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The Cost of Fence-Sitting: A counterfactual analysis of Ukraine's non-integration with the EU

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Abstract

This paper provides an estimate of the export flows that would have emerged from Ukraine to the European Union (EU) had Ukraine integrated with the EU. Using the 2004 enlargement of the EU as a quasi-natural experiment, this paper employs the Synthetic Control Method (SCM) to estimate the counterfactual Ukrainian export flows to the EU. The results from the SCM shows that the aggregate export flows from Ukraine to the EU would have been 34.6% higher if Ukraine had joined the EU in 2004. In addition, the positive export effects are estimated to reach about 40.4% in the latter part of the post-treatment period. The results are robust to standard sensitivity checks. The results are supplemented by a Difference-in-differences (DiD) estimator. The DiD estimator suggests that the non-integration of Ukraine lowered potential exports by 31.9% These results are strongly consistent in magnitude compared to the results from the baseline SCM estimation, although the size of the effects varies less over time in the DiD estimation. The results suggest that Ukraine paid a heavy price in terms of exports, as a result of its non-integration with the EU.

Keywords: Exports, European integration, Ukraine, Synthetic Control Method, Difference-in-differences

1. Introduction

The 2004 enlargement of the European Union was single largest expansion of the union to date, and saw the addition of 10 new member states, mainly post-communist states from Central and Eastern Europe (CEE). The successful integration of these CEE countries was not immediately obvious, as the economic development between old and new member states differed significantly. By studying the impact on exports from joining the European Union (EU), the question arises, whether trade outcomes of Ukraine, a large CEE country that did not join the EU, would have been larger, had it joined the EU in 2004. The large uptake of CEE countries into the EU in 2004 provides a unique opportunity to evaluate the effects of Economic Integration on trade outcomes for Ukraine.

This paper examines the trade effect Ukraine would have experienced by joining the EU. Specifically, the objective is to estimate how much exports would have changed from Ukraine to the EU, had Ukraine joined the EU in 2004. By comparing the development of exports between the CEE countries that joined the EU with those of Ukraine, which did not, it is possible to provide a credible estimate of the counterfactual exports.

Ukraine shares several characteristics with the CEE countries that joined the EU in 2004, making their diverging policy decisions suitable for causal estimations. Indeed, like Ukraine, the Baltic states of Estonia, Latvia and Lithuania were integrated republics of the Soviet Union, while Czechia, Slovakia, Hungary, and Poland, were all politically and economically aligned to the Soviet Union through Comecon and the Warsaw Pact. In addition, Slovenia was part of the Socialist Federal Republic of Yugoslavia. Indeed, these countries share both historical, cultural, and of most interest to this analysis, economic similarities, all previously being socialist planned economies, that make them interesting as potential counterfactuals to Ukraine.

There are several reasons to expect a significant effect on exports from joining the EU. Firstly, the European customs union eliminates trade barriers, such as tariffs and quotas, with other member countries and levies a common tariff on external imports. This reduces the cost of trade, simplifying commerce within the customs union. Secondly, access to the European single market grants the four freedoms: free movement of goods, capital, people, and services. Furthermore, the single market removes technical barriers to trade and other non-tariff measures, including the harmonization of standards and trade procedures, improving efficiency while promoting competition.

To estimate the export flows that would have emerged in the case of Ukrainian integration into the EU, this paper applies a Synthetic Control Method (SCM) to a sample of the eight CEE countries that joined the EU in 2004, with a pre-treatment period spanning from 1993 to 2003. Through an algorithm the SCM selects the best weighted combination of the CEE countries that joined the EU to create a counterfactual Ukraine that best reflects the actual export flows of Ukraine before the eastern enlargement of 2004. If the method is successful, the post 2004 difference between the actual Ukraine and its synthetic counterfactual is interpreted as the causal effect of Ukrainian membership in the EU.

To the best of the authors' knowledge, this method has not been previously applied in this context, representing a novel approach to estimating the impact on export flows from the hypothetical Ukrainian EU membership. The results from the SCM are further supplemented by a Difference-in-differences (DiD) estimation.

The results suggest that actual Ukrainian exports to EU15 over the period 2004-2013 was about 34.6% lower than it would have been in the counterfactual scenario where it had joined the EU in 2004. The results further suggest that the difference in exports between the actual and counterfactual Ukraine grew substantially larger during the period 2009-2013. These results are largely in agreement with the estimations using a standard DiD regressions. Furthermore, the estimates presented in this paper were largely robust to standard robustness tests, such as placebo-in-time, falsification tests and alterations of the donor pool.

The remained of this paper is organized as follows. Part 2 provides a historical context of the fall of the Iron Curtain and the Eastern enlargement of the EU. Part 3 discusses some previous research to which this paper relates, while part 4 discusses the theoretical framework behind economic integration. Part 5 provides a detailed description of the methodology and date used in this research. Part 6 presents the results of the SCM estimations, while part 7 evaluates the robustness of the baseline results by subjecting the model to various sensitivity tests. Part 8 presents the results from a standard DiD estimation. Part 9 concludes the paper.

2. Background

2.1. The Iron Curtain Falls

The end of the Second World War marked a pivotal moment in European history, as the continent became divided into two distinct spheres of influence: a capitalist west and a communist, Soviet-aligned east (Gaddis, 2005, pp. 20-24). This division was famously described by British Prime Minister Winston Churchill as an "Iron Curtain" that had descended upon Europe, creating political, economic, and military barriers that separated the eastern regions from the rest of Europe (Brown, 2010, pp. 176-178).

Along with these policies, the Soviet Union established communist regimes in several CEE nations, including Poland, Czechoslovakia, and Hungary, forming what would become known as the Eastern bloc (Brown, 2010, pp. 161-172). The economies and societies of these countries were heavily influenced by Soviet-style communism, with policies such as collectivization of agriculture, autarky, nationalization of industry, and strict government control of the media and the ban political opposition being implemented (Applebaum, 2013, pp, 238-262; Brown, 2010, pp. 105-114).

However, throughout the 1970s and 1980s, communist governments in eastern Europe faced mounting opposition from nationalistic dissidents and pro-democracy movements. Concurrently, mounting economic problems, especially in comparison to the prosperous west, became ever more difficult to conceal (Brown, 2010, pp. 590-593). By 1989, popular uprisings in Poland and Hungary led to the collapse of communist regimes in these countries (Kenney, 2002, pp. 249-277). Meanwhile the opening of borders between East and West Germany paved the way for the reunification of Germany (Kenney, 2002, p. 285-287). The fall of the Berlin wall in the same year marked the symbolic end of the era of communist rule in Europe.

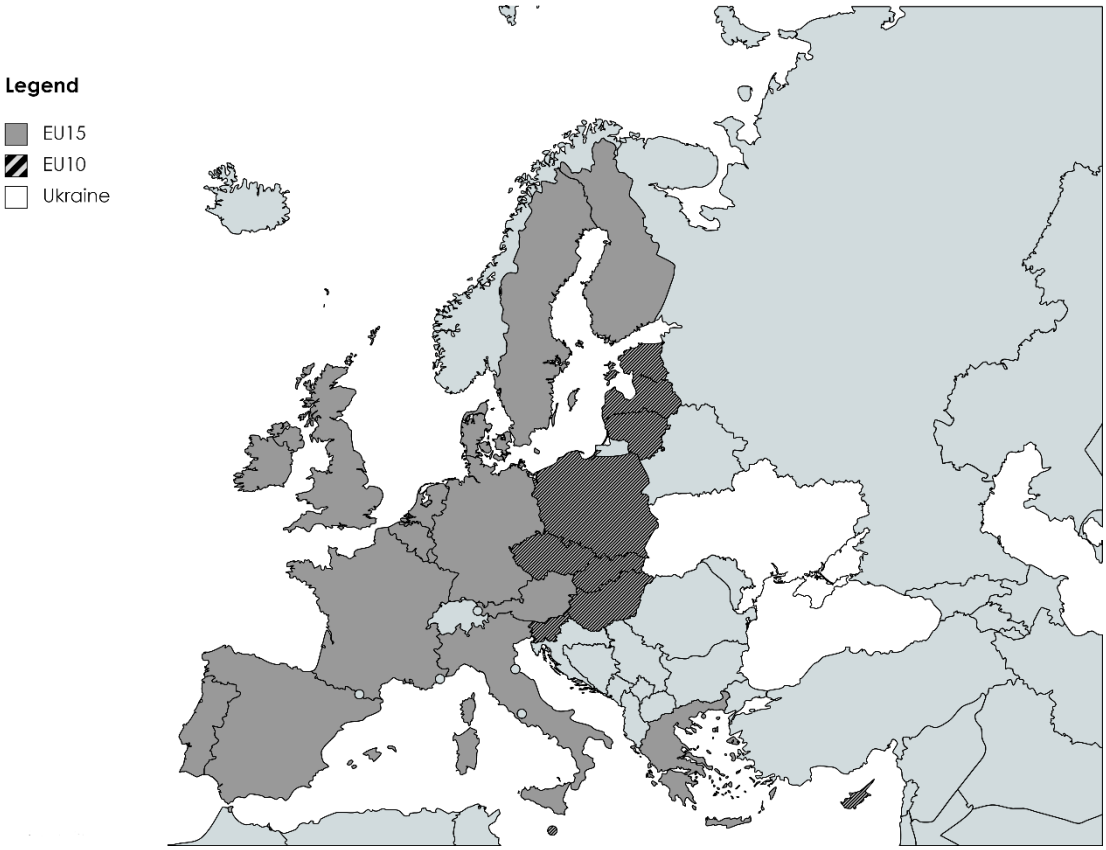
In the years that followed, communist governments in countries such as Czechoslovakia, Romania, and Bulgaria also fell (Kenney, 2002, pp. 249-277; Brown, 2010, pp. 522-548)). The dissolution of the Soviet Union in 1991 was a pivotal event that led to the emergence of independent states and the end of Soviet domination in eastern Europe (Brown, 2010, pp. 249-573). Furthermore, the 1980s saw the gradual transition from communism in Yugoslavia. No longer united by a shared ideology or the charismatic leadership of Tito, ethnic tensions led the breakup of the country, leading to Slovenia’s independence in 1991 (Brown, 2010, pp. 546-548).

