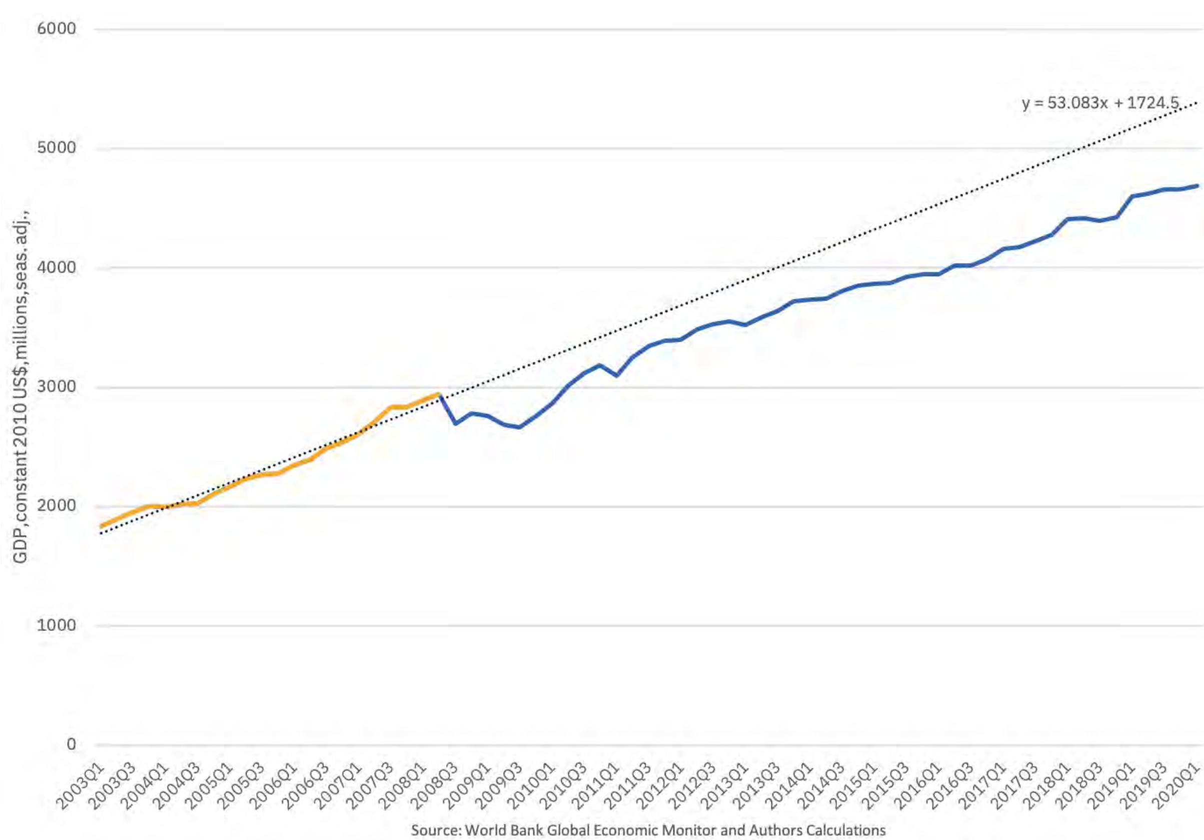

Figure 5: Georgia's post-war output gap (2003 to 2020).

In the long run, the Russian invasion of the Georgian economy was a turning point for its growth momentum. If Georgia's growth trajectory prior to the conflict was extended forward to the present day, overall GDP would be over 15 percent higher. In total, Georgia lost $6.85 billion in long-run output at net present value. Likewise, Georgia's wealth base lost nearly $13.2 billion in long-run wealth.

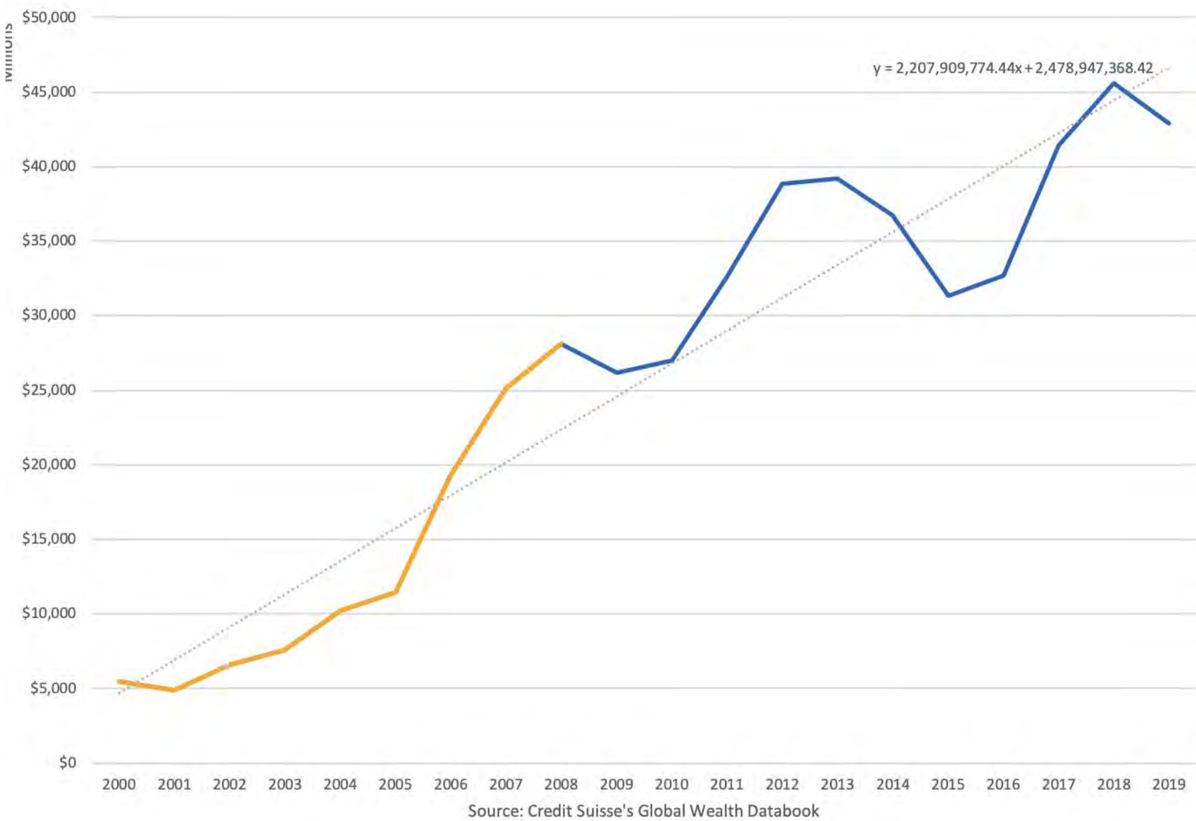

Figure 6: Georgia's post-war wealth gap (2000 to 2019).

"Donbas Feeds Ukraine": The costs of war in Ukraine

Russian intervention in Ukrainian affairs following the Maidan protests of 2014 has had important and tragic consequences for the economy in two ways. First, Russia's annexation of Crimea in early 2014 caused an unprecedented and illegal, but largely peaceful, transfer of assets from Ukrainian to Russian sovereignty. This disrupted business ties, undermined the thriving tourism industry, de-networked

Crimea from Ukrainian utilities and trade flows, and resulted in the expropriation or loss of assets for Ukraine's government and private sector.

In Donbas, the ongoing conflict has been catastrophic for local citizens. In purely human terms, the war has caused tens of thousands of casualties and uprooted the lives of eastern Ukrainians who were already suffering from years of economic and social turmoil. In addition, the fighting and resulting economic blockade has upended supply chains to and from a vital, yet troubled, manufacturing center and uprooted more than 1.4 million Ukrainians, creating a wave of internally displaced people (IDP). Further, fighting has left many towns and villages in ruin. Overall, the conflict has had acutely devastating effects on the citizens of eastern Ukraine, and ripple effects on the rest of the Ukrainian economy.

