Cost to Ukraine of Conflict with Russia

A Cebr report

February 2022

Authorship and acknowledgements

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Contents

Executive summary

This report summarises Cebr's research into the cost to Ukraine of the conflict with Russia over the period 2014 to 2020.

With regards to Ukraine's GDP, our central estimate for the losses over the relevant period amount to $280 billion of forgone output[1], compared with Cebr's pre-conflict forecast. This amounts to **$40 billion in annual terms** or 19.9% of pre-conflict annual GDP.

We also present a lower-bound estimate for comparison. This assumes an extreme counterfactual scenario in which Ukrainian GDP would have stagnated in the absence of the conflict. **Even in this case, the estimated cumulative forgone output amounts to $191 billion or $27 billion in annual terms**. This annual figure is equivalent to 13.6% of pre-conflict GDP.

Furthermore, the report identifies the following economic channels and quantifies their contribution to the headline figure of forgone output over the period:

Regional GRP impacts

- Using the same forgone output approach, we have estimated the economic losses in Crimea and Donbas. These are the two regions most clearly impacted by the conflict.
- Our estimate for the cumulative loss of output associated with the annexation of Crimea amounts to **$58 billion**. This is equivalent to **$8.3 billion** in annual terms.
- Our estimate for the cumulative loss of output in Donbas, encompassing Donetsk and Luhansk, amount to **$102 billion** in cumulative terms or **$14.6 billion** in annual terms.

Impact on components of GDP

- We have estimated the value of losses attributed to two particular components of gross domestic product: exports and investment.
- The military conflict, as well as Russian sanctions on Ukrainian trade, have put downward pressure on Ukrainian exports. This has amounted to cumulative losses of up to **$162 billion** or up to **$20.3 billion** in annual terms.[2]
- Investment has also declined as a result of the conflict and subsequent loss of confidence in the Ukrainian economy. We estimate that the economy has missed out on up to **$72 billion** of investment cumulatively, or **$10.3 billion** annually.

1 These cumulative estimates cover the period from 2014 to 2020. They are estimated in 2021 constant prices, translated into dollars at the estimated 2021 exchange rate (for more detail see Footnote 20).

2 Due to a differing methodology, outlined in the respective section, the estimates for export losses consider the period from 2013 to 2020.

Impact on public sector finances

- Based on the above GDP impacts, Cebr has assessed the scale of the loss of tax revenues in Ukraine resulting from the conflict. We find that cumulative tax revenue losses amounted to **$48.5 billion** up to 2020.

- We also consider the additional cost to public finances. Cumulatively between 2014 and 2020, we estimate that the Ukrainian Government spent an additional **$15 billion** on military operations than would have been the case if the conflict had not occurred.

  Lower tax revenues and higher military expenditure have reduced the fiscal headroom for the Ukrainian Government. Taking these factors in net terms, we estimate that the Ukrainian Government would have had a cumulative **$63 billion** more to spend on non-military activities between 2014 and 2020, if the conflict had not occurred.

Impact on capital stock

- We estimate that cumulative capital losses associated with the annexation of Crimea and destruction in Donbas amount to **$117 billion**.

Methodology

- The figures described above are based on estimates of forgone economic output, relative to a counterfactual situation in which the conflict did not occur. The main counterfactual in the case of the GDP calculations is based on Cebr's forecasts for the Ukrainian economy from our **2013 World Economic League Table**. This was produced prior to the military action. A secondary counterfactual makes the extreme assumption that the Ukrainian economy would have stagnated completely in the absence of the conflict.

- Different counterfactuals have been assumed when considering regional and tax revenue impacts, as well as when looking at exports and investment. These counterfactuals are described in the relevant subsections.

- Our figures are higher than previously published estimates in the literature. The longer time period covered, capturing impacts up to and including 2020, has pushed up our cumulative figures. The annual average figures are also slightly higher than existing estimates. **This reflects our use of a forgone output methodology, which provides a more comprehensive measure of the economic impacts, capturing both direct and indirect effects**. Discussion of this methodology and comparison to alternatives takes place in Section 3.2.

Introduction

This report summarises Cebr's research into the cost to Ukraine of the conflict with Russia over the period 2014 – 2020.

The research focuses on three metrics: the loss to Ukraine's economic output, the cost of capital lost or destroyed, and the net impact on the public finances of the Ukrainian Government.

The loss to Ukraine's economic output reflects three main factors:

- The impact of the annexation of Crimea by Russia
- The direct impact of Russia's military action in Eastern Ukraine
- Knock on economic effects, including sanctions on Ukrainian trade and a weakened investment outlook.

Capital costs reflect the loss of, or damage to, assets previously held by Ukraine or Ukrainian entities. This has resulted both from Russia's illegal annexation of Crimea and from its direct military action in Eastern Ukraine.

The net impact on the Ukrainian Government's finances is then considered through two main channels:

- Reduced tax revenues as a result of the overall economic loss
- The increase in military expenditure associated with the conflict.

The report is split into the following chapters:

1) Review of relevant events in the conflict
2) Review of existing literature
3) Outline of our own calculations relating to the effects on the Ukrainian economy. This considers the losses to economic output (GDP) and capital costs
4) Outline of our own calculations relating to the impact on Ukrainian public finances

1 Context and timeline of the conflict

This section provides some background to the analysis by describing the two regional economies most affected by the conflict and the timelines of the various Russian aggressions.

1.1 Economies of Crimea and Donbas

Crimea is a peninsula, with coastlines on the Black Sea and Sea of Azov. Crimea's coastlines are key to its regional economy, providing significant port activity in cities such as Sevastopol. Meanwhile, tourism has traditionally flourished in coastal resort cities such as Yalta.

Crimea's economic contribution is proportionately smaller than its population size. Between 2009 and 2013 it accounted for 5.1% of the Ukrainian population. Over the same period its share of national GDP was 3.7%.[3,4]

Donbas is a large region in Eastern Ukraine, encompassing the Donetsk and Luhansk oblasts.[5] The region has historically been the heart of Ukrainian industry, possessing large coal mines and production centres for industrial goods. The region has been of great importance in terms of exports, facilitated by its land border with Russia and its coastline on the Sea of Azov.

The region accounted for a slightly larger share of Ukraine's economic output than its share of population. The region contributed 15.7% to national GDP in the five years to 2013, while only accounting for 14.7% of the population.[6,7]

Figure 1: Map of conflict-affected regions

Source: Financial Times

3 State Statistics Service of Ukraine. *Population (by estimate) as of 2013*. https://ukrstat.org/en/operativ/operativ2019/ds/kn/kn_e/kn1219_e.html

4 State Statistics Service of Ukraine. *Gross regional product*. https://ukrstat.org/en/operativ/operativ2008/vvp/vrp/vrp2008_e.htm

5 Throughout the report, the term Donbas will be used to refer to the aggregate of Donetsk and Luhansk.

6 State Statistics Service of Ukraine. *Population (by estimate) as of 2013*. https://ukrstat.org/en/operativ/operativ2019/ds/kn/kn_e/kn1219_e.html

7 State Statistics Service of Ukraine. *Gross regional product*. https://ukrstat.org/en/operativ/operativ2008/vvp/vrp/vrp2008_e.htm

1.2 Events since 2013

The following presents a timeline of key events relating to the conflict between Ukraine and Russia. Due to the intricacy of relations between the two countries, this is not intended to be an exhaustive list.

2013

Russia increases political and economic pressure on Ukraine. This followed negotiations between Ukraine and the European Union and progress towards the conclusion of an Association Agreement between the two parties.

November 2013

Demonstrations and civil unrest begin in Ukraine. This stemmed from the Government's suspension of signing an agreement with the EU, instead opting for closer ties with Russia.

February 2014

Demonstrations escalate into the Maidan revolution, leading to the downfall of the Ukrainian president and government.

February and March 2014

Russian troops enter Crimea and Russian Parliament approves the use of military force in the peninsula. This led to the temporary occupation of Crimea and Sevastopol.

April 2014

Pro-Russian separatist groups begin protests in Eastern Ukraine. Self-proclamation of Donetsk and Luhansk People's Republics.

April – July 2014

Protests amongst separatist groups in Eastern Ukraine escalate into violence. Territories in Donbas are seized by pro-Russian separatists.

Anti-Terrorist Operation (ATO) is launched in Donetsk and Luhansk under the direction of the Security Service of Ukraine.

September 2014

Minsk Protocol agreed and signed by the Trilateral Contact Group in Ukraine, consisting of Ukraine, Russia, and the Organisation for Security and Cooperation in Europe. This fails in its attempt to end the violence in Donbas.

February 2015

Second Minsk Protocol agreed and signed, but ceasefire fails again.

2015 – 2021

Violence in Donbas continues, leading to significant destruction of property and infrastructure, mass outward migration, and many casualties.

Late 2021 - 2022

Hostilities have escalated in late 2021 and into 2022 as a result of Russian build-up of military personnel and equipment on Ukraine's borders

2 Literature review: economic cost estimates

We have reviewed the existing literature relating to the economic cost borne by Ukraine as a result of the conflict. The following provides an overview of key findings, as well as some commentary on the methodology applied:

Åslund (2018) – Kremlin Aggression in Ukraine: The Price Tag[8]

Åslund attempts to assess the material losses to Ukraine since the conflict began. The findings solely relate to the lost activity in Donbas and Crimea, however, rather than the whole economy.

Åslund (2018) assumes that all economic activity has been lost in the occupied territories of Donbas and Crimea. The value of each region's gross product prior to the conflict is then multiplied by a Europe-wide ratio between wealth and income. This is used to estimate the value of the assets Ukraine has lost as a result of the conflict. Åslund's final estimate for capital losses is $98.4 billion across Crimea and Donbas.

Mykhnenko (2020) – Causes and Consequences of the War in Eastern Ukraine: An Economic Geography Perspective[9]

Mykhnenko provides data-driven insights into changing economic outcomes in Donbas, by analysing time trends on various indicators. This shows how variables such as unemployment, earnings, and living standards have worsened since the beginning of the conflict.

Mykhnenko also provides an estimate for the value of capital losses in Crimea and Donbas, which is placed at $84.6 billion. This estimate relies on the same Europe-wide ratio as that used in Åslund (2018), in order to produce an aggregate value for lost assets as a result of the war.

Bluszcz and Valente (2020) – The Economic Costs of Hybrid Wars: The Case of Ukraine[10]

Bluszcz and Valente (2020) draw on a counterfactual approach to estimate the welfare loss associated with conflict in Ukraine. This shows that Ukrainian GDP per capita was 15.1% lower between 2013 and 2017 compared to the counterfactual case in which the conflict did not occur. In dollar terms, this is equivalent to a shortfall of $1,439 per capita. We perceive this to be the most robust estimate of lost economic welfare as a result of the conflict.

The counterfactual is produced using a Synthetic Control Method, involving the production of a 'synthetic' Ukraine. This takes a weighted average of economic variables from structurally

8 Åslund, A. (2018). *Kremlin Aggression in Ukraine: The Price Tag*. Atlantic Council Eurasia Center. https://www.atlanticcouncil.org/wp-content/uploads/2018/03/Kremlin_Aggression_web_040218_revised.pdf

9 Mykhnenko, V. (2020). *Causes and Consequences of the War in Eastern Ukraine: An Economic Geography Perspective*. Europe-Asia Studies, 72:3, 528-560. DOI: 10.1080/09668136.2019.1684447

10 Bluszcz, J. & Valente, M. (2020). *The Economic Costs of Hybrid Wars: The Case of Ukraine*. Defence and Peace Economics, 1-25. DOI: 10.1080/10242694.2020.1791616

similar economies to predict how the Ukrainian economy would have performed in the absence of the war.[11]

Further sources

An array of literature is available discussing the context, causes, and consequences of the conflict. These pieces have been used to inform Cebr's own research and are quoted as appropriate throughout this report.

These publications do not put monetary estimates on the costs to Ukraine, but instead provide more qualitative insight into the context, causes, and consequences of the conflict.

