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The Impact of EU Accession on Agricultural Productivity in
Bulgaria: A Synthetic Control Method Analysis with Implications
for Moldova

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Abstract

This thesis analyses how agricultural productivity in a transition economy may react to accession to the European Union, using Bulgaria's 2007 entry as a benchmark for developments in Moldova. The study applies the Synthetic Control Method and constructs a counterfactual path for Bulgaria's agricultural performance based on non-EU transition economies. Cereal yield, measured as output per hectare, is the main outcome, while arable land as a share of total area is used to check whether yield changes are driven by land use. The results show that Bulgaria's cereal yields remain above those of the synthetic control after accession, whereas changes in arable land are small. This pattern suggests that potential gains for Moldova will depend less on expanding cultivated area and more on domestic reforms, institutional capacity and effective use of agricultural support schemes.

Zusammenfassung

Diese Arbeit untersucht, wie sich die landwirtschaftliche Produktivität in einer Transformationsökonomie durch einen möglichen Beitritt zur Europäischen Union verändern könnte. Der EU-Beitritt Bulgariens im Jahr 2007 dient dabei als Vergleichsfall für die Entwicklung in Moldau. Die Studie verwendet die Synthetic Control Method und erstellt eine kontrafaktische Entwicklung für die landwirtschaftliche Leistung Bulgariens auf Grundlage von Transformationsökonomien außerhalb der EU. Als wichtigste Ergebnisvariable wird der Getreideertrag pro Hektar verwendet, während der Anteil des Ackerlandes an der Gesamtfläche als ergänzende Größe dient, um mögliche Veränderungen in der Landnutzung zu berücksichtigen. Die Ergebnisse zeigen, dass die Getreideerträge Bulgariens nach dem EU-Beitritt über denen der synthetischen Kontrollgruppe liegen, während sich der Anteil des Ackerlandes nur geringfügig verändert. Dieses Muster deutet darauf hin, dass potenzielle Vorteile für Moldau weniger von einer Ausweitung der bewirtschafteten Fläche abhängen, sondern vielmehr von innerstaatlichen Reformen, institutionellen Kapazitäten und einer wirksamen Nutzung agrarpolitischer Förderinstrumente.

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Chapter 1. Introduction

The process of European Union (EU) enlargement has influenced economic and institutional development in post-socialist countries in ways documented across several comparative studies. Accession has provided a long-term framework for political stabilization, legislative reform and the restructuring of market institutions.

Across numerous post-socialist economies, farming continues to be a core source of income and employment in rural areas. Earlier enlargements demonstrated that accession modified structures in agriculture through alignment with the Common Agricultural Policy (CAP) and exposure to the competitive environment of the single market, especially in countries where farming remained a central component of rural livelihoods (Csáki and Jambor 2009).

In 2022, Moldova obtained EU candidate status, which marked the beginning of a period in which domestic policies have been brought into closer alignment with those of the Union. Agriculture still accounts for a notable share of both employment and value added, yet productivity lags behind the EU average. This combination raises a natural question of how the sector is likely to adjust if the accession process advances further. To this end, identifying a historical accession case with comparable structural characteristics is essential.

Bulgaria offers a relevant comparison for this purpose. When it became a member of the EU in 2007, it was the poorest among member states and still suffered from institutional and structural constraints that had emerged during the transition period. Agriculture was an important contributor to rural employment and productivity remained below that of older member states. Observing how agricultural indicators developed after accession in this setting offers a relevant reference point for Moldova, whose structural characteristics today resemble Bulgaria's pre-accession profile more closely than those of the countries that joined in 2004.

The objective of this thesis is to use the Bulgarian experience as an empirical example of how agricultural performance may evolve when a low-income transition economy becomes incorporated into EU policy frameworks. This comparison is intended to inform expectations about Moldova's prospective accession path.

1.1 Review of Related Literature and Contribution

The body of theoretical and empirical literature on the study of agricultural adaptation to EU integration has grown significantly over the past two decades. Comparative studies indicate that New Member States (NMS) benefited from a significant increase in productivity and output, although the extent depended on the initial situation and institutional readiness (Csáki and Jambor 2009). These results suggest that it is vital to consider specific accession events rather than making generalizations.

A number of recent studies use the Synthetic Control Method (SCM) to examine the effects of EU accession. Opatrný (2020), for example, considers the Czech Republic and reports an increase in the food production index after entry to the Union. The interpretation is not straightforward, however, because some of the donor countries in the synthetic control themselves later became EU members. Ikeme (2021) takes a wider view and studies Estonia, Latvia and Lithuania. For these Baltic states, the estimated synthetic controls point to sustained gains in the food production index after 2004, which the author links to structural adjustment and the operation of CAP instruments.

A contemporaneous study by Kinell and Nilsson (2025)¹ approaches the topic from a different angle. The authors explore how Ukraine's agricultural performance might develop under a hypothetical EU accession and build their projections using the experience of the countries that joined EU in 2004. Their outcome of interest is total factor productivity in agriculture. Although their research question touches on similar themes to those examined in this thesis, the methodological setup and the institutional context of the 2004 entrants differ in important ways, which limits the direct applicability of their findings to the present case. The 2004 entrants were significantly wealthier at the time of accession than Moldova is today, and Ukraine's circumstances differ from those of a more stable transition economy. By contrast, the present study evaluates an actual accession case from 2007 and focuses on Bulgaria, which entered the Union as its poorest member and therefore offers a

¹ The paper by Kinell and Nilsson was published while this thesis was being completed. It addresses a similar research question, and the main methodological and contextual differences are discussed in the text.

structural configuration closer to that of Moldova. The use of cereal yield as a crop specific indicator also allows a more detailed view of post accession adjustments. These distinctions are particularly relevant at present, as public support for European integration in Moldova has increased and was reflected in the victory of a pro-European party in the parliamentary elections of September 2025.

Against this background, the present study contributes to literature in three ways. It assesses Bulgaria's agricultural performance after its accession with cereal yield as the outcome variable. The thesis isolates efficiency effects from land-use changes, taking into account yields and the share of arable land. Finally, it interprets Bulgaria's path as a point of reference for Moldova, thereby linking the historical experience of a poorer new member state to current enlargement debates.

1.2 Research Question and Empirical Approach

This thesis addresses a specific research question. The main objective of the work is to investigate the influence of Bulgaria's entry into the European Union on agricultural productivity measured by cereal yields. Another objective is to investigate whether any changes in yields after accession are linked to the change in the share of arable land in total land area. The consideration of both measures allows not only for the assessment of improvements in productivity per hectare but also for the separation of these changes from changes in arable land. To answer these questions the analysis uses the Synthetic Control Method (SCM) which constructs a counterfactual trajectory for Bulgaria using non-EU transition economies with similar pre-accession characteristics.

By focusing on a later and poorer entrant, and by differentiating between intensive and extensive margins, the thesis provides a supplement to existing studies of earlier enlargements with implications for Moldova's progress towards EU membership.

Chapter 2. From Transition to EU Integration: The Cases of Bulgaria and Moldova

2.1 Agricultural Transformation in Transition Economies

Following the dissolution of the Soviet Union and socialism in Central and Eastern Europe (CEE), a number of countries in this region embarked on their transition from centrally planned to market economies. These transition economies are broadly described as those that are shifting from state-controlled systems of economic organization to market-based structures, and such reform is characterized by a set of far-reaching institutional, ownership and policy changes (Csáki and Nash 1998). They include CEE economies, the Baltic states and the economies of the Commonwealth of Independent States (CIS). While sharing a common institutional background, they quickly diverged in their development paths. Central European nations sought further integration with the European Union, while most CIS members took a different path outside of EU frameworks (Lerman 2001).

Historically, agriculture has largely contributed to GDP and served as a significant source of employment in post-socialist countries. During the first years of transition, agricultural sector contributed over 15% to GDP in most CEE and CIS countries. It is important to note that, according to Table 1, agricultural sector in Bulgaria accounted for 17,8% of GDP, whereas in Romania and Georgia this figure was higher and exceeded 20%. Such magnitudes reflect underdeveloped industrial and service sectors and the legacy of collective and state farming (Liefert and Swinnen 2002; Lerman 2001).

Some post-soviet economies have adopted an explicit EU-oriented integration approach. In June 2022 the EU granted candidate status to Ukraine and Moldova, while Georgia received candidate status in December 2023. Other CIS countries have yet to seek this accession path, cooperating with the EU on the basis of non-membership agreements. The prospect of EU enlargement raises an important question about the impact of EU accession on agricultural productivity in transition economies. It remains important to understand whether integration into the EU has had positive effects on productivity in the agricultural sector, as well as what the prospects are for current EU candidates to achieve similarly successful

development.

Table 1 Share of agriculture in GDP in countries with transition economy (percentage)

Country	1990	1995	2000	2005	2010	2015	2020
Albania	-	32,84	22,18	17,12	16,36	18,75	18,81
Belarus	22,86	15,77	12,1	8,52	8,89	6,28	7,1
Bosnia and Herzegovina	-	20,7	9,00	8,29	6,80	6,04	5,91
Bulgaria	17,75	9,22	10,97	7,28	4,03	4,06	3,43
Czechia	-	4,00	3,23	2,28	1,52	2,26	1,94
Georgia	30,07	-	20,60	14,77	8,87	8,54	8,31
Hungaria	-	7,28	5,07	3,72	3,00	3,76	3,36
Moldova	-	29,27	25,41	16,40	11,16	12,82	9,37
Romania	21,81	18,16	10,85	8,49	5,18	4,42	4,06
Serbia	-	14,16	14,67	6,16	6,11	5,61	5,05
Ukraine	24,47	13,77	13,95	8,88	7,40	12,06	9,31

Source: Our World in Data (2024), *Agriculture, forestry, and fishing, value added (% of GDP)*, based on World Bank, World Development Indicators.

The transformation of agricultural sector was one of the most complex and extensive components of the post-socialist transition. Large collective and state farms dominated agricultural production, while resource allocation, procurement, and distribution were strictly determined by central planning. The collapse of this system in the 1990s required a thorough restructuring of ownership, production incentives, and market institutions. According to researchers, the transition process was characterized by four main aspects of agricultural reform (Liefert and Swinnen 2002):

1. market liberalization
2. restructuring through privatization
3. transformation of upstream and downstream sectors
4. creation of market-supporting institutions.

2.1.1 Market liberalization

Under the socialist system, prices were centrally fixed, and the state strictly

controlled both input allocation and output marketing across sectors. In the early 1990s, most transition economies removed price controls and administrative trade barriers, opened domestic markets to international competition, and brought local firms into the global market.

Market liberalization significantly changed the incentive framework. Companies were required to react to price signals and market demand, instead of depending on politically determined prices and inputs allocated by the state. By changing prices, incomes, and exchange rates, liberalization also altered the composition and volume of agricultural output and linked agriculture more closely to macroeconomic factors such as inflation and income growth. Although the reform initially caused output volatility, it was essential for establishing functional markets for both inputs and outputs, laying the foundation for subsequent structural changes (Liefert and Swinnen 2002; Lerman 2001).

2.1.2 Privatization and land reform

The second great driver of transition was the reform of property rights and production organizations through privatization and land reform. During the socialist period, collective and state farms made most of the decisions, while private ownership existed only in the form of small household plots. Transition reforms aimed to reduce these large-scale organizations and transfer ownership of land and assets to individuals or newly created private entities.

Various countries adopted various ways of restructuring farms. In Central and Eastern Europe, property was often restituted to former owners or their descendants, returning pre-socialist property rights. In contrast, several former Soviet Union countries implemented another approach by adopting the system of distribution based on land shares or ownership certificates, which gave people the right to receive land plots and establish farms under private ownership.

This reform changed not only land ownership but also the structure of agricultural production. Unlike market liberalization, which influenced what farmers produced, land reform determined how production was organized, introducing incentives for efficiency and productivity improvements at the farm level (Liefert and Swinnen 2002; Lerman 2001).

2.1.3 Transformation of upstream and downstream sectors

Reorganization of the upstream and downstream sectors was another important part of the transition. Production and distribution of goods and services in centrally planned system was achieved using state monopolies, which exercised monopoly power over inputs and outputs. This extended across industries in which supply chains for machinery, chemicals, food processing and consumer goods were vertically integrated and centrally managed.