As a result of this damage, the expropriation by Russia of Ukrainian assets, and the removal of three economic regions from Ukrainian sovereignty, we estimate that Ukraine's total short-term losses equate to $45.2 billion, including $4.1 billion in lost output, $2.8 billion in lost assets and capital, and $33.8 billion in international support and humanitarian costs. In addition, long-term costs have been equally immense. Overall, in the long term we estimate that Ukraine's economy lost as much as $518.5 billion of output, wealth creation, and human capital gains between 2014 and 2019.

Short-term economic costs

The short-term economic costs of the conflict on Ukraine's economy were severe and exacerbated long-run economic mismanagement. The initial costs on the economy occurred in four primary areas: first, loss of output for internal economic disruptions due to fighting and the subsequent blockade of Donbas and Crimea; second, expropriation of state and private assets through the annexation of Crimea by the Russian Federation; third, destruction of physical assets and infrastructure during fighting in eastern Ukraine; and fourth, the significant adjustment costs and humanitarian support by countries and international organizations. The humanitarian support had two aims: to prevent the complete collapse of the Ukrainian economy through the initial period of heavy fighting and economic uncertainty in 2014, as well as to support Ukraine's long-run growth. Additional costs, including the loss of output, were significant but reinforced an already occurring contraction in the Ukrainian economy caused in part by macroeconomic weakness and mismanagement.[34]

Economic disruptions

[34] "Press Release: IMF Executive Board Approves 2-Year US$17.01 Billion Stand-By Arrangement for Ukraine, US$3.19 Billion for Immediate Disbursement," IMF, accessed November 3, 2020, https://www.imf.org/en/News/Articles/2015/09/14/01/49/pr14189.

Both the Russian annexation of Crimea and the ongoing fighting in Donbas have accentuated long-term economic weakness in Ukraine and caused acute disruptions in output in the months around the annexation of Crimea and the worst fighting in 2014 and early 2015.

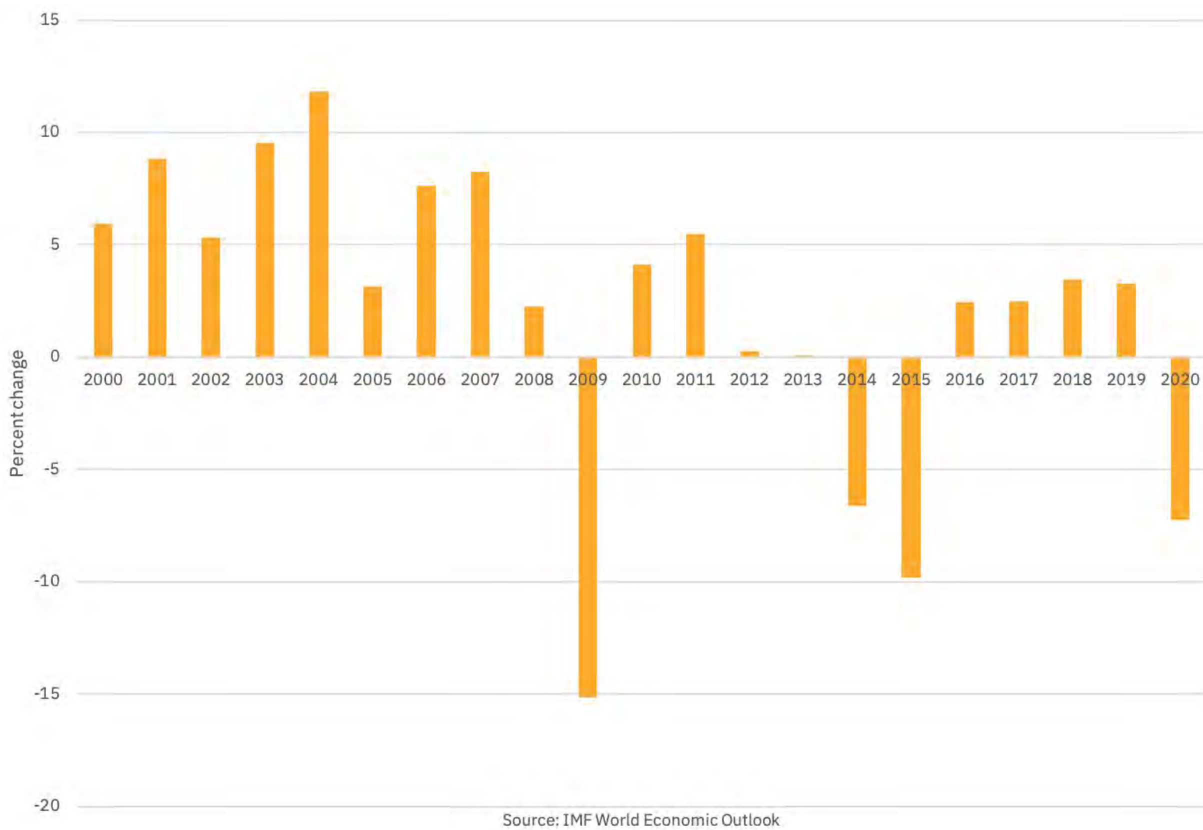

Figure 7: Ukraine's GDP growth (2000 to 2020).

The financial crisis of 2008 and 2009 hit Ukraine's economy hard, and despite a recovery in growth in 2010 and 2011, the economy had once again hit a wall in the years leading up to the conflict. By 2012, the reform agenda implemented after the financial crisis was losing steam just as the financial pressures and a broader sovereign debt crisis in Europe were undermining external demand.

Despite these challenges, seasonally adjusted GDP growth actually expanded in the fourth quarter of 2013 as Maidan protestors entered the streets. However, by the second quarter of 2014, Russian involvement in the broader conflict became entrenched and output began to fall precipitously, declining overall by 6.6 percent in 2014.

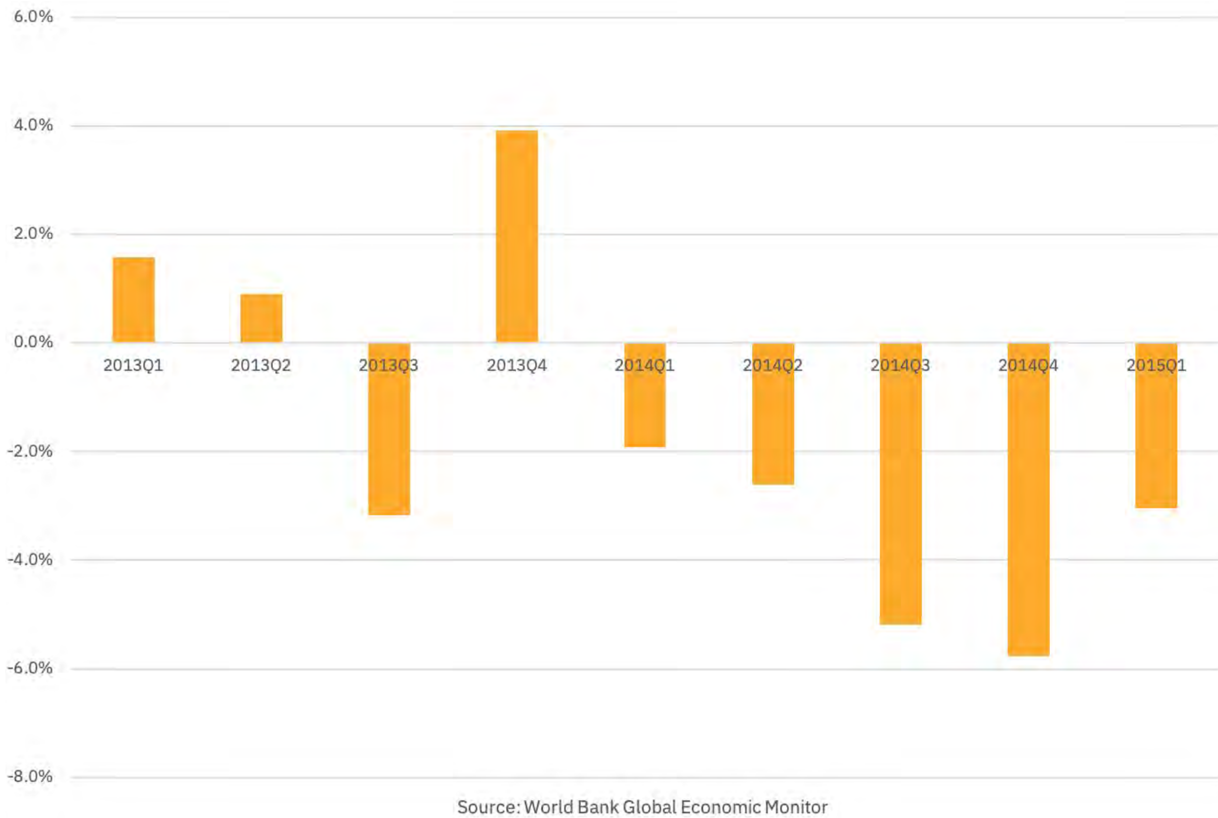

Figure 8: Ukraine's quarterly GDP growth (Q1 2013 to Q1 2015).

