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European Integration and Switzerland

A Synthetic Control Analysis of Switzerland's Trade Potential if Switzerland Had Joined the European Union

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Abstract

The objective of this paper is to investigate how Switzerland's trade outcomes would have evolved had it decided to join the EU. Using the 1995 EU enlargement for identification, the synthetic control method is applied to construct a counterfactual scenario in which Switzerland joined the EU in 1995 together with Sweden, Finland, and Austria. Comparing the actual and the synthetic bilateral trade flows between Switzerland and seven selected EU member countries leads to the conclusion that annual bilateral trade between Switzerland and the EU member states in the period 1995 to 2008 would have been on average around 1.1 percentage points higher if Switzerland joined the EU in 1995. This effect is shown to evolve over time, with some evidence of anticipation effects prior to 1995. The results are robust to a variety of model specifications and standard falsification tests.

Keywords – Switzerland, Synthetic Control, European Integration, Trade

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1 Introduction

The process of European integration can be traced back to 1945, in the aftermath of the Second World War, when the European continent was open to a new beginning, both politically and economically (Gilbert, 2020; Baldwin and Wyplosz, 2020; Urwin, 2014). Starting as a coal and steel community with six member states, the European Union (EU) has since grown into a deeply integrated organization covering all major areas of public policy (Leuffen et al., 2022). In recent years, however, growing discontent about EU membership in various member states and the first example of disintegration in the form of the British exit from the EU have led to renewed discussions about the potential costs and benefits of European integration (Leuffen et al., 2022). Given that trade is at the core of European integration efforts, an essential question arises regarding the potential impact on trade flows for non-member nations had they chosen to join the EU. This paper examines the impact of EU membership on trade flows by analyzing the specific case of Switzerland. In an era of growing EU skepticism and populist sentiment, Switzerland's special place in the EU has taken on new significance (Leuffen et al., 2022). Although Switzerland is not a member of the EU, it is geographically, politically, economically, and culturally closely integrated with the EU, making it an important case to analyze when assessing the costs and benefits of European integration (Blatter, 2015; European Commission, 2016; Vahl and Grolimund, 2006).

The objective of this paper is to investigate how Switzerland's trade outcomes would have evolved had it decided to join the EU. According to Gstöhl (2002), economic theory of integration would predict that small, advanced countries could benefit from joining a common market in terms of specialization opportunities, economies of scale, and beneficial effects of increased competition, especially if they are geographically and economically close to the common market and too small to individually affect the terms of trade. Joining the EU could offer Switzerland a more dynamic relationship compared to the relatively static bilateral agreements currently in place, but it would also entail a loss of independence. To analyze how Switzerland's trade outcomes would have evolved had it decided to join the EU, this paper applies the synthetic control method. The central idea of the synthetic control method is to compare a treated unit with a synthetic control unit formed as an optimally weighted combination of comparable untreated units (see Abadie, 2021). In this

paper, the treatment is determined by Switzerland's decision not to join the EU. Using the 1995 EU enlargement for identification, the synthetic control method allows for the construction of a synthetic Switzerland that joined the EU in 1995 along with Sweden, Finland, and Austria. A post-treatment comparison of actual and synthetic bilateral trade flows between Switzerland and seven selected EU member states robustly indicates that annual bilateral trade between Switzerland and the EU members would have been on average about 1.1 percentage points higher over the period 1995-2008 if Switzerland had joined the EU in 1995. The effect is shown to evolve, with some evidence of anticipation effects prior to 1995.

This paper contributes to the broader literature on European integration and trade outcomes. In previous research, the gravity model is used to evaluate, e.g., the trade related welfare gains of the European Single Market (e.g., Mayer et al., 2019) or the trade effects associated with the Schengen agreement (Davis and Gift, 2014). However, since the decision to join the EU is not a random event, the synthetic control approach provides a suitable alternative to the gravity model when assessing the impact of EU membership (Saia, 2017). The main focus of this paper is to evaluate the impact of EU membership on bilateral trade. The existing literature analyzing the trade effects of EU membership by means of the synthetic control method is quite limited and mainly focuses on the currency union effect on trade (e.g., Saia, 2017) or on outcomes other than bilateral trade (e.g., Campos et al., 2014). In contrast, this paper uses the synthetic control method to evaluate the effects of EU membership on trade, thereby addressing an additional country-specific research gap by analyzing the unique Swiss-EU relationship. Moreover, Switzerland's experience of remaining outside the EU while maintaining close ties provides valuable insights for the UK after the Brexit vote. Therefore, this paper further contributes to the more recent literature on Brexit (e.g., Du and Shepotylo, 2022; Douch and Edwards, 2022) by explicitly evaluating the Swiss option, discussed as an alternative UK-EU relationship in, e.g., Baimbridge and Whyman (2017).

The rest of the paper proceeds as follows. Chapter 2 introduces the reader to the relevant background of the topic. Chapter 3 outlines the previous research on European integration and Switzerland. The synthetic control method and its application to Switzerland are explained in detail in chapter 4. Chapter 5 analyzes and discusses the results. Chapter 6 concludes.

2 Background

The following sections introduce the reader to the relevant background of the analysis, outlining the history of European integration and the unique relationship between Switzerland and the EU.

2.1 European Integration History

Although its intellectual roots go back much further, the history of European integration is generally dated to 1945, after the end of the Second World War, when the European continent was open to a new beginning and the idea of European unity took root (Gilbert, 2020; Baldwin and Wyplosz, 2020; Urwin, 2014). Table 2.1 summarizes the chronology of the main events in the European integration process. In 1952, the Schuman plan was implemented as one of the first big steps towards European unity. It proposed the idea that France and Germany should have their coal and steel production controlled by a supranational authority called the European Coal and Steel Community (ECSC) (Baldwin and Wyplosz, 2020). Apart from France and West Germany, four other nations decided to join the ECSC, namely Belgium, Luxembourg, the Netherlands, and Italy. These countries are commonly referred to as "the Six" (Gilbert, 2020; Baldwin and Wyplosz, 2020). Following the ECSC, in 1957, the Treaties of Rome led to the creation of the European Economic Community (EEC) and the European Atomic Energy Community (Euratom), implementing the basis for profound economic integration via the creation of a customs union, free movement of workers, market integration and further common policies. In 1965, the ECSC, the EEC, and Euratom were merged into the European Communities (EC) (Baldwin and Wyplosz, 2020).

In response to the creation of the EEC, Austria, Denmark, Norway, Portugal, Sweden, Switzerland, and the United Kingdom set up their own bloc of trade arrangements, the European Free Trade Association (EFTA), which was joined by Finland in 1961, Iceland in 1970, and Liechtenstein in 1991. Unlike the EEC which aimed to create a customs union and a single market, the EFTA did not introduce a customs union since it only eliminated tariffs and quotas on industrial products but did not introduce a common external customs tariff (Schwok, 2009; Leuffen et al., 2022).

Table 2.1: European Integration Timeline

	Steps of European Integration
1952	European Coal and Steel Community (France, West Germany, Italy, the Netherlands, Belgium, Luxembourg)
1957	Treaties of Rome (European Economic Community and European Atomic Energy Community)
1973	Northern Enlargement (Denmark, United Kingdom, Ireland)
1981	Greek Enlargement
1986	Southern Enlargement (Spain, Portugal)
1986	Single European Act (Single Market)
1992	Treaty of Maastricht (European Union)
1999	Introduction of the Euro
2004	Eastern Enlargement I (Estonia, Latvia, Lithuania, Poland, Czechia, Slovakia, Hungary, Slovenia, Malta, Cyprus)
2007	Eastern Enlargement II (Romania, Bulgaria)
2013	Croatian Enlargement
2020	Brexit

Notes: Table 2.1 summarizes the timeline of the European integration process. Source: Leuffen et al. (2022).

However, as the economic situation within the EEC bloc improved rapidly, the United Kingdom was the first to apply for EEC membership in 1961 and thereby set the starting point for the enlargement of the EEC, followed by further membership applications from Ireland, Norway, and Denmark. Switzerland was one of the EFTA members not applying for membership in the first round of enlargement for political reasons of neutrality. Denmark, the UK, and Ireland joined the EC in 1973, while Norway's membership request was granted but got rejected by the Norwegian population in a referendum. This first enlargement was accompanied by a set of bilateral free trade agreements between the remaining EFTA members and the EC (Baldwin and Wyplosz, 2020). In 1985, the Schengen Agreement was signed by France, West Germany, Belgium, the Netherlands, and Luxembourg, removing passport requirements for working and traveling across Europe, allowing Schengen members to work, visit and reside in any other member state without restrictions (Davis and Gift, 2014; Leuffen et al., 2022). In 1981, Greece joined the EC, followed by Portugal and Spain in 1986 (Puzzello and Gomis-Porqueras, 2018).

European integration progressed further with the Single European Act of 1986, fostering the establishment of the European Single Market. The Single Market Act introduced major institutional changes and strengthened the free movement of goods, services, people, and capital, removing remaining restrictions and moving towards a single currency (Baldwin and Wyplosz, 2020). In 1992, the Treaty of Maastricht marked another major step in the European integration process, including changing the name from the European

Community (EC) to the European Union (EU). The treaty provided for economic union and established the economic and legal conditions for the future creation of a single European currency, targeting a monetary union by 1999 and the adoption of the euro by 2002 (Baldwin and Wyplosz, 2020; Puzzello and Gomis-Porqueras, 2018).

2.2 The 1995 Enlargement

In 1989, Austria applied for EU membership, closely followed by membership applications of Sweden in 1991, and Finland, Switzerland, and Norway in 1992 (Campos et al., 2022). These new EC membership applications of Austria, Sweden, Finland, Norway, and Switzerland were made possible through the end of the Cold War that lifted Soviet restrains and neutrality obligations (Baldwin and Wyplosz, 2020). However, Norwegian voters rejected membership in a referendum in 1994. Instead, the EFTA members Norway, Liechtenstein, and Iceland joined the European Economic Area (EEA). In addition, also Austria, Finland, and Sweden were granted access to the Single Market through the EEA agreement in 1994 (Campos et al., 2022). Through the EEA agreement, signed in 1992 and implemented in 1994, EFTA economies could gain access to the Single Market by paying contributions and adopting laws and regulations without the possibility of formal representation or the power to influence policies (Baldwin and Wyplosz, 2020).

In Switzerland, when the EEA agreement was signed in 1992, the majority of the Swiss population seemed to support it (Blatter, 2015). Nevertheless, the EEA agreement got rejected in a narrow referendum by 50.3 percent of the voters (Schwok, 2009; Kużelewska, 2013). Since the Swiss believed joining the EEA to be a certain gateway to full membership in the future, the reasons for the EEA rejection coincide with the reasons for the rejection of full EU membership. The rejection was mainly based on political arguments as Switzerland tried to remain outside of any political community that would threaten the special Swiss political standing of neutrality and direct democracy. In contrast, trade outcomes seemed to play a minor role in the decision process and were not prevalent in the public discussion (Blatter, 2015; Kużelewska, 2013).

As a result of the Norwegian and the Swiss referenda, only Austria, Sweden, and Finland joined the EU in the fourth enlargement, the Scandinavian enlargement, that brought the EU to 15 members in 1995 (Campos et al., 2022). This paper uses the 1995 enlargement

as its identification strategy, similar to Campos et al. (2022). It exploits the fact that in 1995, according to EU accession negotiations, Switzerland and Norway could be seen as similarly ready to join as the countries that actually joined, namely Austria, Finland, and Sweden (Campos et al., 2022; Blatter, 2015). As the 1995 enlargement of the EU was preceded by the EEA agreement and lengthy membership discussions, it is crucial to acknowledge the potential anticipation effects that may have influenced trade among the participating nations prior to 1995. This paper, therefore, also examines these potential anticipation effects in its empirical analysis (see chapters 4 and 5).

2.3 European Integration Today

In 2004, the eastern enlargement led to ten new members (Estonia, Latvia, Lithuania, Poland, Czechia, Slovakia, Hungary, Slovenia, Malta, and Cyprus), followed by Romania and Bulgaria in 2007, and Croatia in 2013 (Epstein and Jacoby, 2014). In recent years, the EU has been facing challenges from different directions that influence the European integration process. With the Global Financial Crisis in 2008, the EU fought a major caveat on its common currency (see, e.g., Baldwin and Wyplosz (2020) for a more detailed discussion). In addition, the EU has been confronted with rising EU skepticism and populism in several member states, fueled by the 2015 European migrant crisis (Baldwin and Wyplosz, 2020). In 2016, British people voted for the UK to leave the EU, implemented in 2020 (Leuffen et al., 2022). Today, the EU comprises 27 member states, with Serbia, Moldova, Ukraine, Bosnia and Herzegovina, Albania, Turkey, Montenegro, and North Macedonia undergoing accession negotiations (European Union, 2023). Among the 27 members, 19 are part of the eurozone, six countries have adopted the euro without being in the EU, and four non-members, namely Iceland, Liechtenstein, Norway, and Switzerland, are part of the Schengen area (Leuffen et al., 2022).

2.4 Switzerland-EU Trade Relations

Switzerland is a small country surrounded by four important EU member states (Germany, Italy, France, Austria). Although Switzerland is not a member of the EU, it is geographically, politically, economically, and culturally closely integrated with the EU and also qualifies for membership (Blatter, 2015; European Commission, 2016). From a

trade perspective, the EU is Switzerland's main trading partner (accounting for 42 percent of Switzerland's exports in goods and 50 percent of imports), while Switzerland is the EU's fourth largest trading partner after China, the US, and the UK (The Diplomatic Service of the European Union, 2021*a*). Switzerland's trade with its neighboring countries Austria, Germany, France, and Italy (around 80 billion EUR per year) exceeds its trade with Brazil, Russia, India, China, and South Africa combined (The Diplomatic Service of the European Union, 2021*b*).

Historically, the foundation of Switzerland's trade relations with the EU are given by its membership in the EFTA and the Free-Trade Agreement signed between Switzerland and the EC in 1972 that removed tariffs and quotas on industrial products (Schwok, 2009; Kużelewska, 2013). After the close rejection of EEA membership in 1992, Switzerland and the EU negotiated an agreement known as Bilaterals I, signed in 1999. Bilaterals I include seven sectoral agreements regarding public procurement, free movement of persons (right to live and work in the EU or Switzerland), agriculture, air and land transport, research, and technical trade barriers, that together allow for Switzerland's integration in the common market and give EU citizens the freedom to settle in Switzerland (Blatter, 2015; European Commission, 2016). Bilaterals I is accompanied by a second set of agreements, known as Bilaterals II, signed in 2004. Bilaterals II cover, among others, additional agreements on agriculture, media, and contribution obligations, and removal of border controls for individuals within the Schengen area such that individuals from any EU country may move and reside freely within the Swiss borders (Kużelewska, 2013; Blatter, 2015; European Commission, 2016).