With the onset of transition, these state-controlled production and distribution networks were dismantled or privatized. Trade liberalization and enterprise reform created space for new private firms to enter the input supply, processing, trading, and retail markets. In many countries, the foreign direct investment process drove this restructuring by focusing on food processing, manufacturing and retail trade which increasingly became integrated into international supply chain (Csaki and Nash 1998). For agriculture, this broader process of upstream and downstream sectoral transformation was significant because farms needed the new private input suppliers and marketing channels to be able to operate in a market-oriented environment (Liefert and Swinnen 2002).

2.1.4 Creation of market-supporting institutions

The fourth component of transition reforms was the establishment of market-supporting institutions. Under central planning, most of the fundamental institutions that would emerge in a market economy to facilitate exchange were absent or highly underdeveloped. There were no clearly defined property rights, credit system operated through state banks and contract enforcement did not matter in the context of transactions being planned and supervised by the state.

Transition economies in the 1990s were required to build these institutions from the ground up. These efforts involved the establishment of land cadaster and registration systems, which are necessary for realizing land sales and rentals, the development of rural finance and credit markets that can supply capital to producers and enterprises, establishing legal frameworks for contract enforcement and bankruptcy procedures. A second important policy move was the establishment of systems for market information and agricultural statistics that allowed producers and traders to make informed decisions (Liefert and Swinnen 2002).

Actual advances in these areas varied from one country to another, but the need to build such organizations was generally agreed upon as a precondition for successful market operation. Without secure property rights, finance that was available and enforceable contracts, liberalization and privatization alone could not ensure sustainable productivity growth.

2.2 Agricultural Change across the Region since 1990

2.2.1 Initial Conditions

At the beginning of the transition in the early 1990s, the agricultural sectors of post-socialist countries had remarkably similar institutional and structural background. Throughout the Commonwealth of Independent States (CIS), the Baltic countries, and Central and Eastern Europe (CEE), agricultural production was largely organized in the form of collective and state farms. These organizations relied on centrally planned systems for distribution and procurement. In this system, resource allocation, the provision of inputs, and the functioning of markets were largely determined by political decisions, while farms operated under soft budget constraints that weakened incentives to improve efficiency or innovation (Lerman 2001).

As a result, socialist agriculture in the region tended to exhibit excess labor, low productivity, and only limited interaction with genuine market forces. In the final years of the Soviet Union, more than 25% of the labor force in the region was employed in agriculture, which is several times the share in Western economies (Lerman 2008; Petrick 2021).

Due to these structural similarities, transition economies experienced a largely identical set of early difficulties, including limited property rights, large farms, a strong reliance on government assistance, and the lack of market institutions, even though their reform paths ultimately diverged. The first stage of agricultural reform across the region intended to change the collective system, introduce market incentives, and reestablish private ownership as the institutional foundation for productive agriculture (Lerman 2008; Petrick 2021).

2.2.2 Early Transformational Recession

The initial years of the transition period were characterized by what Kornai

(1994) famously referred to as the “transformational recession”. The decline was especially severe in agriculture. When central planning was suddenly removed, it became clear that the sector was highly inefficient, and both producers and consumers were not prepared to operate in a market economy. Once state procurement ended and subsidies were cut, and governments started using market prices, agricultural production and incomes dropped sharply in many transition economies.

Table 2 demonstrates the decline in agricultural output, which compares agricultural output in the late 1990s to the 1986-1990 baseline average. Output fell significantly in all countries with transition economy (Liefert and Swinnen 2002). These statistics underscore the shared challenges of the transformational recession.

Table 2: Agricultural output in 1997-99 relative to 1986-90 (1986-90 = 100)

Country	Agricultural output (% of 1986-90 average)	GDP (% of 1986-90 average)
Hungary	72	98
Czech Republic	72	91
Poland	92	122
Romania	97	75
Bulgaria	59	68
Russia	60	61
Ukraine	51	39
Moldova	55	-
Kazakhstan	47	51
Belarus	58	71

Source: Liefert, William M., and Johan F. M. Swinnen. 2002. Changes in Agricultural Markets in Transition Economies. Agricultural Economic Report No. 806. Washington, DC: U.S. Department of Agriculture, Economic Research Service.

The decline was made even worse by a sharp drop in the use of key agricultural inputs. There was a sharp drop in the application of fertilizers, energy consumption, and use of machinery, as governmental support declined and global input prices were introduced. In some CIS countries, fertilizer use fell by more than 70% relative to pre-transition levels, directly contributing to lower yields (Liefert and Swinnen 2002). Changes in the labor market made the differences between

regions even bigger. In CEE, the reduction in agricultural employment supported productivity growth, whereas in the CIS, agricultural employment rates often remained high or increased, resulting in significant declines in labor productivity (Lerman 2001).

The recession also had a significant institutional and organizational aspect. Csaki and Lerman (1997) note that reformers expected rapid growth after the property rights were restored and markets were liberalized. In reality, the opposite happened. Despite the legislation of land privatization throughout the region, a considerable portion of the land remained under collective or cooperative management. In Bulgaria, laws on land restitution returned properties to previous owners as they had been before the socialist period. However, delays in execution and fragmentation made it difficult to build productive private farms. In Moldova, land share certificates were distributed to rural households, which resulted in a highly fragmented land structure. Rather than immediately switching to individual farming, many families preferred to leave their plots inside existing collective arrangements, partly to avoid the risks associated with farming on their own. This anticipation slowed down the restructuring process and contributed to a longer period of declining output.

These developments demonstrate that the transformational recession in agriculture was deeper and more complex than initially expected. It included not just a reduction in output, but also a structural realignment involving diminished input utilization, distorted labor allocation, and incomplete restructuring of farm organizations.

2.2.3 Diverging trajectories: CEE and CIS

After the transformational recession of the early 1990s, the agricultural sector of post-socialist economies started to move in different directions. Although all transition economies experienced similar shocks once central planning ended, the speed and effectiveness of reforms differed significantly between CEE and the CIS. By the mid-1990s, agricultural output had stabilized in many CEE countries and even showed signs of recovery in some instances. In contrast, the decline in agricultural output persisted throughout the entire decade in CIS countries.

In CEE reforms were relatively decisive and supported by external anchors,

most importantly the prospect of European Union (EU) accession. EU accession required an extensive legal and administrative realignment in agriculture. Under the EU's Copenhagen criteria candidates were required to align their agricultural policies and institutions with the EU *acquis communautaire*. An acceding country must fully implement the Common Agricultural Policy (CAP), meaning the administrative and regulatory apparatus for EU agricultural policies must be in place.

The main requirement was institutional capacity. Each acceding country set up an accredited Paying Agency to manage CAP funds and built an Integrated Administration and Control System (IACS) to register land plots, livestock and entitlements, monitor eligibility, and withstand EU audits. Enforcement agencies were also required to be upgraded. To ensure that standards were met across the supply chain, many quality control laboratories, plant health services, and food safety and veterinary inspectorates were reorganized or newly established (Schuman, Gross & Smith, 2016).

Land tenure also played an important role in this legal transformation. Countries updated cadastral and land registries, clarified property rights, and, in cases where fragmentation was prevalent, introduced legal tools for land banking and consolidation to promote investment and enable functional land markets. These measures made it simpler to purchase, sell, or lease land. Ministries of agriculture were reorganized to manage inspection, intervention, and rural development duties, frequently with the technical assistance of programs provided by existing EU member states.

Pre-accession instruments also contributed to this transformation and served as practical preparation for EU procedures. SAPARD and similar pre-accession instruments were used to co-finance the modernization of farms and processing facilities, improvements in rural infrastructure, and various forms of human-capital development. The EU, however, released these resources only on the condition that candidate applied its rules on planning, monitoring, and financial control. Empirical evidence suggests that those countries which coupled this compliance-based financial support with broader structural reforms recorded more substantial gains in competitiveness, whereas states that focused mainly on absorbing transfers without

far-reaching institutional change saw more modest benefits.

By contrast, reforms in CIS proceeded more slowly, were less coherent, and largely lacked such external anchors. Swinnen, Van Herck, and Vranken (2015) note that, unlike in CEE, land markets in CIS countries remain fragmented, tenure security is weak, and rental relations are still tightly regulated. Koester (2015) additionally points out that weak enforcement of property rights and the lack of market institutions reduced farmers' incentives and kept the agricultural crisis going for longer. Moldova serves as a prime illustration of the CIS trajectory. Despite the distribution of land share certificates, excessive fragmentation and reluctance to leave collective farms delayed productivity improvements and recovery (Lerman 2009).

To systematically evaluate progress in reforms, the Agricultural Policy Reform Index and the Land Reform Index were created for Europe and Central Asia (ECA) by the World Bank and the European Bank for Reconstruction and Development (EBRD). These indices range from 0 to 10 and capture how far countries have advanced in opening agricultural market, privatizing input supply and processing, developing institutions, expanding rural finance, implementing land reform and land privatization, and promoting individual farming. Lerman (2008) reproduces these indices for CIS countries, providing a convenient comparative snapshot (Table 3). It is important to note that these indices were primarily compiled for the 1990s and early 2000s and are no longer regularly updated. The most recent harmonized data for CIS countries goes back to the mid-2000s. For this reason, Lerman's (2008) results should be viewed as a snapshot that is useful for comparison, rather than as evidence of the situation today.

Table 3: ECA Policy and Land Reform Indices in CIS countries (2004, 0-10 scale)

Country	ECA Agricultural Policy Index (2004)	ECA Land Reform Index (2004)
Russia	6.2	5
Ukraine	6.2	6
Belarus	2.6	2
Moldova	6.0	7
Armenia	7.8	9

Georgia	6.0	7
Azerbaijan	6.6	9
Kazakhstan	6.2	5

Source: World Bank/EBRD indices, reported in Lerman 2008, Table 1, p. 392.

These indices underline the structural divergence between CEE and CIS. By 2004, CEE countries had already completed their transition under the EU accession framework and were no longer included in the ECA reform indices. CIS countries, by contrast, exhibited wide internal variation.

2.3 Bulgaria's Reform Path up to EU Accession in 2007

2.3.1 Pre-accession institutional and legal transformation

In the process of EU integration, Bulgaria experienced profound institutional and legal developmental transformations in agriculture policy. This transformation was mostly related to the need to fulfil the accession requirements of *acquis communautaire* and to improve administrative and institutional systems necessary to operate under Common Agricultural Policy (CAP). In the late 1990s, the country's policy focused less on market liberalism and privatization, and the new goal was to harmonize Bulgarian national laws, rules, and practices with those of the EU, mainly by adopting the *acquis communautaire* that defined the emerging EU-aligned legal framework (Csáki and Jambor 2010; OECD 2000).

Harmonization started with the adoption of the main legislative acts that transposed the EU's agricultural *acquis* into Bulgarian law. The main body of the *acquis communautaire* in the domain of food safety, veterinary and phytosanitary standards, environmental protection and competition policy was transposed and incorporated into national legislation by the Bulgarian legislative authorities. The Food Law (1999) and the Veterinary Act (2000) were among the first legislative acts that brought Bulgaria's food-safety regime in compliance with the EU. The act implemented new sanitary, labeling and risk management requirements for products by aligning them with European practices (Ivanova et al 2007; OECD 2000). Conversely, with the Plant Protection Act (1999) and Animal Health Law (2000), regulatory mechanisms were put into place for disease and pest prevention following EU guidelines. In addition technical legislation, competition and state-aid

law were adjusted to align with EU market principles and prevent the distortion of agricultural trade (Ivanova et al. 2007).

The Ministry of Agriculture and Forestry (later renamed the Ministry of Agriculture and Food) underwent reorganization to manage EU integration work. Directorates focused on EU affairs were established to coordinate EU-related business, such as policy harmonization, food-safety supervision, and rural-development project coordination. The institutional reform was completed with the creation of the State Fund Agriculture, which became Bulgaria's Paying Agency in 2001 and was responsible for administering EU and national agricultural payments, thus ensuring transparency and auditability of fund flows. Bulgaria implemented an Integrated Administration and Control System (IACS) to fulfill CAP's administrative demands, which included the recording of land plots, animals and farmer payments and was governed by the Paying Agency to exclude frauds and irregularities (Schuman, Gross, Smith 2016; Csáki and Jámboor 2009).