As the Russian occupation and annexation of Crimea began in February 2014, the initial short-term effect was on the banking system. Following political moves by the Supreme Council of Crimea to put forth an independence referendum, Crimean savers began to withdraw money from local banks in anticipation of the rising political and economic risks with leaving Ukraine. In some cases, banks moved to limit withdrawals across all Ukrainian branches.[35] Between January 1, 2014 and the Crimea declaration of independence on March 16, 2014 the National Bank of Ukraine's financial stress index for the banking sector rose 68 percent, indicating that the banking industry was under severe stress from ongoing developments.[36] In addition, between January and March the percentage of cash relative to the money supply increased from 26 to 28 percent and accelerated past 30 percent by mid-year, indicating that savers were converting their deposits into cash. This effect undermined financial sector liquidity and highlighted rising consumer and business risk in the economy.[37]

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[35] "The consequences of the annexation of Crimea", Centre for Eastern Study Poland (March 2014), https://www.osw.waw.pl/en/publikacje/analyses/2014-03-19/consequences-annexation-crimea.
[36] "Contributions of Sub-Indices to the Financial Stress Index" National Bank of Ukraine, (June 2020).
[37] "Annual Report" National Bank of Ukraine, (2014).

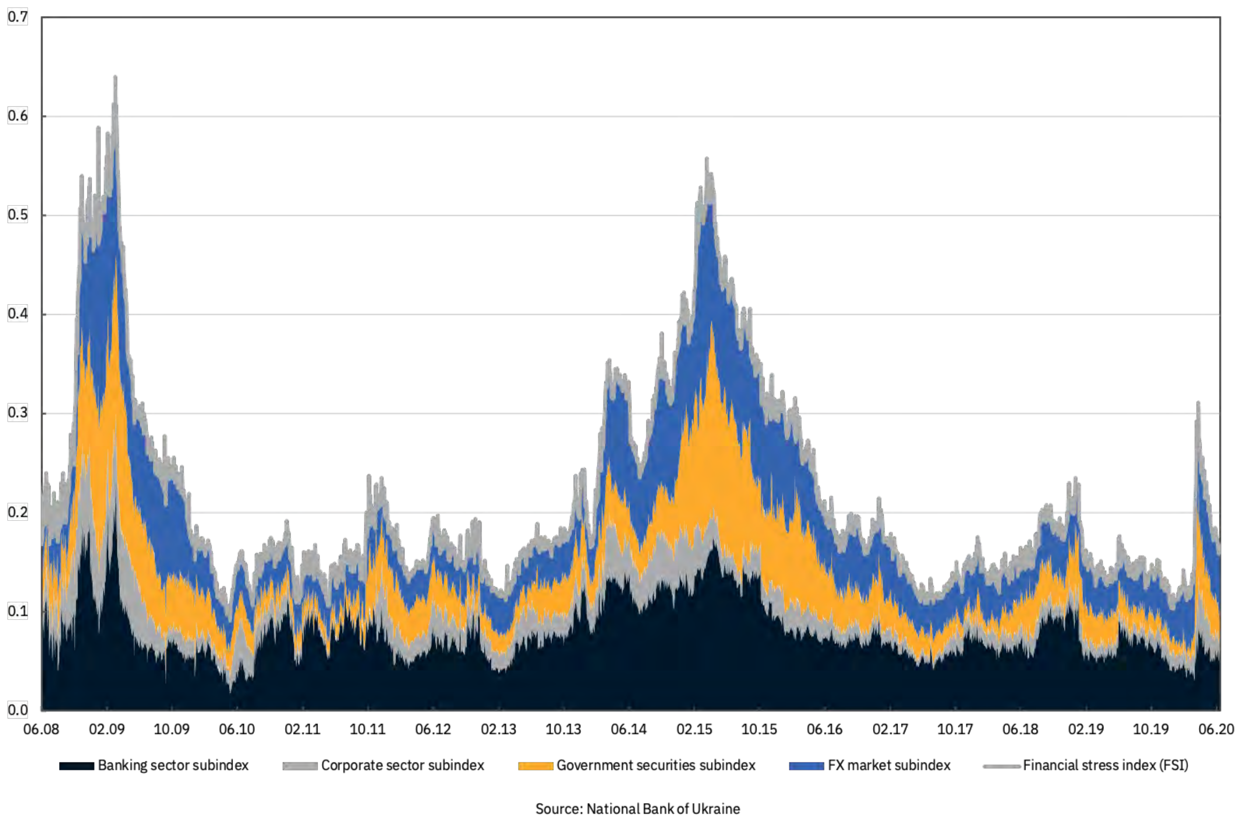

Figure 9: National Bank of Ukraine Financial Stress Index.

However, these pressures have to be taken in context. Liquidity challenges from Crimea only exacerbated already on-going and long-term macroeconomic challenges, including a large current account deficit, an overvalued exchange rate and currency peg, and external sovereign and quasi-sovereign financing issues. Furthermore, because Crimea only makes up around 3 percent of the Ukrainian economy and is a net recipient of tax revenue from Kiev, in practical terms the annexation had serious quality of life consequences that were largely isolated to Crimea itself. Crimea received most of its water and power from Ukraine and was dependent on the mainland for most consumer goods, which largely traveled across two geographic chokepoints. By June 2014, these challenges were readily apparent as shortages of primary goods and rolling blackouts were reported.[38] Russia's large internal transfers to Ukraine indicated the level of economic distress the peninsula was in because of the annexation process.

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[38] "Ukraine Conflict: Crimea Hit by Shortages," *BBC News*, January 8, 2015, https://www.bbc.com/news/world-europe-30713665.

In Donbas, the immediate effects on economic growth were largely a result of the widespread and deadly fighting that began in the spring of 2014 and is still ongoing to this day. This fighting involved intense urban engagements, widespread displacements of citizens, and implementation of martial law in many districts that restricted economic activity. Fighting, basic shortages, and diminishing economic prospects caused a rapid decline in the quality of life in Donbas, which led to large-scale emigration and massive internal displacement. By the end of 2014, IDPs totaled nearly 650,000 individuals and that number rose to over 1.7 million by 2015.

Furthermore, because of the fighting and social disruptions, Donbas' industry has suffered mightily. Once the manufacturing hub of the Soviet Union and a source of energy and primary materials for Soviet and Ukrainian industry, Donbas has seen its industrial production fall. In 2014 alone, industrial production dropped by more than 30 percent in Donetsk and more than 40 percent in Luhansk, contributing to a 10 percent decline across Ukraine as a whole.[39] By 2018, industry in government-controlled areas of Donbas and Luhansk was at 15 to 20 percent of 2013 levels, compared with 80 percent for the rest of Ukraine. Furthermore, in areas under separatist control in Luhansk, industrial emissions fell from 442,000 tons in 2013 to 46,000 tons in 2018, indicating a severe contraction in industrial and economic activity.[40] These challenges were not confined to separatist-controlled areas alone. While many industrial areas were in separatist-controlled regions, much of the working population lived in government-controlled areas, meaning that workers often had to commute across conflict lines. Meanwhile, the conflict has caused unemployment to diverge sharply from the rest of Ukraine since 2014 with peak unemployment occurring in 2017 at 16.6 percent and 14.6 in Luhansk and Donetsk, respectively.[41] Wage arrears, which were a persistent issue even before the conflict began, remain pervasive.[42]

These effects continue to be widespread and have become even further entrenched in recent years. At the start of the conflict, commerce along the line of contact continued in part to preserve Ukrainian ownership of industrial assets in separatist areas, but also for practical reasons — a large proportion of Ukraine's power industry purchased coal from Donetsk and Luhansk.[43] However, in 2017 Ukrainian authorities shifted to a full-blown economic blockade of Donbas, cutting off much of the formal sector from the Ukrainian market. This policy has precipitated the decline of Donbas' industry and effectively cut off the regions from the rest of the country. In Crimea, an economic blockade has not been formalized, but Tartar minority groups have destroyed energy assets supplying electricity to the

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39 Havlik, Kochnev, and Pindyuk, "Economic Challenges and Costs."