In total, more than 120 complex bilateral agreements organize the relationship between Switzerland and the EU (The Diplomatic Service of the European Union, 2021*a*). Table 2.2 summarizes the main agreements that are currently in place. By granting similar rights to individuals and companies as those in the EU/EEA, the agreements have led to a close integration of Switzerland with the EU, making Switzerland one of the most integrated countries compared to other EU external relations (Vahl and Grolimund, 2006; Blatter, 2015). For full EU members, the EU Customs Union eliminates tariffs on intra-EU trade and ensures a common external tariff, while the EU Single Market guarantees the free movement of goods, services, capital, and persons by removing non-tariff barriers (Bottasso and Sembenelli, 2001). Through the Swiss bilateral agreements Switzerland is provided

Table 2.2: Bilateral Agreements between Switzerland and the EU

	Agreement
1972	Free Trade Agreement (industrial products)
1991	Direct insurance other than life insurance
1999	Bilateral I (free movements of persons, technical trade barriers, public procurement, agriculture, research, land and air transport)
2004	Bilateral II (Schengen Area/Dublin Convention, taxation, fight against fraud, processed agricultural products, media, environment, statistics, pension)
2006	Financial contribution of Switzerland as counterpart of Switzerland's participation in the Single Market
2004	Europol
2008	Eurojust
2010	Agreement on education, vocational training and youth programs
2011	Agreement on reciprocal protection of registered designations of origin
2012	Cooperation with the European Defence Agency
2013	Cooperation between competition authorities, Satellite navigation
2014	European Asylum Support Office EASO
2019	Police cooperation Prüm (2019)

Notes: Table 2.2 summarizes the main bilateral agreements in place between Switzerland and the EU. Sources: Kużelewska (2013); Vahl and Grolimund (2006); The Diplomatic Service of the European Union (2021*a*).

access to parts of the EU's internal market while being obliged to contribute to its costs and adapt to EU laws and market regulations (Vahl and Grolimund, 2006; Leuffen et al., 2022; Blatter, 2015).

However, compared to full EU membership, Switzerland is not granted any rights to participate in EU decision shaping (Vahl and Grolimund, 2006). According to Vahl and Grolimund (2006), the lack of an agreement regarding services serves as another illustration of the disparities between Switzerland's EU market access and full EU membership. Since Bilaterals I and Bilaterals II do not foresee a harmonised competition policy, Switzerland further experiences a smaller increase in competitive pressure compared to full EU members (Breuss, 2006). In addition, the Swiss bilateral approach does not dynamically incorporate changes in the Single Market, which makes it more static compared to the EEA agreement. In this regard, the Swiss bilateral approach falls short in relation to EEA membership, making Switzerland less integrated with the EU in contrast to EEA members like Norway. In 2014, the EU and Switzerland started negotiating an Institutional Framework Agreement (IFA), which would establish a more dynamic relationship and modernize Switzerland's access to the Single Market by adopting similar procedures to those used in the EEA (Leuffen et al., 2022). However, the negotiations of the IFA were terminated in 2021 by the Swiss Federal Council, implying the aging of existing agreements

that might include organizational and monetary effort for controls that are not yet included in existing agreements (The Diplomatic Service of the European Union, 2021*b*). Another major difference compared to full EU membership is that Switzerland is allowed to conclude its own trade agreements with third nations, whereas for full EU members, the EU is the sole entity allowed to negotiate trade agreements with nations outside the EU (Baldwin and Wyplosz, 2020). While this allocation of power to a supranational level might be seen as a loss of power on the national level, chapter 3 discusses the main finding of how European integration benefited trade outcomes for EU member countries.

3 Literature Review

The following chapter discusses the relevant previous literature on the topic of European integration, trade, and the Swiss-EU relationship. It outlines the benefits of European integration, to which this paper adds the new perspective of trade outcomes in Switzerland.

3.1 Economic Benefits of European Integration

Previous literature on the (trade) effects of European integration for countries that joined, partly joined, or did not join the EU is mainly dominated by the use of gravity models. For instance, Davis and Gift (2014) make use of a gravity model of trade to analyze how the Schengen agreement affects trade via increased immigration and labor mobility. They find that if two countries are Schengen members, total trade between them increases, suggesting a positive influence of the Schengen agreement on European integration via trade. Mion and Ponattu (2019) and Mayer et al. (2019) evaluate the economic benefits of the European Single Market, using a gravity model of trade for European and non-European regions, and show how all regions investigated benefit from the Single Market in terms of welfare, productivity, and trade. In close alignment with Mion and Ponattu (2019), Mayer et al. (2019) conclude that all member countries gain from the EU in terms of welfare from trade, whereby small open economies gain the most. Noteworthy, Switzerland is found to be the country benefiting the most from participating in the Single Market in terms of annual per capita welfare gains, presumably due to its high productivity and comparably low population size (Mion and Ponattu, 2019).

In addition to the widely used gravity model, the synthetic control method has proven to be a useful tool in the policy evaluation literature in more recent studies. However, comparably few studies make use of the synthetic control method in the context of EU membership. For instance, Campos et al. (2014) find positive effects of EU membership for countries that joined the EU between 1973 and 2004 in terms of GDP per capita and labor productivity, using the synthetic control method to construct plausible counterfactual scenarios. Similar results are obtained by Lehtimäki and Sondermann (2020), using the synthetic control method to estimate the effects of the European Single Market on GDP per capita. Their research suggests that the benefits of the Single Market are most pronounced among smaller member countries. In addition, various recent studies make use of the synthetic control method to analyze the currency union effects on GDP per capita, evaluating the effects of a common currency for countries that decided not to join the euro such as Denmark or Sweden (Cho and Wong, 2021; Lin and Chen, 2017).

Overall, the previously described studies all use the synthetic control method to evaluate the impact of deeper European integration on productivity and GDP outcomes. However, especially given that, compared to GDP or welfare gains, trade is a direct outcome of European integration, surprisingly little work has been done in evaluating trade outcomes of European integration by means of the synthetic control method. The main studies in this area focus on the trade effects of deeper monetary integration by evaluating the introduction of a common currency. For instance, using the synthetic control method, Gabriel and Pessoa (2020) analyze for each country within the eurozone how it would have evolved without adopting the euro in terms of economic growth and trade. Similarly, Saia (2017) uses the synthetic control method to analyze the counterfactual trade flows if the UK had adopted the euro and finds that both trade within Europe and outside Europe would have been higher in the counterfactual scenario of a single currency.

In contrast to evaluating the trade effects of a common currency, this paper uses the synthetic control method to evaluate the effects of EU membership on trade outcomes. Given the broad consensus of previous research on the benefits of European integration, this paper contributes to the existing literature on European economic integration by using the comparatively novel synthetic control approach to analyze the question of how being very closely integrated with the EU while not being a full member affects trade. As the special case of Switzerland constitutes a precise example of deep integration without full

membership, this paper further addresses a country specific research gap, as outlined in the following subchapter.

3.2 European Integration and Switzerland

As Vahl and Grolimund (2006) point out, the relationship between the EU and Switzerland has received comparatively little coverage in the field of European studies. One example, explicitly analyzing the Swiss case, is given by Ecoplan (2015). Showing how Switzerland is benefiting from European integration, Ecoplan (2015) makes use of a computable general equilibrium model to describe what would happen with not more but less European integration of Switzerland. Without the bilateral trade agreement (Bilaterals I), Switzerland would lose not only in terms of economic growth and GDP but also in terms of legal security and attractiveness of location (Ecoplan, 2015). In comparison to the more limited bilateral agreements, Grether and Müller (2001) find no additional welfare gains from full EU accession when comparing different stages of integration by means of a steady state general equilibrium model. In terms of trade, however, Breuss (2006) finds that a potential Customs Union between Switzerland and the EU would raise trade between the two parties by around 3 percent, using a numerical general equilibrium model. The analysis presented in this paper builds on this result by means of a new method, aiming to address the country specific research gap by analyzing Switzerland in the context of EU membership. This is particularly interesting since Switzerland is a small, open economy in the center of Europe and thus resembles most closely the description of the main beneficiaries of European integration as discussed in previous research (e.g., Mion and Ponattu, 2019; Mayer et al., 2019; Lehtimäki and Sondermann, 2020).

In addition, Switzerland's experiences from retaining access to the Single Market without becoming a full EU member are closely connected to more recent evaluations of the Brexit vote. Similar to the analysis of Switzerland, studies on the UK's decision to leave the EU focus on evaluating the consequences of not being a full member while maintaining close ties. For instance, Du and Shepotylo (2022) assess the negative impact of the Brexit vote on the UK's service trade through a synthetic difference and differences analysis. Using the synthetic control method, Brexit is further shown to have negative impacts on the UK's GDP (Born et al., 2017) and trade outcomes (Douch and Edwards, 2022). By focusing on

Switzerland's special relationship with the EU, this paper contributes to the literature on Brexit by explicitly evaluating the Swiss option that is discussed as an alternative UK-EU relationship in, e.g., Pérez Crespo (2017) or Baimbridge and Whyman (2017).

Since the situation of Switzerland is comparable to that of Norway, previous research on Norway might add valuable insights into the Swiss case under investigation. As a most recent example, Campos et al. (2022) study the productivity effects of European integration for Norway, exploiting the 1995 enlargement with a synthetic difference in differences approach, and find that Norway would have experienced positive productivity effects if it joined the EU in 1995. Comparable to previous research that finds positive effects of deep agreements (Mattoo et al., 2022; Campos et al., 2015; 2020), Campos et al. (2022) estimate larger benefits from institutional compared to pure economic integration. They further compare the effects for Norway with preliminary analyses for Iceland and Switzerland and find productivity losses for both countries relative to their counterfactuals. This paper, like Campos et al. (2022), uses the EU enlargement of 1995 as a basis for analysis. However, unlike Campos et al. (2022), this paper focuses on trade outcomes rather than productivity gains, which is appropriate given that trade constitutes a core effort of deeper European integration. Similar to Saia (2017), the Swiss trade outcomes, in the counterfactual scenario of Switzerland being a member of the EU, are analyzed by means of a comparably new econometric method, which, to the best of my knowledge, has not been done before. Combining the analysis of Switzerland's trade outcomes in the context of European integration with the EU enlargement of 1995 allows to exploit the advantages of the synthetic control method, as described in chapter 4.

4 Empirical Strategy

Using the synthetic control method, this paper estimates the hypothetical trade flows between Switzerland and its trade partners that would have occurred if Switzerland had decided to join the EU. The synthetic control method allows for the creation of a synthetic Switzerland that can be compared to the real Switzerland in order to analyze the causal effects of a counterfactual European integration on trade outcomes. The following sections introduce the synthetic control method, provide a detailed outline of the methodology, and describe its application to the case of Switzerland.

4.1 Introducing the Synthetic Control Method

The synthetic control method is one of the most recent econometric methods to understand causal effects. It was first introduced by Abadie and Gardeazabal (2003) and has since gained significant prominence (Abadie, 2021). The synthetic control method generalizes the well-established difference in differences method which is a quasi-experimental method based on comparing observations on a treatment and control unit before and after treatment under the parallel trend assumption (Cunningham, 2021). Similar to the difference in differences method, the synthetic control method aims to estimate the effect of an intervention (treatment) on some outcome of interest by comparing a treated with a counterfactual untreated unit on an aggregate level (Abadie, 2021).

The synthetic control method differs from the difference in differences method in that it utilizes a more appropriate selection of comparison units, allowing for the creation of a more reliable counterfactual scenario (Saia, 2017). Instead of choosing one single comparison unit, the synthetic control method uses a data driven procedure to suggest an optimally weighted combination of unaffected units (the donor pool) as a more appropriate comparison to represent the counterfactual scenario of what would have happened to the treated unit without treatment (Abadie, 2021). The weights are chosen such that the common trend assumption holds, meaning that the trend of the counterfactual unit is matched with the trend of the treated unit before the treatment takes place (Cunningham, 2021).

4.2 Advantages of the Synthetic Control Method

Relative to other statistical methods used for causal inference (e.g., OLS regression) and given its correct application, the synthetic control method comes with many advantages. Since it is a data driven approach, there is no extrapolation needed and the counterfactual can be constructed without access to post-treatment outcomes. In addition, the data driven optimization algorithm minimizes possibilities of subjective researcher bias, specification searches, and p-hacking (Abadie, 2021). An optimally weighted combination of comparison units derived by an algorithm, as used in the synthetic control method, is likely to be more precise and less biased than a single comparison unit or an equally weighted combination of

comparison units (Kaul et al., 2015). The synthetic control method is very transparent in disclosing the weights chosen and the specific contribution of each unit to the counterfactual. As such, it is easy to interpret and evaluate (Abadie, 2021; Cunningham, 2021). This paper exploits the advantages of the synthetic control method by using it to evaluate the question of how Switzerland's trade flows would have evolved if Switzerland had joined the EU. The following sections outline the formal notation of the method and how it is applied to the special case of Switzerland.

4.3 Synthetic Control Method Notation

Using the notation of Brox and Krieger (2021) and Abadie (2021), we observe $j = 1, ..., J+1$ units in periods $t = 1, ..., T$. Suppose that the first unit l_1 $(j = 1)$ is exposed to the treatment in period t_0 and remains treated in all periods $t > t_0$. The remaining J units $(D = l_2, \ldots, l_{J+1})$ are untreated and constitute the donor pool of potential controls (Abadie, 2021; Brox and Krieger, 2021). The period T is divided into two parts. $T < t_0$ represents the pre-treatment period used for the matching process, while the post-treatment period $T \geq t_0$ is used for the estimation of the treatment effect by comparing the synthetic control unit with the actual unit (Abadie et al., 2010). For each unit (treated and untreated), we observe a set of k predictor variables $X_{1j}, \ldots, X_{kj}$ which may also include the outcome variable of interest pre-treatment (Abadie, 2021).