In the aftermath of these events, the countries of eastern Europe embarked on a journey of democratic transformation and economic reform. This involved transitioning from planned to market economies, and from authoritarian rule to democratic government.

2.2. The Eastern Enlargement

The Eastern enlargement of the EU was the largest initiative to integrate several countries from CEE into the EU.[1] The main enlargement occurred in 2004 and saw the inclusion of Czechia, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, and Slovenia.[2]

Figure 1. Map of Europe detailing the 2004 enlargement of the EU



This expansion was motivated by several factors, including the EU's desire to promote democracy, stability, and economic growth in the region, which had previously been under communist rule and isolated from the rest of Europe (Lašas, 2010, pp. 5-7;106-107). It was also viewed as an opportunity to extend the EU's sphere of influence and reach into a previously unrepresented part of Europe (Lašas, 2010, pp. 69-70). The integration of these countries was

[1] For a timeline of the 2004 enlargement, see table A5.

[2] The Mediterranean countries of Malta and Cyprus also joined the EU in 2004, but they are not the subject of this paper.

intended to encourage the adoption of democratic institutions and market economies, which would lead to political and economic stability in the region. Through this process, the EU aimed to bring these countries closer to the values and standards of the union, while also facilitating greater cross-border cooperation, trade, and economic growth (European Union, 2007; De Munter, 2022).

The EU constitutes one of the world's largest economic blocs, and by joining the EU, the new member states gained access to the internal European market, which creates new opportunities for trade, while reaching a large range of new potential customers (European Commission, 2020; Baldwin & Wyplosz, 2020, pp.42-44). Further, being an integrated part of the European single marked is associated with the removal of trade barriers as well the standardization of rules and regulations, further decreasing the costs of trade (European Union, 2007).

However, the EU imposes a range of strict criteria on its potential members, including political, economic, and legal reforms. These criteria are known as the "Copenhagen criteria" and consists of three main parts, namely political, economic, and legal criteria (Sekulić, 2020, pp.30-33). The political criteria stipulates that the candidate member state must have stable institutions that guarantee democracy, rule of law and human rights, as well as an independent judiciary and free and fair elections. The economic criteria demands that the candidate member state maintains a functioning market economy, able to compete within the single market (European Commission, 2020; Baldwin & Wyplosz, 2020, pp.22-24). Further, the legal criteria demands that the new member state adopts EU laws, regulations, and standards. This includes the protection of free competition and protected property rights (European Commission, 2018).

The process of expansion was not without its challenges, as new member states had to adapt to EU regulations and policies, and existing member states had to adjust to the changing political and economic landscape. The new member states were less economically developed than the existing EU countries, which put pressure on the EU's budget and institutions (Baldwin & Wyplosz, 2020, pp.22-24). Indeed, the increase in the number of members with differing economic situations, the sharp increase in the EU population and the number of languages spoken were identified as a particular cause for caution (Baldwin & Wyplosz, 2020, p.23; European Union, 2007).

2.3. European Integration- An overview

The process of economic integration with the EU includes the gradual deepening of cooperation and harmonization with the union as a whole. The road to European integration is a complicated process that is not uniform for every country, as some countries associated with the EU, for one reason or another, remains outside the EU. Therefore, there exists no step-by-step comparison between countries, although in terms of economic integration, there exists several levels of cooperation:

Countries outside the EU may engage in a Preferential Trade Agreements (PTA) with the EU as part of their integration process. These PTAs aim to reduce trade barriers and promote economic cooperation. As the countries implemented economic reforms and aligned their legislation with EU standards, they gained preferential access to the EU market, benefiting from reduced tariffs and quotas (Krugman et al., 2018, pp. 299-301).

Prior to their accession to the EU, the CEE countries engaged in association agreements with the EU. These are comprehensive agreements that cover not only trade but also political and broader economic cooperation. They involve closer alignment with EU policies and political dialogue between the parties. The content and depth of association agreements can vary depending on the specific country and the scope of the agreement (European Commission, n.d).

A further step of EU economic integration the creation of a Free Trade Agreement (FTA). These agreements focus on reducing trade barriers, such as tariffs and quotas facilitating increased trade and market access between the parties. Building on a free trade area, a customs union involves not only removing trade barriers but also establishing a common external tariff external import, while deepening economic cooperation and aligning trade policies (Baldwin & Wyplosz, 2020, pp.130; Krugman et al., 2018, pp. 299-301). Notably, the EU predecessor, the European Economic Community, was initially a customs union.

A single market takes integration further by removing not only tariffs but also non-tariff barriers, such as technical regulations and barriers to the free movement of services and capital. It entails harmonizing regulations and standards across member states to facilitate the free movement of goods, services, capital, and people. While reserved for EU member states, non-EU countries may negotiate agreements that grant them certain levels of access to the EU single market (Baldwin & Wyplosz, 2020, p.18).

2.4. Ukraine and the European Union

Following its independence from the Soviet Union in 1991, Ukraine faced a challenging transition as it sought a new course for its future. The young nation often found it difficult to identify the meaning of its nationhood, and often struggled to define its national conscience as something separate from is Russian neighbour (Kuzio, 1998, pp. 1-22). In the years that followed Ukraine's entrance to the world stage, it often found itself torn between internal forces, with some advocating for closer integration with the EU while others sought to maintain close ties with Russia (Shyrorykh, 2018, p.837; Kuzio, 1998, p.197).

In the early days of her independence, Ukraine declared its intention to join the EU, signalling a desire for closer economic and political ties with the EU (Kuzio, 1998, pp.132; Plokhy, 2021, pp. 326-328). In 1994, Ukraine went on to sign the Partnership and Cooperation Agreement (PCA), establishing a framework for political, economic, and social cooperation with the EU (Plokhy, 2021, pp. 326-328). The PCA laid the foundations for gradually increasing cooperation and integration between Ukraine and the EU. While the PCA aimed to enhance economic cooperation between the two parties, it did not establish a comprehensive PTA. The agreement was designed to promote stability, prosperity, and democratic development in Ukraine, and was seen as a significant step towards alignment with the prerequisites for EU membership (Baldwin & Wyplosz, 2020, pp.23).

Despite these overtures, however, little progress was made towards fulfilling Ukraine's desire for closer ties with the EU. Meaning that, at the time before the 2004 enlargement of the EU, Ukraine had not yet achieved the same level of integration as the other CEE countries. There were several factors that led Ukraine to remain outside the European community, while its former Eastern bloc counterparts chose to seek closer ties with the EU. Firstly, a major challenge in Ukraine's transition to democracy was the stark economic decline that followed the country's independence. The economic hardship was associated with a high degree of emigration and low fertility rates, further acerbating the economic downturn (Plokhy, 2021, pp.328-331). Furthermore, while other former Eastern bloc countries made significant progress to transition to market economies and sought democratic reforms, Ukraine was struggling with widespread corruption and political instability, which ultimately benefitted an elite group of oligarchs (Plokhy, 2021, pp.331-336).

