ASSESSMENT OF THE IMPACT OF THE EAST AFRICAN COMMUNITY (EAC)-2005-CUSTOMS UNION ON ECONOMIC GROWTH FOR FORMER THREE EAC COUNTRIES

EVIDENCE FROM SYNTHETIC CONTROL METHODOLOGY

A Research Paper presented by:

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in partial fulfilment of the requirements for obtaining the degree of
MASTER OF ARTS IN DEVELOPMENT STUDIES

Major:

Economics of Development
(ECD)

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The Hague, The Netherlands
December 2023

Disclaimer:

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List of Acronyms

ARDL	Autoregressive distributed lag
CACM	Central America Customs Union
CET	Common External Tariffs
DRC	Democratic Republic of Congo
EAC	East African Community
EACC	East African Community Cooperation
EACU	Eurasian Customs Union
ECOWAS	Economic Community of West African States
EUCU	European Union Customs Union
FDI	Foreign Direct Investment
FE	Year Fixed Effects
FTA	Free Trade Area
GATT	General Agreement on Tariffs and Trade
GDI	Gross Domestic Investment
GDP	Gross Domestic Product
GFS	General Funds Services
MERCOSUR	Mercado Common del Sur (Southern America Common markets)
OLS	Ordinary Least Square
PTA	Preferential Trade Area
R & D	Research and Development
RMSPE	Root Mean Square Predicted Error
RTA	Regional Trade Agreement
SACU	Southern African Customs Union
SCM	Synthetic Control Methodology
TKU	Tanzania, Kenya and Uganda
WDI	World Development Indicators
WTO	World Trade Organization
QD_0	$Quantity\ Demanded\ before\ customs\ union$
QD_1	$Quantity\ Demanded\ after\ customs\ union$
QS_0	$Quantity\ Supplied\ before\ customs\ union$
QS_1	$Quantity\ Supplied\ after\ customs\ union$

Acknowledgement

As I come to an end of my thesis journey, I would like to extend my sincere gratitude to my family, classmates and ISS staff for their steadfast material and moral support. I would like also to express my appreciation to Nuffic support through OKP which made this journey possible. Above all, thanks to God for orchestrating not only my thesis but also the MA coursework journey through his sent people in the unfathomable ways.

I am grateful to my uncles Sylvester and Sambaa and cousin Petro for their unwavering support and encouragement which immensely reminded me to keep pushing harder even though in my mind I could not see the possibility to make it. On special note, when I was about to give up my best friend P came to my rescue and turned the tide and became my motivation throughout the journey. You are always appreciated P.

Special thanks to my supervisor Dr. Zemzem Shigute Shuka for the best guidance and encouragement who immensely helped me in my thesis journey. The supervisor that in Vienna when we went for academic trip, I would avoid at all cost to share my thesis title as I literally had nothing to share by then. If I could imagine where we started. Her mentorship, counselling and invaluable insights greatly kept me on the track in spite of giving up sometimes.

Special appreciation also goes to my second reader, Dr Ellisaios Papyrakis for always giving constructive comments and material support which greatly shaped my thesis direction. When the second reader suggested using synthetic control approach and changing focus, I remember literally dying on the spot as I knew nothing about synthetic control by then and hearsay has with it that it is challenging approach to understand. Little did I know with time I would fall in love with it despite with challenging experience in the beginning.

To all who contributed to this journey morally and materially I would like once again to extend my sincere gratitude. May the blessing of our Creator be with you.

Abstract

A customs union is a trade agreement that removes tariffs between members and adopt a same set of external tariffs to non-members. Trade and political ties among member nations are two ways that the Customs Union can specifically fosters economic growth. This paper assesses the impact of the launching the EAC customs union in 2005 to the economic growth of the three founding member countries, namely Tanzania, Kenya and Uganda. The study applies five indicators from world development indicators provided by the World Bank database. Accordingly, we use GDP per capita as an outcome variable and gross domestic investment, inflation, industry share and population growth are used as covariates. Furthermore, the study employs the recent and novel technique in causal inference in producing plausible counterfactual referred to as synthetic counterfactual approach. On average, the findings suggest that the customs union has led to about 10, 4 and 2 percentage increase in GDP per capita increase for Tanzania, Kenya and Uganda respectively than it would have been without such intervention for ten years since inception of EAC customs union.