The following sources were considered in our research:

- Beck, T. (2015). Underlying Causes of the Ukrainian Recession. https://globaledge.msu.edu/blog/post/22938/underlying-causes-of-the-ukrainian-reces
- Hamilton, R. (2019). *Five Years of War in the Donbas*. Foreign Policy Research Institute. https://www.fpri.org/article/2019/10/five-years-of-war-in-the-donbas/
- International Crisis Group. *Conflict in Ukraine's Donbas: A Visual Explainer*. https://www.crisisgroup.org/content/conflict-ukraines-donbas-visual-explainer
- Iwański, T. (2015). The collapse of Ukraine's foreign trade. *Centre for Eastern Studies*. https://www.osw.waw.pl/en/publikacje/analyses/2015-03-18/collapse-ukraines-foreign-trade
- Kochnev, A. & Valente, M. (2021). *Cost of Conflict: The Consequences of War in Donbas, Ukraine.* Frontier Europe Initiative. https://mei.edu/publications/cost-conflict-consequences-war-donbas-ukraine
- Kostanyan, H. & Remizov, A. (2017). *Donbas Blockade: Another Blow to the Minsk Peace Process.* Centre for European Policy Studies. https://www.ceps.eu/ceps-publications/donbas-blockade-another-blow-minsk-peace-process/
- Minzarari, D. (2021). *The Russian Military Escalation Around Ukraine's Donbas.* Stiftung Wissenschaft und Politik. DOI: 10.18449/2021C27
- Pifer, S. (2020). *Crimea: Six Years After Illegal Annexation.* Brookings. https://www.brookings.edu/blog/order-from-chaos/2020/03/17/crimea-six-years-after-illegal-annexation/

11 Structurally similar economies included in the study were Armenia, Bulgaria, Moldova, and Slovenia.

3 Economic cost estimates

3.1 Introduction

This section describes Cebr's own analysis of the economic impacts of the conflict.

This analysis measures the cost of the conflict to Ukraine over the period 2014 – 2020 in three ways:

1) the impact of the loss in annual GDP;
2) the value of lost or damaged assets; and
3) the impact on Ukrainian public finances.

3.2 Impact on GDP

The loss of GDP reflects three main impacts:

1) The direct impact of the loss of Crimea and Sevastopol
   - The loss of the Crimean peninsula means that the region no longer contributes to Ukraine's GDP figures.
   - The region had previously accounted for around 3.7% of the Ukrainian economy.
   - We have included Crimea in our estimates of Ukrainian GDP until 2013. There is therefore a sharp fall in 2014, which partially reflects this loss.

2) The direct impact of the conflict in Donbas
   - As described in Section 1.2, the conflict in Donbas has been characterised by a high number of deaths and significant damage to property and infrastructure as a result of artillery fire. This has limited economic output and productive capacity.
   - Blockades in the region have also limited trade between temporarily occupied and non-occupied areas.[12]
   - The inherent instability accompanying warfare has reduced investment and output in the region and also led to substantial outward migration.

3) Indirect effects
   - Impacts away from the directly affected regions need to also be considered.
   - These can be seen as spillover, or indirect, effects upon the wider Ukrainian economy.
   - Reduced export capacity and weakening investment prospects provide two examples of indirect effects. Both of these effects are discussed specifically, with monetary estimates of the losses associated with them.
   - Further effects include loss of confidence in the Ukrainian economy, the drag on consumption from higher inflation, and the impacts of currency depreciation. We have not quantified these impacts directly, but their impact is captured within the overall GDP loss figures.

12 This refers to the de facto ban on trade between Ukraine and the separatist-controlled regions as well as the temporary ban on freight of cargo through the demarcation line by rail and road, other than for certain exemptions.

There are two basic methodologies for calculating the impact of conflict.

One common approach is to produce a bottom-up estimate, looking at each potential impact in isolation and then summing them up. The advantage of this approach is that it gives more detail than the alternatives and that different types of impacts can be considered. The disadvantage of the approach is that it generally misses many of the wider, more indirect impacts that feed through a range of channels, for instance, the impacts of conflict on economic uncertainty, incentives, and institutional security.

In this case, therefore, we have used a 'forgone output' methodology for calculating the impact on GDP. This is a common approach in the study of economic losses in the context of military action. It involves comparing the actual path of GDP with a counterfactual path, based on a likely trend for GDP that might have been reasonably expected in the absence of the conflict. The estimated impact of the conflict is therefore the difference between the GDP actually achieved and the GDP that the counterfactual path suggests might have been achieved in the absence of the conflict.

The advantage of this approach is that it captures all the economic impacts including those that are not always easy to identify. The problem with the approach is the difficulty in estimating the counterfactual path.

Nevertheless the 'forgone output' approach is widely used in similar contexts, as exemplified by:

- Abadie, A. & Gardeazabal, J. (2003). *The Economic Costs of Conflict: A Case Study of the Basque* Country. American Economic Review, 93(1):113-132. DOI: 10.1257/000282803321455188
- Arunatilake, N., Jayasuriya, S.K., & Kelegama, S. (2001). *The Economic Cost of the War in Sri Lanka*. World Development, Elsevier, vol. 29(9), p1483-1500. Handle: RePEc:eee:wdevel:v:29:y:2001:i:9:p:1483-1500
- Bluszcz, J. & Valente, M. (2020). *The Economic Costs of Hybrid Wars: The Case of Ukraine*. Defence and Peace Economics, 1-25. DOI: 10.1080/10242694.2020.1791616

Although we have used the 'forgone output' approach as our main method of quantification of the GDP effects, we have also cross-checked the results from this approach. This has involved the production of estimates for regional and other effects as shown in Table 1 below.

Table 1: Disaggregated impacts to be evaluated

Regional impacts	Aggregate impacts
The loss of Crimea and Sevastopol	The economic losses from forgone exports
The economic losses in Donbas	The economic losses from forgone investment

It should be noted that there is a degree of overlap between these impacts. For instance, some of the regional losses attributed to Crimea, Sevastopol, and Donbas will also reflect lost exports and similarly the aggregate value of exports will include the value of exports lost in those particular regions.

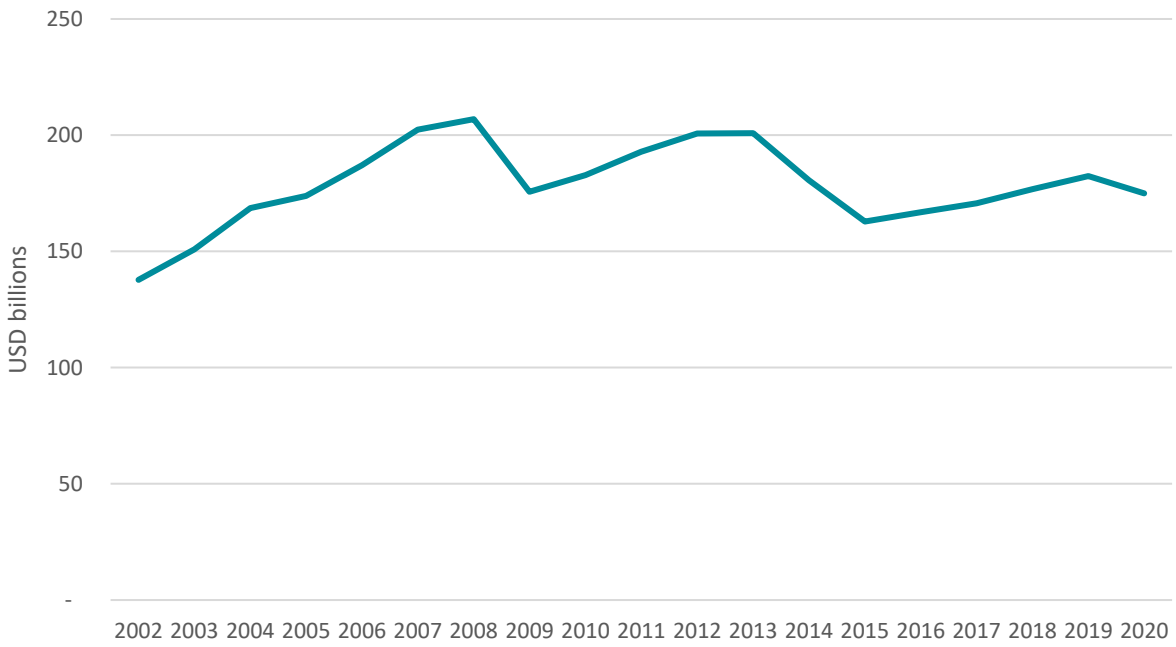
3.3 GDP time series

As shown in Figure 2, Ukrainian GDP has been highly volatile since 2008. After facing a deep slump due to the global financial crisis, the economy had been recovering strongly in the following three years, with real GDP growth of 4.1%, 5.5%, and 4.1% in 2010, 2011, and 2012, respectively. The economy stagnated in 2013, however, at least partly due to the imposition of trade sanctions from Russia and a period of high political instability.[13]

The impacts of the conflict then became more apparent, with the loss of Crimea and Russia's military interventions in Donbas, leading to a 10.1% GDP contraction in 2014. This was followed by a further contraction of 9.8% in 2015, as hostilities continued and confidence in the Ukrainian economy slumped. The 10.1% contraction in GDP is larger than that reported by the International Monetary Fund (IMF), since the IMF data excludes Crimea and Sevastopol from Ukrainian GDP from 2012 onwards, whereas Cebr's estimates include Crimea and Sevastopol up until 2013.

Several years of recovery at moderate pace were then witnessed between 2016 and 2019, before output contracted once again as a result of the Covid-19 pandemic in 2020.

Figure 2: Ukraine real GDP, 2021 constant prices, 2002 - 2020



Source: International Monetary Fund[14], Cebr analysis

13 Institute for Economic Research and Policy Consulting (2013). Year 2013: *Economic Summary for Ukraine*. http://www.ier.com.ua/files//publications/ES_2013_en_fin.pdf

14 The data used here stems from the IMF's World Economic Outlook, a regularly produced overview of economic data for national economies. Unless otherwise stated, figures referencing the IMF will draw upon this dataset.

3.4 Identifying the counterfactual

In formulating a counterfactual case for how the Ukrainian economy might have performed in the absence of the conflict, we have considered a range of pre-conflict forecasts. These forecasts cover the 2012-2014 editions of the IMF's World Economic Outlook, as well as Cebr's World Economic League Table over the same time horizon. These forecasts are shown in Appendix 1.

In 2012, the Ukrainian economy had been expected to grow at a trend rate of around 3.5%. However, by 2013, the economy was experiencing considerable volatility, due in part to Russian economic measures directed against Ukraine. This brought about a slower expected growth rate. Therefore, any counterfactual scenario based on these forecasts will already account for the general macroeconomic instability faced by the Ukrainian economy prior to the conflict.

We have made two different estimates for the counterfactual trend:

- **Scenario 1:**
  - We have used Cebr's forecasts for Ukrainian GDP, produced in 2013, and compared them with the actual path.
  - This forecast was chosen as the counterfactual as it pointed to slower growth than those produced in prior years. This reflects the general weakening of the Ukrainian economy that was beginning to emerge in 2013.
  - It is assumed that the Ukrainian economy would have grown at this forecasted rate in the absence of the conflict.
- **Scenario 2:**
  - We have also modelled a scenario in which the Ukrainian economy would not have grown at all in the absence of conflict.
  - This is an extreme assumption, since very few economies are completely stagnant for a multi-year period in the absence of conflict.
  - The estimated impacts based on this assumption should therefore be seen as the bottom end of the range of likely impacts.

Scenario 1

Our first estimate for Ukrainian output in the absence of the conflict is based on Cebr's growth forecasts from our 2013 World Economic League Table (WELT).[15,16] These figures are the forecasts which Cebr actually made for the Ukrainian economy prior to the onset of political instability and the conflict. The Cebr forecasts are the only forecasts available that cover the whole period of analysis from 2014 to 2020 – the IMF forecasts made pre-conflict even as late as 2013 only project out to 2018. Cebr forecasts have a high reputation for accuracy and in fact over the periods for which the forecasts can be compared are not very different from the IMF forecasts made at the same time.