Finally, Ukraine's geographic position and significant size made its European integration more complicated than for its counterparts. Its strategic location as the gateway between the east and west made Ukraine uniquely important for Russian foreign interests to remain, at the least,

neutral (Plokhy, 2021, pp.325-328; Kuzio, 1998, pp. 110-112). As such, The EU was hesitant to extend its borders too far eastward, while its size and complex characteristics made it more difficult to integrate than smaller countries like the Baltic states (Shyrorykh, 2018, pp.6-8). These factors contributed to slow the progress towards EU integration, leaving Ukraine outside of the European sphere of influence.

3. Previous research

Previous research on the trade effects of European integration, such as Papazoglou, et al. (2006), Bussière, et al. (2008), and Gil, et al. (2008), often use gravity models to estimate the effects for both old and new members of the Union.

Papazoglou, et al. (2006) applies a gravity model to bilateral trade flows between the EU members and their main trade partners. They find that the 2004 enlargement had a significant positive impact on trade between new member states and existing EU members, although also resulting in some redirection of trade flows. Indeed, the authors find that the rises in trade flows for the new members in general arise with EU15 countries, whilst trade decreases with trading partners outside the EU. The paper further suggests that imports increase more than export for all the new member states, although this effect primarily manifested in the members with lowest income levels.

Bussière, et al. (2008) estimate a gravity model using a bilateral trade flow between a wide array of EU and non-EU countries. They find that European integration before 2004 significantly increased trade flows between the new member countries and the EU, while the impact on trade with non-EU countries was less clear. The research further suggested that the economic size and development of the new member states, as well as its geographical location had a significant impact on the trade effects from integration.

Gil, et al. (2008) estimates the effects of enlargement and integration of the EU using a gravity model. The estimates suggests that European integration through enlargements have led to a significant increase in trade for both old and new member states. Further, the results suggests that new EU members could expand intra-bloc trade at the same rate as old members, suggesting that there are no first-mover advantages of being a pre-existing member.

Shepotylo (2009) approaches the same issue from the perspective of the EU's eastern neighbours. Using a gravity model, the author finds that the enlargement of the EU significantly increased trade, also for the eastern European countries who did not join the EU. However, the effects were shown to be stronger for the countries who had closer economic ties to the EU. The results add to the discussion of the benefits of European integration by contrasting them to the costs of non-integration. They provide some guidance on the potential gains from deeper trade integration between EU and Ukraine, and from the potential future EU accession of Ukraine.

Additionally, Shepotylo (2010) uses a gravity equation to calculate the trade effects of EU enlargement, focusing on Ukraine specifically. The author finds that EU accession would have had a significantly positive effect on exports, nearly doubling exports of manufactured goods by 2007. If Ukrainian accession would have been beneficial for the EU as a whole is, however, not explored.

Saia (2017) examines the economic costs and benefits of the United Kingdom's decision to not adopt the Euro. Notably, the author employs a SCM to estimate the counterfactual trade outcome that would have emerged, had the UK adopted the Euro. The author argues that while the decision to stay out of the eurozone allowed the UK to maintain an autonomous monetary policy, it has also come at a significant economic cost in the form of increased transaction costs for businesses and reduced trade flows with eurozone countries. The article suggests that the UK's decision to stay out of the eurozone has had significant economic and political implications and may have limited its ability to fully engage with the rest of Europe.

This thesis contributes to the literature on economic integration by using the quasi-natural experiment presented by the 2004 Eastern enlargement of the EU. Specifically, the paper employs a SCM, similar to Saia (2017), to estimate the counterfactual trade flows that would have occurred if Ukraine had joined the EU in 2004. To the best of the authors' knowledge, this method has not been applied in this context before, presenting a novel approach to estimating the potential trade outcomes of Ukraine's hypothetical EU membership.

4. Theoretical Framework

4.1. International Economic Unions

Economic unions, such as the EU, are created by countries to promote economic integration and cooperation among the members. The theory behind economic unions suggests that by removing barriers to trade and investment, member countries can benefit from increased economic efficiency, greater specialization, and increased economies of scale. To achieve these benefits, an economic union typically includes a customs union, which involves the removal of trade barriers such as tariffs and quotas, with other member countries and levies a common tariff on external imports (Krugman et al., 2018, pp. 299-301).

One of the primary economic benefits of economic unions is that they create larger and more integrated markets. This can lead to increased competition, lower prices, and greater consumer choice. By reducing the cost of trade and investment, economic unions can also promote greater efficiency and innovation. Firms can access a wider range of inputs and markets, which can lead to greater efficiency and innovation. As a result, membership in an economic union is expected to have a positive impact on international trade through various channels. For example, eliminating trade measures within the common market is expected to boost intra-union trade (Krugman et al., 2018, pp. 246-247).

4.2. Partial equilibrium analysis

Partial equilibrium analysis provides a clear theoretical framework for the expected trade outcomes of a decrease in tariffs. From the perspective of the customs union, for example the EU, the decrease of a tariff on a specific market, holding all other factors constant, would lead to a decrease in the price of the imported good, leading to an increase in quantity demanded of the imported product (Baldwin & Wyplosz, 2020, pp.120-141).

Concurrently, the quantity supplied by the EU producers will decrease as they become less profitable in face of foreign competition. In addition, since the foreign and EU products are substitutes, the imported product will put downward pressure on the price of the EU product. Thus, removing a tariff result in the decrease in the price of the imported product, decreasing the price of the EU product. Therefore, the decrease in price leads to a decrease in total revenue of the EU producers, while the EU consumer's purchasing power would increase. The increase in demand for foreign product is therefore associated with an increase in EU imports from the foreign country (Baldwin & Wyplosz, 2020, pp.120-141).

A Preferential Trade Agreement (PTA), although also including the lowering or outright removal of tariffs, is further associated with deeper economic integration than the removal of tariff measures alone. Similar to the previously described case, the agreement of a PTA is expected to increase trade flows between the concerned partners, due to the decrease in the price of traded goods. As discussed previously, this leads to an increase in both quantities demanded and supplied. Additionally, the reduction in tariffs and other trade barriers can make it easier for member countries to trade with each other, leading to a further increase in the quantity traded. For the countries not included in the agreement, the PTA can lead to trade diversion, where member countries replace trade from non-member countries with trade from member countries. This is diversion can lead to a decrease in trade with third parties (Baldwin & Wyplosz, 2020, pp.120-141).

While the theoretical foundations for the strong trade benefits of integration into a larger customs union is well established in the literature, the question of non-integration emerges. The domino theory of regionalism, see for example Baldwin (2006), describes the growing cost of non-integration. As previously described, trade diversion can lead to a reduction in trade with the non-integrating party that face higher tariffs. If the two PTA parties previously imported from the third country, a PTA could make the partners prefer trade with each other rather than with the third party. An event, such as the 2004 EU enlargement, creates closer integration within an existing bloc that harms the trade of non-members, thereby pushing them to seek closer ties to the economic bloc. The increased integration within the bloc alters the equilibrium, leading to non-members seeking further integration.

Had Ukraine joined the EU in 2004, thereby joining the customs union, the remaining tariffs would have been removed. This would have increased the levels of trade with the EU that Ukraine actually experienced. However, entering a customs union, and the subsequential removal of tariffs, is merely a part of the integration process.

Joining the EU, and the subsequent access to the European single market, leads to the removal of non-tariff measures, such as the harmonisation of standards and trade procedures among member countries. Standards refer to the technical and regulatory requirements that products must meet to be sold in a particular market. Therefore, harmonisation of standards means that products that meet the standards in one country can be sold in all other member countries without the need for additional testing or certification. This can reduce the cost and time involved in complying with different standards in different markets, reducing the costs associated with trade (Chen & Aaditya, 2008, p.839).

Trade procedures refer to the rules and processes that govern trade between countries, including customs procedures, documentation requirements, and inspection standards. Trade procedures, such as inspections, documentation requirements, and clearance procedures, can be standardized, reducing the time and costs involved in navigating different procedures in different markets. This can make it easier for firms to engage in cross-border trade and reduce the likelihood of delays or other trade barriers (Carballo, et al. 2021 pp.5-6).

Therefore, in addition to the complete removal of tariff measures, Ukrainian membership in the EU would have led further integration, such as the harmonization of standards and simplification of trade procedures. From this form of deep integration, we expect that EU membership would have further led to an increase in trade for Ukraine.

5. Empirical Strategy

To estimate the counterfactual export flows that Ukraine would have gained from its accession to the EU in 2004, this study employs the SCM to create a counterfactual Ukraine that joined the EU in 2004. This counterfactual Ukraine is created from a donor pool of the eight CEE countries that joined the EU in 2004. Specifically, this paper investigates the counterfactual export flows between Ukraine and the EU15. If Ukraine's actual export flows are lower than that of the counterfactual export flows, this would indicate that Ukraine is exporting less to the EU than it would have, had It joined the EU in 2004. To test the robustness of the baseline results, this paper also uses a DiD specification, which controls for the 2004 enlargement of the EU. The addition of the DiD estimate is simply because the SCM is, in essence, a variation of the DiD (Cunningham, 2021, chap.9). The advantage of the DiD is that it can control for unobserved heterogeneity by using different dimensions of fixed effects. The results from the DiD estimations suggest that the baseline results are robust as they show similar export effects of Ukraine's non-integration with the EU.