Relevance to Development Studies

A comprehensive understanding of linkages of customs union to the GDP per capita for EAC country members provides insights into overall implication of customs union to EAC

societal wellbeing on how has it improved average individual income. Despite the most argued weakness of GDP per capita on accounting welfare, it is crucial and easy to measure traditional variable to shed light on access to healthcare, education and other basic human needs. Apart from understanding intricate relationship between customs union to economic development our rigorous comparative analysis provides evidence-based guidance for key decision makers for ensuring sustainable and equitable wellbeing for all EAC member countries.

Keywords

Customs union; GDP per capita; Kenya; synthetic counterfactual; Tanzania; Uganda.

Chapter 1
Introduction

1.1 Overview of Customs Union evolution

Post World War II is the period when global economy was in shambles and efforts were made to establish the body to oversee the global trade to enhance global economy recovery. In 1947 the General Agreement on Tariffs and Trade (GATT) was launched with aim of liberalization of global trade by lowering barriers across the borders. The body was to further remove policy uncertainty and rationalizing international trade. Later, in 1995 GATT evolved into World Trade Organization (WTO). In additional to GATT, WTO came up with framework to strengthening institutions for robust disputes settlements and extend beyond goods but also services and intellectual property rights. WTO which came into existence in the 8th round of GATT updates further marked the increased global trade. Immediately after its established, WTO accounted $ 3.7 trillion value of trade compared to $10 billion when GATT started in 1947 (Unger, 2017)

Under WTO there are Regional Trade Agreements (RTA) which are pacts signed between two or more countries to promote trade flow across the borders of the member countries. RTA is characterized with levels such as Preferential Trade Area (PTA), Free Trade Area (FTA), Customs Union, Common Market, Economic Integration and highest level is Full Integration. The benefits of RTA include promotion of trade volume, economic growth and variety of goods to consumers and quality of goods and services (Regional Agreement, 2023).

The CU is the third level of RTA with comprehensive sets of rules enough to enhance achieving the goals of RTA. According to Stojanovic 2017, Customs Union is an instrument used to harmonise tariffs, in a particular trade bloc which is composed of two or more countries, to remove tariffs on particular exports or imports between the member countries and also establish common external tariffs to non-members so as to ensure the level playing ground.

Examples of the customs union in the world includes, Eurasian Customs Union (EACU), European Union Customs Union (EUCU), Southern African Customs Union (SACU), Central America Common Market (CACM), East Africa Community (EAC) and Southern Common Market (MERCOSUR). Hartzenbeg (2011) identifies one of driving motives of regional integration in Africa is to address contemporary issues facing the continent, with large number of the countries landlocked and small national markets can be addressed by regional economic integration. This paper focuses on the study of EAC customs union implications to GDP per capita growth of its former country members.

1.2 Background: The East Africa Community

Tanzania, Kenya and Uganda have a long history of regional cooperation through series of agreements which dates back to 1927 on different sectors such political, social and economic.

The cooperation extends into education, public services, security and transport and telecommunication. After independence, 1967 the three states established the East African Community (EAC) which collapsed in ten years later in 1977. Bar (2018) explains that between 1967-1977, the community established different institutions to foster future full integration. The institutions such as the secretariat, the EAC legislative body, The East African Community Cooperation (EACC) was launched to govern railways, aviation and telecommunication channels. The future goals of the community were to achieve common market and common customs tariffs. Furthermore, General Fund Services (GFS) to regulate auditing and budget management.

Due to lack of comprehensive and coherent integration the community slowly started heading to its fall. The community was faced with uneven distribution of the benefits and private sectors was not well engaged in decision making rather only political leaders were decision makers. The process of EAC collapse was even more accelerated when Uganda president Idd Amin Dada took power in 1971 and get into conflict with Tanzania president Julius Nyerere which grew into military attack in 1978. EAC fell in 1977 and efforts were made to find resolution from the third part from west Europe but to no avail. Finally, the Secretariat terminated its operation in Arusha in December 1978.

Following the termination of the EAC, the three states negotiated mediation agreements on dividing assets and liabilities in 1984 when Milton Obote took office after Idd Amin tenure. However, one of the provisions of the 1984 mediation agreement required the countries to explore areas for future cooperation. Eventually, in 1993, the states signed an agreement on establishing a Tripartite Commission for East Africa Cooperation and the corresponding secretariat on the commission was launched in 1996 with headquarter in Arusha-Tanzania.

History of EAC (2023) identifies following the summits held by the Heads of States in an effort to strengthen regional cooperation, the commission was directed to push the upgrading of the previous agreement to an EAC. On July 7, 2000, the EAC was reassumed with its three former founding member countries, namely Tanzania, Kenya and Uganda. The first summit of the EAC, which focused on protocols by heads of the states on the rules and procedures for admission of other countries wishing to join the community was held on January 15, 2000 at the Sheikh Amri Abeid Stadium in Arusha-Tanzania. Before the protocols on the establishment of the customs union in 2004, legislative assembly and court of justice were established in 2001. The customs union came into effect on January 1, 2005.