With this setting in mind, the goal of the synthetic control method is to estimate the treatment effect as follows.

$$\eta_{1,t} = Y^I_{1,t} - Y^N_{1,t} \qquad \forall t \geq t_0 \tag{4.1}$$

In Equation 4.1, $Y^I_{1,t}$ constitutes the observed outcome under treatment while $Y^N_{1,t}$ represents the unobserved counterfactual outcome. In the synthetic control method, the unobserved counterfactual outcome is calculated as a weighted average of observed outcomes of the units in the donor pool (Brox and Krieger, 2021). The synthetic control method addresses the question of how the weights should be chosen optimally such that the synthetic control mimics the performance of the dependent variable for the treated unit in the absence of the treatment (Cunningham, 2021). To this end, the method comprises a nested optimization problem that tries to find optimal weights of each unit in the synthetic control as well

as optimal weights of each variable in predicting the synthetic control such that the counterfactual synthetic unit closely mirrors the pre-treatment values of predictors of the treated unit (Abadie, 2021; Ferman et al., 2020).

$$\min_{\omega} \ [(X_{l_1} - X_D \ \omega)' V (X_{l_1} - X_D \omega)]^{0.5} \quad s.t. \sum_{j \in D} \omega_j = 1 \text{ and } \omega_j \geq 0 \tag{4.2}$$

Equation 4.2 (as taken from Brox and Krieger (2021)) formally describes the aim of the synthetic control method, namely to minimize the difference between the pre-treatment characteristics of the treated and the untreated units (X_{l_1} and X_D, respectively) (Brox and Krieger, 2021). The weights ω are required to be positive and to sum to one. The nested minimization problem consists of choosing the optimal weighting vector ω that is a measure of the relative importance of each control unit in the synthetic control of the treated unit, and choosing the optimal matrix V that measures the relative importance of the predictor variables (Ferman et al., 2020; Brox and Krieger, 2021).

4.4 Applying the Method to Switzerland

Prior to the synthetic control method, the gravity equation was widely used to determine the impacts of trade liberalization. However, in cases where the decision to participate in increased trade liberalization is not a random event, the synthetic control method provides a suitable alternative to the gravity equation (Saia, 2017). In addition, the lack of a clear counterfactual that satisfies the parallel trend assumption when analyzing the trade outcomes of Switzerland if Switzerland joined the EU would likely introduce a bias in the usage of a pure difference in differences approach (Cunningham, 2021). Given the many advantages of the synthetic control method (see section 4.2), the synthetic control method is thus chosen as the most suitable approach to analyze Swiss trade flows if Switzerland had joined the EU. The goal is to estimate the effect of an intervention (not joining the EU) on an aggregate outcome variable (bilateral trade flows), comparing a country affected by the intervention (Switzerland) with a synthetic control group.

The main idea is to construct synthetic Swiss-EU country pairs out of a pool of country pairs that did join the EU. Pre-treatment, the trade flows of the synthetic unit (the counterfactual) should behave like the trade flows of the real unit. After not joining the

EU, the treatment effect is determined by comparing the trade flows of the weighted unit (synthetic Switzerland) to that of the actual unit (real Switzerland) (Saia, 2017). If the synthetic Switzerland and the real Switzerland show enough similarity prior to the treatment (not joining the EU) and the participation in the EU is the sole distinguishing factor between the two, a causal effect can be inferred (Brox and Krieger, 2021). In order to assess the causal impact of the treatment (not joining the EU), it is essential to assume that the treatment is exogenous and that there are no issues of reverse causality or self-selection bias (Cho and Wong, 2021). In the case of Switzerland, the decision not to join the EU was given by a referendum. The decision can be considered exogenous if voters did not make their decision based on trade outcomes. Although trade may have influenced the voting choices of some individuals, it can be assumed that the aggregate decision was influenced primarily by political rather than economic reasons, as discussed in chapter 2, which provides a strong argument in favor of the exogeneity assumption (see Cho and Wong (2021) for a similar discussion). However, the assumption of exogeneity should generally be approached with caution, as it is not entirely justifiable to declare a country's decision to join the EU as completely free from economic factors, especially considering the projected advantages of joining the EU on trade (Cho and Wong, 2021).

4.4.1 Donor Pool

Additionally to the exogeneity assumption, the synthetic control method requires the comparison units to be unaffected by the treatment. The donor pool should thus only consist of country pairs where the spillover effect of Switzerland's decision not to join the EU can be considered negligible. Indeed, due to Switzerland's relatively small size compared to the rest of the EU, it is probable that any potential spillover effects would be negligible (Cho and Wong, 2021). In addition, Abadie (2021) suggests that the donor pool should only comprise units that are considered comparable in observed and unobserved factors to the treated unit. Therefore, when analyzing the impact of not joining the EU on Swiss trade outcomes, this paper uses the EU enlargement of 1995 as the basis for the creation of the donor pool. Using the 1995 enlargement as identification strategy in the context of this analysis yields several advantages when selecting the donor pool. Prior to the 1992 referendum in Switzerland, when Swiss people voted against joining the EEA, Sweden, Finland, Austria, and Switzerland were all EFTA members ready to join

the EU. In this context, Switzerland can be considered to be as ready for accession as the countries that actually joined, namely Austria, Finland, and Sweden (Campos et al., 2022; Blatter, 2015). Selecting the donor pool on the basis of the 1995 enlargement thus provides a non-arbitrary choice of countries that are most similar to Switzerland prior to the intervention (EU enlargement of 1995). However, it is important to note that while Switzerland, Sweden, Finland, and Austria were all EFTA members prior to 1995, in contrast to Switzerland, the other three countries (Sweden, Finland, and Austria) also joined the EEA in 1994, which subsequently increased their level of trade integration within the EU compared to Switzerland. Therefore, when selecting the donor pool in the special case of Switzerland, one has to keep in mind that the comparison group has a higher level of trade integration than the country pairs involving Switzerland since the Swiss accords do not offer equivalent market access as being part of the customs union and single market. When interpreting the trade outcomes, it is important to remember that the unique features of Switzerland are likely to cause a bias in the results. Under the strong assumption that trade integration according to the Swiss accords is reasonably similar to the trade integration when being part of the customs union and single market, three countries that joined the EU in 1995 (Austria, Finland, Sweden) together with seven countries that joined prior to 1995 (Italy, Germany, France, The Netherlands, Ireland, Denmark, and the United Kingdom) are chosen to constitute the comparison units.

The seven countries that joined the EU prior to 1995 are chosen such that the pre-intervention period is sufficiently large. Therefore, Greece, Spain, and Portugal, which joined the EU only in the 1980s, are excluded from the donor pool as corresponding country pairs would involve a too small pre-treatment period. Of the original six member states (Germany, France, Italy, the Netherlands, Belgium, Luxembourg), Belgium and Luxembourg are excluded from the donor pool due to insufficient data availability. Instead, the 1973 enlargement (Denmark, Ireland, and the United Kingdom) is included in the donor pool, allowing for a pre-intervention period of 19 years (1975 to 1994). Setting the start of the pre-intervention period to 1975 instead of 1973 takes account of the fact that it may take some time from the exact year of accession (1973) to become a fully-fledged member.

With this choice of eleven countries (Denmark, France, Germany, Ireland, Italy, the Netherlands, United Kingdom, Austria, Sweden, Finland, Switzerland) a total of 21 donor

country pairs can be constructed such that each country pair in the donor pool consists of country A being either Austria, Sweden, or Finland, and country B being either Denmark, France, Germany, Ireland, Italy, the Netherlands, or the UK. The 21 donor country pairs are then used to construct the counterfactuals for each of the seven country pairs involving Switzerland as county A and Denmark, France, Germany, Ireland, Italy, Netherlands, or the UK as country B. As the outcome variable of interest in this paper is the average of two-way bilateral trade flows (see Appendix A1), the direction of trade, and thus the order of country A and country B in each country pair, does not need to be taken into account.

Following the notation in Saia (2017), the synthetic control approach is explained by taking as an example the particular trade flow between Switzerland and Italy. As shown in Equation 4.3, the goal is to estimate the percentage difference (in year $t \geq t_0$) between the bilateral trade flow of Switzerland-Italy and the bilateral trade flow of Switzerland(EU)-Italy, where Switzerland(EU) is the unobserved counterfactual of a Switzerland that joined the EU (country codes as in Appendix A1).

$$\eta_{t,CHE-ITA} = \left(\frac{TF_{t,CHE-ITA} - TF_{t,CHE(EU)-ITA}}{TF_{t,CHE(EU)-ITA}} \right) \times 100 \tag{4.3}$$

Given that the bilateral trade flow (TF) between a Switzerland that joined the EU and Italy (represented by $TF_{t,CHE(EU)-ITA}$) is unobserved, a credible counterfactual that can mimic this bilateral trade flow must be created (Douch et al., 2018). Since arbitrarily choosing an observable pair to represent Switzerland(EU)-Italy (e.g., Sweden-Italy) would introduce a selection bias, the synthetic control method is used to find an optimally weighted combination of country pairs from the donor pool to represent the unobserved country pair Switzerland(EU)-Italy (Saia, 2017; Douch et al., 2018). The percentage difference in trade flows of Switzerland-Italy as the treated unit and the counterfactual trade flow of Switzerland(EU)-Italy in year $t \geq t_0$ can then be estimated as in Equation 4.4.

$$\hat{\eta}_{t,CHE-ITA} = \left(\frac{TF_{t,CHE-ITA} - \sum_{j=2}^{J+1} \omega_j TF_{t,j}}{\sum_{j=2}^{J+1} \omega_j TF_{t,j}} \right) \times 100 \tag{4.4}$$

In Equation 4.4, the weights for the synthetic unit $\sum_{j=2}^{J+1} \omega_j TF_{t,j}$ are chosen as to solve the minimization problem in Equation 4.2. For each of the seven Swiss-EU country pairs, we get an effect estimate for each year $t \geq t_0$ calculated as in Equation 4.4.

The percentage difference between actual and synthetic bilateral trade flows for each country B over the entire period 1995 to 2008 is then calculated as in Equation 4.5. It describes how much more or less trade there would have been on average over the period 1995 to 2008 between Switzerland and country B had Switzerland decided to join the EU in 1995.

$$\hat{\eta}_{1995-2008,CHE-B} = \left(\frac{\sum_{t=1995}^{2008} \left[TF_{t,CHE-B} - \sum_{j=2}^{J+1} \omega_j TF_{t,j} \right]}{\sum_{t=1995}^{2008} \sum_{j=2}^{J+1} \omega_j TF_{t,j}} \right) \times 100 \tag{4.5}$$

Summing over all seven Swiss-EU country pairs per year yields the yearly aggregate effect, calculated as the percentage difference between actual and synthetic aggregate trade flows for each year in the post-treatment period. It describes how much more or less trade between Switzerland and the EU member states there would have been on average in year t had Switzerland decided to join the EU in 1995.

By summing over all seven Swiss-EU country pairs over the post-treatment period 1995 to 2008, the total effect of EU membership on trade flows between Switzerland and the EU member states is calculated as the percentage difference between actual and synthetic aggregate trade flows over the entire post-treatment period (following Saia (2017)). The total effect estimate describes how much more or less trade between Switzerland and the EU member states there would have been on average over the period 1995 to 2008 had Switzerland decided to join the EU in 1995.

4.4.2 Variable Selection

Similar to selecting the donor pool country pairs, careful consideration should also be given to the choice of pre-treatment characteristics for the successful implementation of the synthetic control method. Predictor variables are chosen such that the synthetic control unit closely approximates how the treated unit's variable of interest would have evolved in the absence of treatment (Kaul et al., 2015). Predictor variables can include pre-treatment values of the outcome variable as well as other predictors (Abadie, 2021). As Ferman et al.

(2020) point out, the lack of guidance when choosing predictor variables creates some room for specification searching. This paper thus includes various specifications into the analysis to make it more reliable.

In line with theoretical recommendations, this paper compares the results of two main specifications. The first specification matches the treated unit with respect to pre-treatment outcome values as well as pre-treatment values of predictors of the outcome variable, taking into account that predictors other than pre-treatment outcome values may play an important role in the matching process while ignoring them may lead to a potential bias of the estimated treatment effect (Abadie, 2021; Botosaru and Ferman, 2019; Kaul et al., 2015). Following the model specification of Saia (2017), this paper uses as a benchmark the specification with pre-treatment outcome values from 1980 to 1994 together with covariates measuring GDP (the averaged sum of the logs of country pairs GDPs (measured in current thousands US-Dollars)), distance between the two countries, the use of a common language, and adjacency. Appendix A1 explains the calculation of these covariates.

When dealing with trade outcomes, it makes sense to take distance and adjacency into account as countries that are in geographical proximity and share borders are likely to have trade facilitating partnerships (Davis and Gift, 2014). In addition, a common language between countries might influence trade outcomes via "enhanced social and economic relations" (Davis and Gift, 2014). In the case when the matching includes predictors other than the pre-treatment outcomes, Kaul et al. (2015) advise against including all pre-treatment lags as in this case all covariates become irrelevant in the matching process, which justifies the choice of using some but not all outcome lags in the first specification of the model.

In a second specification, covariates are excluded, and, instead, all pre-treatment outcome values are used for the matching process in line with theoretical recommendations by Ferman et al. (2020). In the absence of covariates, Ferman et al. (2020) recommend using the specification that includes all pre-treatment periods as this specification minimizes the root mean squared prediction error (RMSPE) of the synthetic control estimator and eliminates any arbitrary or subjective choices.

4.4.3 Inference and Robustness Tests

In the context of the synthetic control method, traditional means of inference cannot be applied due to small sample sizes, lack of randomization, and non-probabilistic sampling (Abadie et al., 2015). Therefore, when applying the synthetic control method, falsification exercises are used as alternative modes of inference. These alternative modes of inference are based on the idea that the validity of the obtained results needs to be questioned when similar effects are obtained in the absence of treatment, e.g., when reassigning the treatment to a unit in the control group that should be unaffected or when reassigning the treatment date to a date prior to the actual treatment (Abadie et al., 2015).

A common method to draw causal inference in the synthetic control setting is based on the permutation approach proposed by Abadie et al. (2010). This paper uses the permutation approach to determine whether the estimated effects are statistically different from zero. Specifically, the permutation approach involves comparing the estimated effect for country pairs involving Switzerland with the effects estimated for placebo units (Saia, 2017). The idea is to assign the treatment to a unit in the donor pool, exclude the treated unit for the construction of the synthetic control, estimate and store the placebo effect, and repeat the procedure for every unit in the donor pool (Brox and Krieger, 2021; Galiani and Quistorff, 2017). The resulting distribution of in-space placebo effects should not contain many effects as large as the effect for the truly treated unit for the true treatment effect to be considered significant. The corresponding p-values can be interpreted as the proportion of control units whose effect estimate is equal to or greater than that of the treated unit (Galiani and Quistorff, 2017).