5.1. Synthetic Control Method

The SCM is a statistical method first introduced by Abadie & Gardeazabal (2003) and subsequently refined by Abadie, et al. (2010; 2015). It allows the estimation of the causal effect of a treatment by creating a synthetic control unit that approximates what the counterfactual outcome of the treated unit would have been in the absence of the treatment. This is achieved by selecting a set of control units that resembles the treated unit in terms of relevant pre-treatment characteristics. To create the synthetic control unit, the SCM employs a weighted combination of control units. The weights are calculated for each control unit based on how closely its pre-treatment outcome matches that of the treated unit.

The difference between the treated unit's actual outcome and the synthetic control unit's outcome after the treatment is then used to estimate the causal effect of the intervention or policy change. If the difference is significant, it suggests that the treatment had an effect on the treated unit's outcome. The SCM is particularly useful for statistical inference in cases where it is not possible to use other experimental designs, due to a lack of randomized control groups, which is often the case in macroeconomics.

The SCM offers several advantages over alternative strategies. The method can be applied even when the sample size is small, as is often the case in policy evaluation studies, including this

one. Unlike other methods, the SCM does not rely on parallel trend assumptions, which can be violated in many real-world scenarios. Furthermore, the SCM allows for a variety of ways to test the robustness of the estimations by differing the specifications of the model, including the choice of treatment date and donor pool. This strengthens the confidence in the estimated treatment effects.

The SCM as presented in detail by Abadie et al. (2010; 2015) functions as follows. Suppose that we observe a sample of $J + 1$ countries, indexed by j, where unit $j = 1$ is the country of interest who received the treatment, while units $j = 2$ to $j = J + 1$ is the "donor pool", consisting of units that did not receive the treatment. We assume that the time periods are split into two parts, a pre- treatment period from $t = 1$ to $t = T_0$, and the post-treatment period from $t = T_0 + 1$ to $t = T$. The SCM requires a sufficiently amount of pre-treatment observations to allow the algorithm to accurately create a suitable synthetic control unit.

We assume that X_1 is a $(Kx1)$ vector with the values of the pre-treatment characteristics of the treated unit, while X_0 is a (KxJ) matrix with the values of the pre-treatment characteristics of the units in the donor pool. There are K number of pre-treatment characteristics, which are variables that are predictors of the dependent variable.

The synthetic control unit is defined as a weighted average of the units in the donor pool that best recreates the pre-treatment characteristics of the treated unit. Now we assume W to be a $(Jx1)$ vector of weights such that $W = \left(w_2, \dots, w_{j+1}\right)'$ with $0 \leq w_j \leq 1$ for $j = 2, \dots J$ amd $w_2, \dots, w_{j+1} = 1$. Then, the vector W is the synthetic control unit. The crucial part is determining the value of W that minimizes the difference between the pre-treatment characteristics of the treated unit and synthetic control unit, given by the vector $X_1 - X_0W$. Then the following minimization problem defines the synthetic control:

$$\min_W (X_1 - X_0W)'V(X_1 - X_0W)$$

Where V is a diagonal matrix which values reflect the relative importance of the pre-treatment characteristics. Then, the solution of this problem gives us the vector W* that defines the synthetic control, which is a combination of weighted averages of the donor pool that best replicated the pre-treatment characteristics of the treated unit. The effect of the treatment is the difference of the post-treatment dependent variable between the treated unit and the synthetic control unit. Formally, let Y_1 be a (T_1x1) vector collecting the post-treatment values of the

outcome for treated unit. Similarly, let Y_0 be a $(T_1\ x\ J)$ matrix, where column j contains the post-treatment values of the outcome for unit $j + 1$, that is the donor pool. The synthetic control estimator of the effect of the treatment is given by the difference of the post-treatment outcomes between the treated unit and the synthetic control unit, that is:

$$Y_1 - Y_0 W^* = \sum_{t=T_0+1}^{T} (Y_{it} - \sum_{j=2}^{J+1} W_j^* Y_{jt})$$

In the context of this paper, the SCM is applied to estimate the percentage loss or gain in trade between Ukraine and its trade partners from not joining the EU can be described using the following relationship:

$$\%\ \text{difference actual vs Synth} = \frac{(Y_1 - Y_0 W^*)}{(Y_0 W^*)}$$

Finally, following Abadie et al. (2015), this paper will conduct the falsification tests using the Root Mean Square Prediction Error (RMSPE). The RMSPE measures the difference between values of the actual outcome variable and its synthetic counterpart for any particular country. Specifically, the falsification test uses the ratio of Post-treatment RMSPE to Pre-treatment RMSPE. This ratio is compared between models to evaluate the level fit between the actual and counterfactual export flows of Ukraine. A high ratio suggests a large difference between the actual and counterfactual outcomes, while a low ratio suggest small difference. The RMSPE for a unit is defined as:

$$RMSPE_i = \sqrt{\frac{1}{T} \sum_{t=1}^{T} (Y_{it} - \sum_{j=2}^{j+1} w_j^* Y_{jt})^2}$$

5.2. Sample and data sources

To estimate the export flows between Ukraine and its trading partners, that would have prevailed if Ukraine had joined the EU in 2004, this paper uses data over a 23-year time span and includes 11 pre-treatment years (1993-2003) and 10 post-treatment years (2004-2013). Somewhat counterintuitively, in the context of the SCM, the treatment in this case is to not join the EU. The post-treatment period ends in 2013, which avoids complications associated with the war in Donbass, as such armed conflicts are likely to have an adverse effect on economic performance and can be discussed as a treatment on its own. The turbulent nature of the post-communist era in CEE presents its own set of challenges for this study, namely the chronic lack of data. This limits the pre-treatment period to start at the earlies in 1993, which makes the pre-treatment period dangerously short. Due to the SCMs requirement for sufficient pre-treatment observations this analysis therefore uses quarterly data. While the use of quarterly data does not improve the accuracy of the estimations, it allows for the algorithm to access sufficient data to create a suitable synthetic control unit. Therefore, the treatment date is set at the second quarter of 2004, as the formal date of the enlargement was May 1st.

As previously described, the SCM requires two set of countries. The first group pertains to Ukraine, the actual country of interest, which did not join the EU member in 2004. The second set comprises the donor pool, which consists of the CEE countries that joined the EU in 2004, whose weighted average mirrors Ukraine's pre-treatment values. The countries that were available to be selected as part of the donor pool was limited to those countries who joined the EU in 2004. Although both Malta and Cyprus joined the EU in 2004, these are not included as part of the donor pool, since they were not a part of the eastern bloc. Thus, the sample consists of Ukraine, as well as the 8 CEE countries that joined the EU in 2004: Czechia, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, and Slovenia.

In addition to being geographically located in the part of Europe, the CEE countries and Ukraine share many characteristics that makes them suitable counterparts for the SCM. They all share a recent history of being part of the Eastern bloc, and as such all recently having socialist planned economies. These countries also faced similar challenges in transitioning to market economies, including the privatisation of industries. In a more abstract sense, these countries share similar cultural influences, often being integrated into larger European states, as well as partly sharing some common linguistic connections.

The outcome variables that describe trade flows consists of data on exports[3] from the 8 CEE countries and Ukraine to EU15[4], retrieved from the International Monetary Fund Direction of Trade Statistics database. The model further includes some country characteristic variables that are used to create the control unit that is as similar as possible to the pre-treatment Ukraine. In line with Saia (2017) this study uses the logarithm of real GDP, measured in current US dollars, as well as the average of lagged exports between 1993 and 2003 as economic indicators. In addition, this study includes a measure for average distance between the trade pairs, as well as a dummy variable for sharing a border. The data on geographic distance, common border, as well as GDP in current US dollars are retrieved from the Gravity Dataset at CEPII.[5]

To determine the number of lags to use in a SCM is not self-evident. While the inclusion of all lags model produces the best pre-treatment fit[6], the inclusion of all lags risks eliminating the predictive power of the other predictive variables (Kaul, et al. 2015). Therefore, three different sets of lags will be used. (1) The baseline model, that uses the average of all lagged exports. (2) The all-lags model that includes all lags. Following a similar approach to Abadie, et al. (2010) (3) the 3 lags model, that uses lags for 1993, 1998 and 2003.