40 https://www.crisisgroup.org/europe-central-asia/eastern-europe/ukraine/261-peace-ukraine-iii-costs-war-donbas.

41 Statistics Service of Ukraine, accessed December 2, 2020, https://ukrstat.org/en/druk/publicat/kat_e/publ7_e.htm.

42 "Peace in Ukraine (III): The Costs of War in Donbas," *International Crisis Group.*

43 Ibid.

peninsula and water has been largely shut off, causing persistent shortages. Water availability in Crimea has become a major source of tension,[44] with Ukrainian authorities insisting that Russia de-occupy the peninsula before resuming water supply. The economic conflict has caused a legal and practical separation of the economies of the separatist areas of Crimea, Luhansk, and Donetsk, which has added to the overall risk environment, economic disruptions, and ultimately loss of output.

Expropriation or dislocation of assets

Russia's annexation of Crimea caused a significant dislocation and expropriation of assets. As has been mentioned previously, in the run up to the independence vote, Crimean savers moved to withdraw millions of dollars from their bank accounts to secure access to their assets. This move ended up being prudent for many account holders. When Russia fully integrated Crimea into the Russian Federation on January 1, 2015, Russian authorities moved to cleave Crimea's banking sector from mainland Ukraine by barring non-resident banks from operating in Crimea and seizing the assets of the peninsula's two largest banks. While Russia's deposit insurance scheme moved to reimburse account holders up to $20,000, all loan agreements were transferred to the Russian state. As a result, arbitration courts have ruled that Oschadbank, the State Savings Bank of Ukraine, is entitled to $1.3 billion in lost assets and business in Crimea. PrivatBank, Ukraine's largest lender, is currently in proceedings over its accounts.[45]

Financial assets weren't the only resources seized in the annexation. Crimea's sizable oil and gas reserves, offshore rigs, pipelines, and compressor assets were seized from Ukrainian state gas company Naftogaz, including up to 80 percent of its Black Sea oil and gas deposits. These losses are currently being litigated in the Permanent Court of Arbitration in The Hague, but initial claims by Naftogaz price these assets at $5.2 billion. So far, 9.2 billion cubic meters, or one-fifth of the reserves, have been extracted from fields illegally and without compensation by Russia and used by Crimean consumers since 2014.[46]

Loss of life and destruction of physical assets and infrastructure

The conflict in Ukraine is the largest and most destructive land war in Europe since the war in the Balkans in the 1990s and has had its biggest effect on the eastern provinces of Donetsk and Luhansk.[47]

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[44] "Kyiv Will Not Change its Position on Water Supplies to Occupied Crimea," *UKRInform,* June 2021, https://www.ukrinform.net/rubric-polytics/3260978-kyiv-will-not-change-its-position-on-water-supplies-to-occupied-crimea-foreign-ministry.html.

[45] "Ukraine's Oschadbank Awarded $1.3 Bln from Russia over Crimea Loss," *Reuters*, November 2018, https://www.reuters.com/article/ukraine-russia-oschadbank/ukraines-oschadbank-awarded-1-3-bln-from-russia-over-crimea-loss-idUSL8N1Y15GC.

[46] "Ukraine's Naftogaz Struggles For Crimea Gas Assets," *Warsaw Institute*, June 17, 2019, https://warsawinstitute.org/ukraines-naftogaz-struggles-crimea-gas-assets/.

[47] As noted previously, nearly all casualties and infrastructure damage has occurred during fighting in Donbass. The annexation in Crimea saw very little violence, and most losses in Crimea are from expropriation of private and state assets.

Overall, nearly 18,000 Ukrainian, separatist, and Russian military personnel have been killed and over 13,000 civilians have perished in the conflict. Meanwhile, the number of wounded equals close to 50,000 on all sides.

The destruction, in terms of both human and physical impact, is partially a result of geography. Prior to the war, the *oblasts* (administrative regions) of Donetsk and Luhansk accounted for 15 percent of Ukraine's population, and Donetsk was the most densely populated oblast in Ukraine. This created a deadly and destructive cocktail given that most fighting happened in or around major population centers. As the war is ongoing, there is currently no comprehensive accounting of the physical destruction in Donbas over the last six years. However, early international assessments of the destruction and more recent humanitarian assessments have helped to paint a partial picture.[48]

The negative effect on industry and manufacturing output has already been noted. However, besides falling output, Donbas' industrial sector has been directly or indirectly caught in fighting between the central government and separatists. Thermoelectric plants have been shelled, affecting the region's electricity supply, and Donbas' water authority has critical assets near the front line that have been damaged and are in constant danger from fighting. Coke plants, which provide inputs to Donbas' iron and steel industries, have been damaged by shelling. Railroads have been seized or destroyed, limiting industrial capacity.[49]

On the civilian side, the fighting not only displaced families and killed and maimed neighbors, but it also caused the widespread destruction of personal property and homes. An assessment of private properties within 0-20 kilometers of the line of contact in Donetsk in 2019 by the Norwegian Refugee Council identified 3,945 private houses damaged by the fighting, including 2,781 of which the resident required shelter assistance for medium or heavy repair or full reconstruction.[50] A similar assessment in Luhansk found 1,261 residences damaged in the fighting, of which 90 percent needed light or medium repairs.[51] Overall, according to the World Bank, private sector housing damage constituted the largest share of rebuilding needs, estimating that property owners would need about $21 million in financial

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[48] The World Bank Group's Joint Need Assessment, which covers the destruction caused by the conflict through October 2014, provides the most comprehensive estimate of the conflict's infrastructure and humanitarian costs.

[49] "Peace in Ukraine (III): The Costs of War in Donbass," *International Crisis Group.*

[50] "Humanitarian Shelter Damage Assessment: Contact Line Communities in GCA, Donetsk Region, Ukraine" *Norwegian Refugee Council*, (2019), https://reliefweb.int/report/ukraine/humanitarian-shelter-damage-assessment-contact-line-communities-gca-donetsk-region.

[51] "Humanitarian Shelter Damage Assessment: Contact Line Communities in GCA, Luhansk Oblast, Ukraine," *Norwegian Refugee Council*, (2018), https://www.nrc.no/globalassets/pdf/reports/ukraine/damage-assessment-report_nrc_luhansk_loc.pdf.

assistance to rebuild or repair residential buildings based on damage done in 2014 alone, during the bulk of the heaviest fighting.[52]

The majority of damage to physical infrastructure in dollar terms occurred to the transport system, whose strategic value for both sides of the conflict in Donbas should be obvious. The roads network bore the brunt of this damage primarily as a result of the ongoing use of heavy armored vehicles and damage from shelling and explosions. According to the World Bank's assessment, 1,100 kilometers of state roads, 10 bridges, and 235 kilometers of municipal roads were affected during 2014, causing $284 million in damage. Additional damage to the Donetsk and Luhansk airports totaled $55.45 million and damage to railway infrastructure was $12.2 million in the 2014-15 time period. Overall, the World Bank has estimated that, for the period from the onset of violence to October 2014, eastern Ukraine suffered nearly $470 million in costs associated with damage of energy, transport, water and housing assets, as well as additional social, health, and education costs. Furthermore, these estimates are likely to be on the low end for short-term damage, as they only measure damages that occurred through October 2014. In addition, because the war is currently ongoing, initial damage assessments are likely to grow.

	Immediate damage and reconstruction costs, 2014 (USD)	**Types of damage**
Energy	$53.4 million	Repairing damaged power generation plants and distribution systems; remediating supply chain disruptions
Transport	$356.8 million	Repairing road damage; rebuilding damaged airport infrastructure; bridge and rail spur repair
Social welfare	$2.9 million	Reconstruction of public facilities that assist populations with disabilities, children, the elderly, and the homeless
Health	$6.6 million	Repair to damage health care facilities; procurement and storage of critical medicines; repair to the state epidemiological control apparatus

[52] "Ukraine Recovery and Peacebuilding Assessment: Analysis of Crisis Impacts and Needs in Eastern Ukraine," *World Bank* (March 2015), https://openknowledge.worldbank.org/handle/10986/22089.