In parallel with these administrative reforms, enforcement institutions were strengthened to ensure implementation of the CAP regulatory framework. The National Veterinary Service and the National Plant Protection Service were modernized and provided with laboratory infrastructure to monitor product quality and disease prevention at the EU level. The National Food Safety Agency was created later (in 2011) to consolidate control functions and introduce transparent certification and monitoring mechanisms, reflecting the EU principle of administrative decentralization (OECD 2000; Csáki & Jámboor 2009).

Land policy reform was another key aspect of the pre-accession legal transformation. By the late 1990s, most land restitution had been completed, but Bulgaria still faced serious structural problems. Agricultural land remained highly fragmented, and property records were often incomplete or unreliable. In the early 2000s, the government revised the legal framework to support land consolidation, modernize the cadaster, and strengthen property rights for potential investors. The Law on Ownership and Use of Agricultural Land was amended several times between 2002 and 2005 to bring land regulation closer to EU standards and to introduce clearer rules for the sale and leasing of land. Foreign ownership of agricultural land was maintained temporarily but progressively liberalized in line

with EU commitments. As Georgiev and Grozdanova (2022) point out, this legal change aimed to strike a careful balance between preserving national control over land and complying with the EU *acquis*, which required a gradual opening of land markets.

These institutional and legal steps were embedded in a broader strategic framework defined by the National Regional Development Plan (NRDP 1999) and the National Economic Development Plan (NEDP 2000-2006), which set out the strategic priorities and financial framework for pre-accession programs. Both plans emphasized sustainable regional development, decentralization of administration, and balanced rural development, considering such systemic deficiencies as an absence of administrative know-how and limited regional data (OECD 2000). In these regards, the National Agriculture and Rural Development Plan (NARDP 2000-2006) laid down the sectoral guidelines for aligning Bulgaria's agricultural policy with the *acquis* and the CAP. For implementation coordination, the Ministry of Agriculture established a special SAPARD Task Force in 1998, providing inter-ministerial coordination and compliance with EU financial and audit procedures (Csáki et al. 2000).

Pre-accession assistance through Special Accession Program for Agriculture and Rural Development (SAPARD) worked both as a source of finance and as a tool for building administrative capacity. Created in 2000, SAPARD provided support for modernizing farms and processing facilities, improving rural infrastructure, and strengthening administrative capacities. Up to 75% of the program's funding was supplied by the EU. The program also gave Bulgarian authorities practical experience with EU-style project appraisal, monitoring, and financial control, which later helped them to absorb CAP funds more effectively (Ivanova et al. 2007).

2.3.2 Expectations and drivers of EU accession

By the early 2000s, EU membership became the principal feature on both Bulgaria's political and economic agenda. After a decade of volatile reforms and an economic crisis, the perspective of accession had become a stability-anchor. EU integration was viewed by Bulgarian society and elites as a way back to economic normality and political respectability. The obligation to meet the accession criteria

facilitated a reform roadmap and served as an external governance device, contributing to the reinforcement of public consensus around modernization and institutional change (Lane 2007; Dimitrova 2021).

The economic expectations created by EU membership were high. The membership was seen as a way to ensure macroeconomic stability, improved governance, and close the gap in living standards between Eastern and Western Europe. It was to attract Foreign Direct Investment (FDI), create export opportunities and enable access to structural and cohesion funds. In the pre-accession period, there was an exponential rise in FDI flows in Bulgaria that mirrored rising investor confidence and the credibility of the accession process (OECD 2000; Dobrinsky, 2017). Accession in particular was expected to strengthen the rule of law, property rights and administrative capacity, which are regarded as preconditions for sustained growth and competitiveness over time (Dimitrova and Dragneva 2001; Lane 2007; Dimitrova 2021).

Politically, EU membership was seen as an insurance against reversals of policy, and a way to anchor democratic rule. The accession process created a series of measurable commitments that linked domestic political accountability to external monitoring. This EU conditionality has also acted as a powerful reform factor, guaranteeing consistency of reforms in the field of public administration, judiciary and regulation enforcement. For a small open economy like Bulgaria, the EU had not only capital but also institutional credibility and membership in a stable policy system (Dimitrova 2021; Dobrinsky 2017).

Agriculture occupied a special position in this process of expectation. With its heavy employment and income-generating potential, agriculture was seen as the prime beneficiary of EU membership. The prospect of CAP subsidies was expected to help ensure price stability and provide investment support for modernization. Farmers and government were counting on the CAP to stabilize incomes in rural areas, make farming more competitive and drive structural change towards more productive and export-oriented farming. Pre-accession instruments such as SAPARD contributed to the creation of these anticipations by offering an early example of how EU funding was distributed and aligning administrative structures with the organization of subsidy management (Ivanova et al. 2007; Dobrinsky

2017).

In the meantime, such high expectations could also pose some challenges. Analysts warned that while EU entry would give Bulgarian agriculture the element of luck, this would also mean coming under greater competition in a single market. The implementation of CAP implied the progressive elimination of local support systems and strict environmental and quality norms, which involved a continuous adaptation of procedures (Ivanova et al 2007; Kiss 2011). The prevailing perception was generally positive, and membership in the EU presented the last step for modernization and development of rural area, as well as long-term sustainability of Bulgaria's agricultural economy (Nikola and Nikolaev 2017).

2.3.3 Early Outcomes and Bulgaria's Readiness for EU Accession

By 2007, Bulgaria had largely completed the formal alignment of its economic and agricultural institutions with European Union standards, and the discussion in the literature shifted toward the country's readiness and early impact of membership. Analyses emphasize that Bulgaria's accession to the Union took place with broadly functioning administrative capacity and growing confidence among investors, but also with structural weaknesses that limited the immediate benefits of integration (Dobrinsky 2017; Lane 2007).

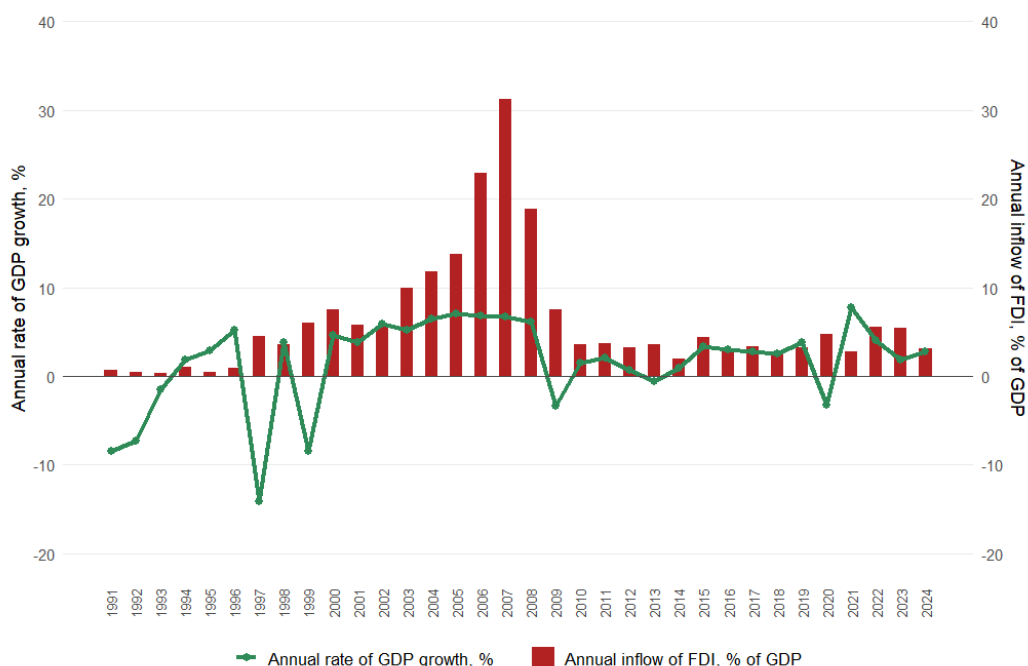
In the broader economy, the first emerging effects were financial and macroeconomic. The initiation of the accession negotiations and the credibility of membership led to rapid capital inflows, declining risk premium, and resumption of growth. However, as Dobrinsky (2017) illustrates this positive tendency was interrupted by the 2008-2009 global financial crisis that affected Bulgaria almost in the very year of its accession into the EU. As shown in Figure 1, GDP growth and foreign direct investment (FDI) flows declined rapidly after 2008 due to the contraction of external demand and a drop in capital inflows. This sudden reversal undermined one of the central expectations associated with membership, which is continuous economic catching-up with Western Europe.

According to Dobrinsky (2017), the years immediately before and after entry showed a surge in foreign direct investment and strong GDP growth, reflecting the expectation of access to European funds and markets. This period also saw rising consumption and employment, which reinforced public optimism and social

satisfaction (Nikola and Nikolaev 2017).

Development of the agricultural sector revealed more uneven results. As Ivanova et al. (2007) and Csáki and Jám bor (2009) note, the membership of Bulgaria in the CAP framework entitled it to direct income support and rural development support. In the first year of membership, Bulgarian farmers started to receive decoupled direct payments by the European Agricultural Guarantee Fund and investment projects were supported through the Rural Development Fund. The literature reveals that total transfers under CAP mechanisms in the early period were on average 2% of agricultural GDP, representing a significant but still moderate injection of public support compared to older member states.

Figure 1: GDP growth and FDI inflows in Bulgaria, 1991-2024



Source: Author's calculations based on World Bank data (World Development Indicators, accessed November 2025)

Pre-accession programs were delivering measurable effects during the transition to full membership. SAPARD projects, finished after 2006, also modernized processing facilities and rural infrastructure, bringing farms to European standards (Dobrinsky 2017). However, structural fragmentation, small size farms and low competitiveness still existed, delaying the process of adjustment

to market and quality requirements (Kiss 2011). Bulgarian agriculture continued to be characterized by numerous smallholdings that could not take advantage of economies of scale or implement investment aid effectively.

A further early difficulty was the bureaucratic use of available EU grants. Dimitrova (2021) explains how Bulgaria's institutions on paper fulfilled all membership criteria but struggled with procedural complexity and monitoring capacity when full access to EU funds was granted. Similar concerns appear in Georgiev and Grozdanova (2022) who demonstrate that post-accession legal refinement in land policy was present even in years after accession, particularly when it comes to property rights and the liberalization of land markets.

Overall, readiness was mixed at the early phase of membership. Macroeconomic and financial indicators improved, confirming that the policy and institutional setting broadly operated in practice. The new funding channels of the CAP, in agriculture specifically, have been implemented and initial income and investment effects were triggered but historical path and structural problems such as fragmentation, low competitiveness, and uneven administrative performance constrained short term impact (Dimitrova 2021; Ivanova et al 2007).

2.4 Moldova after the Transition: A Post-Soviet Agriculture Outside the EU

2.4.1 Land reform and farm structure in the 1990s

The land reform, which took place throughout the 1990s, turned out to be a key agrarian transition in post-Soviet space. Although it reached a remarkable degree of equality as to the distribution of land, the reform was unsatisfactory in terms of efficiency and productivity. Unlike Bulgaria's restitution-oriented system, which sought to return land to its former pre-socialist owners or their descendants, in the Moldovan case the policy was based on land share certificates. These were distributed to members of collectives and state-owned farms, granting them rights to specific shares of land which could subsequently be physically divided (Lerman et al. 1998). As a legal foundation, the 1992 Land Code prescribed land for over 1.2 million citizens.

The reform package led to a prolonged and uncertain transition period. On

collective farms, the process of “exiting” with physical land plots was often slow and encountered unresolved farm debts as well as local political resistance. As noted by Dudwick et al. (2007), this created environment facilitated asset misuse and enabled former farm managers to remain influential throughout the late 1990s. Only with the National Land Program of 1998, supported by USAID, and after the Debt Law of 1999 was there an improvement in how physical plots were distributed, which led to a large part of collective farms being dissolved and their land and assets being redistributed.