[3] The same analysis was attempted for imports. However, after conducting the standard robustness tests, the SCM proved unable to provide estimates for imports as a dependent variable. It suggests that the limited nature of the donor pool was unable to reliably create the synthetic imports flows, leading to unusable outputs.
[4] EU15 refers to the following countries: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom.
[5] See appendix table A4.
[6] See appendix table A3.

6. Results

The following chapter presents the main results from the SCM estimates of the counterfactual export flows from Ukraine to EU15. The results from the baseline model are briefly compared to the results from the all-lags and 3-lags model.

Figure 2 plots the actual and synthetic aggregate exports from Ukraine to the EU15 countries over the period 1993 to 2013. The solid line shows the actual development of aggregate export flows from Ukraine to the EU15 countries, while the dashed line shows the synthetic aggregate export flows. Unit weights and predictor balances are reported in table A1 and A2 respectively. As seen in table 1, the percentage differences between the actual and counterfactual units in the pre-treatment period is not significantly different from zero. This suggests that synthetic aggregate export flows seem to be a good approximation of the actual aggregate export flows in the pre-treatment period from 1993-2003. This is a necessary condition for the SCM estimates to be reliable. The fact that the subsequent actual export frows strongly underperforms compared to its synthetic control unit suggests that Ukraine paid a heavy price in terms of lost exports to the EU. In other words, the interpretation of the results is that: had Ukraine indeed joined the EU in 2004, it would have experienced far greater export outcomes with the EU.

Figure 2. Actual and Counterfactual export flows from Ukraine to EU-15. The vertical line indicates the time of the treatment.

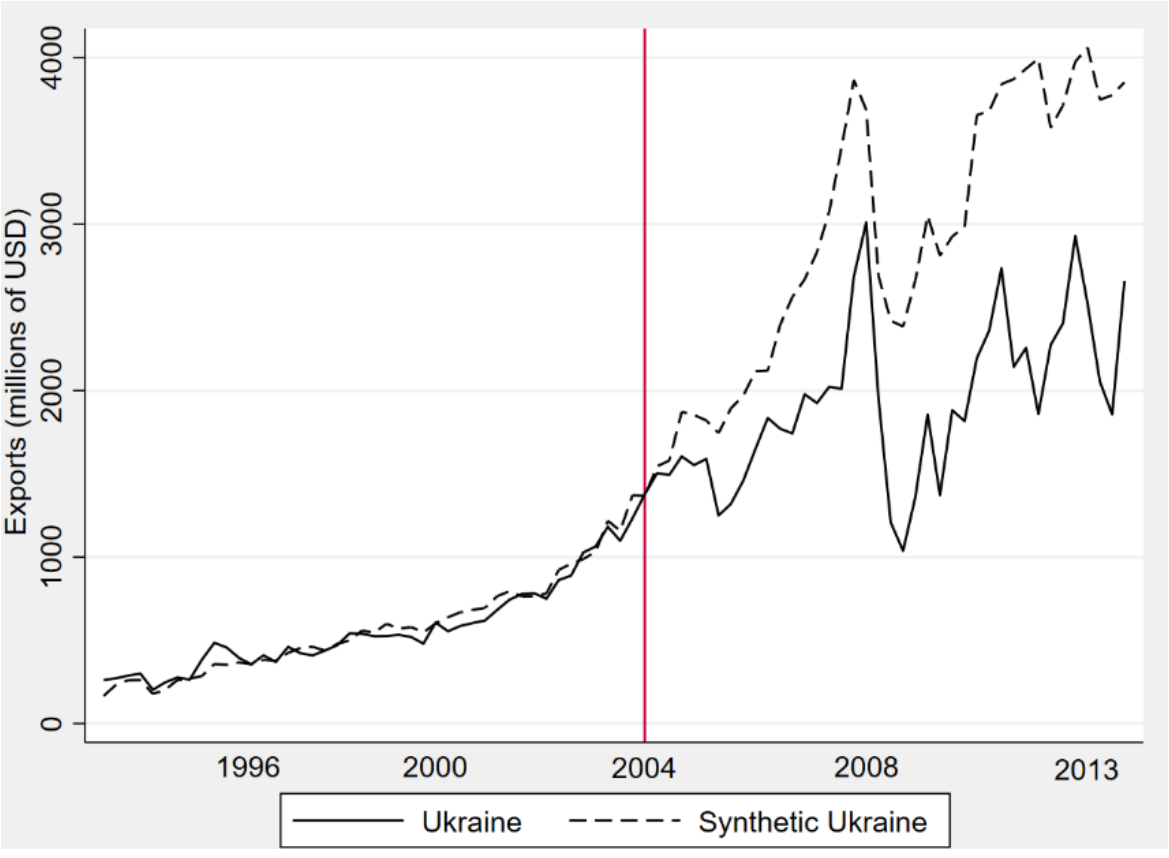


Table 1 presents the percentage difference between the actual and synthetic export flows from Ukraine to EU15 over different periods. During the pre-treatment period 1993–2003, the difference between actual and synthetic aggregate export is close to zero. The percentage difference over the entire post-treatment period suggests that the synthetic export flows significantly outperform the actual export flows, suggesting an average difference of 34.6%.

Table 1. Difference between actual and synthetic aggregate exports from Ukraine to EU15 and measures of fit over different periods.

	1993-2003	2004-2013		
		2004-2013	2004-2008	2009-2013
Difference actual vs synth.	-1.6%	-34.6%	-24.9%	-40.4%
	(0.022)	(0.021)	(0.024)	(0.019)
RMSPE	58.089	1144.233	705.546	1442.278
Post-RMSPE/Pre-RMSPE		19.698	12.146	24.829

Standard errors are reported in parentheses.

However, the real Ukrainian export flows become increasingly volatile after 2008. Therefore, splitting the post treatment period in two, reveals that the average difference of 24.9% between 2004-2008. This difference, although considerably smaller than for the full post-treatment period, remains significant. On the other hand, the average difference in the period 2009-2013 is 40.4%. In total, the estimates of synthetic export flows after 2004 suggests that the overall effect of joining the EU on Ukrainian trade would have been positive. This gradual improvement of export flows may come from two avenues. Firstly, it is likely that the trade effects of integration emerge slowly as the new equilibrium is reached. Secondly, the Great Recession of 2008 may have played a part in the further divergence in export outcomes. Integration to the EU and the development of the financial systems may have helped the new EU countries to dampen the negative effects of the global recession, while Ukraine lacked the necessary financial infrastructure to effectively recover from the economic downturn.

In comparison, the results from the all-lags model presented in table A3 estimates that the pre-treatment difference between actual and synthetic exports is -0.35%, suggesting a better fit when all lags are included. The subsequent divergence over the entire post-treatment period is estimated to about -28.14%, suggesting a somewhat smaller effect to the baseline model.

However, as previously discussed the inclusion of all lags of the dependent variable reduces the predictive power of the other covariates. In addition, the results from the 3-lags model, also presented in table A3 estimates the pre-treatment difference between actual and synthetic exports to -2.8%, suggesting a somewhat worse fit compared to both the baseline and all-lags models. The subsequent difference over the entire post treatment period is estimated to about -29.4%, again suggesting a somewhat smaller effect compared to the baseline model. Therefore, although the all lags model produces a somewhat better pre-treatment fit, the reduced predictive power of the covariates leaves the baseline specification as the preferred model.

7. Robustness analysis

In this section, the baseline SCM is subject to a number of sensitivity test to control the robustness of the results. As suggested by Abadie et al. (2015), placebo effects are analysed in both by altering the treatment date to evaluate the presence of anticipation effects, as well as by altering which country receives the treatment. Additionally, to ensure that the results are not driven by a single country, the robustness of the results are controlled by altering the donor pool.