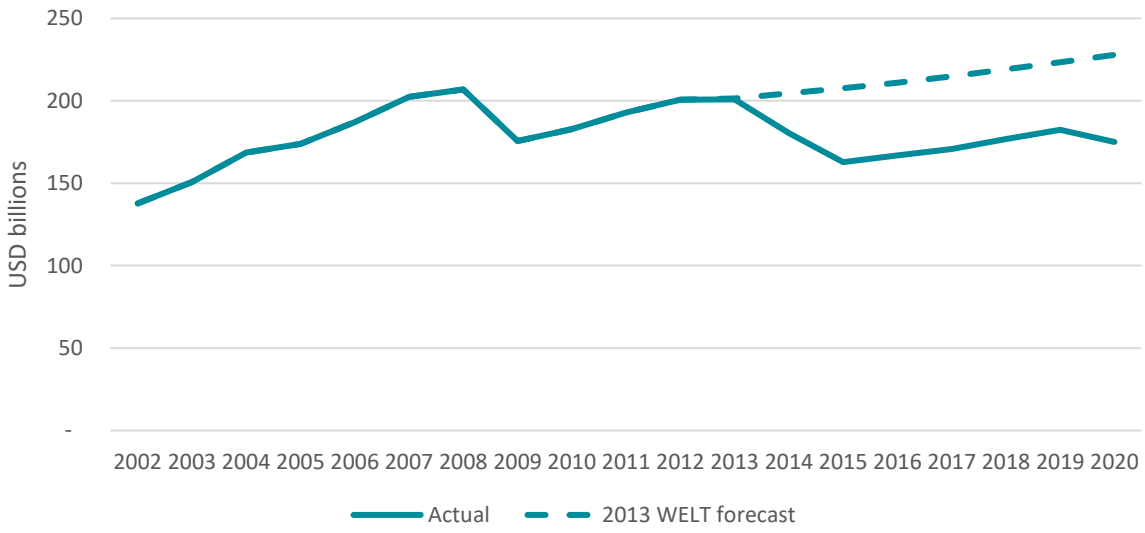
These forecasts pointed to a trend GDP growth rate of around 1.4% in the years between 2013 and 2017. Growth was then expected to accelerate to around 2.0% from 2018 to 2022. The forecast for slower growth between 2013 and 2017 had reflected concerns about the

15 Centre for Economics and Business Research (Cebr). *World Economic League Table 2013*.

16 Further Cebr forecasts for the Ukrainian economy, produced between 2012 and 2014 are displayed in Appendix 1. These figures show how perceptions of Ukraine's growth prospects changed as the military and economic crises developed.

sustainability of the rapid growth that had been experienced in the previous three years following the recovery from the global financial crisis. Figure 3 compares the actual GDP outcome outlined in Section 3.3 to the path predicted from these forecasts.

Figure 3: Ukraine real GDP, 2021 constant prices, 2002 – 2020, actual and counterfactual

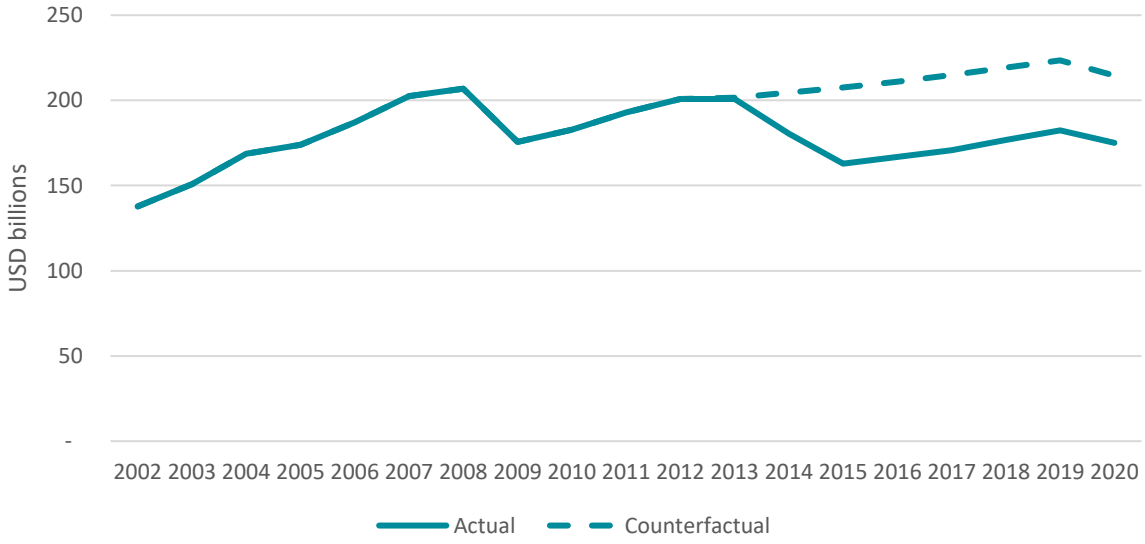


Source: International Monetary Fund, Cebr analysis

It would be unrealistic not to take the pandemic into account in the counterfactual situation, however. IMF data shows a decline in Ukraine's real GDP of 4.0% between 2019 and 2020. To account for this, we have adjusted our counterfactual case in 2020, assuming that the decline in output would have been the same proportional size regardless of whether the conflict had taken place or not.

This adjustment leads us to a finalised initial counterfactual case, shown in Figure 4. This will henceforth be referred to as Scenario 1.

Figure 4: Ukraine real GDP, 2021 constant prices, 2002 – 2020, actual and Scenario 1 counterfactual accounting for the pandemic



Source: International Monetary Fund, Cebr analysis

Scenario 2

There were concerns that the Ukrainian economy was set to face difficulties even before the conflict began. Ukraine was subject to a stand-by arrangement with the IMF in 2008, in an attempt to finance the economy through the financial crisis. A further arrangement was provided in 2010, adding to the economy's debt burden.

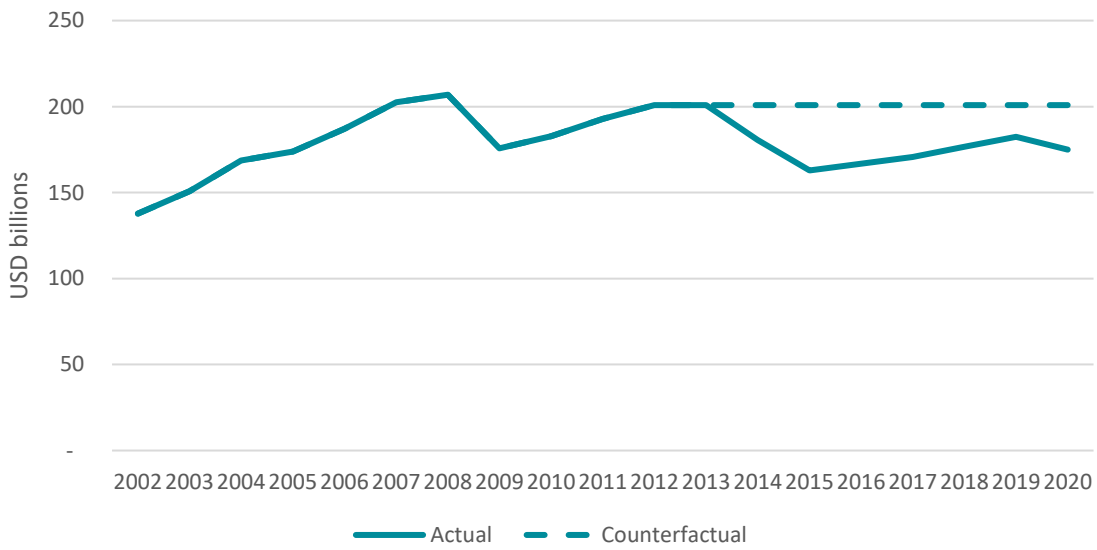
The Ukrainian economy, which is largely open and hence dependent on a range of global factors, had also been adversely impacted by changing commodity prices. A fall in global steel prices around the turn of the 2010s reduced the value of Ukraine's steel exports, for example, while rising gas prices contributed to a growing trade deficit.[17]

Taking these factors together, it might be suggested that the Ukrainian economy would not have continued a strong growth path in the absence of the conflict. Instead, the economy could have faced a period of relative stagnation, with growth being held back by general macroeconomic weakness and specific factors such as those outlined above.

Though these factors were accounted for in Cebr's 2013 growth forecast for Ukraine to some degree, we can present a case in which their impact on growth was even more stark. To do so, we present the counterfactual case in which the economy stagnates at its 2013 level.[18] This is shown graphically in Figure 5 and will henceforth be referred to as Scenario 2.

For this scenario we have assumed that the economy would have stagnated in real terms from 2013 onwards. It should be noted that this is an extreme assumption. Estimates of the economic impact of the conflict from this approach give an extreme lower bound.

Figure 5: Ukraine real GDP, 2021 constant prices, 2002 – 2020, actual and Scenario 2 counterfactual



Source: International Monetary Fund, Cebr analysis

17 Sarna, A. (2012). *Ukrainian economy on the verge of recession*. Centre for Eastern Studies.
https://www.osw.waw.pl/sites/default/files/commentary_96.pdf

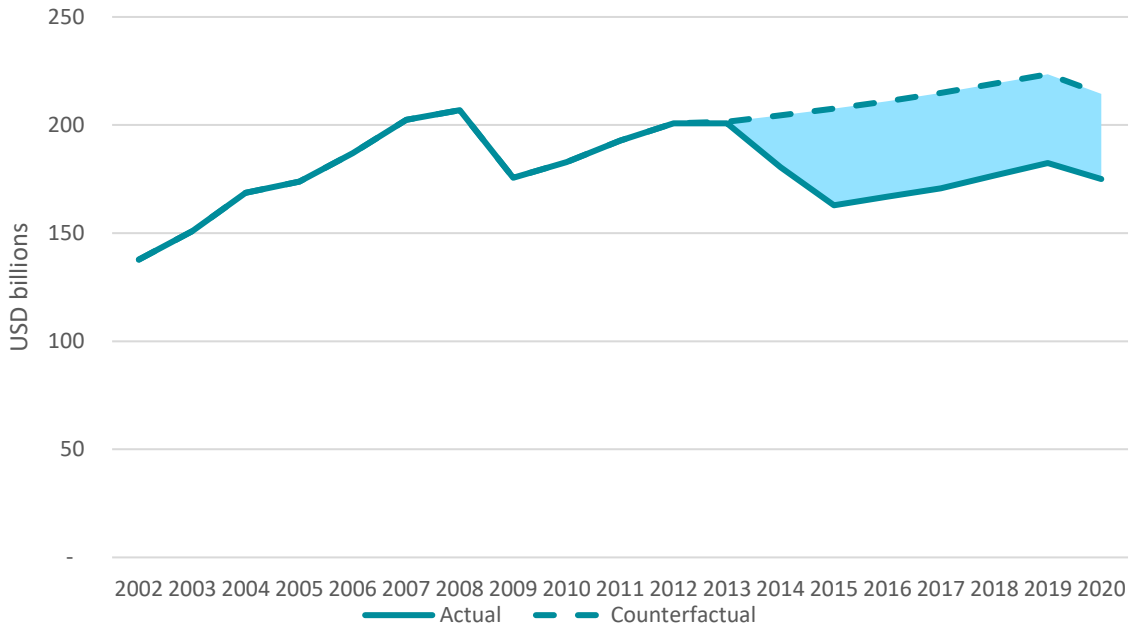
18 The impacts of the pandemic are here ignored for simplicity, allowing us to outline a purely stagnant case.

3.5 Aggregating GDP losses

The following subsections present the counterfactual GDP losses for Scenarios 1 and 2.

Our estimate for the Ukrainian economy's lost output in the period 2014 – 2020 as a result of the conflict is given by the integral of the vertical difference between the actual and counterfactual GDP paths.
Graphically, this is the shaded area shown in Figure 6 when applied to Scenario 1.

Figure 6: Ukraine real GDP, 2021 constant prices, 2002 – 2020, actual data and counterfactual represented by Cebr's 2013 WELT forecasts with pandemic adjustment



Source: International Monetary Fund, Cebr analysis

Starting year

Our estimates of the cost of the conflict cumulate the GDP losses from 2014. It would be possible to start at an earlier date since instability at least partly associated with the conflict started to appear in 2013.[19] In addition, trade action against Ukraine by Russia had also adversely impacted Ukrainian GDP in that year. But to ensure that the estimated impacts are not exaggerated we have not included any impact in 2013. The cumulative and average annual figures in this section therefore reflect the seven years between 2014 and 2020 inclusive.