The consequence was the rise of more than one million small landowners. Early in the twenty-first century household-based agricultural production accounted for 56% of cultivated areas and 44% was under newly established corporate farms (Dudwick et al. 2007). The average size of landholdings was considerably small, less than 2 ha/household, and they were usually fragmented into three to four plots (Timofti, Popa, and Kielbasa 2015). This high fragmentation level was more pronounced than in Bulgaria, where restitution also produced fragmentation but was partly mitigated by subsequent land market reforms driven by the European Union.

The Moldovan policy focused on equity rather than efficiency. Land was comprehensively divided among farm workers, retirees, and rural residents resulting in a relatively egalitarian pattern of ownership (Lerman 2001). However, the dominance of small subsistence-oriented landholders, who also operated with low level of inputs and services, such as machinery and fertilizers, credit and market access meant that scope for productivity increase was restricted. This structural evolution helped to consolidate dualism, where a large number of semi-subsistence farms coexisted with a smaller number of corporate enterprises, and it became a factor behind Moldova’s agricultural long-term stagnation.

2.4.2 Institutional environment and Agricultural Performance

The post-soviet institutional environment of Moldovan agriculture continued to suffer from long-standing weaknesses that prevented it from adjusting adequately to market conditions. Moldova did not have an external anchor, like some other countries in Central and Eastern Europe had, to help guide these reforms, so the changes were made under the divided influence of national political interests and

outside donors. The World Bank, USAID and IFAD provided substantial assistance, yet this involved short-term input rather than the institutional discipline that EU candidate countries experienced.

The issue of land ownership and management continued to be a challenge in the 1990s. The cadaster was not yet fully functional, and unpredictable transaction costs remained, creating an uncertain environment for investors and making efficient land markets more difficult. Farmers had limited access to credit, while leasing contracts developed slowly, which did not significantly facilitate the consolidation of fragmented holdings (Dudwick et al. 2007). As a result, most smallholders remained self-sufficiency oriented to satisfy their dietary requirements with low capital input and without much scope for expansion.

The macroeconomic environment added constraints. Moldova fell into one of the deepest recessions among post-soviet economics. During this period, the gross domestic product decreased by almost 70% from 1985 to 1999, and inflation ranged between 300% and 1200% per year in the early 1990s (Lerman 2001; Dudwick et al. 2007). These conditions meant that there was no money for the country's farmers to spend on improving and modernizing their holdings. At the same time, the government continued ad hoc interventions in commodity markets, which maintained soft budget constraints for corporate farms through multiple cycles of debt write-off, subsidies and concessional credit. These policy measures weakened restructuring and promoted inefficiency.

These institutional and economic weaknesses were also clear in terms of agricultural productivity. Input utilization collapsed, with fertilizer use declining from above 200 kg per hectare in the late Soviet era to less than 1 kg per hectare by 1999 (Dudwick et al. 2007). Crop and livestock yield fell dramatically in the 1990s, although there was some stabilization after 2000. Land productivity remained among the lowest in the region. While the EU average exceeded 2000 EUR/ha, productivity in Moldova reached only 771 EUR/ha by 2008 (Timofti, Popa, and Kielbasa 2015). These figures show how far Moldova lagged behind its European neighbors.

2.4.3 Post-2000 Adjustment and External Orientation

After land reform was fully implemented in the late 1990s, Moldovan

agriculture steadily adapted. One crucial shift in the 2000s was the creation of larger farms through land leasing from many smallholders. Although the majority of rural households retained small and scattered plots, medium and larger farms consolidated their activities, suggesting modest movements toward structural change. The size of the average farm increased from roughly 1.9 hectares in 2003 to 2.9 hectares in 2012, but these were still very small compared with the rest of the world (Timofti, Popa and Kielbasa 2015). As a result, widespread land fragmentation remained, and productivity growth and investment options were limited.

Post-2007 government support for agriculture grew, but the scale and efficiency were far behind EU levels. The Agency of Interventions and Payments in Agriculture (AIPA) became responsible for administering subsidies since 2010. In the same year, the NFDARE (National Fund for Development of Agriculture and Rural Environment) was created to centralize agricultural support. Public investment was mainly in the form of subsidies for machinery, perennial plantings, irrigation equipment and infrastructure. However, the post-investment subsidy structure targeted farmers who had access to capital or credit beforehand, which excluded many smallholders. As a result, state support was biased towards better-capitalized farms (Herzfeld, Lucasenco and Zvyagintsev 2022).

Indicators from OECD countries confirm that public support was limited. Between 2007 and 2018, the average Producer Support Estimate (PSE) in Moldova was -13.5%, while in the EU it was 23.2%. Budget support comprised only 2.3% of agricultural production value, while budget allocations ranged from 242 million MDL in 2012 to 954 million MDL in 2018. This volatility highlighted the lack of stability in the policy framework and its low capacity to produce consistent behavior by farmers (Herzfeld, Lucasenco, and Zvyagintsev 2022).

Externally, Moldova increasingly oriented its market toward Europe. The Partnership and Cooperation Agreement signed in 1999, and later the more far-reaching Deep and Comprehensive Free Trade Agreement (DCFTA) in 2014, laid the foundation for closer integration with the EU. Over time, the policy discussion shifted towards how well Moldovan agricultural policy fits with the CAP and broader EU frameworks, especially the Green Deal and the Farm to Fork

strategy (Herzfeld, Lucasenco, and Zvyagintsev 2022). However, as there were no EU CAP instruments or structural resources available to it, Moldovan agricultural sector was struggling to accumulate the necessary infrastructure for modernization. Moreover, the fact that Russia was a major market for wine, fruits, and nuts made producers vulnerable to seasonal trade blockades, emphasizing the urgency of diversification (Gheorghiuță, Strătilă & Gumeniuc 2024).

Social and structural challenges continued during this time. While the contribution of agriculture to gross value added dropped to around 11% by 2020, the sector still accounted for some 21% of total employment (Herzfeld, Lucasenco and Zvyagintsev 2022). This imbalance was reflected in a chronic problem of low labor productivity. Large-scale rural outmigration reduced the available labor force, and high debt together with underinvestment in infrastructure made rural areas even more vulnerable. Agriculture still had a dualistic structure, because subsistence-oriented smallholders and better-capitalized corporate and medium farms continued to exist side by side and to shape the sector.

After 2000, the restructuring of Moldovan agriculture involved only modest land consolidation and limited policy change, so many structural weaknesses remained. Although access to European markets increased, the sector's development was held back by insufficient state support, the exclusion of smallholders from compensation schemes, and persistent social and infrastructure problems.

2.4.4 Moldova's Path toward EU Accession and Agricultural Prospects

Moldova's process of full integration into the EU has been progressively driven by agricultural and rural development policies. Following Moldova's official status of candidate in 2022, further reforms were introduced to increase institutional convergence with the *acquis communautaire*, especially in agriculture, environmental protection and food safety (European Commission 2024). Although Moldova is a small country, agriculture continues to have an important place in the economy. It employs around 20% of the workforce and accounts for roughly one tenth of GDP. However, despite its high level of economic and social importance, agricultural productivity has still not reached the level of EU countries because of structural inefficiency, climatic vulnerabilities, and limited access to modern

technologies (Litvin 2025).

Over the past decade, Moldovan policy instruments have increasingly been brought in line with the overall principles of the CAP. The establishment of the National Fund for Agriculture and Rural Development, as well as the Agency for Intervention and Payments in Agriculture, were key measures aimed at developing an institutional framework in line with EU principles. However, the design of supportive measures is still highly investment oriented. The largest share of government subsidies is given *ex post* for the purchase of machinery, the modernization of orchards, irrigation systems and processing facilities, and these subsidies are mainly directed at medium and larger farms that can access capital or credit (Herzfeld, Lucasenco and Zvyagintsev 2022). This adds to the reduction in inclusiveness and the increasing gap between smallholders and commercial farms.

Public support for agriculture has been rising, but a large share of the funds is still used for investment subsidies and inspection systems instead of direct or decoupled payments. At the same time, the General Services Support Estimate (GSSE) shows that the administration concentrates mainly on control and compliance, while research, education and innovation receive less attention. Because of these structural differences, the current agricultural policy model in Moldova remains far from the CAP, especially with regard to stability, sustainability and income security for farmers.

Yet new analyses suggest that Moldova has achieved some meaningful strategic alignment. The National Strategy for Agricultural and Rural Development 2023-2030 focuses on competitiveness, sustainability and environmental integration, with features of the EU's Green Deal and Farm-to Fork strategies (Litvin 2025). Already over 50% of Moldovan agri-food exports go to the EU, particularly to Romania, Italy and Germany, while its trade with the CIS has been declining steadily. Furthermore, legislative alignment with Regulation (EU) 2018/848 is already underway in the areas of organic production, geographical indications and food safety requirements. Nevertheless, according to the European Commission (2024), system capacity remains a major bottleneck. A fully functioning Paying Agency is not yet in place, the implementation of Land Parcel Identification System (LPIS) is still ongoing, and administrative capacity needs

further modernization for the management of pre-accession funds.

These institutional factors notwithstanding, the process of EU-directed reform has generated firm expectations in Moldova's rural sector. Alignment of support measures with the CAP framework will open new opportunities for funding for rural development, technology transfer and increased export competitiveness. It also entails a range of adjustment costs, such as farm consolidation, a reduction of farm employment and competition in the EU market. For the government, this challenge will take the form of a demanding task of ensuring policy coherence and transparency, so that the gains of integration can reach rural communities. According to the European Commission (2024), stronger coordination at the interministerial level, better financial management and digitization of public services are all required to meet EU standards.

Even though Moldova has already done a great deal to align its legislation with EU rules, several structural and geopolitical barriers still stand in the way of accession. The unresolved situation in Transnistria is a central problem, because the ongoing presence of Russian troops weakens Moldova's territorial integrity and makes it difficult to apply EU law across the whole territory of the country. In addition to the territorial difficulty, Moldova's state capacity and economic robustness are weak. Persistent corruption, weak energy security, and the heavy fiscal burden of modernization may slow the pace of convergence. While the EU can and does offer comprehensive support through its instruments, true institutional reform needs steady political will and ministerial coordination, to form its foundation. Moreover, Moldova, as the Europe's poorest nation, will have to manage the social costs of transformation, such as rural depopulation and adjustment pressures on small farms, which could emerge once EU competition and environmental rules take hold.

Chapter 3. Methodology

3.1 Research Design and Motivation for SCM

Bulgaria is a latecomer among the acceding states (2007) and is therefore particularly relevant to analyze alongside the more frequently covered 2004 enlargement. Agricultural performance is expected to be influenced by EU accession through a wide range of transmission channels, including enhanced investment opportunities and the utilization of structural funds, participation in the CAP, the harmonization of institutions and regulations, and improved access to the EU's internal market.

As the EU has expanded, a significant literature has focused on post-integration agricultural performance, using indicators such as production, trade competitiveness, price dynamics, farm structure, farmers' income, and rural development. For Bulgaria in particular, previous research documents pre-accession and post-accession price and production variability, changes in farm incomes, increases in value added, investment activity, labor productivity, exports and the availability of agricultural credit during the first decade of membership years (Yancheva, Borisov 2018). A comparative synthesis for new member states finds generally positive effects while emphasizing cross-country heterogeneity (Csáki 2013). However, most of this evidence is descriptive or short-run in nature, and the findings are difficult to attribute cleanly to accession rather than to simultaneous shocks such as global price movements and technology diffusion, which motivates a counterfactual design.

A standard DiD or OLS setup is ill-suited for assessing the effects of EU accession on agricultural productivity because a single treated unit (Bulgaria) is studied, and no individual country provides a credible parallel-trends counterfactual.

The Synthetic Control Method (SCM) is increasingly used in comparative case studies to evaluate the effects of policy implementation. Campos, Coricelli, and Moretti (2014) use SCM across enlargement waves to estimate benefits for income and productivity and explicitly probe anticipation effects, showing why evaluations must consider policy alignment that begins before the legal accession.

However, these applications address overall economic performance rather than sector-specific impacts.

3.2 The Synthetic Control Method (SCM)

The Synthetic Control Method (SCM), introduced by Abadie and Gardeazabal (2003) and later developed in subsequent work by Abadie, Diamond, and Hainmueller (2010; 2015), has attracted growing attention in the context of policy evaluation. According to Athey and Imbens (2017), SCM is „the most important innovation in the policy evaluation literature in the last 15 years”. Despite being a relatively recent innovation, the method is still rarely used in agricultural economics. Methodologically, SCM is most suitable when three conditions hold: the objective of the study is to estimate an intervention effect on a defined outcome, the units of analysis are aggregates such as countries or regions, and the intervention applies to one of the treated units.