In addition to the permutation approach for inference as described above, the credibility and robustness of the results obtained from the synthetic control method with respect to changes in the study design are evaluated by implementing further falsification and robustness tests. In this paper, different robustness tests are performed regarding specification decisions, treatment time, donor selection, and method design. Results for all robustness checks are presented in chapter 5.

4.5 Data

To analyze the question of how Swiss trade outcomes would have developed if Switzerland had joined the EU in 1995, this paper uses the most recent data from the CEPII Gravity database (Conte et al., 2022). The Gravity database contains data on trade flows, geographic, cultural, trade facilitation, and macroeconomic variables for 252 countries covering the years 1948 to 2020. The data are structured such that each observation corresponds to a combination of an exporter country, an importing country, and a year (Conte et al., 2022). When selecting the time horizon for the synthetic control method it is advisable to have a long pre-treatment period, which reduces the possibility for specification searching and makes it more likely that the units are alike in observed as well as unobserved factors (Ferman et al., 2020; Cunningham, 2021). Similarly, also the post-treatment period should be sufficiently large to account for the possibility that some effects may take time to be large enough to show and to provide a more complete picture of the effects (Abadie, 2021). In this paper, the time horizon is chosen to range from 1975 to 2008. The pre-treatment period thus contains 19 years, from 1975 to 1994, which is in line with similar papers (e.g., Saia, 2017; Cho and Wong, 2021). When using the 1995 enlargement as an identification strategy, Campos et al. (2022) express concerns about the possible confounding influence of the introduction of the euro in 1999. However, in contrast to Campos et al. (2022), this paper utilizes a more diverse set of donor units and thus prioritizes a longer post-treatment period over potential confounding effects of the euro introduction. The sample period used in this analysis ends in 2008 to provide a large enough post-treatment period while at the same time avoiding potential confounding factors connected with the financial crisis. Since the German reunification falls within the covered time frame, data for West Germany are used until 1990, and German data thereafter. Trade flow data, reported in 1000 current USD, are obtained from the United Nations Comtrade database (UN Comtrade Database, 2023). The outcome variable of interest is the bilateral trade flow for each of the selected country pairs. In line with similar studies (Saia, 2017; Micco et al., 2003), it is calculated as the average of two-way bilateral trade flows and utilized in logarithmic form. Calculation details are described in Appendix A1.

5 Empirical Results

To investigate how Swiss trade outcomes would have evolved if Switzerland had joined the EU in 1995, this paper uses the synthetic control approach. The following subchapters describe and discuss the main results of the empirical analysis together with various robustness checks as outlined in chapter 4.

5.1 Model Specification with Covariates

In a first specification of the model (specification 1), the matching is based on pre-treatment outcome values from 1980 to 1994 as well as covariates measuring GDP, distance, the use of a common language, and adjacency. Results for specification 1 are depicted in Figure 5.1 for all seven country pairs under investigation. The following section describes the pre-treatment fit, followed by a detailed analysis of the post-treatment differences.

In the pre-treatment period from 1975 to 1994, the synthetic units provide an overall good approximation of the actual units. Table A2.1 in Appendix A2 summarizes all potential counterfactual units and the corresponding weights used to create the synthetic units. Weights for each of the 21 control units are obtained by a data driven approach to best resemble the pre-treatment characteristics of Switzerland. Non-zero weights range from 0.074 (Switzerland-Italy) to 1 (Switzerland-Germany). Having a weight of one in the case of Germany is noteworthy as the matching appears to find as a single best match the country pair Austria-Germany. This result should be treated with caution and is therefore confirmed by running a Lasso regression as shown in Appendix A4. In addition, the weight of one in the case of Switzerland-Germany remains for various model specifications. Future research is advised to use a richer data set (e.g., regional or disaggregated data) to confirm the result. Nevertheless, although the result should be treated cautiously, the pre-treatment predictor balance confirms the matching fit. Table 5.1 summarizes the predictor balance for the pre-treatment outcome values (log average of two-way bilateral trade flows) for the seven country-pairs under investigation in the pre-treatment period (averaged over the period 1980 to 1995). The predictor balance for all five predictors used in specification 1 can be found in Appendix A3. In Table 5.1, the average actual trade values are reported together with the average synthetic values. The bias indicates the

Table 5.1: Predictor Balance for Pre-Treatment Outcome Values (Specification 1)

	Treated	Synthetic	Bias	Average	Bias	RMSE
CHE-DNK	13.0353	13.0347	-0.00%	13.8509	6.26%	0.068
CHE-FRA	15.3281	15.3227	-0.04%	13.8509	-9.64%	0.055
CHE-DEU	16.2658	16.2389	-0.17%	13.8509	-14.85%	0.068
CHE-IRE	12.0225	11.9732	-0.41%	13.8509	15.21%	0.140
CHE-ITA	15.2263	15.2261	-0.00%	13.8509	-9.03%	0.058
CHE-NDL	14.1504	14.1459	-0.03%	13.8509	-2.12%	0.062
CHE-UK	14.8659	14.8869	0.14%	13.8509	-6.83%	0.150

Notes: Table 5.1 summarizes for each country pair the average of the bilateral trade flow (log) over the period 1980 to 1994 for the treated unit, the synthetic control, and the average control together with the percentage difference between treated and control unit (bias) and the root mean squared error (RMSE). All values are generated using synth2 in Stata (Yan and Chen, 2023).

percentage difference between the actual and the synthetic values. Table 5.1 compares the synthetic control values, that is the weighted average of donor units with optimal weights, with the average control value, that is the simple average of all control units with equal weights. When comparing the bias for the synthetic and the average control, Table 5.1 shows that for all seven country pairs the synthetic control values clearly outperform the average control values, indicating a successful matching process for the outcome variable of interest (bilateral trade flows). The root mean squared error (RMSE) of the model fitted in the pre-treatment period is shown to be sufficiently low for all country pairs with the highest values for the country pairs involving Ireland and the UK. This is in line with the graphical representation in Figure 5.1, where also Ireland and the UK seem to have a worse pre-treatment fit compared to the other country pairs, possibly due to their special geographical location compared to the rest of the donor countries. Especially for the UK, the synthetic control unit is not perfectly able to match the comparably high volatility of the Swiss-UK trade flows in the pre-treatment period. Nevertheless, Figure 5.1 and Table 5.1 confirm an overall good pre-treatment fit for all country pairs under investigation, allowing for further analyses of post-treatment differences.

In the post-treatment period from 1995 to 2008, Figure 5.1 indicates that for all countries, with the exception of Ireland, trade would have been higher if Switzerland had joined the EU. The effect is most obvious for the country pair Switzerland-Denmark. This makes sense since the identification strategy used in this paper exploits the Scandinavian enlargement of the EU. In the 1995 enlargement, two of Denmark's closest neighbors (Sweden and Finland) joined the EU which potentially implied a large deviation of trade flows away

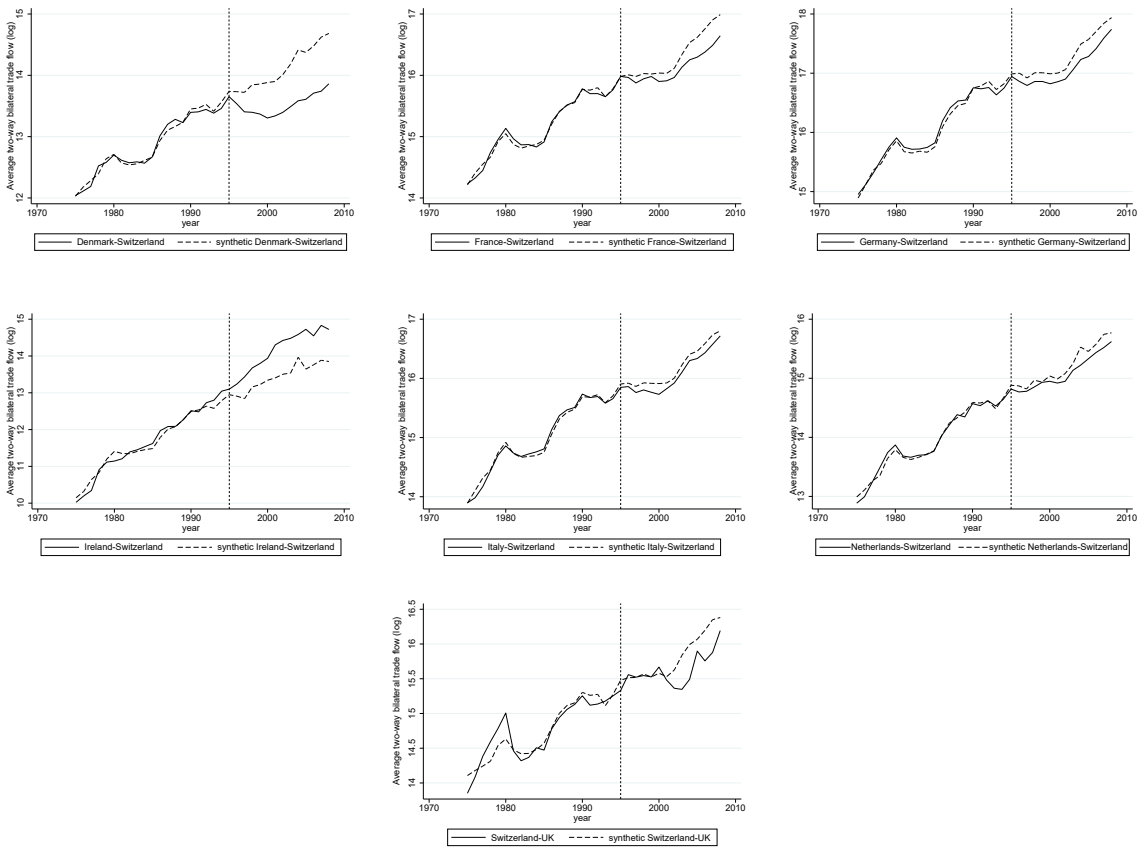

Figure 5.1: Actual and Synthetic Trade Flows between Switzerland and EU members (Specification 1)

Notes: Solid lines represent actual trade flows (log average of two-way bilateral trade flow). Dashed lines represent synthetic trade flows. The dashed vertical line represents the treatment period (1995). Results are obtained using synth in Stata (Abadie et al., 2014).

from other countries (including Switzerland) towards the new EU member states. The average treatment effect over the post-treatment period as the percentage difference between actual and synthetic trade flows for all seven country pairs is reported in Table 5.2. Average country specific treatment effects range from −4.075 percent (Switzerland-Denmark) to +5.335 percent (Switzerland-Ireland), implying that trade in the post-treatment period between Switzerland and Denmark would have been on average around 4 percentage points higher, while trade between Switzerland and Ireland would have been around 5 percentage points lower if Switzerland had joined the EU in 1995. For the remaining country pairs, the results in Table 5.2 indicate that trade flows would have been on average around 1 percentage point higher if Switzerland had joined the EU in 1995. To put this into context, total trade between Switzerland and Denmark amounted to roughly 600 million USD in 2001 (UN Comtrade Database, 2023). An increase of 4 percent in this amount would generate roughly 20 million USD worth of extra trade

Table 5.2: Post-Treatment Effect Estimates for Each Country Pair (Specification 1)

	DNK	FRA	DEU	IRE	ITA	NDL	UK
ATE	-4.075%	-1.152%	-1.066%	5.335%	-0.941%	-0.784%	-1.179%

Notes: Table 5.2 reports the average treatment effect (ATE) for specification 1 for all countries under investigation over the post-treatment period from 1995 to 2008 as the percentage difference between actual and synthetic value. Values are obtained using the synth2 command in Stata (Yan and Chen, 2023).

between Switzerland and Denmark in this year (see Davis and Gift (2014) for a similar comparison). The average treatment effects are negative for all country pairs but the country pair Switzerland-Ireland, suggesting that for all country pairs but the country pair Switzerland-Ireland trade flows would have been higher if Switzerland had joined the EU in 1995. The country pair Switzerland-Ireland represents the only country pair for which the treated unit performs better than the synthetic unit. One possible reason for this deviation could be that due to Ireland's geographical location, its main trading partner is the UK. Therefore, Ireland's trade flow with Switzerland is not significantly affected by Switzerland's decision not to join the EU. This can be seen in Figure 5.1, as for all other countries but Ireland the actual trend in trade flows seems to change around the treatment period (most obvious for Denmark, France, Germany, and Italy), whereas the trade flow between Ireland and Switzerland seems to be unaffected. When comparing the predictor weights for all country-pairs under investigation (Appendix A3), Ireland is among the few countries that are not mainly matched on pre-treatment outcome values but on all five predictor variables, including adjacency and GDP. This is in line with the above described reasoning that Ireland's case might deviate from the overall results due to its small size and special geographical location. Therefore, the following aggregate results for specification 1 (including Ireland) are contrasted with the aggregate results when excluding Ireland from the calculations (Figure 5.2).