Scenario 1

Comparing the actual and counterfactual paths between 2014 and 2020 yields a cumulative lost output estimate of UAH 7.7 trillion in Scenario 1 or an average annual output loss of

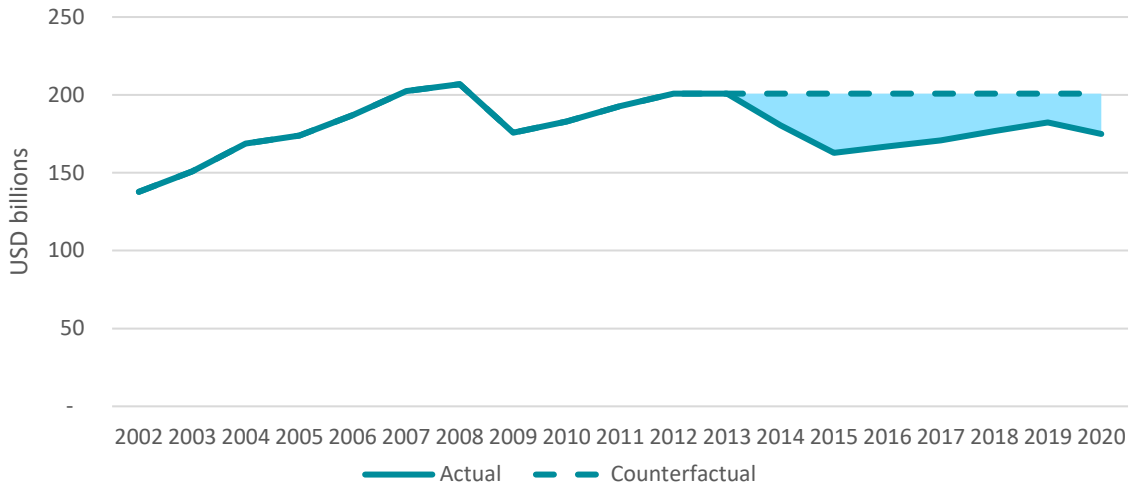
19 This is the approach taken by Bluszcz and Valente (2020) in The Economic Costs of Hybrid Wars: The Case of Ukraine.

UAH 1.1 trillion.[20] This annual figure equates to a loss of 19.9% compared with pre-conflict GDP. In dollars, these figures amount to losses of $280 billion in cumulative terms and $40.0 billion in average annual terms.[21]

This average annual percentage loss figure of 19.9% is roughly comparable to the 15.1% loss between 2013 and 2017 estimated by Bluszcz and Valente.

Scenario 2

Figure 7: Ukraine real GDP, 2021 constant prices, 2002 – 2020, actual data and counterfactual represented by stagnation assumption



Source: International Monetary Fund, Cebr analysis

The estimated losses using the Scenario 2 counterfactual are smaller, reflecting the reduced divergence between the actual and counterfactual paths. The cumulative losses in this case amount to UAH 5.3 trillion, equating to an annual average output loss of UAH 750 billion. Comparing this annual value to pre-conflict levels of GDP equates to a proportional loss of 13.6% per year. In USD, the cumulative and annual figures amount to $191 billion and $27.3 billion, respectively.

A summary of our GDP loss estimates is given in the table below:

Table 2: Forgone Ukrainian GDP as a result of the Russian-Ukrainian conflict

	Scenario 1	Scenario 2
Cumulative value of forgone GDP, 2014 – 2020, 2021 UAH	UAH 7,700,000,000,000	UAH 5,300,000,000,000
Average annual value of forgone GDP, 2014 – 2020, 2021 UAH	UAH 1,100,000,000,000	UAH 750,000,000,000

20 Figure quoted in constant 2021 prices. All subsequent figures also quoted in 2021 prices unless otherwise stated.

21 All dollar conversions utilise the 2021 constant price exchange rate from the IMF's World Economic Outlook Database: October 2021. This equates to 27.523 UAH to 1 USD.

Cumulative value of forgone GDP, 2014 – 2020, 2021 USD	$280,100,000,000	$190,800,000,000
Average annual value of forgone GDP, 2014 – 2020, 2021 USD	$40,000,000,000	$27,300,000,000
Forgone GDP as percentage of pre-conflict GDP	19.9%	13.6%

Source: International Monetary Fund, Cebr analysis

3.6 Channels of output loss – regions

This subsection considers the cumulative output losses associated with Crimea and Donbas, the two regions most directly affected by the conflict. The loss estimates associated with the regions are already captured within the aggregate loss estimates outlined above and follow a similar methodology.

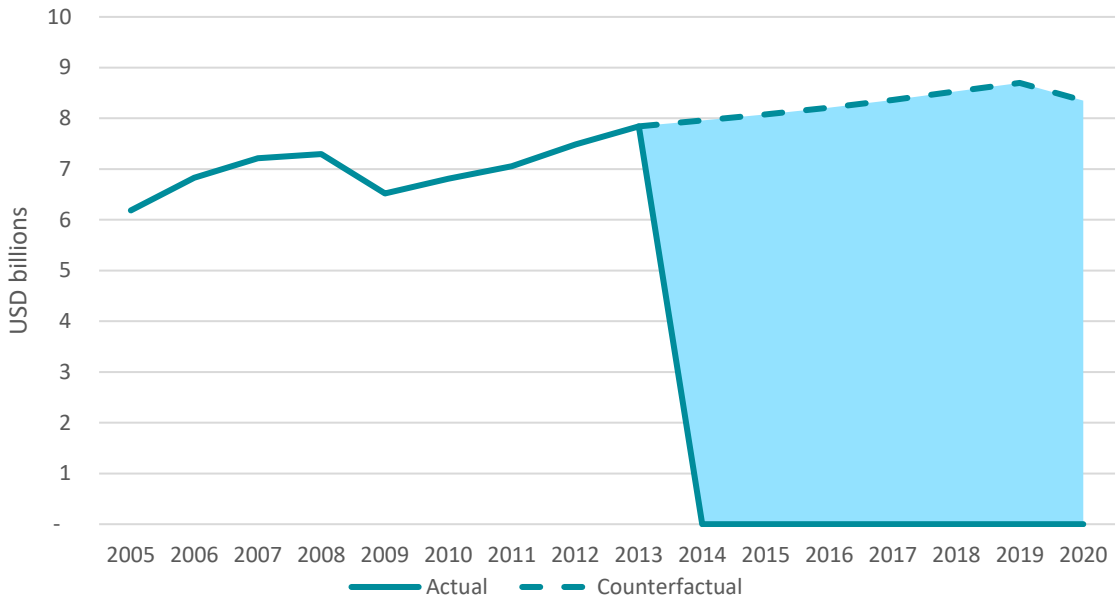
Crimea and Sevastopol

In the case of the Crimean peninsula, though economic activity has continued since its annexation in 2014, this activity is no longer classified as a contribution to Ukrainian GDP. As such, the value of forgone output in the region is simply equal to the expected value of regional output over time. We assume in Scenario 1 that Crimea, together with the city of Sevastopol, would have mirrored the growth rate seen for the entire Ukrainian economy. This counterfactual case is presented in Figure 8.[22]

This analysis yields a cumulative loss estimate of UAH 1.6 trillion associated with the annexation of Crimea and Sevastopol between 2014 and 2020. This is equivalent to an annual value of UAH 225 billion in 2021 currency. In US dollars, these figures amount to $58 billion in cumulative terms and $8.3 billion in annual terms.

22 Rosstat, Russia's Federal State Statistics Service, reports economic data for Crimea and Sevastopol going back to 2014. The data show extremely rapid growth, with gross regional product at basic current prices increasing by 148% in Crimea between 2014 and 2019, compared to cumulative growth of 60% for Russia as a whole. For the City of Sevastopol, reported growth is even higher at 354% over the same period. These figures are impacted by the high levels of infrastructure spending and other public expenditure seen in the areas since 2014. Therefore, these reported growth rates in Crimea and Sevastopol are not suitable as a counterfactual scenario.

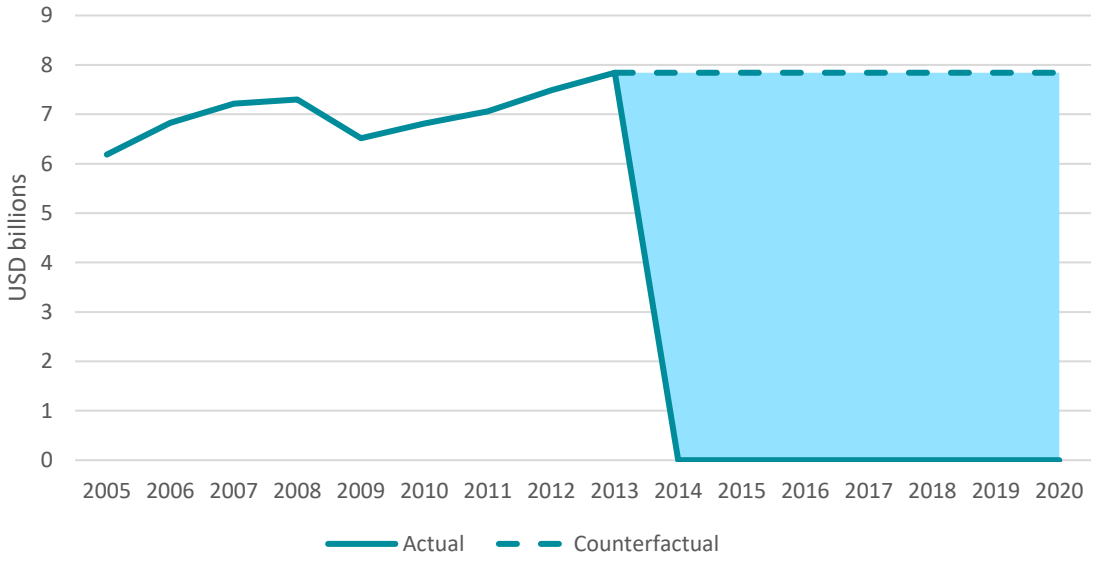
Figure 8: Crimea and Sevastopol real gross regional product (GRP), 2021 constant prices, 2002 – 2020, actual data and counterfactual – Scenario 1



Source: State Statistics Service of Ukraine, Cebr analysis

We have also estimated a Scenario 2 case for Crimea, using the same assumptions as for Scenario 2 for the aggregate economy. Here it is assumed that Crimea's economic output remains constant at its 2013 level, as presented in Figure 9. The cumulative losses in this case amount to UAH 1.5 trillion in cumulative terms or UAH 216 billion in annual terms. In USD, these figures are $55 billion and $7.8 billion, respectively.

Figure 9: Crimea and Sevastopol real gross regional product (GRP), 2021 constant prices, 2002 – 2020, actual data and counterfactual – Scenario 2



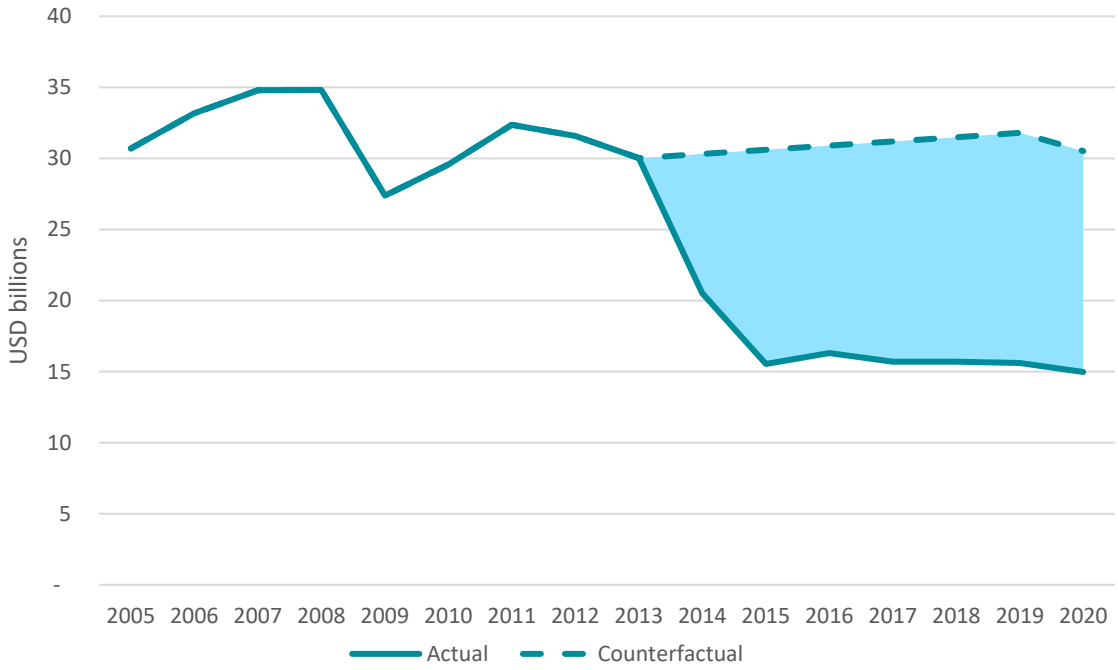
Source: State Statistics Service of Ukraine, Cebr analysis

Donbas

We have made a similar analysis for Donbas. Though damage in the region has been much more extensive than in Crimea, the region is only partly under Russian control.