Synthetic Control Method (SCM) estimates the effect of a policy on an aggregate unit by constructing a synthetic counterfactual that approximates what would have happened without the intervention. In this setting, the treated unit is Bulgaria, which underwent EU accession in 2007. The synthetic Bulgaria is an unobserved benchmark constructed as a weighted average of untreated countries that were similar to Bulgaria before 2007. The weights assigned to countries in the donor pool are chosen so that the synthetic unit closely reproduces Bulgaria’s pre-accession outcomes, and the post-2007 differences between the observed and synthetic paths are interpreted as the accession effect. SCM explicitly combines multiple untreated units through non-negative weights that sum to one, providing a transparent and data-driven counterfactual for a single treated unit (Abadie and Gardeazabal 2003; Abadie, Diamond, and Hainmueller 2015).

Formally, consider $J + 1$ units observed, where $i = 1, 2, \dots, J + 1$, over periods $t = 1, \dots, T$. Unit $i = 1$ (Bulgaria) is exposed to the intervention, the remaining J countries are part of the donor pool. The intervention takes place at $t_0 \in \{1, \dots, T\}$. For each country i , we observe a set of k pre-treatment variables $X_{1,i}, \dots, X_{k,i}$. Let X_1 denote the vector containing the variables $X_{11}, \dots, X_{k,1}$, and X_0 the $k \times J$ matrix. The outcome variable with the treatment is Y_{it}^I , and Y_{it}^N the

potential outcome without treatment. Let T_0 be the number of pre-intervention years, with $1 \leq T_0 \leq T$. By construction there is no treatment effect before the intervention, so $Y_{it}^N = Y_{it}^I$ for $t \in \{1, \dots, T_0\}$. The treatment effect is denoted by V_{it} where: $V_{it} = Y_{it}^I - Y_{it}^N$ for $t > T_0$ (Abadie, Diamond, and Hainmueller 2010).

Since Y_{it}^N is unobserved after the intervention, we approximate it using outcomes from untreated countries that resemble the treated unit prior to accession. We form a donor pool of such countries and construct a synthetic unit as a weighted average of their outcomes. Let the weight vector be $W = \{w_2, \dots, w_{J+1}\}$ with $0 \leq w_j \leq 1$ for $j = 2, \dots, J+1$, and the sum of all weights is equal to 1 which rules out extrapolation. Given W , the synthetic control provides an estimate of the no-treatment path and, hence, of the treatment effect:

$$\begin{aligned}\widehat{Y}_{it}^N &= w_2 Y_{2t} + \dots + w_{J+1} Y_{J+1,t} \\ \widehat{V}_{it} &= Y_{it}^I - \widehat{Y}_{it}^N\end{aligned}$$

The weights indicate each donor's contribution to matching the treated unit in the pre-intervention period. Following Abadie, Diamond, and Hainmueller (2010), we choose the optimal vector of weights $W^* = (w_2^*, \dots, w_{J+1}^*)$, such that the synthetic unit reproduces the pretreatment predictors of the outcome variable as closely as possible for the treated unit.

The vector $V = (v_1, \dots, v_k)$ encodes the relative importance assigned to the k predictors in constructing the synthetic control. It is chosen so that, together with the weights W , it minimizes the root mean squared prediction error of the outcome variable for Bulgaria relative to its synthetic counterpart in the pre-intervention period. In other words, the weights are selected to make the pre-treatment characteristics of the synthetic unit resemble those of the treated unit as closely as possible. Once these weights are determined, the post-2007 path of the outcome variable for Bulgaria is compared with that of its synthetic control to obtain the estimated treatment effect.

3.3 Mechanism evidence from arable land share

Economic growth in agriculture can arise along two margins. The intensive

margin reflects improvements within already cultivated land when better practices, higher-quality input and technology raise output per hectare. The extensive margin shows changes in the scale and composition of cultivated area when arable land increases or decreases. In this study, cereal yield is the intensive outcome. To understand whether the observed change in yield comes from better use of existing land or from changes in how much land is cultivated, a complementary mechanism test is conducted using the share of arable land in total land area as an alternative outcome.

The outcome is the arable land share in percent of national area, taken from the same source and time window, with Bulgaria as the treated unit and 2007 as the intervention year. I applied the same Synthetic Control setup to ensure comparability. Structural covariates such as income per person, consumption and investment shares, agriculture value added, agricultural employment, fertilizer intensity and precipitation enter as pre-intervention means. By examining whether the share of arable land deviated substantially from its synthetic counterpart after 2007, this mechanism test allows to assess whether the treatment effect on cereal yields stems from intensive productivity gains or from land-use changes.

3.4 Estimating Treatment Effects

After constructing a synthetic counterfactual for the treated unit, I summarize the policy effect over the post-accession period using the Average Treatment Effect on the Treated (ATT). For each post-intervention year $t > T_0$, the year-specific treatment effect is defined as the gap between the observed outcome and the outcome of the synthetic control $\widehat{V}_{1t} = Y_{1t} - \widehat{Y}_{1t}^N$.

To consolidate the magnitude of the effect across time, I compute the ATT as the average of these yearly gaps over the post-accession period, $ATT = \frac{1}{T_1} \sum_{t=T_0+1}^T \widehat{V}_{1t}$, where $T_1 = T - T_0$ is the number of post-intervention years. This summary statistic captures the mean divergence of Bulgaria's productivity from the path predicted by its synthetic counterpart after EU accession and can be interpreted as the average effect of EU membership on the treated unit.

3.5 Robustness and Inference

Formal inference is required to assess the statistical credibility of the synthetic control estimates. Because the sample is small and there is no randomization, conventional statistical inference is difficult to apply in a comparative case study setting (Abadie, Diamond and Hainmueller 2015). In line with the synthetic control literature, I assess statistical significance using placebo tests. The idea is to run SCM for each country in the donor pool as if it was treated at T_0 , re-estimate the synthetic control, and obtain a vector of placebo effects. I then compare the treated unit's effect with the placebo distribution. If the difference between these effects is considerable, the null hypothesis of no treatment effect is rejected. Statistically the null hypothesis states that: $H_0: Y_{it}^I = Y_{it}^N$ for $i \in \{1, \dots, J + 1\}$ and $t \in \{1, \dots, T\}$.

In other words, confidence in the result would diminish if synthetic control produced a large effect for a unit that never experienced the intervention. Formally, for each country $i \in \{1, \dots, J + 1\}$ and period $t \in \{T_0, \dots, T\}$, Abadie, Diamond, and Hainmueller (2015) recommend comparing the treated unit's effect vector, $\widehat{v}_{1t}$, with the effects for the placebo units, $\widehat{v}_{it}$. To address the possibility that $\widehat{v}_{1t}$ is atypically large in some years but not others, they suggest focusing on the ratio of post- to pre-intervention root mean squared prediction error (RMSPE) for each unit. Let

$$\text{RMSPE}_i^{\text{pre}} = \sqrt{\frac{1}{T_0} \sum_{t=1}^{T_0} (Y_{it}^I - Y_{it}^N)^2}$$

denote the pre-intervention RMSPE and

$$\text{RMSPE}_i^{\text{post}} = \sqrt{\frac{1}{T - T_0} \sum_{t=T_0+1}^T (Y_{it}^I - Y_{it}^N)^2}$$

Denote the post-intervention RMSPE. I report the ratio of post-treatment RMSPE to pre-treatment RMSPE for Bulgaria and for each placebo unit. A large ratio for the treated unit together with comparatively small ratios for placebo units indicates that the divergence after 2007 is unlikely to arise from noise, whereas a poor pre-treatment fit weakens the inference.

To complement the in-space placebo inference, I implement an in-time placebo as a robustness check. The idea is to artificially shift the intervention to an

earlier date within the pretreatment window and re-estimate the SCM with the same specification. If the method is credible, the synthetic control should closely track the treated unit prior to the true intervention, and no sizable effect should appear around the placebo date. Backdating also helps rule out anticipation. If agents adjusted outcomes well before the actual accession, a non-negligible gap would emerge after the placebo date. This procedure follows Abadie, Diamond, and Hainmueller's "in-time placebo" and Abadie's subsequent discussion of backdating as a diagnostic for credibility (Abadie, Diamond, and Hainmueller 2015; Abadie 2021). Operationally, I keep the donor pool, predictors, and optimization window unchanged and only reassign the intervention date to a point in the middle of the pre-treatment period.

3.6 Data and Variables

To implement the Synthetic Control Method, the variables must be observed at the national aggregate level that matches the policy under study. In this thesis, I evaluate Bulgaria's EU accession at the country level, so all series are annual aggregates from the World Bank's World Development Indicators (WDI). The design relies on a clearly defined pre-treatment and a post-treatment period. In my case, the years 1997-2006 give enough information to determine predictor importance and donor weights and to obtain a close pre-treatment fit. The post-treatment period 2007-2019 is long enough to trace medium and long-run adjustments. The endpoint 2019 is chosen to avoid distortions caused by the COVID-19 years and by the war in Ukraine, which both generated large, exogenous shocks to agricultural markets in the region.

This study evaluates the effect of EU membership on Bulgaria's agricultural performance at the national level. The outcome of primary interest is cereal yield. Cereal yield is reported by WDI as kilograms of output per hectare of harvested land. It covers major cereal crops such as wheat, maize, barley, rice and related grains. As such, it is a clean intensive-margin measure, because higher values reflect more output per hectare, not expansion of cultivated area. Yields capture the effects of agronomic practices, technological change, and weather shocks. They are not price-based and therefore avoid valuation issues that affect monetary

aggregates. Because the denominator is harvested area rather than total arable land, this outcome is distinct from the extensive margin. To probe mechanisms, I also analyze arable land as a share of total land area as an extensive-margin indicator, allowing me to distinguish productivity gains on existing cultivated area from changes in land use.

Synthetic control weights are identified using pre-treatment covariates from the World Bank's WDI that summarize both structural conditions and the main drivers of agricultural production. Overall development is proxied by GDP per capita (constant prices), while total consumption and gross capital formation (both as a share of GDP) capture demand for food and investment capacity. The sectoral structure is represented by agricultural value added (% of GDP). On the supply side, inputs are measured by employment in agriculture (% of total employment) as a proxy for available farm labor and by fertilizer consumption (kg per hectare) as an indicator of input intensity. Precipitation (mm/year) controls climatic variation that directly affects yields. When cereal yield is the outcome, I additionally include arable land (% of total land area) as a slow-moving structural control, when arable land is the outcome, it is not used as a predictor to avoid mechanical overlap. All predictors enter as pre-treatment averages, ensuring that the synthetic unit resembles Bulgaria's pre-accession economic, sectoral, input and weather environment.

The credibility of synthetic control depends critically on the construction of a comparison group. I construct the donor pool from non-EU countries in the wider CEE region, primarily post-socialist transition economies and Turkey. These countries are Bosnia and Herzegovina, Moldova, North Macedonia, Belarus, Azerbaijan, Georgia, Kazakhstan and the Kyrgyz Republic. These countries were not directly affected by Bulgaria's 2007 accession and, for the post-socialist cases, share institutional and structural features rooted in the socialist legacy of agriculture, such as land collectivization and farm restructuring in the 1990s and early 2000s. Turkey is included as a regional non-EU benchmark because it also did not accede to the EU, shares similar agro-climatic conditions and cereal cropping patterns with Bulgaria and faces similar Black Sea commodity and macro shocks, which helps match pre-accession dynamics. The selection balances

comparability and isolation from the treatment, providing a plausible counterfactual trajectory for Bulgaria at the national level.

3.7 Limitations

Some of the indicators employed in this study are obtained from international databases that standardize national statistics and sometimes interpolate missing values. Where this is the case, changes in productivity may partly arise from the way information is compiled rather than from actual developments in the sector. This calls for some caution when considering the numerical size of the estimated effect. At the same time, the policy context of Bulgaria's EU accession has not been fully stable. There have been a few reforms of the Common Agricultural Policy, which have changed the design of payments and farmers incentives. Due to these developments, the effect found in this study refers to the institutional framework that existed in the period after Bulgaria's EU accession and may not remain constant as the CAP continues to adapt.