Education	$5 million	Damage and loss of equipment; repair of core infrastructure; land mine removal
Water and sanitation	$22.7 million	Replacing damaged infrastructure including piping, water treatment and pumping systems
Housing	$21.8 million	Assisting with 15-20 percent of present replacement value of damaged housing and public stock
Total	$469.4 million	

Table 5: Types of damage and costs as a result of conflict in Ukraine.

Military costs

Insecurity in the Black Sea had not caused indirect regional military costs for Ukraine prior to 2014. Ukraine had failed to raise its threat perception of Russia, and just prior to the annexation the Ukrainian government had extended Russia's use of the Sevastopol military base until 2042. Following major direct military losses in 2014, Ukraine increased its military budget to 3-4 percent of GDP, meaning billions of additional dollars were being spent as a result of the conflict (Table 7).

Asset category	Asset type	Units lost	Cost of lost assets in 2010 USD
Infantry Fighting Vehicle	BMP-1/2	365	$194,148,975
IFV	BTR-60/70	170	$24,134,448
IFV	BRDM-2	49	$6,850,255
IFV	BMD-1/2	39	$27,845,240
Main Battle Tank	T-64/72	266	$272,984,380
Amphibious Transport	Mt-LB	76	NA
Air Defense	Medium-Range SAM	NA	NA
Helicopter	Mi-8/17	5	$41,998,330
Helicopter	Mi-24	5	$60,000,000
Combat Aircraft	Su-24	1	$30,238,790

Combat Aircraft	Su-25	6	$55,437,790
Combat Aircraft	Mig-29	2	$41,402,760
Transport Aircraft	An-26	1	$7,559,698
Transport Aircraft	An-30	1	NA
Transport Aircraft	Il-76	1	$41,998,330
Supplies	Balaklia Depot	1	$892,310,000
Supplies	Kalynivka Depot	1	$713,845,800
Total			**$2,410,754,796**

Table 6: Ukrainian military assets lost or destroyed during the war with Russia.[53]

Losses to military assets have been the largest costs associated with the conflict in Donbas. According to our calculation (based on available open-source data), total military assets lost over the last six years amount to at least $2.4 billion (Table 6). The overall cost to Ukrainian military assets increased significantly with the explosions of two ammunition depots in 2017 and 2018 — the loss of these constituted more than half of total military costs to Ukraine ($1.6 billion). Ukraine has also suffered losses in armored vehicles ($526 million) and air capabilities (over $278 million). It's worth noting, however, that as Ukraine's military assets mostly stem from the Soviet era, their monetary value is reduced.

While much of the military assets lost by Ukraine — including the approximately 75 percent of Ukraine's naval forces seized by Russia — are unquantifiable, it is clear the country's armed forces have been crippled. Despite Ukraine raising its military budget from 2014, most military investment has been directed to the Donbas region. An end to conflict is not in sight — indeed, 2021 saw a significant uptick

[53] The above data represents our best approximations based on open sourcing. Ground losses come primarily from the website https://lostarmour.info/armour/#statistic; air losses from: Chris Pocock, "Ukraine has Lost 22 Aircraft," *AinOnline*, November 2014, https://www.ainonline.com/aviation-news/defense/2014-11-26/ukraine-has-lost-22-aircraft-rebel-forces. The approximate costs of replacement units were compiled from various open sources, including the following websites: http://www.army-guide.com/eng/product119.html; https://web.archive.org/web/20110605222340/http://en.rian.ru/mlitary_news/20090806/155743859.html; https://tanks-encyclopedia.com/#:~:text=Base%20price%20for%20the%20BTR%2D70%20was%20around%2057%2C000%20dollars.; https://libya-businessnews.com/2013/06/13/52m-czech-deal-with-libyan-military/; https://army-news.org/2013/04/mnogocelevoj-istrebitel-mig-29s/.

in fighting along the line of contact[54] — and Ukraine will need decades of military investment to rebuild the military assets lost.

		BULGARIA	GEORGIA	MOLDOVA	ROMANIA	TURKEY	UKRAINE
‘12	**Budget**	$686,000,000	$380,000,000	$24,200,000	$2,018,000,000	$11,556,000,000	$2,000,000,000
	% GDP	1.34	3.12	0.33	1.23	2.03	1.61
‘13	**Budget**	$740,000,000	$346,000,000	$26,900,000	$2,172,000,000	$11,868,000,000	$2,047,000,000
	% GDP	1.46	2.74	0.33	1.28	1.94	1.58
‘14	**Budget**	$692,000,000	$335,000,000	$29,500,000	$2,373,000,000	$11,955,000,000	$2,812,000,000
	% GDP	1.32	2.52	0.35	1.35	1.88	2.25
‘15	**Budget**	$701,000,000	$298,000,000	$30,200,000	$2,738,000,000	$12,302,000,000	$3,432,000,000
	% GDP	1.27	2.14	0.35	1.45	1.82	3.25
‘16	**Budget**	$751,000,000	$320,000,000	$35,800,000	$2,889,000,000	$14,423,000,000	$3,507,000,000
	% GDP	1.27	2.19	0.40	1.40	2.06	3.16
‘17	**Budget**	$779,000,000	$316,000,000	$35,000,000	$3,919,000,000	$14,480,000,000	$3,505,000,000
	% GDP	1.24	2.10	0.32	1.72	2.07	2.88
‘18	**Budget**	$961,000,000	$327,000,000	$37,400,000	$4,359,000,000	$19,649,000,000	$4,170,000,000
	% GDP	1.48	2.00	0.34	1.82	2.55	3.19
‘19	**Budget**	$2,187,000,000	$337,000,000	$43,800,000	$5,098,000,000	$20,796,000,000	$4,557,000,000
	% GDP	3.22	2.00	0.38	2.04	2.72	3.36

[54] Mike Eckel, "The Guns of April: Six Questions About the New Russia-Ukraine Tension," *Radio Free Europe*, April 7, 2021, https://www.rferl.org/a/six-questions-russia-ukraine-military-buildup/31191350.html.

Table 7: Black Sea Defense Budgets (2012-2019)

SOURCE: "Military Expenditure By Country, 1988-2019," SIPRI, 2020, [https://www.sipri.org/sites/default/files/Data%20for%20all%20countries%20from%201988%E2%80%93 2019%20in%20constant%20%282018%29%20USD.pdf](https://www.sipri.org/sites/default/files/Data%20for%20all%20countries%20from%201988%E2%80%932019%20in%20constant%20%282018%29%20USD.pdf); "Military Expenditure (% of GDP)," World Bank, 2020, https://data.worldbank.org/indicator/MS.MIL.XPND.GD.ZS.

	BULGARIA	**GEORGIA**	**MOLDOVA**	**ROMANIA**	**TURKEY**	**UKRAINE**
'00	7,576,863	6,036,395	3,834,386	9,575,405	5,045,585	32,917,628
'01	19,390,760	40,443,672	21,237,466	20,181,323	3,805,507	48,431,841
'02	11,771,714	102,409,721	5,809,059	12,559,234	52,956,000	67,743,528
'03	22,259,514	31,122,266	4,050,669	28,772,239	20,750,000	26,578,631
'04	11,913,000	38,944,676	5,272,805	11,194,000	40,600,000	22,636,720
'05	8,976,000	42,104,688	4,032,949	15,737,000	38,923,661	25,040,897
'06	11,880,000	33,764,759	4,482,747	14,355,000	18,641,881	41,098,933
'07	11,059,000	106,165,087	3,905,381	16,128,300	20,079,993	41,979,829
'08	9,735,619	162,858,160	3,487,357	16,291,000	13,755,193	80,508,468
'09	9,778,303	92,950,133	3,010,041	17,898,788	8,339,107	46,937,331
'10	12,593,000	63,246,183	4,425,075	29,323,980	8,311,000	50,804,748
'11	12,028,942	52,478,222	2,944,085	23,619,335	7,096,538	48,230,116
'12	16,042,964	192,487,187	17,313,374	28,649,322	6,216,686	71,409,775
'13	17,226,000	67,244,027	6,875,560	33,511,000	9,909,606	49,760,718
'14	34,138,659	62,042,784	14,300,431	30,333,078	9,875,504	91,031,069
'15	10,464,008	66,999,562	20,947,076	26,358,403	4,727,000	182,845,775
'16	13,849,000	33,985,000	14,621,000	6,317,000	33,623,000	318,132,000
'17	20,783,000	82,774,000	14,680,000	6,120,000	3,054,000	262,240,000
'18	1,646,000	47,228,257	23,610,719	2,021,000	5,341,173	298,884,061
'19	9,453,000	46,488,000	9,992,000	34,248,000	4,245,000	427,919,000

Table 8: US Defense Aid to Black Sea States in USD (2000-2019)

SOURCE: "Security Assistance Database (Military Aid Dashboard)," CIP Security Assistance Monitor, 2020, https://securityassistance.org/security-sector-assistance/.