The scale of these losses is presented in Figure 10. The Scenario 1 counterfactual case is here given as the expected growth rate of the Donbas region in the absence of the conflict, with the exception of a pandemic-induced decline in 2020. This is a slower growth rate than for the Ukrainian economy as a whole, reflecting the region's export exposure, which had been a key driver in the macroeconomic volatility facing Ukraine even prior to the crisis.

Figure 10: Donbas real gross regional product (GRP), 2021 constant prices, 2002 – 2020, actual data and counterfactual – Scenario 1

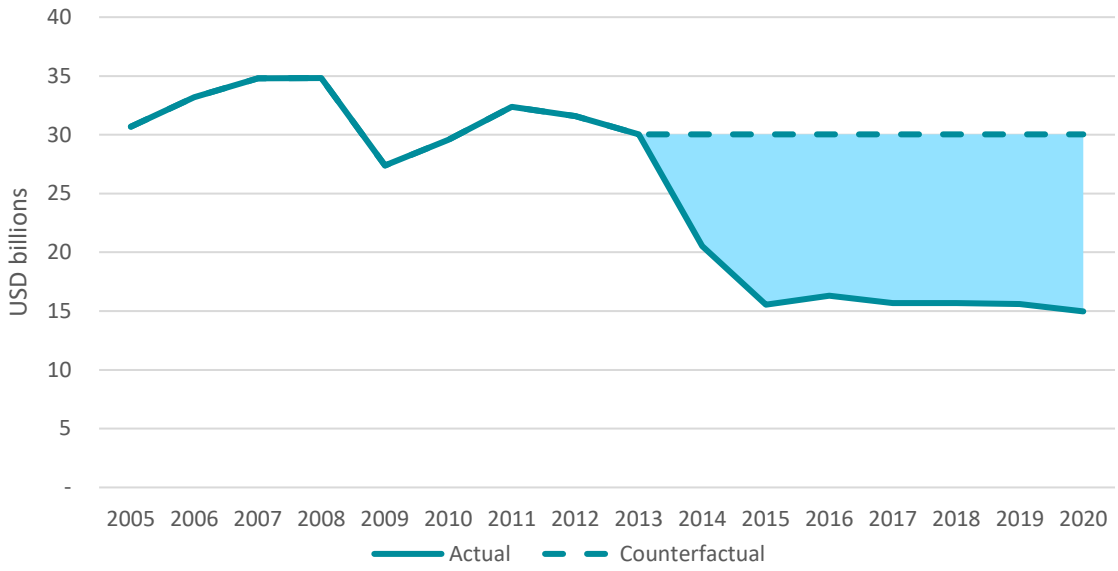


Source: State Statistics Service of Ukraine, Cebr analysis

In the Donbas case, this yields cumulative output losses of UAH 2.8 trillion compared to the situation in which the conflict had not occurred. This is equivalent to an annual value of UAH 403 billion in 2021 currency. In US dollars, these figures amount to $102 billion in cumulative terms and $14.6 billion in annual terms.

We have also made a Scenario 2 estimate for the economic impact in Donbas, with output remaining at its 2013 level in line with the case presented for the aggregate economy. This is shown in Figure 11.

Figure 11: Donbas real gross regional product (GRP), 2021 constant prices, 2002 – 2020, actual data and counterfactual – Scenario 2



Source: State Statistics Service of Ukraine, Cebr analysis

The cumulative losses in this case amount to UAH 2.6 trillion or UAH 377 billion in annual terms. In USD, these figures stand at $96 billion and $13.7 billion, respectively.

The loss estimates in Crimea and Donbas under these two scenarios are summarised in the below tables:

Table 3: Outline of regional output losses – Scenario 1

	Crimea and Sevastopol	Donbas
Cumulative value of forgone GDP, 2014 – 2020, 2021 UAH	UAH 1,600,000,000,000	UAH 2,800,000,000,000
Average annual value of forgone GDP, 2014 – 2020, 2021 UAH	UAH 225,000,000,000	UAH 403,000,000,000
Cumulative value of forgone GDP, 2014 – 2020, 2021 USD	$58,200,000,000	$102,500,000,000
Average annual value of forgone GDP, 2014 – 2020, 2021 USD	$8,300,000,000	$14,600,000,000

Source: State Statistics Service of Ukraine, Cebr analysis

Table 4: Outline of regional output losses – Scenario 2

	Crimea and Sevastopol	Donbas
Cumulative value of forgone GDP, 2014 – 2020, 2021 UAH	UAH 1,500,000,000,000	UAH 2,600,000,000,000

Average annual value of forgone GDP, 2014 – 2020, 2021 UAH	UAH 216,000,000,000	UAH 377,000,000,000
Cumulative value of forgone GDP, 2014 – 2020, 2021 USD	$54,900,000,000	$95,900,000,000
Average annual value of forgone GDP, 2014 – 2020, 2021 USD	$7,800,000,000	$13,700,000,000

Source: State Statistics Service of Ukraine, Cebr analysis

3.7 Channels of output loss – wider economic impacts

This subsection looks at the impacts on Ukrainian investment[23] and exports. As above, it compares the likely path for exports and investment in the absence of the conflict with the actual pathways for these variables. This will produce estimates for the losses stemming from these components of GDP.

Exports

Downward pressure on Ukrainian trade has resulted from the imposition of sanctions on Ukraine by Russia. Russia has historically been Ukraine's main trading partner. However, worsening relations in the aftermath of the Crimean annexation, Russia's military intervention in Donbas, and economic pressure imposed by Russia have led to a fall in Ukraine's exports. The effects of this were exacerbated by Russia's suspension of its free trade agreement with Ukraine in early 2016 as well as the imposition of transit restrictions on Ukrainian exports to other former Soviet states, including Kazakhstan and Kyrgyzstan.[24]

These factors have seen Ukrainian exports to Russia fall to an estimated UAH 103 billion in 2020 from UAH 766 billion in 2011. The dollar value of this drop is shown in Figure 12, showing a fall to $3.8 billion from $27.8 billion.[25]

In addition, the situation in Donbas has particularly impacted Ukraine's international trade. There have been two key reasons for this. First, the region has historically been a major producer of key Ukrainian export goods such as steel, which accounted for about 25% of Ukrainian goods exports pre-conflict.[26] Second, Donbas's infrastructure, combined with its Russian land border and coastline, were important for transporting goods out of Ukraine.

23 Note investment here describes the gross fixed capital formation as commonly used in national accounting frameworks. See also: https://data.oecd.org/gdp/investment-gfcf.htm

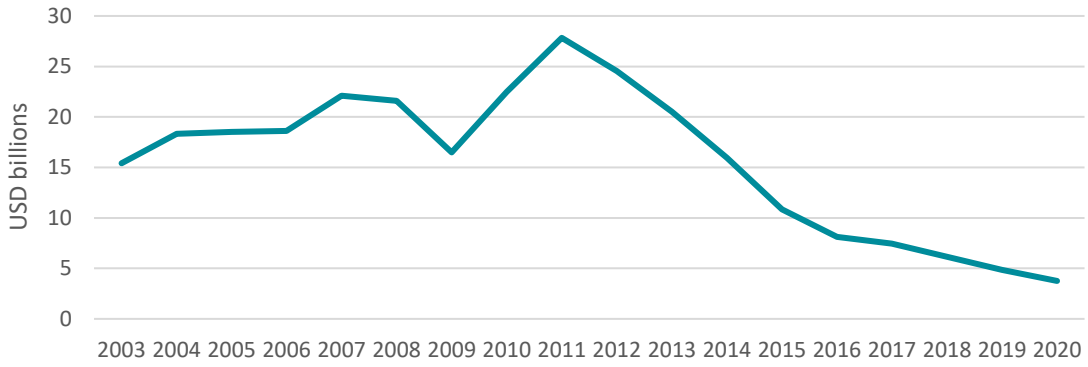
24 Åslund, A. (2018). *Kremlin Aggression in Ukraine: The Price Tag*. Atlantic Council Eurasia Center. https://www.atlanticcouncil.org/wp-content/uploads/2018/03/Kremlin_Aggression_web_040218_revised.pdf

25 Due to poor data availability on the value and destination of services exports, it is assumed that the proportion of total services exports attributable to Russia is equivalent to that of goods exports.

26 Iwański, T. (2015). *The collapse of Ukraine's foreign trade*. Centre for Eastern Studies. https://www.osw.waw.pl/en/publikacje/analyses/2015-03-18/collapse-ukraines-foreign-trade

The destruction of this infrastructure, including railways, bridges, and roads as a result of the conflict has therefore affected Ukraine's exports.[27]

Figure 12: Estimate for annual value of Ukrainian exports to Russia, 2021 constant prices, 2002 – 2020



Source: Cebr analysis, World Bank, State Statistics Service of Ukraine

The loss of Crimea also hindered exports because of the loss of key ports on the Black Sea coast.

The decline in exports has, however, been somewhat cushioned by the depreciation of the Ukrainian currency. The hryvnia was floated, that is, unpegged from the USD, in February 2014 amidst mounting political tensions, before depreciating significantly as the events in Crimea and Donbas developed later that year. Though a weaker currency makes exported goods more competitive, it also raises the cost of imported goods. This has contributed to imported inflation and the significant acceleration in the rate of price growth seen in Ukraine during this period. Such rising prices have adversely impacted domestic demand and, hence, the wider Ukrainian economy.[28]

The combination of these factors has contributed to a significant fall in the value of exports at the aggregate level. To make the counterfactual case of how exports would have fared in the absence of the conflict, we assume that export value growth would have mirrored that of the wider economy. That is, export growth would have been slower in the early 2010s followed by a slight acceleration in the later period. It should be noted, however, that even without the annexation of Crimea and conflict in Donbas, the changing nature of the Russian-Ukrainian relationship may have led to a decline in exports to Russia in any case.

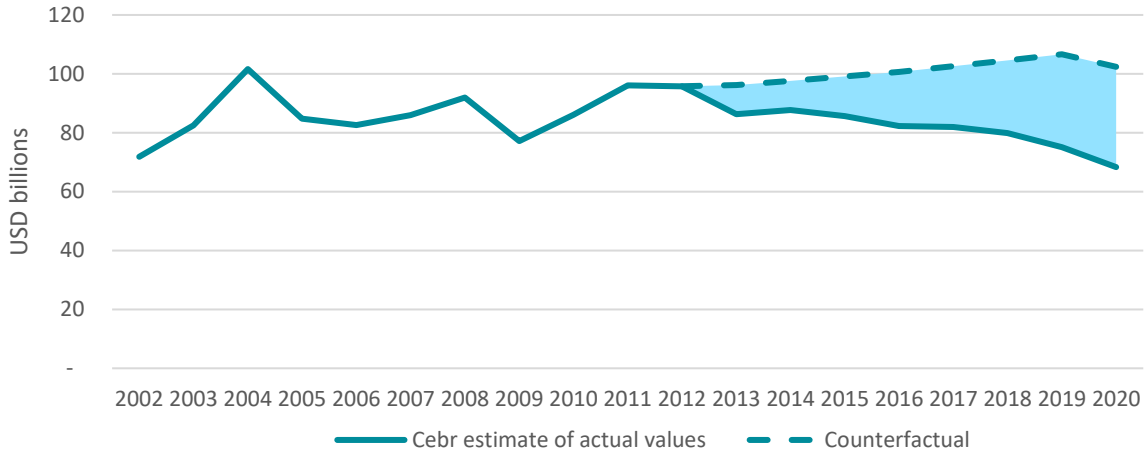
Our estimates of the real value of Ukrainian exports point to a decline in each year between 2012 and 2020, with the exception of 2014. 2014 saw a slight rise in export volumes of 1.7%, with trade having been significantly hindered in the previous year as a result of the initial imposition of Russian trade sanctions against Ukrainian imports.

27 Bluszcz, J. & Valente, M. (2020). The Economic Costs of Hybrid Wars: The Case of Ukraine. Defence and Peace Economics, 1-25. DOI: 10.1080/10242694.2020.1791616

28 Iwański, T. (2015). *The collapse of Ukraine's foreign trade*. Centre for Eastern Studies. https://www.osw.waw.pl/en/publikacje/analyses/2015-03-18/collapse-ukraines-foreign-trade

Because the political difficulties started to affect Ukraine's exports at an earlier stage than the main wider economic impacts, we have measured these impacts from 2013 rather than 2014 for the estimated impacts on GDP.