Further limitations relate to the synthetic control design itself and the construction of the donor pool. The synthetic Bulgaria used in this study is a statistical construct built from a combination of other countries, not an actual observed path. The credibility of this counterfactual depends on the assumption that, without EU accession, Bulgaria would have followed a similar trajectory to that of the weighted donor group. This assumption cannot be verified directly, and it may be affected by unobserved factors that influenced Bulgaria differently from the donor economies. The accuracy of the pre-accession fit, although satisfactory, is not perfect, since no non-EU country fully mirrors Bulgaria's structural and institutional characteristics. The donor pool includes transition economies with comparable agricultural legacies and development levels, yet differences remain in climate, farm structure, and input intensity.

The interpretation of results is also limited by the outcome variable selection. Cereal yield is a very effective measure of land productivity, but it is not the only indicator of agricultural performance. The special emphasis on cereals is due to their predominance in the crop pattern of Bulgaria and the donor countries, but it does not reflect changes in other subsectors such as livestock, horticulture or

permanent crops, which may respond differently to EU membership and to CAP measures. Furthermore, cereal yield is likely to be indirectly influenced by policy incentives that are aimed at other production branches, through effects such as investment subsidies or coupled payments for specific crops. Such interactions could offset or counterbalance the noted productivity increase in cereals without necessarily reflecting overall agricultural efficiency.

Chapter 4. Empirical Results on Synthetic Control Estimates and Mechanism Evidence

4.1 Results on Intensive Margin

This section reports the estimated impact of EU accession on Bulgaria's cereal yield. Before interpreting the effects, it is essential to assess the pre-treatment fit, as the credibility of SCM relies on how well the synthetic unit reproduces real outcome before the intervention year.

Table 4 reports predictor means for Bulgaria and its synthetic counterpart over the pre-treatment period. The synthetic control closely tracks Bulgaria's pre-accession cereal yield level and trend. Several structural characteristics of the synthetic unit differ from those of Bulgaria, which reflects feasible combinations within the donor pool and the method's emphasis on matching the outcome path. In line with standard practice in SCM, these differences do not undermine identification as long as the outcome trajectory before treatment is well reproduced. Given the adequate pre-intervention fit, the post-intervention estimates are interpretable.

Table 4: Predictor means in Bulgaria and Synthetic Bulgaria before 2007

	Variables	Treated	Synthetic
Bulgaria	Arable land (% of area)	31.625	22.692
	GDP per capita (const.)	4 319.873	2 897.643
	Total consumption (% of GDP)	84.622	101.765
	Gross capital formation (% of GDP)	21.451	28.162
	Agriculture Value Added (% of GDP)	10.906	10.589
	Employment in agriculture (% of total)	11.485	19.676
	Fertilizer use (kg/ha)	71.935	78.893
	Precipitation (mm)	608	836
	Cereal yield 1997-1999 (kg/ha)	2 881	2 938
	Cereal yield 2000-2002 (kg/ha)	2 838	2 757
	Cereal yield 2003-2006 (kg/ha)	3 352	3 378

Source: Author's calculations based on R output, see ANNEX A. Predictor means in Bulgaria and Synthetic Bulgaria before 2007.

The numerical fit diagnostics further confirm the validity of the pre-treatment fit. The pre-intervention RMSPE amounts to 159 kg/ha, which corresponds to roughly 5% of Bulgaria's average pre-accession cereal yield. Such low prediction error indicates a close alignment between Bulgaria's observed and synthetic trajectories before 2007, providing confidence that estimated post-accession effects are based on a reliable counterfactual.

SCM is transparent about how the counterfactual is built, since each donor's contribution is observed in the estimated weights. Table 5 reports the weights for synthetic Bulgaria. It is formed mainly from Bosnia and Herzegovina at about 53.2%, Belarus about 34.0%, and North Macedonia at about 12.7%, while all other donors receive negligible or zero weights. This mix best reproduces Bulgaria's pre-accession yield path and predictor mean.

Table 5: Countries Weights for Synthetic Bulgaria

Country	Unit weight
Bosnia and Herzegovina	53.20%
Belarus	33.99%
North Macedonia	12.67%
Turkey	0.13%
Kazakhstan	0.00%
Azerbaijan	0.00%
Georgia	0.00%
Kyrgyzstan	0.00%
Moldova	0.00%

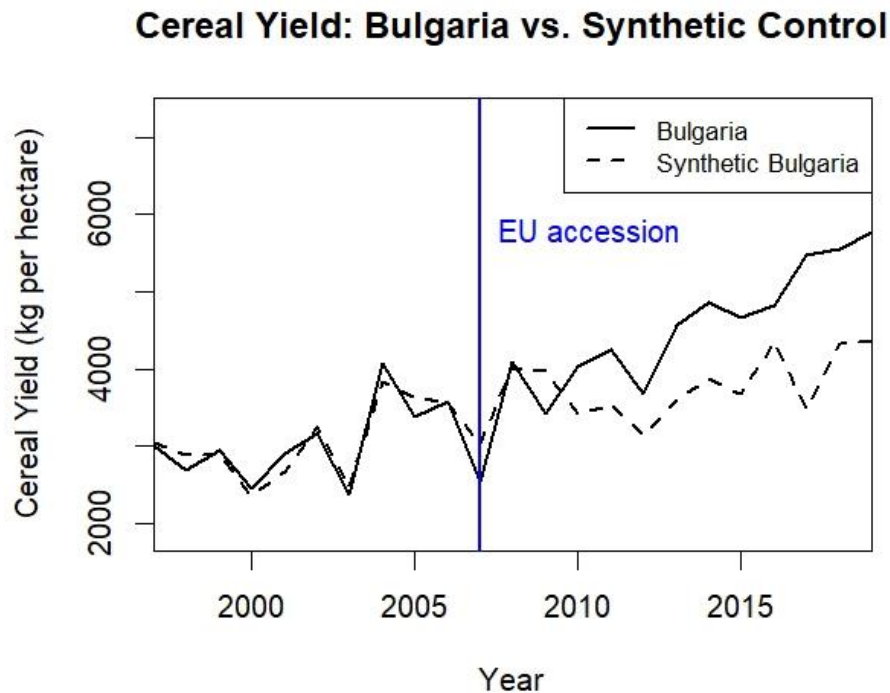
Source: Author's calculations based on R output, see ANNEX B. Countries weights for Synthetic Bulgaria.

Figure 2 illustrates the result of the SCM application for Bulgaria, where cereal yield is shown as a function of time. The graph contains two series, one for the treated unit and one for its synthetic value. The treatment effect is the difference between the outcome of the treated unit and the synthetic unit after accession. Graphically, it is the gap between the two lines in the period after 2007.

Before the intervention in 2007, the two series display a similar path with only small deviations, which indicates that the synthetic unit reproduces the

pre-intervention history with high accuracy. After accession, Bulgaria's series moves above the synthetic path and remains higher in most subsequent years. The gap becomes more pronounced during the 2010s, with temporary fluctuations but a clear advantage of the treated unit.

Figure 2: Synthetic Control Estimates for Bulgaria's Cereal Yield



Source: Author's calculations based on R output, see ANNEX C. SCM for Cereal Yield.

4.2 Mechanism Evidence from Arable Land

This subsection examines whether post-accession changes in Bulgaria's arable land share can account for the cereal yield gains. The same SCM design is used as in Section 4.1, but with the outcome set to arable land (% of total land area).

Table 6 compares Bulgaria with its synthetic counterpart before 2007. The pre-intervention outcome history is reproduced very closely. The structural predictors are also largely aligned. Given the good match on the outcome history and the broad similarity of covariates, this specification is appropriate for interpreting any post-2007 difference in arable land as a treatment response.

Table 6: Predictor means in Bulgaria and Synthetic Bulgaria in the arable land before 2007

	Variables	Treated	Synthetic
Bulgaria	GDP per capita (const.)	4 319.506	4 409.309
	Total consumption (% of GDP)	85.404	86.545
	Gross capital formation (% of GDP)	22.754	23.260
	Agriculture Value Added (% of GDP)	9.842	11.6112
	Employment in agriculture (% of total)	11.151	30.037
	Fertilizer use (kg/ha)	74.762	75.674
	Precipitation (mm)	608	583.122
	Arable land 1998-1999 (% of total area)	32.152	32.064
	Arable land 2000-2002 (% of total area)	31.349	31.157
	Arable land 2003-2006 (% of total area)	29.763	29.755

Source: Author's calculations based on R output, see ANNEX D. Predictor means in Bulgaria and Synthetic Bulgaria in the arable land before 2007.

The numerical fit diagnostics further confirm the accuracy of the specification. The pre-treatment RMSPE equals 0,399 percentage points, corresponding to only 1,29% of Bulgaria's average pre-accession arable land share, which demonstrates an excellent in-sample fit. The synthetic trajectory reproduces the pre-accession path of land use with high precision, suggesting that the model captures the relevant structural relationships.

The construction of the synthetic counterfactual for arable land is transparent from the estimated weights. The largest contributors are Turkey, North Macedonia, and Belarus, followed by Moldova. The remaining donors receive only very small weights. This pattern differs from the yield model, where Bosnia and Herzegovina dominated and Moldova had no weight. The change reflects the fact that the model now fits pre-accession path of land use rather than the path of productivity.

Table 7: Countries Weights for Synthetic Bulgaria in the arable land

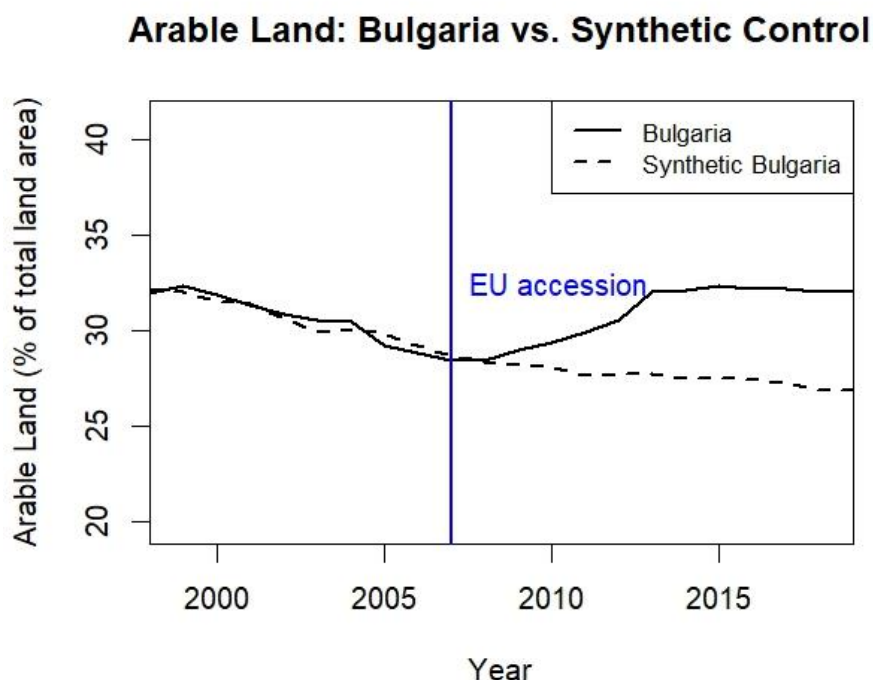
	Unit weight
Turkey	40.79%
North Macedonia	28.30%
Belarus	16.11%

Moldova	13.84%
Kazakhstan	0.43%
Kyrgyzstan	0.31%
Azerbaijan	0.15%
Georgia	0.08%
Bosnia and Herzegovina	0.00%

Source: Author's calculations based on R output, see ANNEX E. Countries weights for Synthetic Bulgaria in the arable land.

Figure 3 plots the arable land share for Bulgaria and its synthetic counterpart over time. Before 2007 the two lines move downward in a similar way. An increase in the share of arable land is visible after the accession year. The gap emerges in the early 2010s and remains until the end of the sample. This visual evidence indicates expansion of cultivated area in Bulgaria relative to the counterfactual, so an extensive margin component is present alongside the yield gains documented earlier.