Ongoing devastation

Because the conflict in eastern Ukraine is ongoing, measuring the costs of the conflict is a unique challenge. What is clear is that the conflict had a serious effect on the livelihoods of Ukrainian citizens and businesses and caused severe damage to property and Ukraine's economic sovereignty. Indeed, Ukraine's return to growth in 2016 despite war and the economic dislocation in Donbas is a testament to its resilience.

However, the short-term impact on Ukraine's output between February 2014 and February 2015 was severe. Prior to 2014, long-term quarterly seasonally adjusted GDP growth in Ukraine averaged 0.7 percent. Between the first quarter of 2014 and the first quarter of 2015, Ukraine's GDP fell by 3.8 percent on average each quarter, indicating a severe impact from the annexation and outbreak of violence. This, coupled with the physical and capital damage and reallocation of external resources to support the Ukrainian economy, added an additional $45.2 billion in costs.

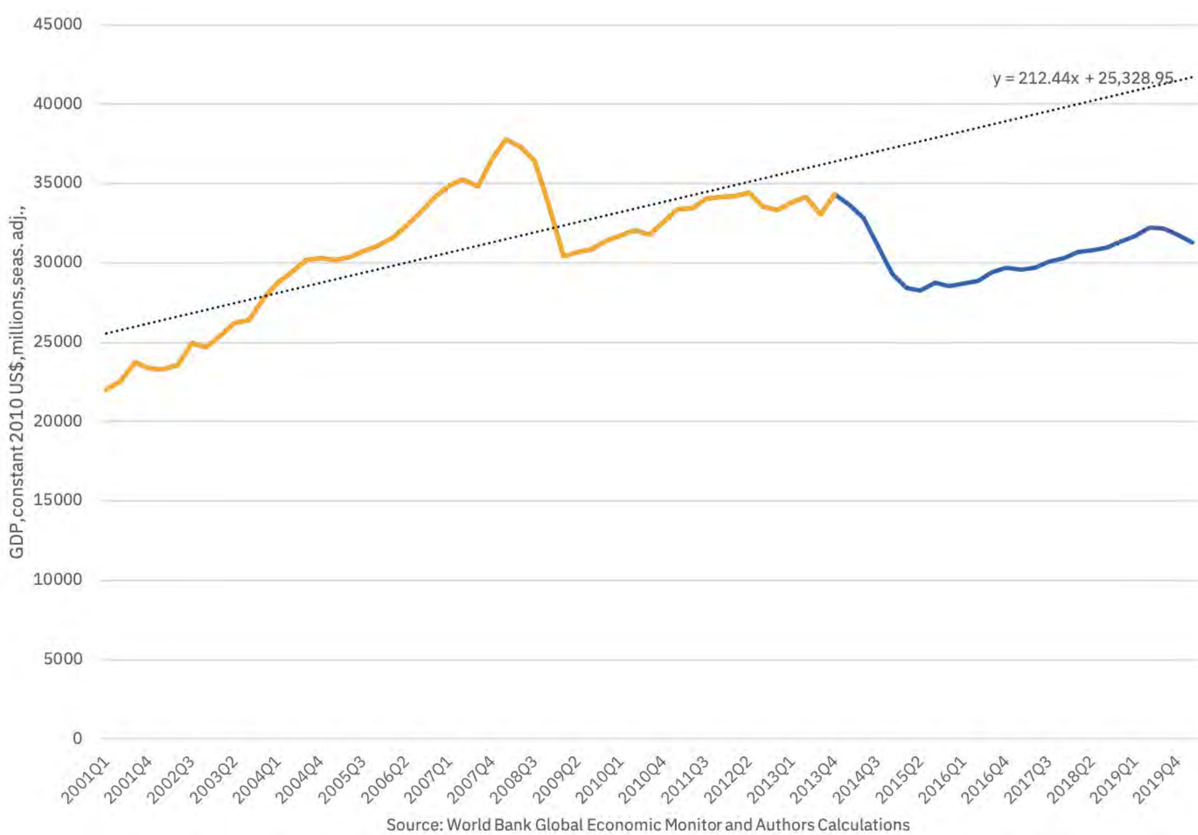

Figure 10: Ukraine's post-war output gap (2001 to 2020).

In the long run, Russia's annexation of Crimea and participation in the separatist movements in Donbas may be a turning point for its growth, as Western reforms seem to have gained support since the Maidan protests. However, the ongoing violence and conflict, despite a series of imperfect cease-fires, is still affecting Ukraine's output and wealth formation. If Ukraine's growth trajectory prior to the conflict was extended forward to the present day, overall GDP would be over 33 percent higher. In total, Ukraine lost $117 billion in long-run output at net present value.

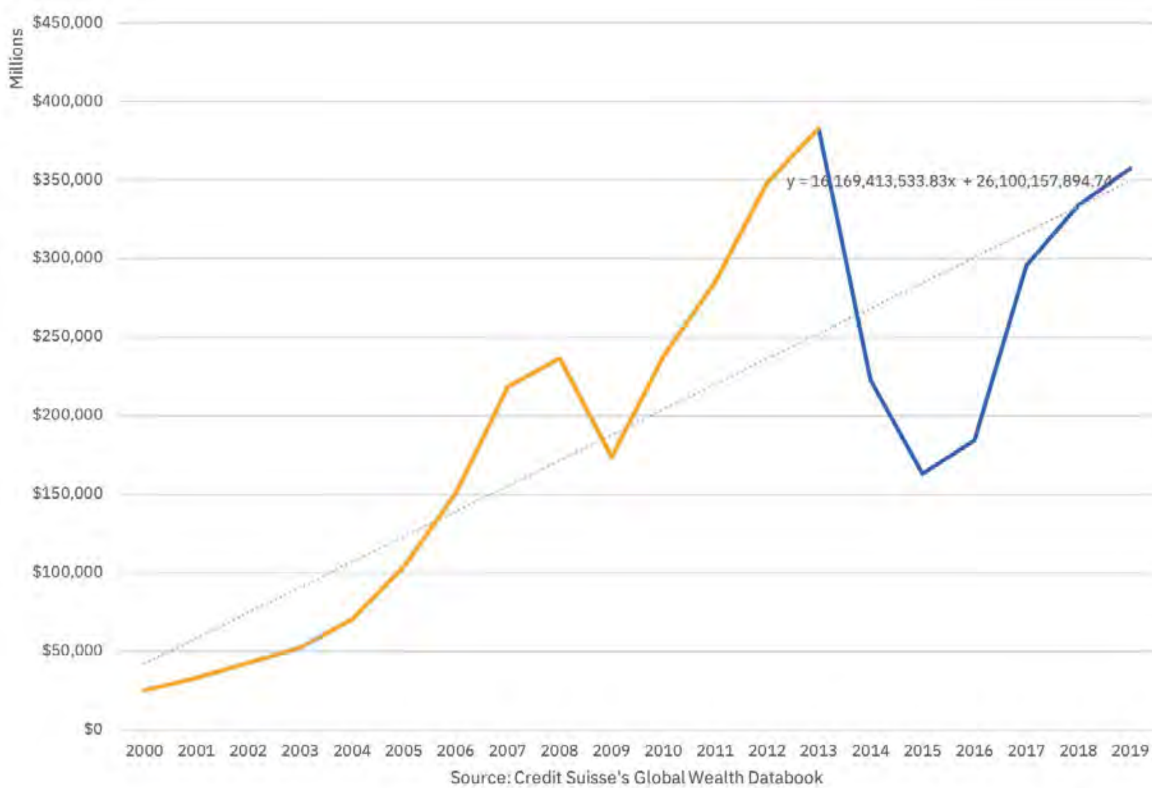

Figure 11: Ukraine's post-war wealth gap (2000 to 2019).