7.1. Placebo in time

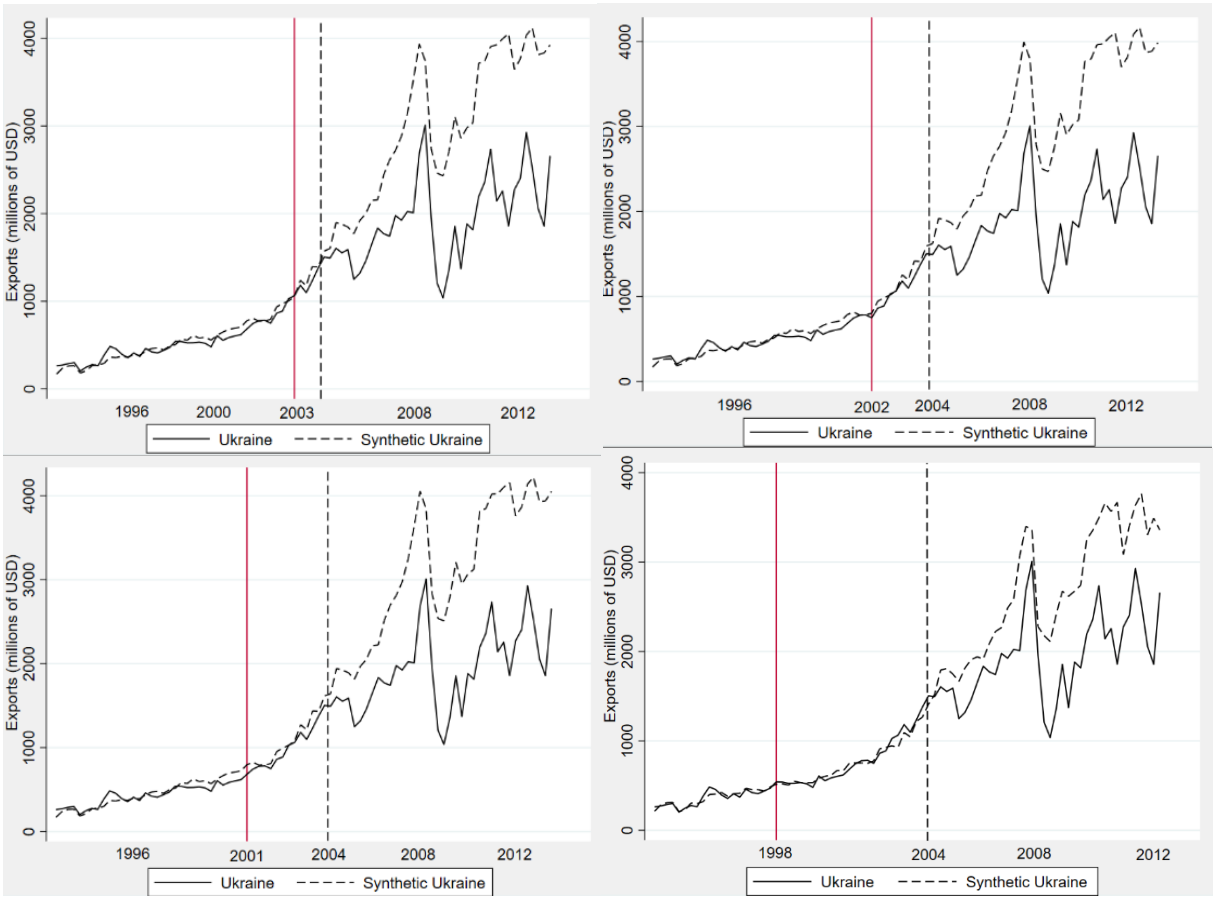
This subsection examines the robustness of the results by changing the treatment date. As the Eastern enlargement of the EU in 2004 was well known in advance, both in time and which countries were set to ascend, it is possible that the trade flows were altered in anticipation of the enlargement. Therefore, we validate the results by performing a placebo in-time test where the Eastern enlargement is assumed to have occurred before 2004. Specifically, the treatment year is reassigned to quarter 2 of 2001, 2002 and 2003. If the treatment effects from this test prove to be large, it may suggest that the estimated results from the baseline estimates lack sufficient robustness, since the treatment effect would been anticipated before the actual treatment date.

In addition to the anticipation tests, the treatment date is reassigned to 1998, constituting a pure placebo test, since well before the enlargement of the EU, any export effects are unlikely to have been due to potential anticipation effects. If the results from this false date suggest a divergence well before the enlargement of the EU, we would be less confident in the reliability of the baseline results. It is important to note that pushing the falsification test to 1998 severely limits the pre-treatment matching window, leaving less observations for the SCM algorithm to assign weights to the donor pool.

Figure 3 shows the actual and synthetic aggregate exports flows from Ukraine to EU15 with the various alternative treatment years. The trends for actual and synthetic export flows show similar patterns before the placebo treatment and continues on a similar trend to the actual treatment date in 2004. This suggests that the placebo treatments in 2001, 2002, and 2003 show no significant anticipation effects on export flows between Ukraine and EU15. Furthermore, assigning the treatment date to the false year of 1998 shows no significant change in effects. As such, the results from the specifications with alternative treatment years are consistent with the

baseline estimates. Therefore, the placebo-in-time test provides strong support for the robustness of the baseline estimates.

Figure 3. Actual and synthetic exports from Ukraine to EU15 using alternative treatment years. The vertical solid line indicates the placebo year of the treatment, while the vertical dotted line indicates the actual treatment year.



7.2. Falsification test

This subsection explores the robustness of the results by iteratively altering the treatment to all the units of the donor pool. The results of these estimates are compared to our baseline estimates where Ukraine is the treated unit. For the baseline estimates to hold, the estimated effect for Ukraine should significantly larger than the placebo treatment effects estimated in this test. Ideally, no placebo effects should appear for the donor pool since they indeed did join the EU in 2004.

Table 2 shows the ratio of post-treatment RMSPE to pre-treatment RMSPE where all countries in the donor pool have been subject to the placebo treatment. That is, for each control unit in the donor pool we pretend they never joined the EU. The results suggest relatively strong placebo effects for Czechia and Hungary with a post-treatment RMSPE to pre-treatment

RMSPE ratio of 15 and 9.1 respectively. Although the falsification test suggests some strong placebo effects for exports, the treatment effect for Ukrainian exports reports a post-treatment RMSPE to pre-treatment RMSPE ratio of 19.7. Thus, although this placebo test does not entirely dismantle the robustness of the baseline results, it does create some uncertainly.

These unexpected placebo effects may come from outlier export performances from the countries in question, as Czechia outperformed its synthetic control unit, while Hungary underperformed its synthetic control unit. As the synthetic control can only be created from the countries in the donor pool, it is possible that the donor pool is not large or varied enough, since only CEE countries joined the EU in 2004 are included. Therefore, it is possible that the unexpected placebo effects arise due to the country's divergence in export behaviour from the remainder of the donor pool. Taken together, the falsification test provides some support for the robustness of the baseline estimates, although suggesting that the results for the export flows of Ukraine to EU15 should be interpreted with some caution.

Table 2. The ratio of post-treatment RMSPE to pre-treatment RMSPE for all countries being assigned for treatment.

Country	Post-RMSPE/ Pre-RMSPE
	Exports
Ukraine	19.7
Czechia	15.0
Hungary	9.1
Slovenia	6.4
Slovakia	6.4
Poland	5.6
Latvia	4.6
Estonia	4.3
Lithuania	2.9

7.3. Altering the donor pool

This subsection examines the robustness of the results by changing the composition of the control units of the donor pool. This test is performed to ensure that no single control unit is driving the results. This test will iteratively re-estimating the model, each time creating a new synthetic Ukraine by removing one of the countries from the donor pool and estimate of the results significantly changes. Excluding countries from the donor pool inevitably leads to a less fitting estimation but allows for analysis of whether the results are driven by a single country. For the results to be robust, the removal of one control unit from the donor pool should not remove the divergence between actual and counterfactual Ukrainian exports. If the treatment effects disappear from altering the donor pool, it may suggest that the estimates from the baseline estimates lack sufficient robustness.

Figure 4 shows the result of iteratively excluding one country from the donor pool. In addition, table 3 presents the ratio of post-treatment RMSPE to pre-treatment RMSPE for all iterations of the donor pool. The results suggest removal of any single unit from the donor pool does not significantly contradict the baseline estimates. This result suggests that the estimates of the counterfactual export flows from Ukraine are not driven by any particular country. Although the estimates do vary depending on the donor pool composition, for example removing Poland lowers the ratio of post-treatment RMSPE to pre-treatment RMSPE to 9.3, all iterations of the synthetic Ukrainian exports significantly outperform the export flows of actual Ukraine. This result supports the robustness of the baseline estimates to the altering of the donor pool.

Figure 4. Results of altering the donor pool. Actual Ukraine is represented by the solid black line.