Rwanda and Burundi joined the EAC in 2007, two years after the establishment of the customs union between Tanzania, Kenya and Uganda. These two countries adopted the customs union in 2009, just one year before the customs union went full-fledged. In 2009, the EAC adopted common markets, after five years of transitional period. South Sudan and Democratic Republic of Congo (DRC) were the last two countries to join the EAC, bringing the total number of member countries to seven.

According to the EAC (2022), the Customs Unions were started to enhance free trade area among the member countries and establish same playing field among member countries by having common external tariffs. Furthermore, the movement of goods need to comply with EAC criteria of originality as documented in the provisions and customs union framework. Accordingly, the aim of launching the EAC customs union is to enhance seamless trade flow across the borders of the members countries. This trade liberalisation, in return, will facilitate countries to benefit from the economies of scale and enhance economic development, industrialization, diversification and efficiency in production and resource allocation within the region.

One of the major objectives of establishing the EAC customs union-2005 is to remove trade barriers and enhance balanced economic growth of the member countries by establishing Free Trade Area (FTA) and Common External Tariffs (CET). Treichel (2005) argues that due to macroeconomic balance in Tanzania due to radical liberal economic policies reforms led to reduce tariffs index from 7 in 1996 to 5 in 2002. He further argues that, the launching of customs union in 2005 even further reduced tariffs whereas a study by Mugema et al. (2020) reveals that the former EAC members have reaped long period economic integration with steady growth of total trade volume which tripled between 2000-2015.

Identification of the causal impact of the EAC customs unions on some macro-economic variables such us employment, GDP growth, investment and trade flow is of paramount importance in particular if comparison between the members countries is carried out.This paper employs novel and new technique which allow creating credible counterfactual driven by data to estimate the impact of EAC-2005 customs union on economic growth to the three former member countries, that is Tanzania, Kenya and Uganda (TKU), by taking into consideration that the impacts on the different countries are heterogenous.

While it makes contribution to literature in the area, it is important to acknowledge that the current study also has its own limitations. First, we limit our analysis only to three founding members for various reasons[1]. Second, although we have access to data until 2022, we limit our analysis to 2015 because the customs union of the Economic Community of West African States (ECOWAS) was launched in 2015. This is one of the radical changes in the region which potentially can produce noise in our covariates. This may limit possibility to capture the long-term impact, if any, as most of our covariates and donor countries are from the West Africa which are used to construct our counterfactual as baseline for comparison. Last, we limit our analysis by focusing on the effect of customs union to economic growth (GDP) and not focusing on outcomes that are more linked with trade such as trade volume, export, import and trade creation and diversion due to lack of intra region data and time constraint to work on our thesis.

In spite of the limitations mentioned above, we take advantages of the launching of the EAC customs union in 2005 as policy change and the novelty of the synthetic control methodology in comparatives studies in political studies to evaluate the impact of the customs union on the economic growth of the former three EAC states. Most intervention in political studies happen at the aggregate level such as region, countries which leaves no credible groups. The use of the synthetic counterfactuals which are constructed from weighted averages of the covariates of the donor countries generate plausible counterfactual for impact evaluation

Only three countries established the EAC that also launched the customs union. Moreover, these countries had a long common history in the EAC and were under the British colonial system which may have the implications also in their economic investment infrastructures. Rwanda and Burundi joined the customs union later in 2009 and our study runs from 2005-2015 which may not allow us capture comparable impact to the three countries. The other two EAC states, Congo DRC and South Sudan, joined much later and this period is beyond our study coverage.

1.3 Research Objectives

The main objective of this research is to examine the impact of the East Africa Community (EAC) Customs Union (CU) on TKU GDP growth. The CU came into effect 2005, five years after recreation of the community in 2000. Furthermore, the research will help

1. To assess the impact of the 2005-customs union on the economic growth of the former three EAC countries.
2. To carry out the comparative analysis of the differences in the impact of the 2005-customs union to the former EAC countries.

1.4 Research Questions

This research is led by one central question:

What is the impact of the East Africa Community customs union-2005 on GDP growth to each former EAC country?

And the following sub-questions

(i) To what extent has the EAC-2005- customs union impacted the economic growth of Tanzania?

(ii) How much has the EAC-2005- customs union affected the economic growth of Kenya?