Figure 13: Estimated real terms value of exports, 2021 constant prices, 2002 – 2020, actual and counterfactual – Scenario 1



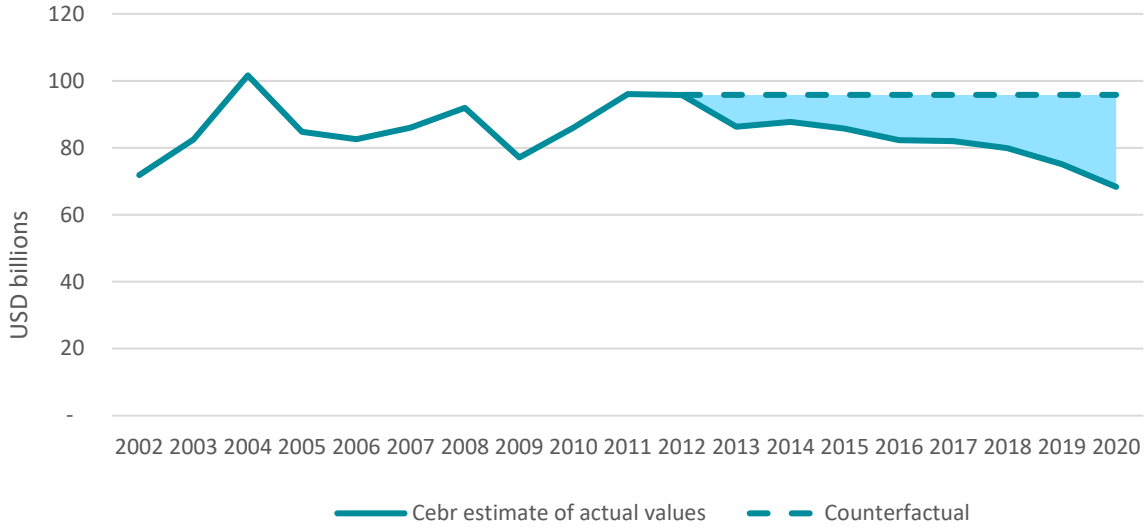
Source: Cebr analysis, State Statistics Service of Ukraine

Comparing the actual and counterfactual cases shows that the decline in trade following the onset of the conflict yields cumulative losses of UAH 4.5 trillion. In annual terms, this is equivalent to UAH 559 billion. As a percentage of pre-crisis GDP, this annual average equates to 10.1%. In USD, the estimated cumulative losses associated with forgone trade amount to $162 billion or $20.3 billion in annual terms.

As with the aggregate economy and the regional analyses, we can present a further comparison with a counterfactual case in which the value of Ukraine's exports is assumed to have stagnated. However, we assume a stagnation from 2012 in this case, in order to account for the Russian economic pressures on Ukraine from 2013 onwards. This case is presented in Figure 14 and represents Scenario 2.

Here, the cumulative losses associated with forgone exports amount to UAH 3.3 trillion. This is equivalent to UAH 410 billion in annual terms. In US dollars, these figures are equivalent to $119 billion and $14.9 billion, respectively.

Figure 14: Estimated real terms value of exports, 2021 constant prices, 2002 – 2020, actual and counterfactual – Scenario 2



Source: Cebr analysis, State Statistics Service of Ukraine

Investment

Investment is another channel of economic activity that is likely to have been affected by the conflict.

The data for Gross Fixed Capital Formation at constant prices in Figure 15 shows the decline in investment in Ukraine from its peak in 2007.

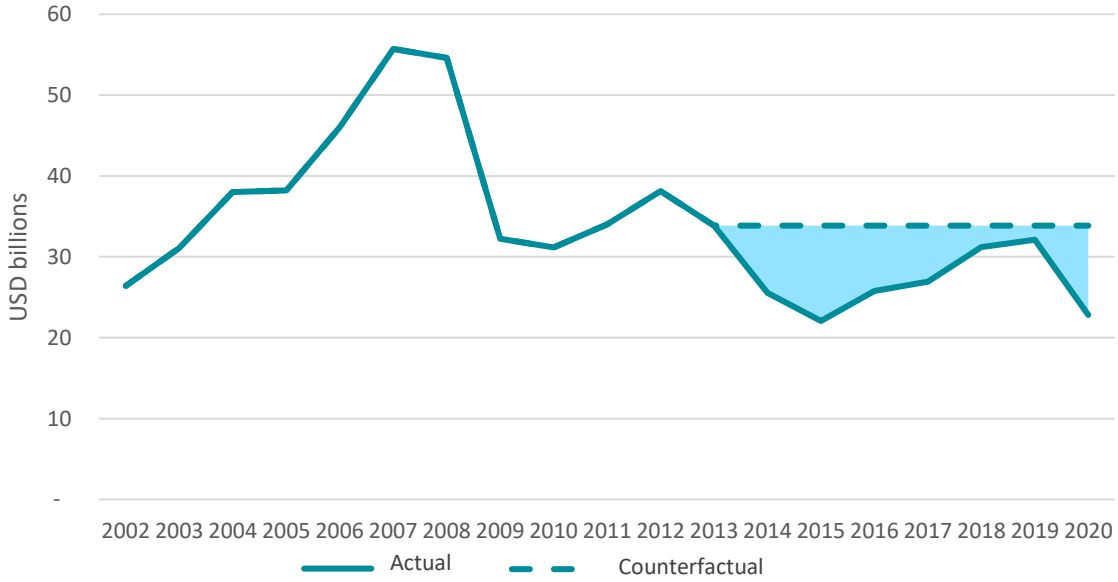
For our Scenario 1 counterfactual estimates of how investment in Ukraine would have developed in the absence of the conflict, we have used the IMF estimates for the expected share of GDP attributed to investment and applied these shares to Cebr's counterfactual GDP estimates. This produces our counterfactual investment scenario, shown in Figure 15 below.

Figure 15: Ukraine gross fixed capital formation, 2021 constant prices, 2002 – 2020, actual and counterfactual – Scenario 1

Source: Cebr analysis, State Statistics Service of Ukraine

The estimated forgone investment since 2014 of the conflict is a cumulative loss of UAH 2.0 trillion. In annual terms, this is equivalent to UAH 284 billion. As a percentage of pre-crisis GDP, this annual average equates to 5.1%. In USD, the estimated cumulative losses associated with forgone investment amount to $72 billion or $10.3 billion in annual terms.

Figure 16: Ukraine gross fixed capital formation, 2021 constant prices, 2002 – 2020, actual and counterfactual – Scenario 2



Source: Cebr analysis, State Statistics Service of Ukraine

We have also made a Scenario 2 calculation where the counterfactual assumes that in the absence of conflict investment would have been stagnant. This is shown in Figure 16.

The cumulative loss estimates in this case amount to UAH 1.4 trillion or UAH 202 billion in annual terms. These figures are equivalent to $51 billion and $7.3 billion, respectively.

The loss estimates associated specifically with exports and investment are summarised in the below tables:

Table 5: Outline of output losses attributed to forgone exports and forgone investment – Scenario 1

	Exports	Investment
Cumulative value of forgone GDP, 2014 – 2020, 2021 UAH	UAH 4,500,000,000,000	UAH 2,000,000,000,000
Average annual value of forgone GDP, 2014 – 2020, 2021 UAH	UAH 559,000,000,000	UAH 284,000,000,000
Cumulative value of forgone GDP, 2014 – 2020, 2021 USD	$162,400,000,000	$72,400,000,000
Average annual value of forgone GDP, 2014 – 2020, 2021 USD	$20,300,000,000	$10,300,000,000

Source: State Statistics Service of Ukraine, Cebr analysis

Table 6: Outline of output losses attributed to forgone exports and forgone investment – Scenario 2

	Exports	Investment
Cumulative value of forgone GDP, 2013 – 2020, 2021 UAH	UAH 3,300,000,000,000	UAH 1,400,000,000,000
Average annual value of forgone GDP, 2013 – 2020, 2021 UAH	UAH 410,000,000,000	UAH 202,000,000,000
Cumulative value of forgone GDP, 2013 – 2020, 2021 USD	$119,100,000,000	$51,300,000,000
Average annual value of forgone GDP, 2013 – 2020, 2021 USD	$14,900,000,000	$7,300,000,000

Source: State Statistics Service of Ukraine, Cebr analysis

Other impacts

Exports and investment do not provide an exhaustive analysis of the conflict's consequences for the Ukrainian economy. There are many other variables that are likely to have been impacted either directly by the conflict or indirectly through the resulting uncertainty and economic instability.

For example, Ukrainian inflation reaching 48.7% in 2015 is likely to have affected household consumption. This rapid price growth has been attributed to several factors, including the supply difficulties caused by the ongoing conflict and the depreciation of the hryvnia caused

by the political instability.[29] The depreciation of the hryvnia boosted inflation by raising import costs, which affected inflation directly as well as adding upward pressure to production costs for businesses reliant on foreign trade.

3.8 Cross checking the estimates of lost GDP by different methodologies

The figures presented for the two regions and for exports and investment are not intended to be added to the estimated lost GDP. But they provide a useful cross check.

Given the scale of the estimated regional impacts and the estimated impacts on investment and exports, the Scenario 1 GDP estimates are very much corroborated.

3.9 Capital stock losses

The analysis in the preceding sections has focussed on GDP losses. GDP is a flow measure of economic activity, representing the value of final goods and services produced in an economy over a given period. This should be distinguished from a stock measure, which measures the value of assets or liabilities at a particular point in time. This distinction is analogous to the difference between a household's income and wealth.

This subsection estimates the losses to the Ukrainian capital stock as a result of the conflict. It should be noted that stocks and flows cannot meaningfully be compared, equated or summed.

The literature on the Russian-Ukrainian conflict describes a range of channels through which Ukraine has lost assets including the destruction of property infrastructure and human life as a result of violence in Donbas, the seizure of Ukrainian companies and their holdings by Russia-backed separatists, and the annexation of Crimea.

Åslund (2018) provides an estimate of the capital losses associated with the annexation of Crimea and the violence in Donbas, based on estimates of GDP losses in both of the regions using an assumed ratio between income and capital. These capital losses are estimated at $98.4 billion.[30]

The Åslund methodology could be refined in two areas:

1. Åslund relies on a not publicly available data source, stating that the occupied areas in Donbas accounted for 10% of Ukrainian GDP in 2013. This seems an underestimate Ukrainian national statistics show that Donetsk and Luhansk accounted for around 15% of GDP in that year. We therefore believe our counterfactual scenario analysis to be a more accurate description of the GDP losses.

29 Beck, T. (2015). *Underlying Causes of the Ukrainian Recession*. https://globaledge.msu.edu/blog/post/22938/underlying-causes-of-the-ukrainian-reces

30 Åslund, A. (2018). *Kremlin Aggression in Ukraine: The Price Tag*. Atlantic Council Eurasia Center. https://www.atlanticcouncil.org/wp-content/uploads/2018/03/Kremlin_Aggression_web_040218_revised.pdf

2. The methodology scales up the estimated GDP losses by a Europe-wide ratio of capital to income. The use of a Europe-wide figure ignores key structural differences between the Ukrainian economy and the rest of Europe. The methodology could be refined by constructing an estimate of the Ukrainian ratio of capital to GDP.

For our own assessment we have used an essentially similar methodology to Åslund but have incorporated these refinements.

Crimea

Since the annexation of Crimea and Sevastopol the region has not contributed to Ukrainian GDP figures. We can apply similar reasoning to suggest that all assets in Crimea have been permanently lost and no longer contribute to Ukraine's national wealth. As estimated in Section 3.6, this has resulted in an estimated annual GDP loss of UAH 225 billion or $8.3 billion.

To translate this into a loss of capital we have scaled these figures up by an estimate for the capital-to-income ratio in order to estimate the scale of the capital losses associated with the annexation.

Åslund (2018) used Piketty's (2013) Europe-wide ratio of capital to income, approximately 4.[31] However, this ignores key structural differences between the Ukrainian economy and the rest of Europe. For our calculation, although we use the same approach of scaling up by a capital-to-output ratio, we instead use a Ukraine-specific ratio.[32] This shows an average capital-to-output ratio of 4.8 between 1995 and an average of 5.1 between 2010 and 2020.