Figure 3: Synthetic Control Estimates for Bulgaria's Arable Land



Source: Author's calculations based on R output, see ANNEX F. SCM for Arable Land.

4.3 Inference Procedures and Robustness Check

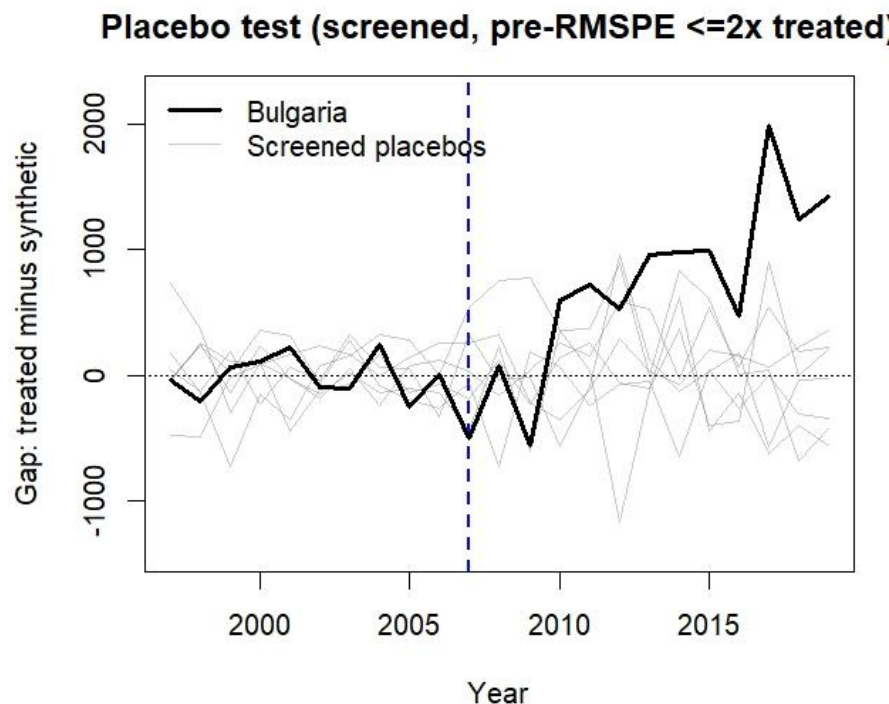
4.3.1 Inference and Robustness of Cereal Yield

Following Abadie et al. (2010), I evaluate statistical credibility with an in-space placebo test. For each donor country, the same SCM specification used for Bulgaria is re-estimated as if that country had received the treatment in 2007. This produces a set of placebo effects for untreated units, which serve as a reference for assessing the significance of Bulgaria's estimated accession effect.

To ensure comparability, I apply a two-times RMSPE screen, retaining only countries whose pre-treatment fit (pre-RMSPE) does not exceed twice Bulgaria's value. This restriction follows standard SCM practice and eliminates poorly fitted placebos that could distort inference.

Figure 4 presents the in-space placebo test for cereal yield, plotting the gaps (treated minus synthetic) for Bulgaria and the screened placebo countries. Before 2007, all lines fluctuate around zero, confirming a credible pre-intervention match. After EU accession, Bulgaria's trajectory moves clearly above the placebo bundle, and the divergence widens through the 2010s.

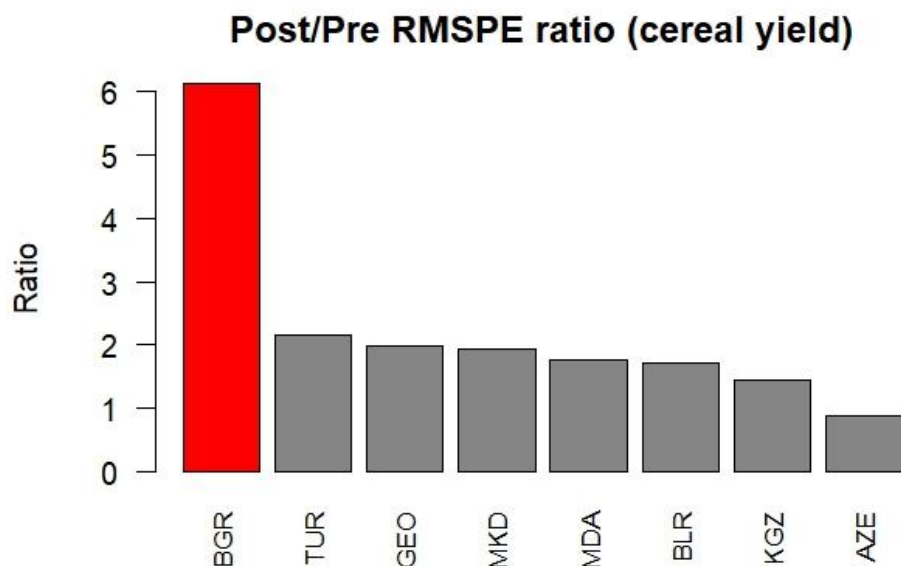
Figure 4: In-space placebo test (gaps 1995-2019)



Source: Author's calculations based on R output.

Figure 5 summarizes the relative post-treatment divergence across countries by plotting the ratio of post- to pre-RMSPE for all donors. Bulgaria ranks first among the screened sample, with a ratio of approximately 6.1. This value substantially exceeds those of all control units, indicating that the post-2007 deviation between actual and synthetic cereal yields is both large and unique to Bulgaria. The dominance of Bulgaria's ratio over the donor pool supports the statistical credibility of the estimated treatment effect and reinforces the interpretation of a persistent productivity gain following EU accession.

Figure 5: post-/pre-RMSPE ratios for cereal yield: Bulgaria and screened placebos



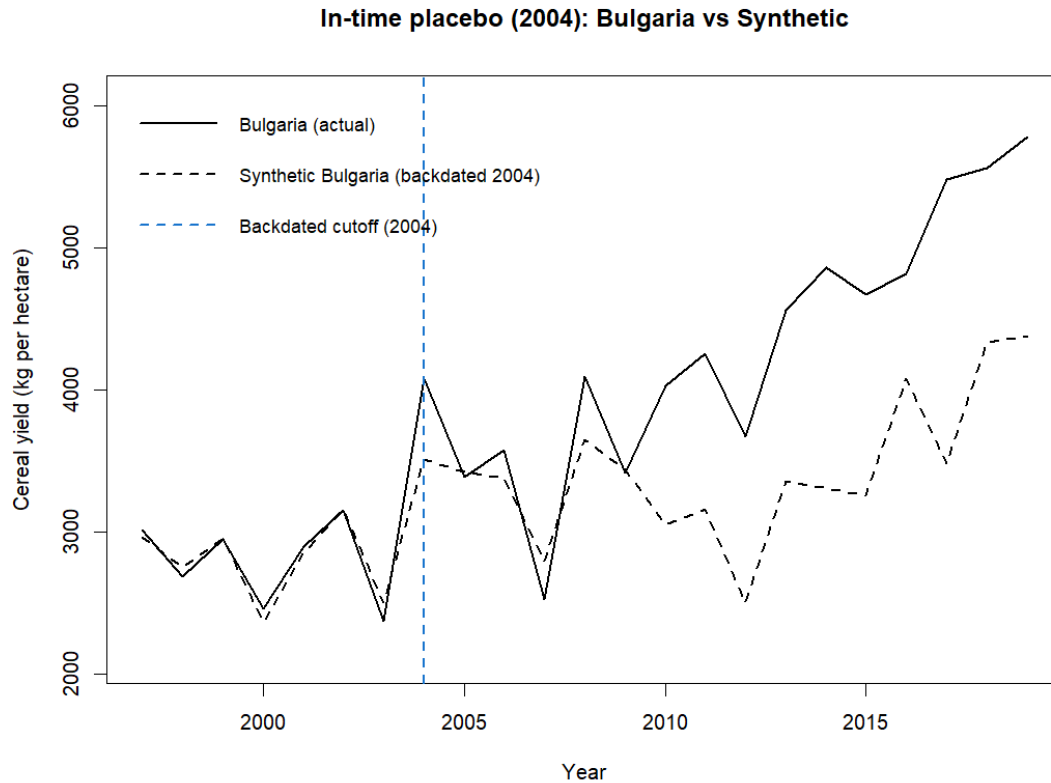
Source: Author's calculation based on R output.

As a robustness check, I conduct a placebo-in-time test by assigning a fictitious EU accession to Bulgaria in 2004 while keeping the SCM specification unchanged. The aim is to verify whether the method would incorrectly detect a treatment effect in the absence of any policy intervention.

As illustrated in Figure 6, the backdated synthetic counterpart follows real Bulgaria very closely until 2004, and the gap remains small in the period 2004 to 2007. The sustained divergence appears only after the true 2007 accession. This outcome confirms that the SCM does not incorrectly identify gains before accession and strengthens the interpretation that the post-accession improvement in cereal

yields reflects the genuine impact of EU membership rather than pre-existing dynamics.

Figure 6: In-time placebo test cereal yield (intervention in 2004)



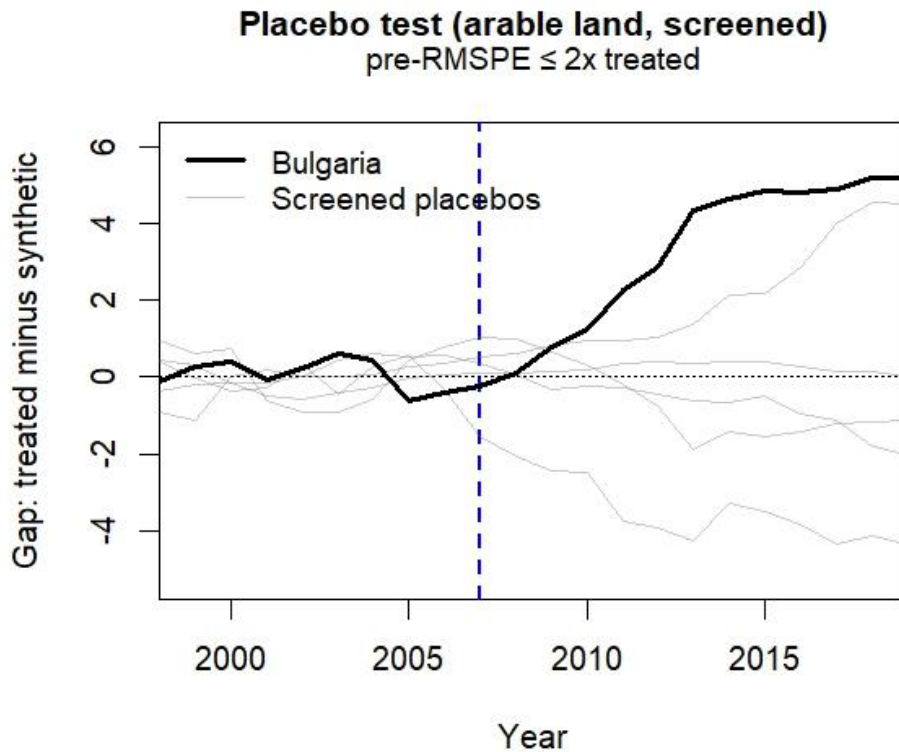
Source: Author's calculations based on R output.

4.3.2 Inference and Robustness for Arable Land

The inference test for arable land follows the same procedure as in Section 4.3.1 but focuses on the extensive margin of agricultural adjustment.

Figure 7 displays the in-space placebo gaps for arable land (% of total area). Before 2007, the lines for the donor countries oscillate around zero, suggesting that the synthetic control reproduces the pre-accession path of Bulgaria reasonably well and that the observed variation is most probably noise. Following EU entry, Bulgaria's trajectory begins to rise above the placebo paths, and with some year-to-year volatility, remains at a higher level throughout the 2010s.