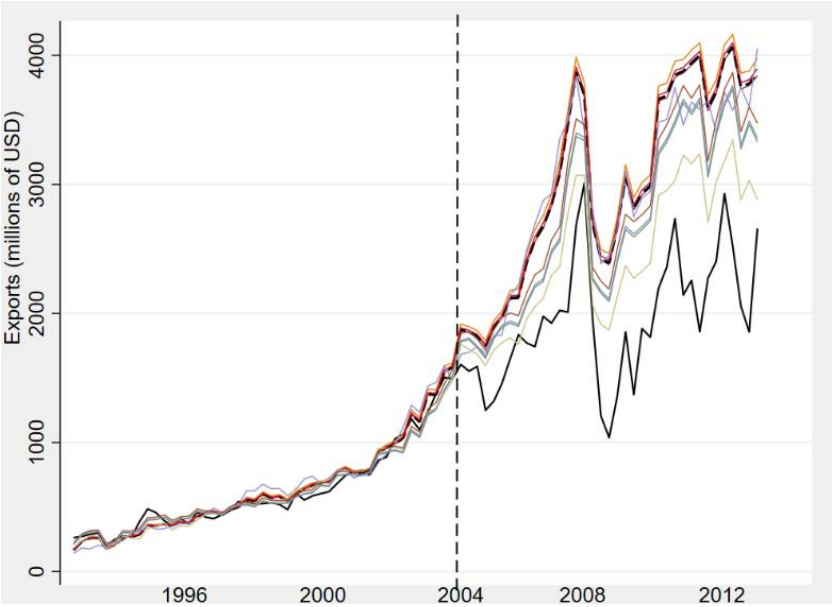


Table 3. The ratio of post-treatment RMSPE to pre-treatment RMSPE ratio for all iterations of the donor pool.

Donor Pool	Post-RMSPE/ Pre-RMSPE
Full Sample	19.7
No Czechia	20.1
No Estonia	18.5
No Hungary	17.5
No Latvia	19.5
No Lithuania	12.1
No Poland	9.3
No Slovakia	19.7
No Slovenia	18.3

8. Difference-in-differences

This section provides further evidence for the trade effects of Ukraine's non-integration into the EU by employing Difference-in-differences (DiD) estimators. The specification of the DiD closely resembles the baseline SCM model. The DiD estimator is specified by the following regression DiD equation:

$$Exports_{kt} = \beta_o + \beta_1 ln(GDP_{it} \times GDP_{jt}) + \beta_3(PostEnlargement) + \beta_4 UKR\text{-}EU \times PostEnlargement + \epsilon_{ijt}$$

Where $ln(GDP_{it} \times GDP_{jt})$ is the product of the GDP of country i and country j. The PostEnlargement dummy variable takes the value one for the post treatment period 2004-2013. And the interaction term $UKR - EU \times PostEnlargement$ is one for Ukraine-EU15 exports after the 2004 enlargement of the EU. The regression is estimated using a two-way fixed effects specification and the results are reported in column 1 of table 4. The coefficients for the product of trading pairs' GDPs are positive and significant at the 1% confidence level. Similarly, the coefficient for the PostEnlargement dummy variable is positive and highly significant, suggesting that the 2004 enlargement of the EU was overall positive for the countries in the sample. However, the coefficient of the interaction term $UKR - EU \times PostEnlargement$, which measures the export effects of Ukraine's non-integration with the EU and therefore resembles the estimates of the baseline SCM results, is significantly negative. Said coefficient is estimated to -0.385 and is significant at the 1% confidence level, suggesting that the non-integration of Ukraine lowered potential exports in the period 2004-2013 by 31.9%[7]. In comparison, the baseline SCM estimation indicated that Ukrainian exports to the EU15 was 34.6% lower than its synthetic counterpart.

As in the baseline SCM results, the post-enlargement effects on Ukraine's exports to EU15 is split into two periods, one from 2004-2008 and a second period from 2009-2013. The estimations of the subperiods are reported in column 2 of table 4 and resembles the estimations from the baseline SCM results. The coefficient for the period 2004-2008 is estimated to -0.365, and is significant at the 1% confidence level, suggesting that the Ukraine's exports to EU15 lowered the potential exports by 30.6% compared to the 24.9% estimated by the baseline SCM output. The coefficient for the period 2009-2013 is estimated to -0.405, and is significant at the

[7] The percentage effect is estimated by taking the anti-logs of the coefficient.

1% confidence level, suggesting that the Ukraine's exports to EU15 lowered the potential exports by 33.3% compared to the 40.4% estimated by the baseline SCM output.

Column 3 and 4 runs a regression similar to the placebo-in-time analysis from the SCM. The coefficients for time period before the 2004 enlargement of the EU show no significant effects on exports for Ukraine, while the PostEnlargement coefficients remain highly significant. These results are in line with the results from the SCM placebo tests. In addition, column 5 runs a regression with time fixed effects to control for time-specific factors or trends that may affect the dependent variable. It allows the model to capture time-related variations in the data that are not explained by other independent variables. Again, the results from using time fixed effects are consistent with the previous DiD regressions, although estimating slightly larger negative effects for Ukraine.

Taken together, the results from the DiD estimator suggest strong negative costs in terms of exports as an effect of Ukraine's non-integration with the EU in 2004. These results are strongly consistent in magnitude compared to the results from the baseline SCM estimation, although the size of the effects varies less over time in the DiD estimation.

Table 4. Difference-in-differences of aggregate exports from CCE countries to the EU15

	(1)	(2)	(3)	(4)	(5)
$ln\ GDP_{it} \times GDP_{jt}$	0.231***	0.233***	0.233***	0.233***	0.197***
	(0.033)	(0.033)	(0.034)	(0.033)	(0.048)
PostEnlargement	0.259***	0.257***	0.256***	0.256***	
	(0.060)	(0.060)	(0.060)	(0.060)	
UKR-EU × PostEnlargement (2004-2013)	-0.385***				-0.415***
	(0.076)				(0.078)
UKR-EU × PostEnlargement (2004-2008)		-0.365***	-0.360***	-0.318**	
		(0.093)	(0.098)	(0.124)	
UKR-EU × PostEnlargement (2009-2013)		-0.405***	-0.400***	-0.358***	
		(0.092)	(0.097)	(0.123)	
UKR-EU × PreEnlargement (2001)			0.053		
			(0.175)		
UKR-EU × PreEnlargement (2002)			0.023		
			(0.175)		
UKR-EU × PreEnlargement (2003)			-0.015		
			(0.175)		
UKR-EU × PreEnlargement (1996-1999)				0.058	
				(0.126)	
UKR-EU × PreEnlargement (2000-2003)				0.070	
				(0.124)	
Observations	756	756	756	756	756
R^2	0.888	0.887	0.827	0.862	0.906
Country-pair fixed effects	Yes	Yes	Yes	Yes	Yes
Year dummies	No	No	No	No	Yes

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

9. Concluding remarks

The question of whether or not to seek integration with a larger economic bloc is not always straightforward, however the consequences thereof can have large ramifications for the long-term development of a country's trade performance. The case of Ukraine's uncertain relationship with the EU is perhaps one of the clearest examples of the adverse effects of its indecision. Although various internal and external factors eventually played a decisive role in leaving Ukraine outside the EU, the trade performance compared to its CEE counterparts asks the question of what costs Ukraine paid in terms of exports as a result of her non-integration.

This paper uses a novel approach using the 2004 enlargement of the EU, where 8 other CEE countries joined the EU, as a quasi-natural experiment to estimate the effects of European integration on exports using a SCM. The results suggest that Ukrainian exports to EU15 over the period 2004-2013 was about 34.6% lower than it would have been in the counterfactual scenario where it had joined the EU in 2004. The results further suggest that the difference in exports between the actual and counterfactual Ukraine grew substantially larger after 2008, suggesting that Ukraine was perhaps less equipped to dampen the adverse effects of the 2008 global recession. These results are supported by the estimations using a standard DiD regressions. Furthermore, the SCM estimations presented in this paper were largely robust to standard robustness tests, such as placebo-in-time, falsification tests and alterations of the donor pool.

The positive effects associated with integration with the EU presented in this paper is useful for policy makers who consider a future ascension to the EU. Taken together with the findings of Gil, et al (2008), who finds that there are no first-mover advantages of being a pre-existing member, the results can be somewhat extrapolated to a potential future Ukrainian ascension to the EU. That is, the positive trade effects are not stuck in history, instead the positive export effects of EU integration are likely to emerge from future Ukrainian EU membership.

Although the results provide strong evidence for Ukraine's loss in potential export as a result of the absent integration, it must be considered that the integration into the EU, in addition to trade, effects other economic aspects, such as reduced control of natural resources, of which Ukraine is bountiful. It is clear that any analysis of the overall economic benefits of EU integration must consider aspects in addition to trade outcomes. Therefore, there exists several avenues to expand upon this paper. Firstly, the same estimation can be conducted on other CEE countries, such as Belarus and Moldova, to investigate if the results are similar for countries less integrated with the EU than Ukraine. Secondly, future research may explore the effects on

trade diversification as a result of EU integration. Indeed, this paper has not discussed the prevalence of natural resource extraction and agricultural produce as being a large portion of Ukrainian exports. It is therefore of interest to investigate if integration into the EU would have significantly altered the composition of Ukrainian exports.