Applying this latter figure to the value of GDP losses in Crimea and Sevastopol gives an estimated capital loss of UAH 1.2 trillion or $42 billion. This is larger than Åslund's estimate, reflecting the higher capital-to-income ratio, a larger estimate of lost output, and prices being presented in 2021 terms.

Applying the ratio to the smaller output loss estimates under Scenario 2 would induce smaller capital losses. Losses would amount to UAH 1.1 trillion in this case or $40 billion.

Donbas

A similar analysis can be applied to Donbas. This is slightly more difficult in conceptual terms, since it is not the case that the whole territory has been temporarily occupied. However, we can still apply the estimated losses to GDP to produce a figure for lost assets. This figure would seek to capture the significant destruction that has been seen in the region, notably of buildings and infrastructure, as well as the human cost.

Section 3.6 showed that the estimated annual loss of economic activity in Donbas amounted to UAH 403 billion or $14.6 billion. Applying the Ukrainian ratio of capital-to-income points to capital losses in Donbas of approximately UAH 2.1 trillion or $75 billion. These estimates are smaller than Åslund's. This reflects the fact that Åslund assumed that the entire occupied territory of Donbas was no longer economically active.

31 Piketty, T. (2014). Capital in the twenty-first century. Cambridge Massachusetts: The Belknap Press of Harvard University Press.

32 The World Inequality Database provides estimates of the ratio of national wealth to national income. Net national wealth to net national income ratio, Ukraine, 1995 – 2020. https://wid.world/country/ukraine/

Applying the Ukrainian capital-to-income ratio to the output loss figure described in Scenario 2 suggests a loss of wealth of UAH 1.9 trillion or $70 billion for the region.
Combining the estimates for Crimea, Sevastopol and Donbas suggests that Ukraine has incurred capital losses of around UAH 3.2 trillion or $117 billion as a result of the conflict as a top-end estimate. Meanwhile, at the lower end, the losses to capital stock amount to UAH 3.0 trillion or $110 billion.

Summaries for the sizes of capital losses are presented in the below tables:

Table 7: Outline of capital losses – Scenario 1

	Crimea and Sevastopol	Donbas
Value of capital losses, 2021 UAH	UAH 1,200,000,000,000	UAH 2,100,000,000,000
Value of capital losses, 2021 USD	$42,000,000,000	$75,000,000,000

Source: Cebr analysis, World Inequality Database

Table 8: Outline of capital losses – Scenario 2

	Crimea and Sevastopol	Donbas
Value of capital losses, 2021 UAH	UAH 1,100,000,000,000	UAH 1,900,000,000,000
Value of capital losses, 2021 USD	$40,000,000,000	$70,000,000,000

Source: Cebr analysis, World Inequality Database

4 Fiscal impacts

This chapter considers the impact of the conflict on public finances. The methodology follows from the previous chapter, using the forgone output figures to produce estimates for forgone tax revenue and estimates of increased conflict related expenditure.

4.1 Policy changes

The Ukrainian Government has implemented a series of policy changes during the course of the conflict, some of which are in direct response to it.

These include:

- An increase in income tax levels specifically announced to pay for some of the costs of conflict. This was expected to raise an additional USD 290 million.[33] As a result, personal income tax collections increased from 4.7% of GDP in the 2013 – 2014 financial year to 5.0% in 2015 and 5.8% of GDP in 2016.[34]
- Increased taxes on tobacco and the mining, oil and gas sectors. These increases were earmarked to raise an estimated USD 167 million for the rebuilding of infrastructure damaged by fighting in Eastern Ukraine. [35,36]
- Military spending rose sharply. Expenditure as a share of GDP rose from 1.5% in 2013 to 2.2% in 2014 as military action escalated. By 2019, military expenditure accounted for 3.4% of GDP.[37]
- Since July 2014 the Ukrainian parliament temporarily introduced a 1.5% military tax for the needs of the Ukrainian army. The base for taxation is the same as for personal income tax. The payers of the military tax are both residents and non-residents of Ukraine. Residents pay the tax on their worldwide income while non-residents pay on their Ukrainian sourced income.

These tax and spending changes are evidence of the fiscal impact of the conflict.

4.2 The estimated fiscal impact

The following subsection quantifies the size of the loss in tax revenue associated with the loss of overall economic output. Combining this result with the increase in government expenditure to address the conflict gives the estimated overall impact on the Government's ability to finance other activities in the economy.

33 Zinets, N. (2014). *Ukraine to raise income tax levels to help war-battered budget.* Reuters. https://www.reuters.com/article/us-ukraine-crisis-tax-idUSKBN0G61V120140806

34 Bogdan, T. & Landesmann, M. (2017). *From Fiscal Austerity towards Growth-Enhancing Fiscal Policy in Ukraine*. The Vienna Institute for Economic Studies https://wiiw.ac.at/from-fiscal-austerity-towards-growth-enhancing-fiscal-policy-in-ukraine-dlp-4189.pdf

35 Zinets, N. (2014). *Ukraine to raise income tax levels to help war-battered budget.* Reuters. https://www.reuters.com/article/us-ukraine-crisis-tax-idUSKBN0G61V120140806

36 Based on reports of UAH 2.0 billion in expenditure and average annual exchange rate of 12.01 UAH to 1 USD in 2014.

37 Wider spending on security and defence can be expected to stand significantly higher than that. However, due to limited data availability we restrict the analysis here to military expenditure only.

Loss of tax revenue

We have estimated the potential loss in tax revenue associated with the counterfactual GDP figures described in Scenarios 1 and 2 of this report. To determine the counterfactual losses, we have estimated tax revenue as a percentage of Ukrainian GDP in the absence of the conflict on each Scenario.

Prior to 2013, tax revenues as a percentage of GDP were relatively stable, at approximately 17.3% over the 2005 to 2012 period. The only exception to this was 2010, when there was a drop to 15.6%, which is attributable to the impact of the global financial crisis and can be treated as exceptional.

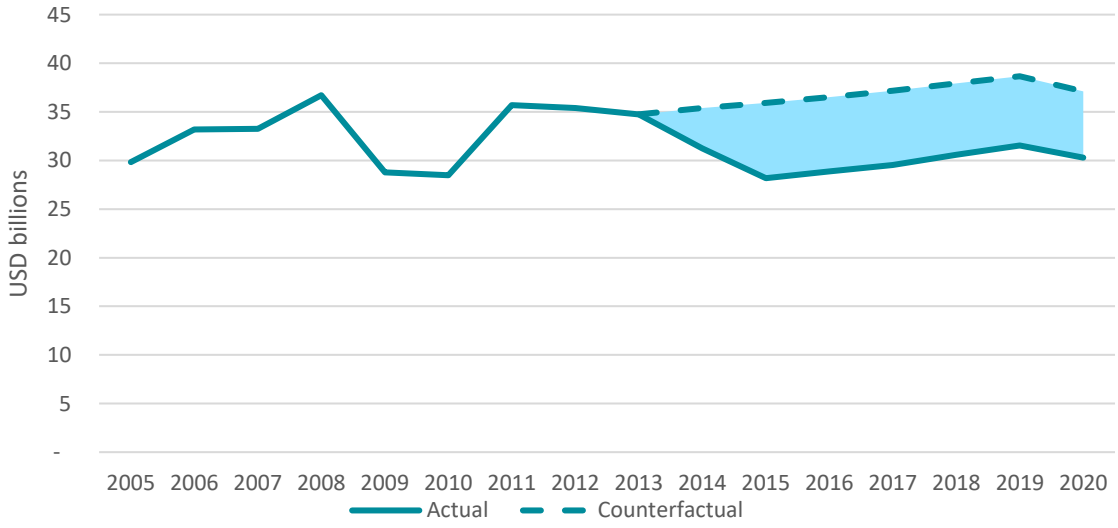
To estimate the loss of tax revenue from the loss of output we have therefore multiplied the loss of output by the tax-to-GDP figure of 17.3%. We do this for both the actual and counterfactual GDP paths in order to account for the tax policy changes that were driven by the conflict.

Scenario 1

Applying this share to the GDP figures described previously in Section 3, we can estimate the counterfactual tax revenues that would have been collected by the Government, had the conflict not occurred. This counterfactual situation considers the tax revenues lost across Ukraine as a whole, rather than solely the tax lost from the regions under occupation.

The case for Scenario 1 is presented in the figure below. The difference between the actual tax revenue and counterfactual tax revenue represents our estimate for lost tax revenue as a result of the conflict.

Figure 17: Estimated real terms value of tax revenue, 2021 constant prices, 2005 – 2019, actual and counterfactual – Scenario 1



Source: World Bank, Cebr analysis

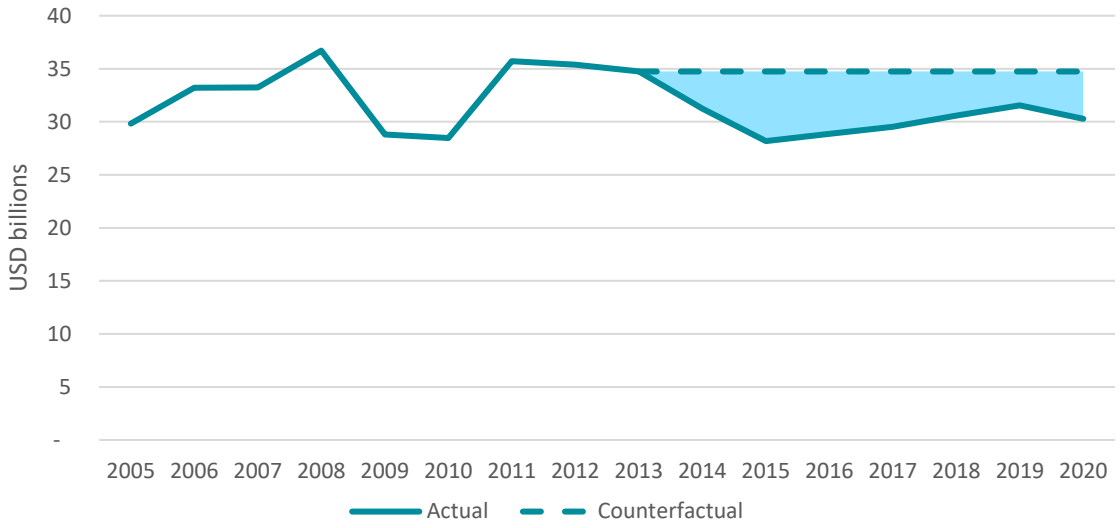
The cumulative difference between the counterfactual case and actual tax revenue from 2014 to 2020 points to a potential loss of approximately UAH 1.3 trillion as a result of the

conflict occurring.[38] This equates to annual losses of UAH 191 billion. In USD, this amounts to cumulative losses of $48.5 billion or annual losses of $6.9 billion. These figures represent the forgone tax revenues under the GDP path described by Scenario 1.[39]

Scenario 2

We have estimated the equivalent figures using the Scenario 2 GDP counterfactual assumption. This case is presented in Figure 18.

Figure 18: Estimated real terms value of tax revenue, 2021 constant prices, 2005 – 2019, actual and counterfactual – Scenario 2



Source: World Bank, Cebr analysis

In this case, the cumulative net losses to tax revenue in this case amount to UAH 909 billion or UAH 130 billion in annual terms. In USD, these figures equate to $33.0 billion and $4.7 billion, respectively.

Increase in military spending

The category of public expenditure that is most clearly attributable to the conflict is military spending.

From 2011 to 2013, military expenditure as a percentage of GDP remained relatively stable and was, on average, 1.5%. Our counterfactual assumption is that spending would have continued at this share of GDP over the years 2013 to 2020.