Figure 5.2 depicts the yearly effect estimates of Switzerland's decision not to join the EU on Swiss trade outcomes for specification 1 when including versus excluding Ireland from the donor pool. In the pre-treatment period, the synthetic trade flow (dashed line) closely follows the actual trade flow (solid line) until 1995. The difference between the actual and the synthetic trade flow in the post-treatment period indicates the negative trade effect of Switzerland's decision not to join the EU. When excluding Ireland, the estimated effect on trade if Switzerland had joined the EU is negative and significant in

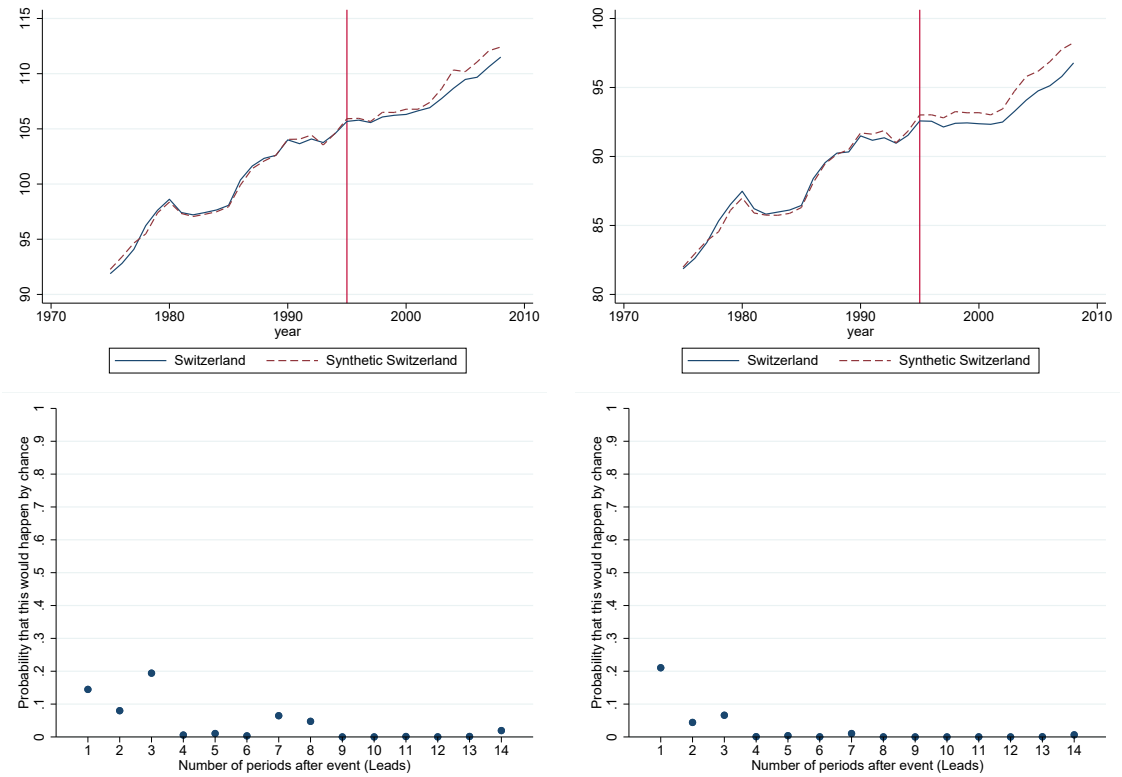

Figure 5.2: Aggregate Effect in Specification 1

Notes: Figure 5.2 depicts the aggregate effect on trade flows (log average of two-way bilateral trade flow) for specification 1 including Ireland (left) and excluding Ireland (right). Results are obtained using the synth command in Stata (Abadie et al., 2014). p-values are obtained by means of in-space placebos (permutation approach) using synth_runner in Stata (Galiani and Quistorff, 2017).

almost all post-treatment periods. When including Ireland, the estimated effect is smaller (in absolute terms) but still significant in most post-treatment periods. The corresponding p-values, obtained using the permutation approach as described in chapter 4, are depicted in Figure 5.2. Table 5.3 reports the depicted post-treatment effect estimates (calculated as described in chapter 4) together with the corresponding p-values for specification 1 when including versus excluding Ireland and indicates how the effect evolves over time. It is noteworthy that even though Ireland has the biggest effect in absolute and relative terms (Table 5.2), the overall treatment effects are still all negative for the entire post-treatment period even when including Ireland into the specification. When excluding Ireland, trade effects of Switzerland's decision not to join the EU range from -0.364 percent in 1995 to -1.834 percent in 2007 and clearly increase in magnitude over time with statistical significance from 1996 onward. This result is striking, given that some of the Swiss-EU bilateral agreements were introduced in the post-treatment period, suggesting decreasing effects over time as Switzerland becomes more closely integrated with the EU. However,

Table 5.3: Aggregate Post-Treatment Effect Estimates for Specification 1

	Estimate with Ireland	Estimate without Ireland
1995	-0.232%	-0.364%
1996	-0.153%	-0.452%*
1997	-0.092%	-0.597%*
1998	-0.395%**	-0.884%***
1999	-0.241%*	-0.774%***
2000	-0.443%**	-0.839%***
2001	-0.136%	-0.715%***
2002	-0.447%*	-0.968%***
2003	-0.821%***	-1.467%***
2004	-1.510%***	-1.719%***
2005	-0.645%**	-1.377%***
2006	-1.248%***	-1.664%***
2007	-1.296%**	-1.834%***
2008	-0.813%*	-1.336%***

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: Table 5.3 reports the estimated aggregate effects for specification 1 as the percentage difference between the actual and the synthetic unit when including Ireland (left) versus excluding Ireland (right) for the post-treatment period from 1995 to 2008. Values are obtained using synth_runner in Stata (Galiani and Quistorff, 2017).

the increase in the magnitude of the effect estimates indicates that the increase in intra-EU trade is relatively larger than the increase in Swiss-EU trade. Since European integration is not binary (Campos et al., 2014), the trade effects of joining the EU evolve as intra-EU integration increases. In addition, the introduction of the euro in 1999 is shown to increase intra-eurozone trade over time (Saia, 2017). At the same time, only a few of the new Swiss-EU agreements introduced in the post-treatment period specifically address trade issues, such as processed agricultural products. Therefore, the growing effect size despite the evolving relationship between Switzerland and the EU may be explained by a relatively larger increase in intra-EU trade compared to Swiss-EU trade. To disentangle this result and investigate any potential downward bias in the effect size, future research is advised to use disaggregated data and compare the effect estimates when excluding sectors that were only liberalized in the post-treatment period from the analysis.

Keeping the potential downward bias in mind, the total effect of EU membership for specification 1 over the entire post-treatment period 1995 to 2008 can be calculated as described in chapter 4. The effect estimate indicates that Switzerland's EU membership would have increased trade flows between Switzerland and the EU member countries by

around 0.614 percent, when including Ireland into the calculations, and by around 1.108 percent, when excluding Ireland from the calculations. Additionally excluding the country pair Switzerland-UK as the second country pair with a comparable worse pre-treatment fit changes the total effect estimate to -1.298 percent. However, due to the relatively low number of observations and donors used for this analysis, this result should be taken with some caution. Overall, the total effect size of the estimates is slightly lower compared to the 3 percent of additional trade estimated in Breuss (2006), but considerably higher than comparable trade effect estimates of 0.10 percent of the Schengen agreement analysis by Davis and Gift (2014). It has to be noted, however, that the magnitude of trade effect estimates tends to vary a lot across different studies subject to the model setup and the data set used (Rose, 2017). Therefore, it is useful to put the estimated effects into context. Considering that total trade between Switzerland and its neighboring regions in Austria, Germany, France, and Italy alone amounts to around 80 billion EUR per year (The Diplomatic Service of the European Union, 2021*a*), an additional 1.108 percent worth in trade would amount to around 88 million EUR extra trade every year (see Davis and Gift (2014) for a similar comparison). The negative trade effect of Switzerland's decision not to join the EU, although economically small, should thus not be neglected, especially considering that the effect seems to increase over time.

5.2 Model Specification without Covariates

In a second specification of the model (specification 2), all pre-treatment outcome values and no covariates are used for the matching. However, it should be noted that the number of observations in this specification without covariates is too small to perform a fully nested optimization procedure. Therefore, the results of specification 1 are expected to perform better, which can be confirmed by observing the corresponding country weights as reported in Table A2.3 in combination with the pre-treatment matching fit.

When comparing the country weights of specification 1 (Table A2.1) and the country weights of specification 2 (Table A2.3) in Appendix A2, specification 1 should be preferred over specification 2 as the results of specification 2 are clearly less sparse. Sparsity in the synthetic control method, meaning that only a small number of comparison units are used, should be preferred as it avoids overfitting and allows for an intuitive interpretation

Table 5.4: Predictor Balance for Pre-Treatment Outcome Values (Specification 2)

	Treated	Synthetic	Bias2	Bias1	RMSE
CHE-DNK	12.8486	12.8346	-0.11%	-0.00%	0.136
CHE-FRA	15.1311	15.1170	-0.09%	-0.04%	0.085
CHE-DEU	16.0335	16.0070	-0.17%	-0.17%	0.068
CHE-IRE	11.6464	11.6446	-0.02%	-0.41%	0.17318
CHE-ITA	14.9792	14.9536	-0.17%	-0.00%	0.071
CHE-NDL	13.9302	13.9134	-0.12%	-0.03%	0.058
CHE-UK	14.7346	14.7768	0.29%	0.14%	0.200

Notes: Table 5.4 summarizes for each country pair the average of the bilateral trade flow (log) over the pre-treatment period for the treated unit and the synthetic control unit together with the percentage difference between treated and control unit (bias2) in comparison to the bias of specification 1 (bias1) and the root mean squared error (RMSE). All values are generated using synth2 in Stata (Yan and Chen, 2023).

and evaluation of the counterfactual units (Abadie, 2021). Additionally, when comparing the percentage difference between the average treated and the average synthetic outcome value in the pre-treatment period for specification 2 (bias2) with specification 1 (bias1), Table 5.4 shows that the predictor balance in the pre-treatment period of specification 1 outperforms the corresponding predictor balance of specification 2, indicating a better pre-treatment fit for specification 1.

Figure 5.3 illustrates the trade flows between Switzerland and the seven EU members together with the corresponding synthetic counterfactuals for specification 2. With the exception of the country pair Switzerland-UK, the synthetic unit (dashed line) closely follows the actual unit (solid line) in the pre-treatment period until 1995, indicating a good approximation of the actual trade flows. The pre-treatment fit for the country pair Switzerland-UK clearly performs worse for specification 2 compared to specification 1, possibly due to the non-nested optimization procedure and the comparably smaller number of observations in combination with the restricted choice of predictor variables. Nevertheless, the general effect direction, observable as the difference between the actual and the synthetic unit in the post-treatment period, stays the same in both specifications, indicating that Switzerland's decision not to join the EU negatively influenced its trade outcomes. Similar to specification 1, also in specification 2 the country pair Switzerland-Ireland represents the only country pair for which the treated unit performs better than the synthetic unit in the post-treatment period. In contrast to specification 1, in specification 2 also the country pair Switzerland-Netherlands does not show a clear effect direction

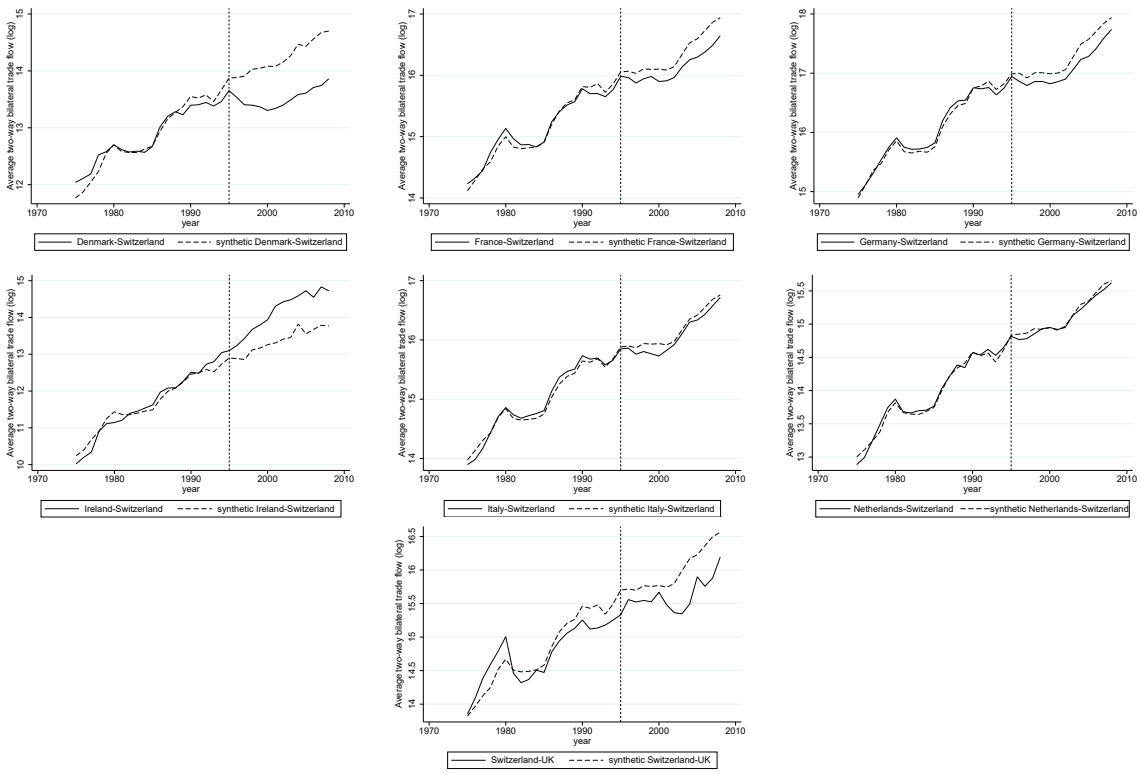

Figure 5.3: Actual and Synthetic Trade Flows between Switzerland and EU members (Specification 2)

Notes: Solid lines represent actual trade flows (log average of two-way bilateral trade flow). Dashed lines represent synthetic trade flows. The dashed vertical line represents the treatment period (1995). Results are obtained using synth in Stata (Abadie et al., 2014).

in the post-treatment period. Table 5.5 reports the post-treatment average treatment effect for all countries under investigation. As in specification 1, the post-treatment average treatment effect is negative for all countries but Ireland (Table 5.5). Similar to specification 1, the average country specific treatment effects in specification 2 range from around -5 percent (Switzerland-Denmark) to around $+6$ percent (Switzerland-Ireland), implying that trade between Switzerland and Denmark would have been on average around 5 percentage points higher, while trade between Switzerland and Ireland would have been around 6 percentage points lower in the post-treatment period 1995 to 2008 if Switzerland had joined the EU in 1995. In comparison to specification 1, the estimated trade effect for the country pair Switzerland-UK seems to be higher in specification 2, which is likely a spurious result since the worse pre-treatment fit for the UK in specification 2 does not allow for valid conclusions on post-treatment differences. In total, the country specific aggregate effects of Switzerland's decision not to join the EU in specification 2 confirm the results of specification 1, indicating negative trade effects for all country pairs but the country pair Switzerland-Ireland.

Table 5.5: Post-Treatment Effect Estimates for each Country Pair (Specification 2)

	DNK	FRA	DEU	IRE	ITA	NDL	UK
ATE	-4.899%	-1.297%	-1.066%	5.798%	-0.573%	-0.236%	-2.319%

Notes: Table 5.5 reports the average treatment effect (ATE) for specification 2 as the percentage difference between the actual and the treated unit for all countries under investigation over the post-treatment period from 1995 to 2008. Values are obtained using the synth2 command in Stata (Yan and Chen, 2023).

Table 5.6: Aggregate Post-Treatment Effect Estimates for Specification 2

	Estimate with Ireland	Estimate without Ireland
1995	-0.518%	-0.454%
1996	-0.476%	-0.549%*
1997	-0.539%	-0.857%*
1998	-0.769%**	-0.991%***
1999	-0.641%*	-0.882%***
2000	-0.732%**	-0.963%***
2001	-0.382%	-0.875%**
2002	-0.543%	-1.096%**
2003	-0.808%*	-1.528%***
2004	-1.323%*	-1.723%***
2005	-0.599%	-1.426%***
2006	-1.247%**	-1.799%***
2007	-1.179%*	-1.945%***
2008	-0.734%	-1.395%**

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: Table 5.6 reports the estimated effects as the percentage difference between the actual and the synthetic unit for specification 2 when including Ireland (left) versus excluding Ireland (right) for the post-treatment period from 1995 to 2008. Values are obtained using synth_runner in Stata (Galiani and Quistorff, 2017).