Figure 7: In-space placebo test for arable land (1995-2019)

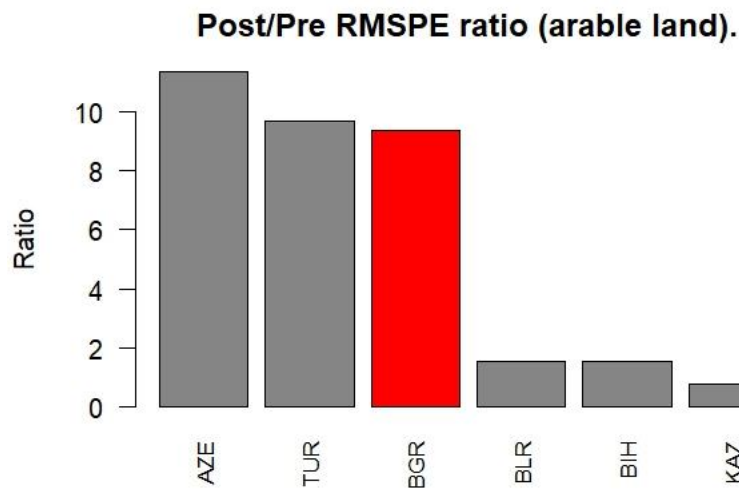


Source: Author's calculations based on R output.

To summarize the magnitude of this divergence, Figure 8 reports the post-/pre-RMSPE ratios for Bulgaria and the screened placebos. Bulgaria's ratio equals 9,34 and ranks behind Azerbaijan and Turkey. This ranking implies that Bulgaria's post-accession increase in arable land share is not the highest relative to credible placebos. Hence, the extensive margin shows some upward movement but does not provide convincing evidence of a distinct treatment effect.

Overall, the evidence for arable land is too weak to justify a substantive interpretation. Although Bulgaria's arable land share grows, the placebo distribution shows that several donor countries exhibit even larger post-/pre-RMSPE ratios. Because Bulgaria does not stand out relative to the credible placebos, the divergence cannot be attributed to EU entry with confidence. For this reason, I refrain from treating the arable land pattern as meaningful treatment effect. It should be considered as a minor fluctuation on the extensive margin, rather than as a structural change driven by accession.

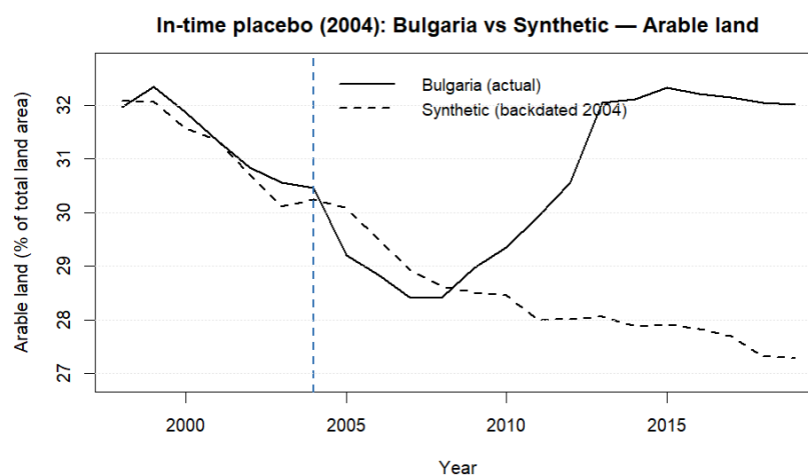
Figure 8: post-/pre-RMSPE ratios for arable land: Bulgaria and screened placebos



Source: Author's calculations based on R output.

Although the inference results already point to the absence of a distinct effect, a placebo in-time robustness check remains informative for evaluating the stability of the model itself. Figure 9 therefore backdates the intervention to 2004, keeping the SCM specification unchanged. The synthetic path tracks Bulgaria's actual arable land share closely up to the real accession year. Divergence appears only after the true accession, confirming that the model does not incorrectly attribute effects where none exist.

Figure 9: In-time placebo test arable land (intervention in 2004)



Source: Author's calculations based on R output.

Chapter 5. Conclusion and Policy implications

5.1 Implications and Conclusions of Bulgaria's Experience for Moldova

The results for Bulgaria suggest that agricultural productivity rose after the country joined the EU, and the increase remained visible over time. The estimated effect is close to 690 kg/ha, which corresponds to roughly 22% of the average cereal yield in the pre-accession period. In the following years the effect becomes even more pronounced. Between 2017 and 2019 the gap is around 1 500 kg/ha, which shows that the improvement continued to grow. This pattern points to a delayed but persistent improvement in productivity. It is consistent with an initial adjustment phase influenced by the global financial crisis and by temporary costs linked to compliance with EU quality and environmental standards. When producers had adjusted to the institutional setting of the CAP, they took advantage of increased market access, and agricultural output increased, reflecting an improvement in the level of productivity.

In contrast, the extensive margin played only a minor role. The post-accession change in cultivated area is not statistically different from the change in credible placebo countries, which indicates that the improvement observed during the analyzed period originates mainly from efficiency gains and technological upgrading rather than increased cultivation.

While the synthetic Bulgaria composition assigned a relatively low weight to Moldova, suggesting little similarity in pre-accession period, the Bulgarian case provides insights into plausible shifts that can be anticipated once Moldova joins the EU. The underlying logic can be explained more intuitively. Even when two economies differ in their initial characteristics, the way a comparable policy reform affects their productive structures may still follow a similar pattern.

A large structural distance between countries may reduce the reliability of direct quantitative comparisons and make the estimated effects less precise. As the synthetic control literature stresses, results are most robust if underlying economic structures are similar. Thus, the results for Moldova should be interpreted with caution. If the country fulfils the accession conditions and brings its institutions and

policies closer to those of the EU, agricultural productivity is likely to follow a path with an initial decline and then a gradual improvement. The size of this improvement will depend on how effective domestic reforms are and on the pace of technological modernization.

5.2 Discussion

Moldova's possible accession to the EU brings both opportunities and risks. The experience of Bulgaria suggests that the advantages of membership depend strongly on how well prepared a country is and on how credible its institutional reforms are. EU integration can open access to the CAP, to rural development funds and to a large internal market. At the same time, Moldova's structural problems and institutional weaknesses mean that turning these opportunities into higher agricultural productivity will require active national policies and a planned sequence of reforms.

First, consolidation and more efficient use of agricultural land remain a priority. As evidenced by the accession experience of Bulgaria, a combination of land restitution and market-driven consolidation was a necessary condition for absorbing CAP instruments and enhancing productivity (Ivanova et al. 2007; Georgiev and Grozdanova 2022). In Moldova, the situation is different, with excessive fragmentation and weak land markets still prevailing. While there have been legal advances, the small size of the average plot and incomplete cadastral coverage have prevented the development of farms that can operate profitably. Policies should therefore aim at promoting voluntary land consolidation, updating the land registration system and keeping transaction costs affordable for farmers. Securing land tenure and access to credit through land collateralization will be essential for unlocking investment and modernizing the sector.

Second, Moldova has to improve its administrative and institutional capacity to apply the *acquis* and manage EU-style support schemes. The Bulgarian example shows that formal alignment is not enough in the absence of strong monitoring and enforcement capacities (Dimitrova 2021). The creation of a working Paying Agency and Land Parcel Identification System (LPIS) must be considered a strategic priority before full membership. Strengthening governance, financial

management and audit systems will be important to ensure that pre-accession and structural funds can also be used credibly. Furthermore, the use of extension services and training programs can be enhanced to help producers comply with EU food-safety, environmental, and animal health regulations.

Third, Moldova has to work towards adapting the CAP to the specific conditions of its agricultural sector. The Bulgarian case illustrates that while the CAP payments can stabilize some income, their role depends on supportive national measures targeted at structural bottlenecks (Csáki and Jám bor 2013). Moldova's dualistic farm structure, with a small number of capital-intensive enterprises and a large number of semi-subsistence farms, requires targeted instruments. The government should also negotiate a degree of flexibility in the use of CAP instruments, for example by increasing co-financing rates for small-scale modernization, irrigation and cooperative investments. Furthermore, support for investment should be linked to innovation and sustainability objectives rather than pure capacity expansion, in order to avoid reinforcing existing inequalities between farm types.

Taken together, the Bulgarian experience implies that Moldova's agricultural convergence with the EU will depend less on the magnitude of transfers and more on the coherence of domestic reform. The decisive factors will be secure property rights, capable administration, and adaptive use of CAP mechanisms tailored to Moldova's structural realities. If accompanied by credible governance reforms and rural-development strategies, EU accession could serve as a long-term anchor for productivity growth and rural transformation rather than a temporary inflow of financial support.

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I acknowledge that I used AI-based tools, to check grammar, clarify concepts and assist in the debugging code written in R. All analytical decisions, interpretations of results and the final written content are my own.

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Figure 9: In-time placebo test arable land (intervention in 2004)

Appendices

ANNEX A. Predictor means in Bulgaria and Synthetic Bulgaria before 2007.

```
> print(tab41)
```

	Variables	Treated	Synthetic
1	Arable land (% of area)	31.625	22.692
2	GDP per capita (const.)	4319.873	2897.643
3	Total consumption (% of GDP)	84.622	101.765
4	Gross capital formation (% of GDP)	21.451	28.162
5	Agriculture VA (% of GDP)	10.906	10.589
6	Employment in agriculture (% of total)	11.485	19.676
7	Fertilizer use (kg/ha)	71.935	78.893
8	Precipitation (mm)	608.000	836.178
9	special.cereal_yield.1997.1999	2881.000	2938.415
10	special.cereal_yield.2000.2002	2838.233	2757.719
11	special.cereal_yield.2003.2006	3352.150	3378.933

ANNEX B. Countries weights for Synthetic Bulgaria.

```
> print(weights41)
```

	country_id	iso3	weight
1	3	BIH	0.5320
2	4	BLR	0.3399
3	9	MKD	0.1267
4	10	TUR	0.0013
5	6	KAZ	0.0001
6	1	AZE	0.0000
7	5	GEO	0.0000
8	7	KGZ	0.0000
9	8	MDA	0.0000

ANNEX C. SCM for Cereal Yield.

```
X1, X0, Z1, Z0 all come directly from dataprep object.
```

```
*****  
searching for synthetic control unit
```

```
*****  
*****  
*****
```

```
MSPE (LOSS V): 24391.72
```

```
solution.v:  
0.1787357 0.01234511 0.01413353 2.814e-06 0.02703756 0.3004559 0.007492163 0.02426234 0.05836825 0.1815078 0.195659
```

```
solution.w:  
1.192e-07 3.662e-07 0.4764795 1.392e-07 8.661e-07 1.998e-07 1.058e-07 0.1806451 8.829e-07 0.3428727
```

ANNEX D. Predictor means in Bulgaria and Synthetic Bulgaria in the arable land before 2007.

```
> print(pred_tab_ar)
```

	Variables	Treated	Synthetic
gdp_per_capita	GDP per capita (constant prices)	4391.506	4409.309
consumption	Total consumption (% of GDP)	85.404	86.545
gross_investment	Gross capital formation (% of GDP)	22.754	23.260
agri_va	Agriculture value added (% of GDP)	9.842	11.612
agri_employment	Employment in agriculture (% of total)	11.151	30.037
fertilizer_use	Fertilizer use (kg per hectare)	74.762	75.674
precipitation	Precipitation (mm)	608.000	583.122
special.arable_land.1998.1999	special.arable_land.1998.1999	32.152	32.064
special.arable_land.2000.2002	special.arable_land.2000.2002	31.349	31.157
special.arable_land.2003.2006	special.arable_land.2003.2006	29.763	29.755

ANNEX E. Countries weights for Synthetic Bulgaria in the arable land.

```
> print(weights_ar)
```

	country_id	iso3	weight
1	10	TUR	0.4079
2	9	MKD	0.2830
3	4	BLR	0.1611
4	8	MDA	0.1384
5	6	KAZ	0.0043
6	7	KGZ	0.0031
7	1	AZE	0.0015
8	5	GEO	0.0008
9	3	BIH	0.0000

ANNEX F. SCM for Arable Land.

X1, X0, Z1, Z0 all come directly from dataprep object.

```
*****
searching for synthetic control unit
```

```
*****
*****
*****
```

MSPE (LOSS V): 0.137286

```
solution.v:
1.8335e-05 0.000182881 3.36996e-05 4.2843e-06 1.1348e-06 2.76e-08 9.32248e-05 0.2494496 0.5197334 0.2304834
```

```
solution.w:
0.01488871 0.02358088 0.01706502 0.07305264 0.01677212 0.01648472 0.01762597 0.333335 0.2550387 0.2321562
```