Costs of conflict for the Black Sea, United States, and Western allies

Following the 2008 war in Georgia, the security costs of conflict remained largely confined to Georgia and the U.S. Regional Black Sea military budgets were not raised. Russia remained NATO's partner and NATO military budgets did not increase either. Neither the U.S. nor Europe imposed sanctions on Russia. Meanwhile, NATO's presence in the region remained weak and Black Sea countries did not raise their investments in defense capabilities.

Only in 2014, when Russia invaded Ukraine and annexed Crimea, did the West and NATO change their perception of Russia from partner to security threat. Russia's aggression and the ongoing conflict in eastern Ukraine radically changed the security environment of the region, resulting in extensive direct and indirect military costs for Black Sea countries, the U.S., and other Western partners.

Russia's militarization of the Black Sea region has raised significant costs for the West. Russia began investing heavily in its Black Sea forces as early as 2008 while undertaking extensive modernization of its military capabilities. Following 2014, Russia transformed the annexed Crimean Peninsula into an A2/AD zone and heavily militarized through a build-up of land, naval, and air forces. In doing so, Moscow was able to directly threaten NATO security while projecting power into NATO territories.

Russia's Black Sea Fleet, the most powerful element of the Russian Navy, has grown substantially. Seven submarines and several frigates have been added since 2014 and an additional 18 military ships in production are destined for Crimea. The Black Sea Fleet's current composition of more than 20 combat ships and eight submarines dwarfs the one or two American ships patrolling the region. Meanwhile, Black Sea allies and partners Georgia, Ukraine, Romania, and Bulgaria have very limited and outdated naval forces.

Russia has also deployed S-300 and S-400 anti-aircraft missile systems in Crimea, Bastion mobile coastal defense missile systems, anti-ship missiles, and dozens of fighter jets and attack helicopters, all supported by modernized military infrastructure such as early warning stations and electronic warfare systems. Moscow has also deployed extensive nuclear-capable systems. Together, these upgraded military capabilities form an almost impenetrable Russian defense system with significant offensive capacity against the West, adding major additional costs of conflict to the Black Sea region.

The increased frequency and scale of Russia's military exercises in the Black Sea region have forced NATO allies and partners to respond, albeit slowly.

The United States, NATO, and the European Union

Military costs

The U.S. and EU imposed sanctions on Russia and strengthened support for both Ukraine and Georgia following the annexation of Crimea and war in Donbas. Meanwhile, the election of President Donald Trump ushered in a regional policy of great power competition against Russia and China. As a result, deterrence measures were triggered along the Eastern Flank of NATO, the EDI budget increased, as did NATO defense budgets. Investments into military defense capabilities along the Black Sea were given greater priority. This increased Western defense has caused indirect military costs for the U.S., NATO allies Romania and Bulgaria, and aspiring NATO members Ukraine and Georgia.

Before Russian aggression in 2014, NATO and its member states focused on expeditionary warfare capability development. The 2014 NATO Wales summit offered an adapted threat perception toward Russia and a Readiness Action Plan to address security challenges posed by Russia. For the entire Alliance, NATO's Readiness Action Plan came with the doubling of NATO's rapid reaction force, a faster Very High Readiness Joint Task Force, and an increase in defense budgets to 2 percent of GDP. Concrete steps for Black Sea security were only taken following the 2016 NATO Warsaw Summit, which established a Tailored Forward Presence in the Black Sea and an Enhanced Forward Presence on the Baltic Sea.

NATO deterrence measures in the Baltic Sea enabled four battlegroups of 1,000 troops, each acting as military tripwires in case of Russian aggression against NATO territory. In contrast, measures put in place for NATO in the Black Sea were limited, made up of the Romanian-led multinational Southeast brigade and a rotational naval presence. Other NATO measures in the Black Sea include allied support to protect NATO airspace patrols in Romania and Bulgaria, a Combined Joint Enhanced Training Initiative in Romania, and increased military exercises in the region.

The European Reassurance Initiative (ERI), established under the Obama administration in response to Russian aggression in Ukraine, had a 2015 budget of $1 billion [55] The program was renamed the EDI under the Trump administration with an annual budget of $6.5 billion by 2019. Funding is distributed across Eastern Europe to facilitate increased military presence and exercises with NATO allies and partners.

Foreign aid and humanitarian assistance

While foreign and humanitarian assistance is not a direct cost in a conflict, it does represent a real and indirect cost for the country or institution providing the assistance. Foreign assistance is a scarce good, and its use in this context implies that those funds were not available to assist with other tragedies. In this sense, it is an opportunity cost that should be measured.

In Georgia's case, foreign donors were quick to respond with assistance. In the short term, the International Monetary Fund (IMF) and the United States Government provided immediate budgetary and foreign reserve support with a $750 million loan package and $250 million in direct budgetary support, respectively. In addition, foreign institutions and sovereigns raised an additional $4.5 billion in aid at an October 2008 donor conference in Brussels, including an additional $850 million contribution from the U.S.[56]

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[55] "European Reassurance Initiative: Department of Defense Budget," *Office of the Secretary of Defense*, February 2015, https://comptroller.defense.gov/Portals/45/Documents/defbudget/fy2016/FY2016_ERI_J-Book.pdf.
[56] "FACTBOX: Facts about the 2008 War in Georgia," *Reuters,* August 4, 2009, https://www.reuters.com/article/us-georgia-war-conflict-sb/factbox-facts-about-the-2008-war-in-georgia-idUSTRE5732TH20090804.

As was the case in Georgia, foreign donors stepped in to support Ukraine as it dealt with the separatist uprisings and Russia's annexation and intervention. The U.S. has also significantly increased military assistance to Ukraine through the ERI/EDI, from almost $50 million in 2013 to $318 million in 2016 (Table 8). By March 2014 the European Union had committed $15 billion in economic support and since 2014 the U.S. has provided over $1.5 billion in overall support.

On the multilateral side, the IMF was quick to step in with a two-year, $17 billion stand-by agreement in April 2014. However, while this agreement no doubt helped with Ukraine's funding challenges in the ensuing months, its timing and purpose was largely to help with the significant and self-imposed structural imbalances in the economy, and the staff report initially makes little reference to the conflict. However, as the economic crisis deepened into the summer of 2014, IMF staff recognized the effect that violence in Donbas was having on economic growth above and beyond the country's long-run structural challenges.[57]

Romania

The costs of conflict are distributed unevenly at the regional level. Romania has shouldered more indirect costs associated with the conflicts than any other Black Sea NATO member state. Following the invasion of Georgia, Romania agreed to host part of the NATO-U.S. missile system, drawing strong condemnation and regular threats from Russia. Bucharest also proposed NATO's Tailored Forward Presence and has hosted the multinational Southeast brigade. In preparation for the 2016 NATO Warsaw Summit, Romania also proposed a NATO Black Sea naval presence, which was vetoed by Bulgaria and opposed by Turkey, reflecting the uneven threat perception among NATO member states vis-à-vis Russia.

Meanwhile, indirect costs of Russian aggression coincided with the bipartisan decision in 2015 to raise Romania's military budget to 2 percent GDP by 2017 and maintain these levels until 2027. At the same time, Bucharest initiated an ambitious military modernization program that includes F-16 fighter planes, several air and coastal defense systems, military ships and submarines, military vehicles, and other defense capabilities.[58] Finally, Romania's strategic partnership with the U.S. has been further developed, enabling the opening of a third American military base in Romania and most recently the signing of a 10-year Roadmap for Defense Cooperation to increase Romania's readiness and Black Sea security. U.S. military aid to Romania doubled in 2009 (Table 8).

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[57] "Press Release: IMF Announces Staff Level Agreement with Ukraine on First Review under the Stand-By Arrangement," *IMF*, July 18, 2014, https://www.imf.org/en/News/Articles/2015/09/14/01/49/pr14351.
[58] George Visan, "The Known Unknowns of Romania's Defense Modernization Plans," *Roec*, March 7, 2019, https://www.roec.biz/project/the-known-unknowns-of-romanias-defense-modernization-plans/.