The development of the actual and the synthetic aggregate trade flows over the period 1975 to 2008 for specification 2 when excluding versus including Ireland from the calculations is depicted in Figure 5.4, confirming the overall result of specification 1 (Figure 5.2). Table 5.6 reports the yearly effect estimates for the post-treatment period for specification 2 with and without Ireland. The effect size resembles specification 1 with fewer statistically significant effects for the specification including Ireland. When excluding Ireland, it is again observable that the negative aggregate effect of Switzerland's decision not to join the EU evolves over time. While trade flows between Switzerland and the EU member countries would have been around 0.5 percentage points higher in the years immediately following the 1995 EU enlargement, in 2007, trade flows would have been almost 2 percentage points higher if Switzerland had decided to join the EU in 1995. For the entire post-treatment

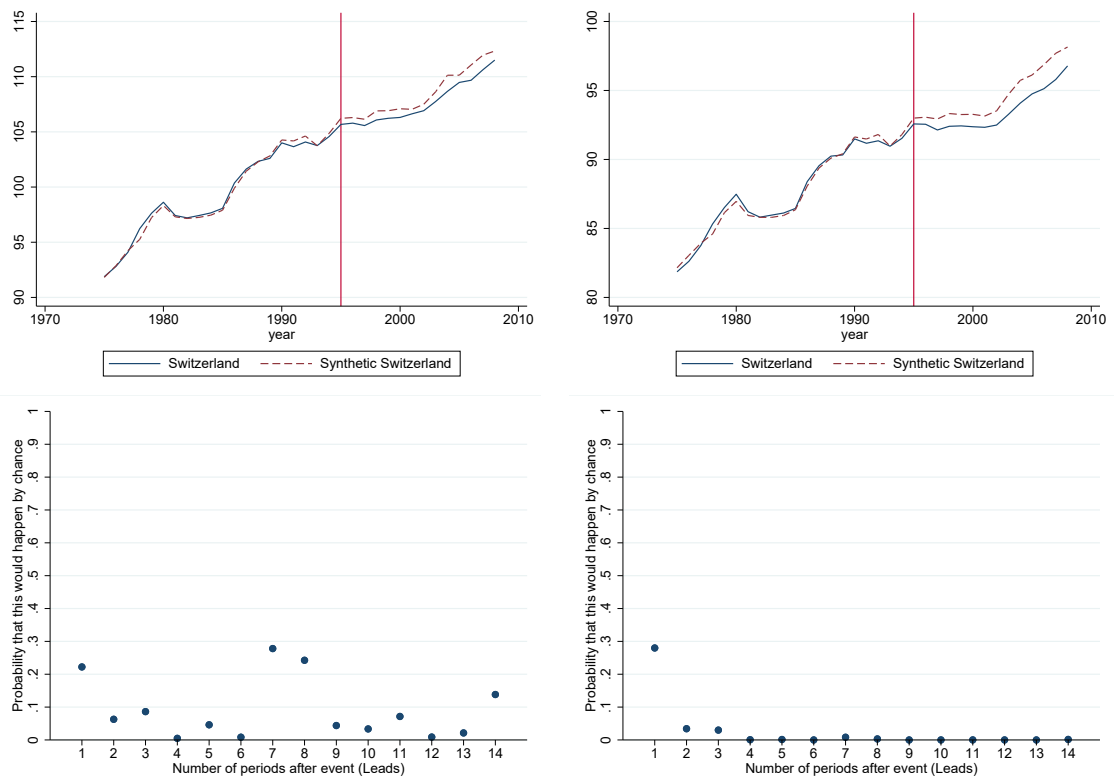

Figure 5.4: Aggregate Effect in Specification 2

Notes: Figure 5.4 depicts the aggregate effect on trade flows (log average of two-way bilateral trade flow) for specification 2 including Ireland (left) and excluding Ireland (right). Results are obtained using the synth command in Stata (Abadie et al., 2014). *p*-values are obtained by means of in-space placebos (permutation approach) using synth_runner in Stata (Galiani and Quistorff, 2017).

period from 1995 to 2008, the total effect for specification 2 indicates that Switzerland's EU membership would have increased trade flows between Switzerland and the EU member countries by around 0.823 percent, when including Ireland into the calculations, and by around 1.369 percent, when excluding Ireland from the calculations, confirming the results of specification 1. However, since specification 1 allows for a fully nested optimization procedure that results in a better pre-treatment matching fit and sparsity in the country weights compared to specification 2, specification 1 constitutes the benchmark model of the analysis and is used for further robustness checks as described in the following subchapter.

5.3 Robustness and Placebo Exercises

As discussed in the previous section, the overall results are robust to various model specifications, including the adoption of different predictor variables and different outcome lags. Additionally, results are robust to the inclusion of the country pair Switzerland-

Ireland, which represents the country pair with the largest effect in absolute terms and the only country pair for which the effect direction differs. The following sections complement the analysis by implementing further robustness checks, namely a placebo in-time test, a placebo in-space test, as well as a synthetic difference in differences application.

5.3.1 Placebo In-Time Test

Switzerland's decision not to join the EU was marked by the referendum on EEA membership in 1992, while Sweden, Finland, and Austria were granted access to the Single Market already in 1994 (see chapter 2). Under these circumstances, possible anticipation effects on trade need to be taken into account when analyzing the trade outcomes in the context of Switzerland's decision not to join the EU. In-time placebos provide valuable means to validate the robustness of the results and yield insights into the possibility of anticipation effects. The placebo in-time test reassigns the treatment to a year prior to the actual treatment where there should not be an effect (Cunningham, 2021; Abadie, 2021).

Following Saia (2017), in a first placebo in-time test, the placebo treatment date is set to 1985. When using the year 1985 as the treatment date, in order to have a sufficiently large pre-treatment period, the in-time placebo test is constructed over the period 1973 to 1994. Note that no years prior to 1973 can be considered for the analysis as three of the countries under investigation (Denmark, the UK, and Ireland) only joined the EU in 1973. Considering the year 1985 as the placebo intervention date leaves the period 1973 to 1984 as the pre-treatment period and the period 1985 to 1994 as the post-intervention period, which is sufficient to fulfill the requirement of having a pre-treatment period as least as large as the post-treatment period (Saia, 2017).

Figure A4.2 in Appendix A4 depicts the placebo in-time results for all seven country pairs under consideration. For all country pairs, the synthetic trade flow resembles the actual trade flow well beyond the placebo treatment date 1985, even though for some country pairs an effect seems to emerge towards the end of the placebo post-treatment period. The same observation holds when looking at the aggregate effect presented in Figure 5.5. However, the corresponding p-values obtained by means of in-space placebos (permutation approach) for the placebo treatment time indicate that all potential effects in the period

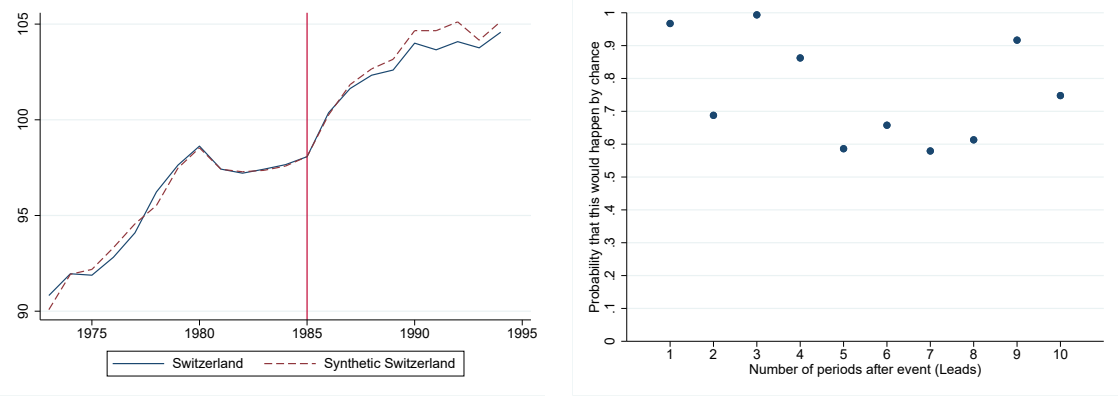

Figure 5.5: In-Time Placebo 1985 Aggregate Effect

Notes: Figure 5.5 depicts the aggregate effect on trade flows (log average of two-way bilateral trade flow) for specification 1 including Ireland using the placebo treatment time 1985. p-values are obtained by means of in-space placebos. Results are obtained using synth_runner in Stata (Galiani and Quistorff, 2017).

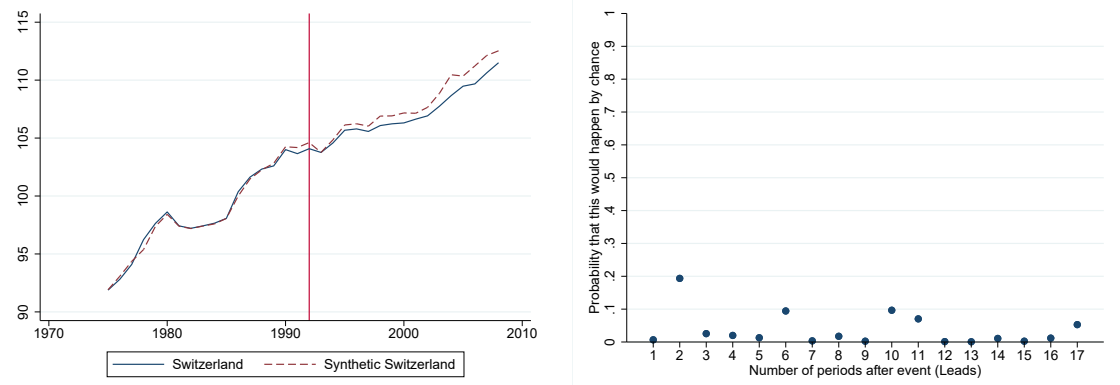

Figure 5.6: In-Time Placebo 1992 Aggregate Effect

Notes: Figure 5.5 depicts the aggregate effect on trade flows (log average of two-way bilateral trade flow) for specification 1 including Ireland using the placebo treatment time 1992. p-values are obtained by means of in-space placebos. Results are obtained using synth_runner in Stata (Galiani and Quistorff, 2017).

1985 to 1994 (prior to the actual intervention in 1995) are not significant. These results indicate that if anticipation effects occur, they only appear close to the actual treatment date. To further validate this result, a second in-time placebo test is constructed for the placebo date 1992, when the Swiss referendum on EEA membership was held.

Following Gabriel and Pessoa (2020), in the second placebo in-time test, the same total time period as in the main analysis is used (1975 to 2008), but instead of 1995, the placebo treatment date is set to 1992. Figure A4.3 in Appendix A4 depicts the placebo in-time results for all seven country pairs under consideration, drawing a heterogeneous picture of possible anticipation effects. Especially for Denmark, Ireland, and Italy, the synthetic unit starts to differ from the actual unit already around 1990, while for Germany, the Netherlands, and France, observable differences between the actual and the treated unit

only emerge around the actual treatment date 1995. The aggregate effect, as depicted in Figure 5.6, confirms the results, indicating emerging significant differences between actual and synthetic unit from 1992 onward. These results provide evidence in favor of short term anticipation effects in the years prior to 1995, although with some heterogeneity across countries. In combination with the results of the main analysis, we can conclude that while negative trade effects of Switzerland's decision not to join the EU start to show prior to the 1995 EU enlargement (anticipation effects), the size of the effects only increases over time.

5.3.2 Placebo In-Space Test

In addition to the placebo in-time test, this paper implements a placebo in-space test for the country pairs involving Austria. Placebo in-space tests reassign the treatment to a unit in the donor pool for which no effect should be observable in order to rule out spillover effects and validate the robustness of the results for the actual treated unit (Gabriel and Pessoa, 2020). Selecting Austria for the in-space placebo is a reasonable choice to investigate potential spillover effects of Switzerland's decision not to join the EU on donors since Austria is geographically close to Switzerland and trade between both countries is facilitated not only by a common border but also by sharing a common language. Following Gabriel and Pessoa (2020), the placebo in-space is constructed by exposing Austria to a placebo treatment in 1995, and comparing the post-treatment gap for the placebo unit (Austria) with the post-treatment gap observed for the actual treated unit (Switzerland).

Figure A4.4 in Appendix A4 displays the results for all country pairs under investigation. Note that for this analysis, Germany, Denmark, and Ireland are excluded from the donor pool since for all three countries no valid counterfactual could be constructed. This is in line with a similar analysis by Gabriel and Pessoa (2020), taking into account that, when performing in-space placebo tests, countries with a bad pre-treatment fit are not suitable for providing information on the post-treatment effects (Gabriel and Pessoa, 2020). In addition, the actual treated unit (Switzerland) is excluded from the in-space placebo donor pool. Figure A4.4 shows that for all country pairs under investigation, the actual and the placebo treated series closely follow each other in the pre-treatment period from 1975 to 1994. In contrast to the Switzerland-EU country pairs in Figure 5.1, for the Austria-EU

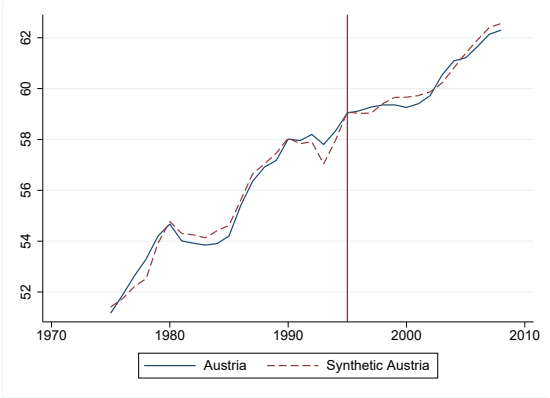

Figure 5.7: In-Space Placebo Austria Aggregate Result

Notes: Figure 5.7 depicts the aggregate results (logged average of two-way bilateral trade flow) for the in-space placebo test using Austria as the placebo treated unit. Results are obtained using synth in Stata (Abadie et al., 2014).

country pairs in Figure A4.4 no difference between the actual and the placebo treated series can be observed in the post-treatment period. The fact that no post-treatment effect can be observed for the Austria-EU country pairs confirms the robustness of the main results and lets to the conclusion that Austria did not experience any substantial spillover effects from Switzerland's decision not to join the EU in 1995. The aggregate results, presented in Figure 5.7, obtained by summing over all individual country pairs, confirm this conclusion as also on the aggregate level, synthetic and placebo treated series closely resemble each other pre-treatment and do not diverge post-treatment.