References

Abadie, A., Diamond, A., & Hainmueller, J., (2010) Synthetic Control Methods for Comparative Case Studies: Estimating the Effect of California's Tobacco Control Program, *Journal of the American Statistical Association*, vol. 105, no. 490, pp. 493-505

Abadie, A., Diamond, A., Hainmueller, J., (2015). Comparative politics and the synthetic control method, *American Journal of Political Science,* vol. 59, no.2, pp. 495-510

Abadie, A., Gardeazabal, J., (2003). The Economic Costs of Conflict: A Case Study of the Basque Country, *American Economic Review,* vol. 93, no.1, pp. 113-132

Applebaum, A., (2012), Iron Curtain: The Crushing of Eastern Europe, Milton Keynes: Penguin books

Baldwin, R., (2006). Multilateralising Regionalism: Spaghetti Bowls as Building Blocs on the Path to Global Free Trade, *The World Economy,* vol.29, no.11, pp. 1451-1518

Baldwin, R., & Wyplosz, C., (2020). The Economics of European Integration, 6th edn, London: *McGraw-Hill Education*

Brown, A., (2010). The Rise & Fall of Communism, London: Vintage

Bussière, M., Fidrmuc, J., & Schnatz, B., (2008). EU Enlargement and Trade Integration: Lessons from a Gravity Model, *Review of Development Economics*, vol. 12, no. 3, pp.562-576

Carballo, J., Graziano, A., Schaur, G., & Volpe Martincus, C., (2021). Import Processing and Trade Costs, *CESifo Working Paper* 9170

Centre d'Etudes Prospectives et d'Informations (CEPII). Gravity Database. Available at: http://www.cepii.fr/CEPII/en/bdd_modele/presentation.asp?id= [Accessed 10 March 2023]

Chen, M., & Aaditya, M., (2008). Regionalism in Standards: Good or Bad for Trade?, *Canadian Journal of Economics,* vol.41, no.3, pp.838-863

Cunningham, S., (2021). Causal Inference: The Mixtape, New Haven: *Yale University Press,* available online: https://mixtape.scunning.com/ [Accessed 17 May 2023]

De Munter, A., (2022). The Enlargement of the Union, European Parliament, available online: https://www.europarl.europa.eu/factsheets/en/sheet/167/the-enlargement-of-the-union [Accessed 10 May 2023]

European Commission. (n.d). Association agreement, Available online: https://neighbourhood-enlargement.ec.europa.eu/enlargement-policy/glossary/association-agreement_en [Accessed 18 May 2023]

European Commission. (2018). *EU competition policy in action*, Directorate-General for Competition, Publications Office, Available online:

https://data.europa.eu/doi/10.2763/897035 [Accessed 10 May 2023]

European Commission. (2020). Single market, Directorate-General for Communication, Publications Office, Available online:

https://data.europa.eu/doi/10.2775/282406 [Accessed 10 May 2023]

European Union, (2007). The 2004 enlargement: the challenge of a 25-member EU, Available online:

https://eur-lex.europa.eu/EN/legal-content/summary/the-2004-enlargement-the-challenge-of-a-25-member-eu.html [Accessed 10 May 2023]

Gaddis, J.L., (2005). The Cold War: A New History, New York: The Penguin Press

Gil, S., Llorca, R., & Martínez-Serrano, J., (2008). Assessing the Enlargement and Deepening of the European Union, *The World Economy*, vol. 31, no. 9, pp.1253-1272

International Monetary Fund, Direction of Trade Statistics Database (DOTS). Available at: https://data.imf.org/?sk=9D6028D4-F14A-464C-A2F2-59B2CD424B85-IMF Data [Accessed 10 March 2023]

Kaul, A., Klößner, S., Pfeifer, G., and Schieler, M. (2015). Synthetic control methods: Never use all pre-intervention outcomes together with covariates. Mpra paper, University Library of Munich, Germany.

Kenney, P., (2002). A Carnival of Revolution: Central Europe 1989, Princeton: Princeton University Press

Krugman, P., Obstfeld, M., & Melitz, M., (2018). International Economics: Theory and Policy, 11th edn, Pearsons

Kuzio, T., (1998). Ukraine: State and nation building, London: Routledge

Lašas, A., (2010). European Union and NATO Expansion, New York: Palgrave MacMillan

Plokhy, S., (2021). The Gates of Europe: A History of Ukraine, 2nd edn, New York: Basic Books

Saia, A., (2017). Choosing the open sea: The cost to the UK of staying out of the euro, *Journal of International Economics*, vol. 108, pp.82–98

Sekulić, T., (2020). The European Union and the Paradox of Enlargement: The Complex Accession of the Western Balkans, New York: Palgrave MacMillan

Shepotylo, O., (2009) EU Integration and Trade: A Look from the Outside of the EU Eastern Border, Available at SSRN: https://ssrn.com/abstract=1458277

Shepotylo, O., (2010). A Gravity Model of Net Benefits of EU Membership: The Case of Ukraine, Journal of Economic Integration, vol. 25, no. 4, pp.676–702

Shyrokykh, K., (2018). The Evolution of the Foreign Policy of Ukraine: External Actors and Domestic Factors, Europe-Asia Studies, vol. 70, no. 5, pp.832–850

Papazoglou, C., Pentecost, E., & Marques, H., (2006). A Gravity Model Forecast of the Potential Trade Effects of EU Enlargement: Lessons from 2004 and Path-dependency in Integration, The World Economy, vol. 29, no. 8, pp. 1077-1089

Appendix

Table A1: Weights for SCM baseline model, all lag model and 3 lags model.

Country	Baseline	All lags	3 lags
Czechia	0	0	0
Estonia	0	0	0.038
Hungary	0	0	0
Latvia	0	0	0
Lithuania	0.824	0.948	0.919
Poland	0	0.031	0.042
Slovakia	0.176	0.021	0
Slovenia	0	0	0

Table A2: Predictor balance for baseline model, all lag model and 3 lags model.

Baseline Model		
Predictor	Ukraine	Synthetic Ukraine
Exports 1993-2003	539.79	552.78
Log of GDP 1993-2003	20.30	19.07
Distance	1831.16	1472.5
Common border	0	0.176
All lags model (averaged per year)		
Predictor	Ukraine	Synthetic Ukraine
Exports (1993)	280.50	267.69
Exports (1994)	247.98	249.69
Exports (1995)	430.46	372.96
Exports (1996)	399.17	405.42
Exports (1997)	435.65	449.72
Exports (1998)	533.12	515.04
Exports (1999)	535.12	537.89
Exports (2000)	590.82	630.25
Exports (2001)	747.08	740.26
Exports (2002)	881.80	877.28
Exports (2003)	1144.27	1065.75
Log of GDP 1993-2003	20.30	18.96
Distance	1831.16	1520.87
Common Border	0	0.052
3 lags model (averaged per year)		
Predictor	Ukraine	Synthetic Ukraine
Exports (1993)	280.5006	284.09
Exports (1998)	533.125	543.43
Exports (2003)	1144.275	1105.65
Log of GDP 1993-2003	20.30	18.93
Distance	1831.16	1525.40
Common Border	0	0.042

Table A3: Difference between actual and synthetic aggregate exports from Ukraine to EU15 and measures of fit over different periods for all lags model and model with 3 lags.

	1993-2003	2004-2013		
		2004-2013	2004-2008	2009-2013
All lags (averaged per year)				
Difference actual vs synth.	-0.35%	-28.138%	-17.442%	-35.21%
	(0.0127)	(0.022)	(0.022)	(0.021)
RMSPE	46.795	883.295	461.077	1148.672
Post-RMSPE/Pre-RMSPE		18.876	9.853	24.547
3 lags (averaged per year)				
Difference actual vs synth.	-2.8%	-29.4%	-18.9%	-36.3%
	(0.024)	(0.021)	(0.021)	0.020
RMSPE	48.684	927.928	499.689	1200.768
Post-RMSPE/Pre-RMSPE		19.060	10.264	24.664

Standard errors are reported in parentheses.

Table A4. Data and data sources

Variable	**Measurement**	**Data source**
Export	Value of Exports to EU15, current USD.	International Monetary Fund, Direction of Trade Statistics Database
GDP	Real GDP, measured in current U.S dollars.	Centre d'Etudes Prospectives et d'Informations Internationales
Distance	Average distance between most populated cities, measured in km.	Centre d'Etudes Prospectives et d'Informations Internationales
Common land border	Dummy variable = 1 if country share a land border with the EU	Centre d'Etudes Prospectives et d'Informations Internationales

Table A5. Timeline of EU integration

Country	Membership application	Association agreement	EU-membership
Czechia	1996	1995	2004
Estonia	1995	1998	2004
Hungary	1994	1994	2004
Latvia	1995	1998	2004
Lithuania	1995	1998	2004
Poland	1994	1994	2004
Slovakia	1995	1995	2004
Slovenia	1996	1999	2004
Ukraine	2022	2017	TBD