Bulgaria

Bulgaria has not raised its threat perception of Russia. On several occasions, Sofia has opposed EU sanctions on Russia. Bulgaria increased its military spending above the 2 percent NATO threshold in 2019 (Table 7). Military spending has been allocated primarily to military salaries, which are still well below the NATO average. Bulgaria's defense acquisitions have faced consistent delays over the past decade, with approval for the necessary Black Sea air patrol fighter jets only coming in 2019.

With Bulgaria's political leadership and public reluctance to engage in confrontation with Russia on the Black Sea, Washington has played a key role in nudging Sofia toward a more coherent threat perception of the Black Sea security environment. The U.S. tripled its military aid to Bulgaria between 2011 and 2014 (see Table 8) and most recently signed a deal for the construction of Bulgaria's nuclear power plant Belene, in the process cancelling Russia's investment in the project. Nevertheless, Russia's influence on Bulgaria's economy, including Sofia's dependence on Russian energy, prevents Bulgaria from significantly increasing the cost of conflict for Russia in the Black Sea.

Turkey

Turkey's burden of the cost is the most difficult to assess of the three Black Sea NATO member states. Ankara's military budget has indeed increased since 2016 (Table 7), but this has been determined by Turkey's military engagement in Syria. Turkey is the only country that is able to impose costs on Russia, for two reasons. First, Turkey controls access to the Black Sea under the Montreux Convention and can therefore prevent Russia and the West from freely navigating the region. Second, Turkey is the only Black Sea country, aside from Russia, with a substantial navy force. This includes a significant Black Sea presence. In recent years, the relationship between Turkey and Russia has deteriorated, causing some regional costs of conflict on Turkey. After Turkey downed a Russian fighter in 2015 following airspace violations, Moscow imposed temporary sanctions upon Turkey. Furthermore, Turkey is confronting Russia directly or indirectly in three ongoing conflicts: Syria, Libya, and Nagorno-Karabakh. In late 2020, a brief but intense conflict broke out over the Nagorno-Karabakh region that saw heavy involvement from Turkey.[59] The conflict ended with a Russian-brokered cease-fire that included the presence of Russian forces in the region. Turkey also actively supported the Western integration of Ukraine and Georgia following Russia's aggression. Nevertheless, with the acquisition and recent testing of the Russian S-400 missile defense system and under American sanctions, Turkey's burden-sharing of regional security costs will likely remain limited.

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[59] "Armenia-Azerbaijan: Why Did Nagorno-Karabakh Spark a Conflict?" BBC News, November 12, 2020, https://www.bbc.com/news/world-europe-54324772.

Methodological Annex

This report measures the cost of Russia's invasion of Georgia and Russia by accounting for two types of costs.[60] The first is what we call direct and indirect "short-term" costs, which seeks to measure the effect that the conflict had on economic flows in the economy during the conflict period, the effect that conflict had on capital stock including military hardware, and the cost to international donors for humanitarian relief and rebuilding. The second type of cost, direct and indirect "long-term" costs, measures the effect that the conflict may have had on economic growth, wealth, and human capital from the period beginning with the cessation of major combat activities to the present. All costs are stated in 2010 U.S. dollars

Short-term costs

Short-term costs have three components. The first is a measure of seasonally adjusted quarterly GDP from the World Bank's Global Economic Monitor (GEM) database. For both Georgia and Ukraine, we take an average of long-run quarterly GDP growth prior to the conflict and subtract that from the average growth rates experienced during the conflict period. This provides an estimation of the effect that the conflict had on output during the conflict period compared to long-term expectations. This figure is then multiplied by output from the period immediately preceding the conflict in order to provide a measurement of lost output during the conflict. In Georgia, this period is Q2 2008; in Ukraine, this period is 2013.

Second, we use publicly available sources to develop a database for both countries that estimates losses of public and private capital due to the conflict. For this component, we measure the damage and destruction caused to the overall capital stock as a direct result of the fighting, the valuation of seized assets (in the case of Crimea), and the value of military assets destroyed in the conflict.

Third, we try to measure indirect costs in the form of budgetary support, humanitarian aid, and defense aid as a direct result of the conflict. We justify the inclusion of aid for two reasons. First, as this aid is spent in the domestic economy, it raises GDP and thus narrows our estimation of the long-run costs on the economy. By providing some accounting measure of this aid in our short-run costs we can at least in part offset this phenomenon. Second, while much of the aid is meant to help rebuild and recapitalize the economy, in a sense partially helping to repay for the damaged capital stock we have already accounted for, it still represents an opportunity cost on behalf of the country or institution donating the funds. For example, the U.S. contribution of $1 billion to Georgia's rebuilding efforts helped to rebuild some of

[60] All cost components are stated in constant 2010 U.S. dollars.

Georgia's damaged infrastructure. But it also represented a qualitative decision by the U.S. Government to assign that funding to Georgia. This opportunity cost is what we are trying to imperfectly measure.

With these three components, we can establish a total (direct) short-term cost. We do this by adding together the lost output, total accounting of the damaged and destroyed capital stock and seized assets, and total accounting of all budgetary support, humanitarian, and defense aid. This calculation gives us an estimate of the lower bound of our cost of conflict.

Long-term costs

Long-term costs are also calculated based on three components. First, we address potential losses of long-term output by taking seasonally adjusted quarterly GDP from the World Bank's GEM database and using that to estimate what GDP would be if its trajectory followed pre-conflict trends in a linear way. We then take this estimated output based on pre-conflict trends and subtract it from real output measured by the GEM database and calculate its net present value. We utilize the same 5 percent discount rate used by Collier and Hoeffler in their analysis of the economic costs of civil war.[61] This type of technique assumes that, in a counterfactual world, trend growth will continue largely based on its historical trajectory. Furthermore, our estimate of the cost assigns 100 percent of the difference between real and potential output to the conflict alone. We do not try to make any assumptions about other effects that may have affected real output.

Second, we try to estimate the effects the conflict had on total wealth in Georgia and Ukraine. We use total wealth estimated in Credit Suisse's Global Wealth Databook 2019 adjusted to constant 2010 U.S. dollars. We then apply the same methodology used in our estimate of output to produce a potential cost that the conflict had on the economy's wealth.

Finally, we attempt to account for the lost productive capacity of the Georgian and Ukrainian military personnel and civilians that lost their lives in the conflict. To do so, we multiply the total deaths from the conflicts by an estimate of per capita human capital at net present value from the World Bank's Wealth Accounts database. This provides an estimate of the loss of economic output caused by the tragic loss of these lives. In doing so, we are not trying to simplify the spectrum of these individuals to their economic output, but instead provide a more complete picture of the potential economic loss caused by these conflicts.

To estimate an upper bound of our costs based on these long-term costs, we add together the long-run loss of output and wealth with our estimate of lost human capital.

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[61] Paul Collier and Anke Hoeffler, "The Challenge of Reducing the Global Incidence of Civil War," *Copenhagen Consensus* (April 23, 2004), https://www.researchgate.net/publication/228382275_The_Challenge_of_Reducing_the_Global_Incidence_of_Civil_War.

Final calculation and cost range

Our final calculation of the costs of conflict provides a range of potential costs. On the lower end of our range are the short-term costs. Short-term costs are estimated by adding together our estimate for loss of short-term output with our research on the value of the physical capital destroyed and indirect cost accumulated.

On the higher end of our range are our long-term costs, which account for the accumulated costs to output, wealth, and human capital from the end of the conflict to the present day. We estimate these by taking our cost calculation of lost output and wealth and adding it to our calculation of lost human capital.

Our confidence in the accuracy of these costs differ between our short-term and long-term estimates. On the short-term side, we have a higher level of confidence in the accuracy of our costs because the timeframe is constrained, the output effects beginning with the assumption of hostilities are clear, and the estimates of physical and indirect costs are well documented.

On the long-term side, our confidence levels are lower because our long-term estimate of potential output and wealth does not take into account dynamic endogenous and exogenous effects. Policy choices and global events, among other factors, clearly have an impact on growth in the post-conflict period. However, instead of trying to assume the level of this impact, we instead provide a simple linear estimate of output and wealth based on the historical trend.

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