5.3.3 Synthetic Difference in Differences

To evaluate whether the chosen method is reasonable and to confirm the robustness of the results, this paper further complements the synthetic control method with a synthetic difference in differences specification. The synthetic difference in differences method, introduced by Arkhangelsky et al. (2021), is used, e.g., by Campos et al. (2022) in the context of the 1995 EU enlargement. The synthetic difference in differences approach combines elements of both the synthetic control and the difference in differences method in that it adds weights to the difference in differences approach and is thus able to construct parallel trends similar to the synthetic control method. Similar to the difference in differences approach, the treatment effect in the synthetic difference in differences method is calculated by comparing the outcomes of the treated and the synthetic control group before and after treatment. The synthetic difference in differences approach allows for

Figure 5.8: Synthetic Difference in Differences Outcome

Notes: Figure 5.8 depicts the outcome (logged average of two-way bilateral trade flow) of the synthetic difference in differences method including Ireland (left) and excluding Ireland (right). Results are obtained using sdid in Stata (Pailanir and Clarke, 2023).

differences in the levels of the outcomes by implementing time and unit fixed effects in combination with unit and time weights. In contrast to the synthetic control approach, the synthetic difference in differences approach relies on extrapolation for the construction of additional time weights and can thus not be constructed without access to post-treatment outcomes (Arkhangelsky et al., 2021; Clarke et al., 2023; Campos et al., 2022; Cunningham, 2021; Pailanir and Clarke, 2023). As this paper uses the synthetic difference in difference method merely as a complementary robustness check, the method will not be discussed and analysed in detail. Nevertheless, its similarity to the synthetic control approach renders it a valuable addition to the analysis.

When implementing the synthetic difference in differences approach for the analysis of Switzerland's trade outcomes, the aggregate effects of the main synthetic control specification are confirmed. Similar to the synthetic control approach as discussed above, the synthetic difference in differences approach yields an average trade loss of -0.667 percent from Switzerland's decision not to join the EU between 1995 and 2008, when Ireland is included into the analysis. The average treatment effect is negative but not statistically significant. When excluding Ireland, the treatment effect becomes statistically significant and takes on a higher value in absolute terms, implying an average trade loss of -1.244 percent for Switzerland after deciding not to join the EU. Results are depicted in Figure 5.8. In Figure 5.8, the solid line represents the treated unit (Switzerland), while the dashed line displays the trade flows of the control unit. The difference in trends post-treatment describes the estimated treatment effect, which is more clearly observable for the specification without Ireland. Results should however be treated cautiously as

it is out of the scope of this paper to analyze the method in depth and provide further robustness checks on the synthetic difference in differences method to confirm the results. Nevertheless, the synthetic difference in differences method reaffirms the overall results of the main analysis.

6 Concluding Remarks

The European Union in its current form involves a high degree of economic and political integration, the costs and benefits of which are much debated. Given the prevalence of EU skepticism and populism together with the first example of disintegration provided by the British exit from the EU, this paper contributes to the discussion by analyzing the special case of Switzerland. Switzerland's unique relationship with the EU makes it a particularly relevant case to analyze since its experiences of being closely connected with the EU while still not being a full member provide valuable insights into different aspects of European integration.

This paper applies the comparatively novel synthetic control method to examine how Switzerland's trade outcomes would have evolved if it had opted to become a member of the EU. Using the 1995 EU enlargement for identification, the synthetic control method enables the creation of a hypothetical scenario where Switzerland joined the EU alongside Sweden, Finland, and Austria in 1995. By comparing actual bilateral trade flows between Switzerland and seven chosen EU member countries with the synthetic scenario, the study concludes that if Switzerland had joined the EU in 1995, the annual bilateral trade between Switzerland and the EU member states would have been on average around 1.1 percentage points higher. Moreover, the findings demonstrate that the effect evolves over time and remains robust when considering different model specifications and standard falsification tests. An additional application of the synthetic difference in differences method further validates the results. Considering the historical events leading up to the 1995 EU enlargement, the study also notes some indications of anticipation effects related to the Swiss EEA membership referendum in 1992. However, no evidence suggests potential spillover effects from Switzerland's decision not to join the EU on Switzerland's neighboring country Austria. Future research is advised to confirm the results by implementing different modes of inference (e.g., RMSPE decomposition as

proposed in Abadie (2021)) and additional robustness checks. By using a richer data set (e.g., disaggregated or monthly data) and additional donor countries, future research could benefit from focusing on country pairs with the best pre-treatment fit only and further validate the robustness of the results by leaving out important donors. However, while complementing the analysis with a different choice of donor units might yield additional insights, Switzerland's unique bilateral relation with the EU renders an exact imitation difficult (Blatter, 2015).

The overall results of the analysis confirm the economic expectations of negative trade effects in connection to Switzerland's missing European integration, indicating that Switzerland's decision not to join the EU came at a cost in terms of less trade. Even though the magnitude of the estimated effects might be considered economically small, such that countries like Switzerland or the UK would perhaps place more weight on their sovereignty when deciding on a specific level of integration with the EU, one has to keep in mind the various layers of economic and non-economic considerations connected to EU membership. This paper focuses on trade in goods. Since Switzerland and the EU are yet to conclude an explicit agreement on service trade, a complementary analysis focusing on service trade could yield additional insights for the evaluation of the Swiss-EU relationship. Moreover, by incorporating non-EU nations into the analysis, it would be possible to complement the findings, examining the extent to which Switzerland's unique position within Europe impacts its trade outside Europe. Given the complexity of European integration, this paper serves as an important starting point for future research to provide a more complete picture of the economic consequences connected to it. Amid rising EU skepticism, this paper highlights the differences between EU membership and close affiliation, offering valuable insights into the ongoing discourse on the costs and benefits of European integration.

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Appendix

A1 Data Description and Variable Calculation

This appendix describes the country codes as well as the data and variables used for the analysis in this paper.

Table A1.1: Country Codes

Country	Code
Austria	AUT
Switzerland	CHE
Germany	DEU
Denmark	DNK
Finland	FIN
France	FRA
United Kingdom	UK
Ireland	IRL
Italy	ITA
Netherlands	NLD
Sweden	SWE

Outcome Variable: Trade data, obtained from the United Nations Comtrade database (UN Comtrade Database, 2023), are provided in 1000 current USD as reported by the country of origin and as reported by the country of destination. Trade flows reported by the exporter are FOB (Free on Board). Trade flows reported by the importer include Cost, Insurance and Freight (Conte et al., 2022). Following Micco et al. (2003) and in line with similar papers (Saia, 2017; Rose, 2000; Tomz et al., 2007), the outcome variable of interest is calculated as the average of two-way bilateral trade flows. For example, the average two-way bilateral trade flow for the country pair Switzerland-Italy in 1975 is calculated as the simple average of the four values: trade flow Italy-Switzerland in 1975 as reported by the exporter, trade flow Italy-Switzerland in 1975 as reported by the importer, trade flow Switzerland-Italy in 1975 as reported by the exporter, and trade flow Switzerland-Italy in 1975 as reported by the importer. The same calculation is done for all years and all country pairs. The data set includes all necessary values and no observations with zero trade, such that no further adjustments have to be done for the calculation of the logarithmic values from the averaged trade flows.

Covariates: Data on GDP are provided in current thousands USD (unilateral). The analysis uses the sum of the logs of country pairs GDPs (lgdp). Distance data are provided as the simple distance in km between the most populated cities (bilateral) (variable name: finaldist). The covariate measuring the use of a common language (finalcomlang) is based on a dummy variable equal to one if countries share a common language spoken by at least 9 percent of the population (bilateral). The used adjacency measure (finalcontig) is based on a dummy variable equal to one if countries are contiguous (bilateral) (Conte et al., 2022). All data for the construction of the covariates are obtained from the CEPII Gravity database (Conte et al., 2022). As in Saia (2017), all covariates are calculated using the following formula (based on Baier and Bergstrand (2009)).

$$C_{ij} = X_{ij} - \frac{1}{M}\sum_{m=1}^{M} X_{mj} - \frac{1}{N}\sum_{k=1}^{N} X_{ik} + \frac{1}{NM}\sum_{m=1}^{M}\sum_{k=1}^{N} X_{mk} \tag{.1}$$

In Equation .1, X represents the log of the bilateral distance, the adjacency dummy, and the common language dummy, respectively.

A2 Synthetic Control Country Weights

Table A2.1: Synthetic Control Weights for Specification 1 including Ireland

	CHE-DNK	CHE-FRA	CHE-DEU	CHE-IRE	CHE-ITA	CHE-NDL	CHE-UK
AUT-DNK	.377	0	0	0	0	0	0
AUT-FRA	0	0	0	0	0	0	0
AUT-DEU	0	.36	1	0	.252	0	0
AUT-IRE	.239	0	0	.772	0	.298	0
AUT-ITA	0	.274	0	0	.674	0	0
AUT-NDL	0	0	0	0	0	0	0
AUT-UK	0	0	0	0	0	0	.263
FIN-DNK	0	0	0	0	0	0	0
SWE-DNK	.384	.366	0	0	0	.184	.297
FIN-FRA	0	0	0	0	0	0	0
FIN-DEU	0	0	0	.228	0	0	0
FIN-IRE	0	0	0	0	0	0	0
FIN-ITA	0	0	0	0	0	0	0
FIN-NDL	0	0	0	0	0	0	0
FIN-UK	0	0	0	0	0	0	0
SWE-FRA	0	0	0	0	0	0	0
SWE-DEU	0	0	0	0	.074	.518	.44
SWE-IRE	0	0	0	0	0	0	0
SWE-ITA	0	0	0	0	0	0	0
SWE-NDL	0	0	0	0	0	0	0
SWE-UK	0	0	0	0	0	0	0

Notes: Table A2.1 summarizes the weights for specification 1 with covariates for all country-pairs under investigation when including Ireland. Weights are obtained using the synth command in Stata (Abadie et al., 2014).

Table A2.2: Synthetic Control Weights for Specification 1 excluding Ireland

	CHE-DNK	CHE-FRA	CHE-DEU	CHE-ITA	CHE-NDL	CHE-UK
AUT-DNK	.432	0	0	0	.199	.139
AUT-FRA	0	0	0	0	.199	.174
AUT-DEU	0	.326	1	.578	0	0
AUT-ITA	0	.162	0	0	.602	0
AUT-NDL	0	0	0	0	0	0
AUT-UK	0	0	0	0	0	0
FIN-DNK	.188	0	0	0	0	0
SWE-DNK	0	0	0	0	0	.02
FIN-FRA	0	0	0	0	0	0
FIN-DEU	0	0	0	0	0	0
FIN-ITA	0	0	0	.135	0	0
FIN-NDL	.248	0	0	.01	0	0
FIN-UK	0	0	0	0	0	0
SWE-FRA	0	.323	0	0	0	0
SWE-DEU	0	.189	0	0	0	.667
SWE-ITA	.132	0	0	0.278	0	0
SWE-NDL	0	0	0	0	0	0
SWE-UK	0	0	0	0	0	0

Notes: Table A2.2 summarizes the weights for specification 1 with covariates for all country-pairs under investigation when excluding Ireland. Weights are obtained using the synth command in Stata (Abadie et al., 2014).

Table A2.3: Synthetic Control Weights for Specification 2

	CHE-DNK	CHE-FRA	CHE-DEU	CHE-IRE	CHE-ITA	CHE-NDL	CHE-UK
AUT-DNK	.059	.012	0	.032	.014	.037	.019
AUT-FRA	.038	.022	0	.016	.026	.045	.032
AUT-DEU	.017	.568	1	.004	.495	.096	.382
AUT-IRE	.199	.005	0	.638	.006	.031	.009
AUT-ITA	.03	.03	0	.011	.034	.051	.041
AUT-NDL	.043	.019	0	.02	.022	.043	.028
AUT-UK	.04	.021	0	.018	.025	.044	.03
FIN-DNK	.046	.018	0	.022	.021	.042	.026
SWE-DNK	.028	.031	0	.01	.036	.053	.043
FIN-FRA	.043	.019	0	.02	.022	.043	.028
FIN-DEU	.031	.029	0	.011	.033	.05	.04
FIN-IRE	.085	.007	0	.051	.008	.033	.011
FIN-ITA	.049	.016	0	.024	.019	.041	.024
FIN-NDL	.046	.017	0	.022	.021	.042	.026
FIN-UK	.034	.026	0	.013	.03	.048	.037
SWE-FRA	.032	.028	0	.012	.032	.05	.038
SWE-DEU	.022	.036	0	.006	.043	.062	.054
SWE-IRE	.62	.011	0	.034	.013	.037	.017
SWE-ITA	.036	.024	0	.015	.028	.047	.034
SWE-NDL	.034	.026	0	.013	.03	.048	.036
SWE-UK	.025	.034	0	.008	.04	.056	.048

Notes: Table A2.3 summarizes the weights for specification 2 without covariates for all country-pairs under investigation. Weights are obtained using the synth command in Stata (Abadie et al., 2014).