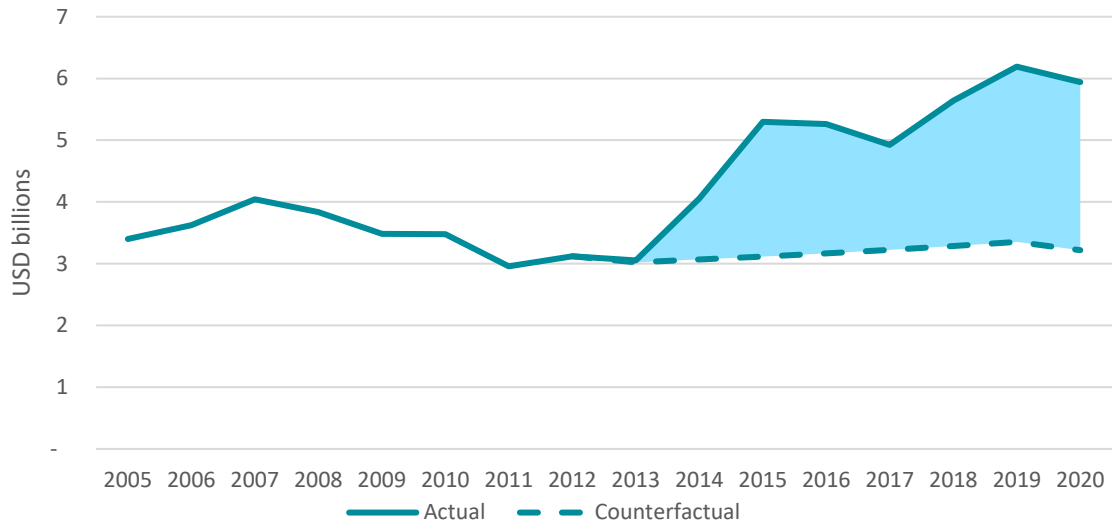
38 We acknowledge that fiscal policy may have timing lags between announcement and implementation, but have started our analysis from 2013 for consistency purposes.

39 We have here not accounted for the additional tax revenue raised by the Ukrainian Government as a result of the policy changes outlined in Section 4.1. This is so we can identify a direct causal impact of the conflict, rather than from a new fiscal regime.

Actual military expenditure as a percentage of GDP significantly increased from 1.5% in 2013 to 2.2% in 2014[40], as a direct consequence of the conflict. This further increased to 3.4% in 2019, which clearly demonstrates the impact of the conflict on military expenditure. Military spending data for 2020 are as yet unavailable. We assume that expenditure as a percentage of GDP would have been maintained at its 2019 level.

To determine the impact of the conflict on military expenditure, we assumed that military spending as a percentage of GDP would have remained around 1.5% from the years 2013 to 2019, in the absence of the conflict to give us our counterfactual.[41] We then compared this to the actual military expenditure, to determine the extra spending resulting from the conflict. The results are demonstrated in the graph below.

Figure 19: Comparison of military expenditure, 2021 constant terms, 2013 – 2020, actual data and counterfactual



Source: World Bank, Cebr analysis

Over the whole period, these divergences combine to a cumulative figure of UAH 410 billion, reflecting the increased military expenditure relative to a situation in which the conflict did not occur. This equates to average additional spending of UAH 59 billion per year. In USD, these figures stand at $14.9 billion cumulatively or $2.1 billion annually.

In the case in which military expenditure stagnated at its 2013 level, cumulative additional expenditure would amount to UAH 445 billion, or UAH 64 billion in annual terms. In USD, these figures stand at $16.2 billion and $2.3 billion, respectively.

Net fiscal position

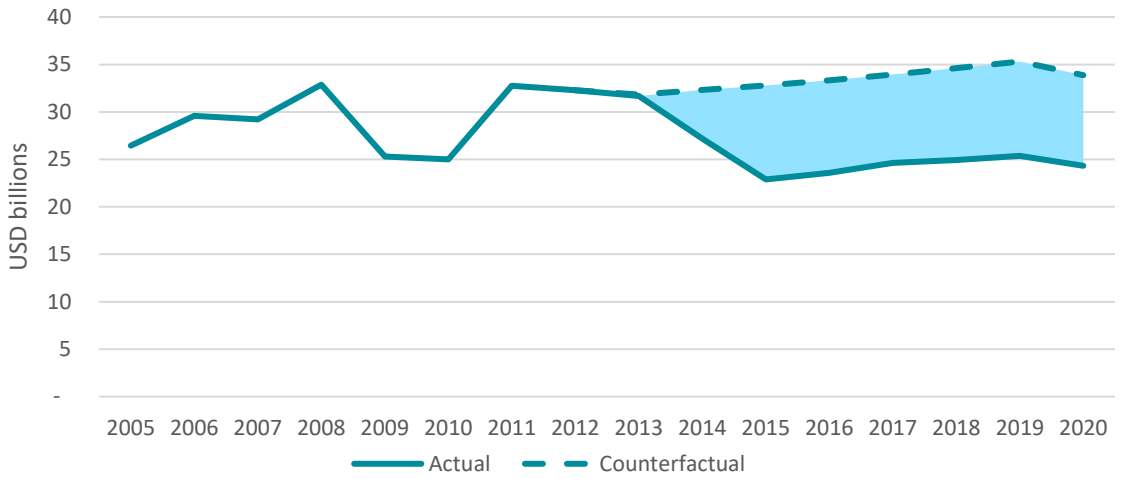
Combining the subsections above, we can now analyse the overall effect of a decrease in tax revenue and an increase in government spending, specifically on military expenditure, to

40 Although we analyse the data from 2013 for consistency purposes, we note that military expenditure increased from 2014 because of the conflict.

41 2019 is here used as the end point as military expenditure data for 2020 are currently unavailable. The annual averages reflect this shorter time period.

determine the net impact on the Ukrainian Government. To do so, we have added the net tax losses to the additional military spending.[42]

Figure 20: Comparison of government budget for non-military activities, 2021 constant terms, 2013 – 2020, actual data and counterfactual – Scenario 1



Source: World Bank, Cebr analysis

Under Scenario 1, the total fiscal loss on a cumulative basis from 2014 to 2020 was approximately UAH 1.7 trillion. This yields an annual average of UAH 249 billion.[43] In USD, these figures stand at $63 billion cumulatively and $9.0 billion annually. Under Scenario 2, the total fiscal loss was approximately UAH 1.4 trillion cumulatively from 2014 to 2020.[44] This yields an annual average of UAH 193 billion. In USD, these figures stand at $49 billion cumulatively and $7.0 billion annually.

The estimated fiscal impacts described in Section 4 are summarised in the below tables:

Table 9: Forgone tax revenue estimates[45]

	Scenario 1	Scenario 2
Cumulative value of forgone tax revenue, 2014 – 2020, 2021 UAH	UAH 1,300,000,000,000	UAH 909,000,000,000
Annual average value of forgone tax revenue, 2014 – 2020, 2021 UAH	UAH 191,000,000,000	UAH 130,000,000,000
Cumulative value of forgone tax revenue, 2014 – 2020, 2021 USD	$48,500,000,000	$33,000,000,000

42 At this point, it is worth noting that government expenditure is not tied to income from tax receipts in any given year as there are other means to finance government expenditure. However, this does represent the relative worsening of the Government's fiscal position.

43 The annual and cumulative figures reflect a shorter time period here than was considered under the subsection covering tax revenues specifically. This is because of lack of data for military expenditure in 2020.

44 Ibid.

45 Note that Table 9 covers the period from 2014 to 2020, while Tables 10 and 11 cover the shorter period of 2014 to 2019.

Annual average value of forgone tax revenue, 2014 – 2020, 2021 USD	$6,900,000,000	$4,700,000,000

Source: Cebr analysis

Table 10: Additional military expenditure estimates

	Scenario 1	Scenario 2
Cumulative value of additional military expenditure, 2014 – 2020, 2021 UAH	UAH 410,000,000,000	UAH 445,000,000,000
Annual average value of additional military expenditure, 2014 – 2020, 2021 UAH	UAH 59,000,000,000	UAH 64,000,000,000
Cumulative value of additional military expenditure, 2014 – 2020, 2021 USD	$14,900,000,000	$16,200,000,000
Annual average value of additional military expenditure, 2014 – 2020, 2021 USD	$2,100,000,000	$2,300,000,000

Source: Cebr analysis

Table 11: Total fiscal loss estimates[46]

	Scenario 1	Scenario 2
Cumulative value of fiscal losses, 2014 – 2020, 2021 UAH	UAH 1,700,000,000,000	UAH 1,400,000,000,000
Annual average value of fiscal losses, 2014 – 2020, 2021 UAH	UAH 249,000,000,000	UAH 193,000,000,000
Cumulative value of fiscal losses, 2014 – 2020, 2021 USD	$63,300,000,000	$49,000,000,000
Annual average value of fiscal losses, 2014 – 2020, 2021 USD	$9,000,000,000	$7,000,000,000

Source: Cebr analysis

46 Differences between total impacts and sum of individual impacts due to rounding.

Conclusion

This paper has shown the economic impact of the conflict between Russia and Ukraine on the Ukrainian economy over the period 2014 - 2020. The conflict has contributed to a significant downturn in the Ukrainian economy, while also leading to the loss of assets and tax revenues. By comparing the actual economic output with that of a counterfactual scenario in which the Ukrainian economy would have grown at its pre-conflict trend, we can estimate the economic impact over the relevant years of the conflict.

Cebr estimates the following economic costs stemming from the conflict. All figures are presented in average annual terms between 2014 and 2020, unless otherwise stated:

- A central estimate of **$280 billion of lost output over the seven-year period, or $40.0 billion of forgone GDP per annum.** This is equivalent to 19.9% of annual pre-crisis GDP.
- A bottom-end estimate for forgone GDP stands at **$27.3 billion** assuming a conservative counterfactual scenario in which the Ukrainian economy didn't record any growth over the period analysed. This is equivalent to 13.6% of annual pre-crisis GDP.

Within the **$40.0 billion** headline figure, the following channels of loss have been identified:

- Lost output in Crimea and Sevastopol of up to **$8.3 billion**
- Lost output of up to **$14.6 billion** in Donbas
- Lost export value of up to **$20.3 billion**
- Lost investment value of up to **$10.3 billion**

Aside from lowering economic output, the conflict has also caused significant destruction of capital stock such as buildings and industries. Longer-term effects in the form of lost assets have been calculated for the affected regions. These costs are separate from the GDP impacts. These lost asset costs amount to:

- Lost capital assets of up to **$42.4 billion** in total in Crimea and Sevastopol
- Lost capital assets of up to **$74.8 billion** in total in Donbas

Finally, we have considered the impact on the public purse, resulting from lower tax revenues and higher requirements for military expenditure. These results are also separate from the GDP impacts. We have identified the following cumulative effects:

- Lost tax revenues of up to **$48.5 billion** between 2014 and 2020
- Additional military expenditure of up to **$14.9 billion** between 2014 and 2020
- A net worsening of public finances of up to **$63.3 billion** cumulatively between 2014 and 2020[47]

These estimates reflect our forecasting expertise, by considering how the Ukrainian economy would likely have performed in the absence of the conflict. Ultimately, this paper has added to the literature surrounding the impacts of the Russian-Ukrainian conflict,

47 $0.1 billion difference between total impacts and sum of individual impacts due to rounding.

providing insight into its economic consequences, while building on and refining the contributions of other authors.

Notably, the estimates presented in this report show a higher cost of conflict than previous literature. This is due to our implementation of a forgone output methodology, which provides a more comprehensive measure of the economic impacts, capturing both direct and indirect effects, thereby revealing the substantial economic cost of this conflict.

Appendix I

The table below presents Cebr and IMF forecasts for the Ukrainian economy, produced between 2012 and 2014. These figures show how perceptions of Ukraine's growth prospects changed as the military and economic crises developed. These figures informed our selection of a counterfactual situation, noting that expectations for Ukraine's growth were already subject to downward revisions prior to the launching of Russia's military actions in 2014. This supports our counterfactual estimates for the cost of the conflict, allowing us to account for macroeconomic difficulties that would have occurred even in the absence of the conflict.

Table 12: IMF and Cebr growth forecasts for annual growth of Ukrainian economy, 2010 - 2024

	IMF 2012 (released Oct 2012)	IMF 2013 (released Oct 2013)	IMF 2014 (released Oct 2014)	WELT 2013 (released Dec 2013)	WELT 2014 (released Dec 2014)
2010	4.1%	4.1%	4.1%	4.1%	4.1%
2011	5.2%	5.2%	5.2%	5.2%	5.2%
2012	3.0%	0.2%	0.2%	0.2%	0.3%
2013	3.5%	0.4%	0.1%	-1.0%	0.0%
2014	3.5%	1.5%	N/A	0.8%	-9.0%
2015	3.5%	1.5%	N/A	1.5%	0.0%
2016	3.5%	1.6%	N/A	1.6%	0.5%
2017	3.5%	1.8%	N/A	1.8%	1.0%
2018	-	2.0%	N/A	2.0%	2.0%
2019	-	-	N/A	2.0%	2.5%
2020	-	-	-	2.0%	2.5%
2021	-	-	-	2.0%	2.5%
2022	-	-	-	2.0%	2.5%
2023	-	-	-	2.0%	2.5%
2024	-	-	-	1.9%	2.4%

Source: IMF, Cebr analysis


Cebr