A3 Predictor Weights and Predictor Balance

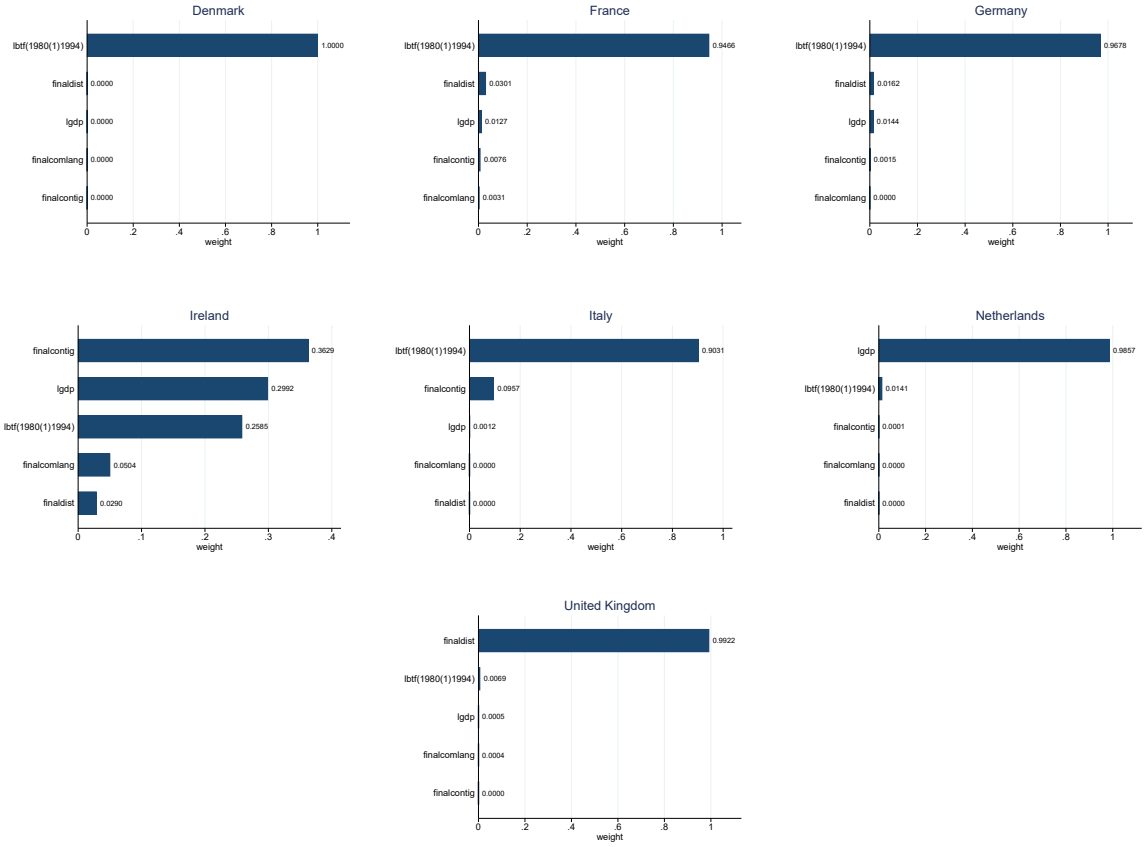

Figure A3.1: Predictor Weights

Notes: Predictor weights for specification 1 with covariates are calculated using the synth2 command in Stata (Yan and Chen, 2023). Variable descriptions can be found in Appendix A1.

Table A3.1: Predictor Balance

	CHE-DNK	CHE-FRA	CHE-DEU	CHE-IRE	CHE-ITA	CHE-NDL	CHE-UK
lbtf(1980(1)1994)	13.03527	15.32806	16.26583	12.02254	15.22631	14.15041	14.86593
synthetic	13.03469	15.32266	16.2389	11.97541	15.20747	14.14594	14.88687
lgdp	36.94769	39.15154	39.42405	35.78369	38.88439	37.82721	38.91908
synthetic	36.46807	38.16023	39.0481	36.15524	38.718	37.82667	38.51477
finaldist	4.309584	4.139724	4.518599	4.471204	4.334684	4.3735	4.805769
synthetic	4.551787	4.443625	4.644129	5.382863	5.090848	5.132759	4.805798
finalcontig	-.1946429	.5392857	.5053571	-.2125	.4535714	-.2160714	-.1214286
synthetic	.0821732	.2617571	.0821429	.0366571	.4536036	.0306643	.0370607
finalcomlang	-.2035714	.5303571	.4071429	-.2214286	.525	-.225	-.1303571
synthetic	.1054571	.2678357	.6232143	.0402071	.1264	-.0121357	-.0034857

Notes: Table A3.1 summarizes the predictor balance for specification 1 with covariates for all country-pairs under investigation when including Ireland. Variable descriptions can be found in Appendix A1. Values are obtained using the synth command in Stata (Abadie et al., 2014).

A4 Figures

A4.1 Lasso Outcome for Germany

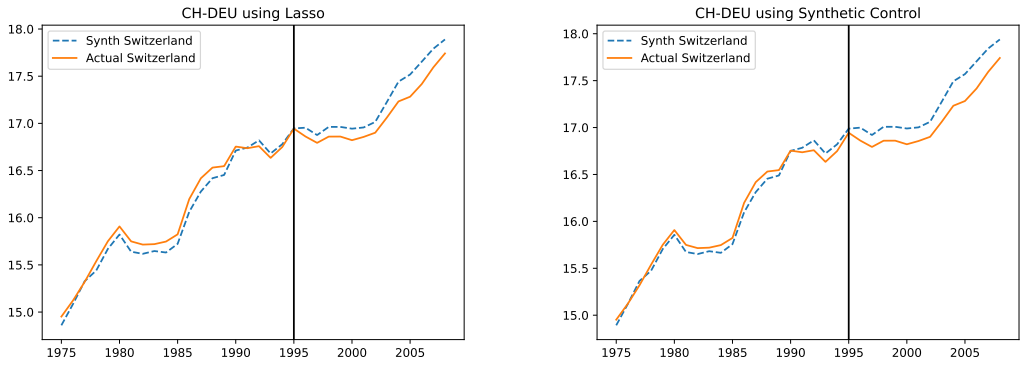

Figure A4.1: Comparing Lasso Weights with Synthetic Control Weights

Notes: The solid line represents the actual trade flow of the country pair Switzerland-Germany. The dashed line represents the synthetic trade flows obtained from a Lasso (Least Absolute Shrinkage and Selection Operator) regression (left) and the synthetic control matching algorithm using the synth command in Stata (right) (Abadie et al., 2014). The Lasso regression is a shrinkage method for variable selection that shrinks irrelevant regression coefficients to zero and thereby identifies the variables and regression coefficients to find a sparse model where the prediction error is minimized (Ranstam and Cook, 2018).

A4.2 In-Time Placebo 1985

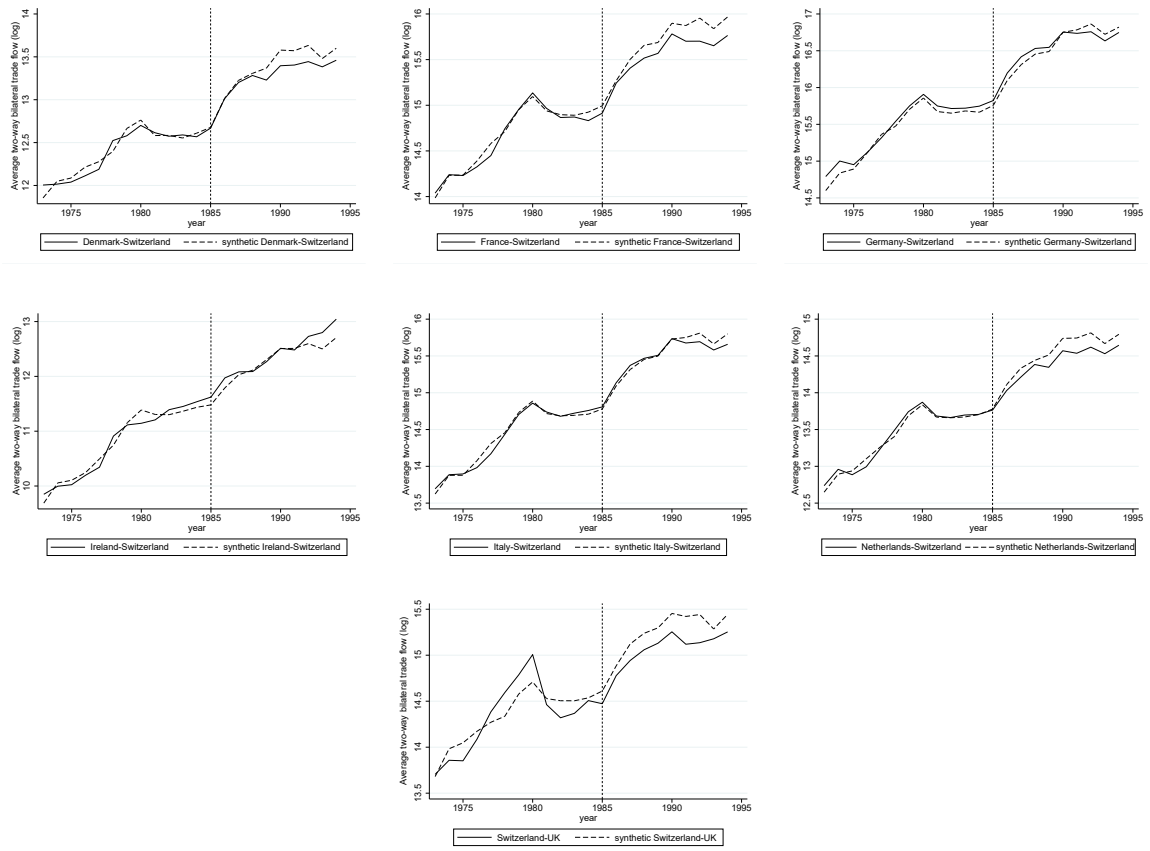

Figure A4.2: In-Time Placebo 1985

Notes: Solid lines represent actual trade flows (log average two-way bilateral trade flow). Dashed lines represent synthetic trade flows. The dashed vertical line represents the placebo treatment period (1985). Results are obtained using synth in Stata (Abadie et al., 2014).

A4.3 In-Time Placebo 1992

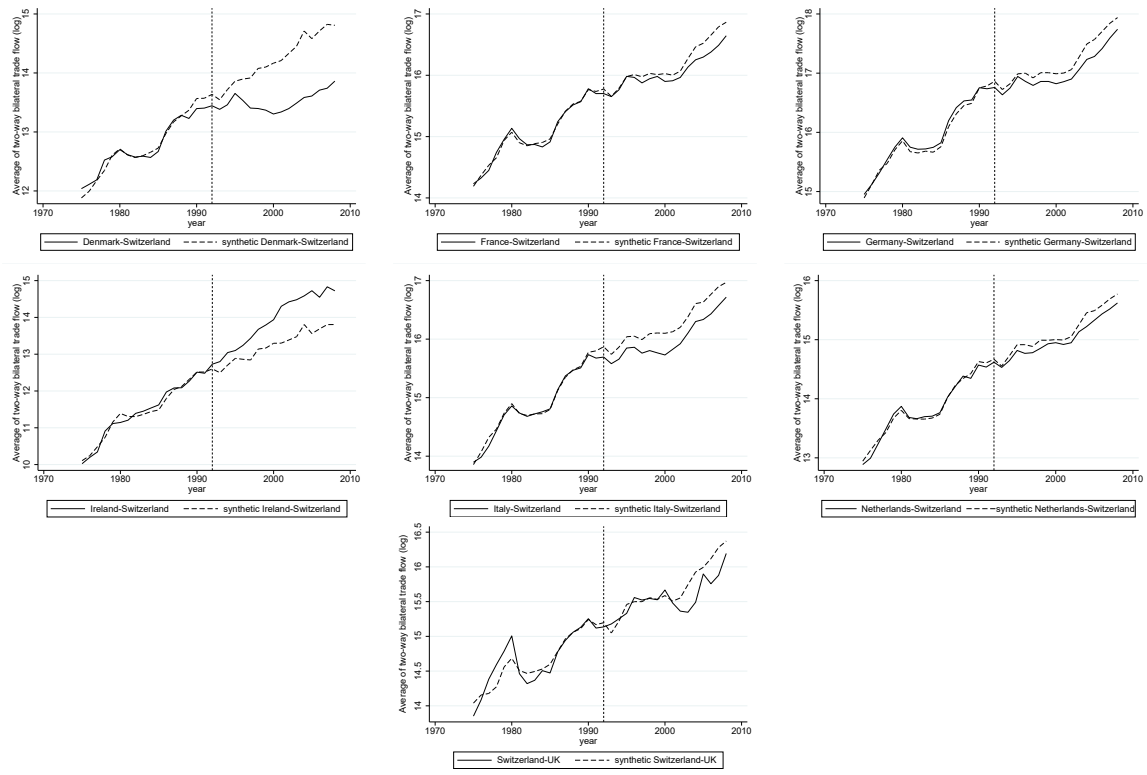

Figure A4.3: In-Time Placebo 1992

Notes: Solid lines represent actual trade flows (log average two-way bilateral trade flow). Dashed lines represent synthetic trade flows. The dashed vertical line represents the placebo treatment period (1992). Results are obtained using synth in Stata (Abadie et al., 2014).

A4.4 In-Space Placebo Austria

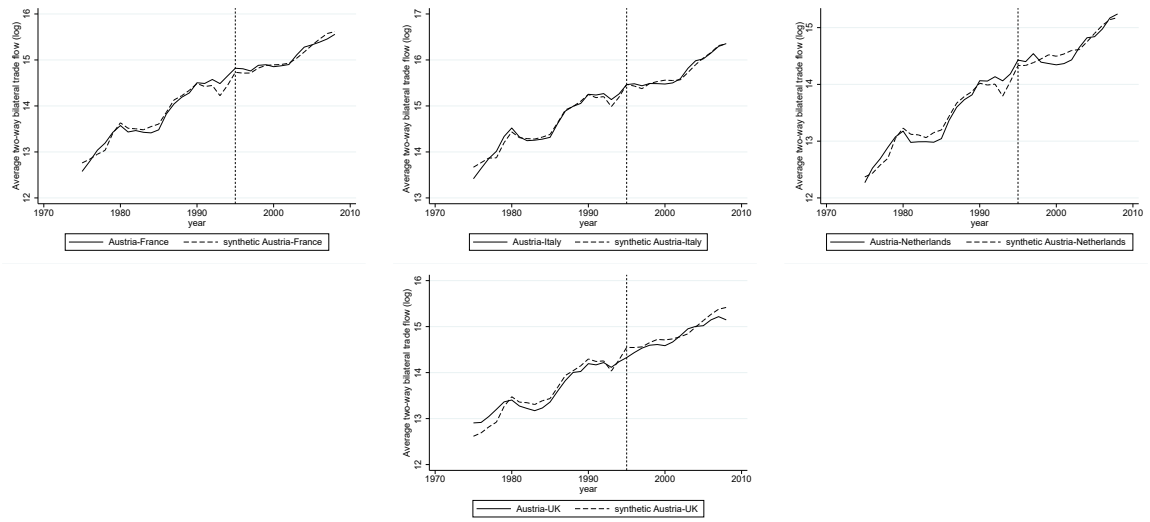

Figure A4.4: In-Space Placebo Austria

Notes: Solid lines represent actual trade flows (log average two-way bilateral trade flow). Dashed lines represent synthetic trade flows for the placebo treated unit Austria. The dashed vertical line represents the treatment period (1995). Results are obtained using synth in Stata (Abadie et al., 2014).