(iii) To what extent has the EAC-2005-customs union impacted the economic growth of Uganda?

(iv) To what extent there are differences in economic benefits reaped from the EAC-2005-customs union among the former EAC countries?

1.5 The Paper Organisation

The rest of the paper is organized as follows. Chapter 2 will present the conceptualization and the theories behind the trade liberalization and channels through which seamless trade is enhanced and trade creation and diversion are enabled by the customs union and finally the implications of the customs union on the economic welfare. Chapter 3 will present literature review which will be empirical evidence of the customs union on the economic growth and empirical evidence on the synthetic control approach to inform our research design and background of the previous studies on EAC customs union. Chapter 4 will present the methodology employed to conduct our data analysis. Chapter 5 will cover data description and results discussions of our findings; chapter 6 concluding remarks will present the conclusion of the paper.

Chapter 2
Theoretical and Analytical Framework

2.1 Theoretical Framework

2.1.1 The Theory of Economic Integration

According to the Economic Theory of integration by Balassa (1961), there are four levels of economic integration. The first level is Free Trade Area (FTA). This is a situation where the member countries abolish tariffs and quota restrictions and each country reserve its own tariffs with non-members. The second level is Customs Union (CU). Here the aim is to enhance seamless movements of commodities within the union members along with creating Common External Tariffs (CET) to non-member countries. Common Market is the next level where it does not only enable movement of goods but also mobility of capital and services are enhanced. The last level is Economic Union, which is the most comprehensive economic integration which incorporates all common market features along with common fiscal policy. If the economic integration adopts one common currency like European Union (EU), it is known as monetary union.

Balassa (1961) further argues that economic integration is expected to foster economic growth which is compounded effect of large-scale economies, enlarged markets, technological advancement through competition and efficient resources allocation. Economic integration roll-out is often approached in sector phases to facilitate gradual integration and evaluation of policy intervention feasibility. This approach allows flexibility and efficiency in managing development of integration. Economic integration can boost wellbeing by fostering trade and specialization, leading to increased productivity and efficiency. It can also result in larger markets, economies of scale, and increased competition by removing trade barriers. However, it can also have negative effects on welfare, particularly in industries with severe job losses due to increased competition. Overall, the net effect of economic integration on welfare and future welfare depends on a variety of factors, such as the level of integration, the specific policies implemented, and the ability of individual countries to adapt to changing conditions and benefit from integration.

To EAC the highest current level of economic integration is common market. Article 7 on the protocol on the inception of EAC Common markets clearly stipulate for accelerated economic growth, there must be the free movement of people, capital and goods. On the other hand, the right of residence and establishment. Unfortunately, most of these salient features of common market are controlled and limited by host partner states (EAC 2022). We will focus on estimating impact of customs union instead of the common market for the following reasons apart from our data being limited in 2015; customs union was started in 2005 and became fully-fledged in 2010 whereas common market was launched in 2010 and expected to become fully fledged in 2015 which has literally not achieved its goals only insignificant steps have been made

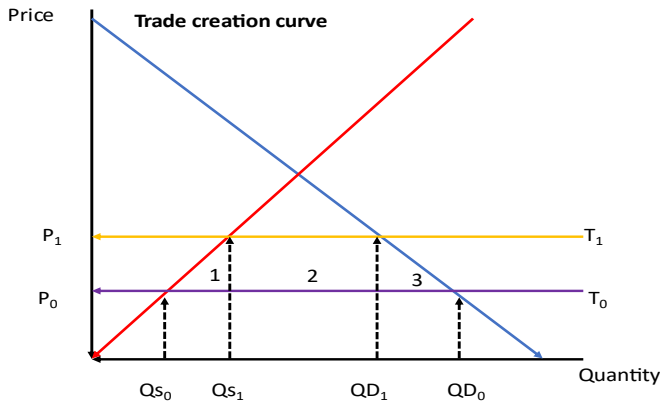
2.1.2 Theory of customs union: Customs union welfare, trade creation and diversion

According to Yi, S. (1996) argues that stable Customs Union enhances welfare of the member countries in a variety of ways. Membership to a significant union provides access to economies of scale, market prospects, and increased bargaining power in international trade

negotiations, leading to increased trade, investment, and improved economic performance. Countries can switch between customs unions to negotiate the best trade agreements, and due to increased competition, customs unions must offer more attractive terms to attract and retain members. In general, stable customs union institutions will benefit their members' welfare by giving them access to bigger markets, more trade possibilities, and the freedom to select the most advantageous trade agreements.

The customs union has two types of effects. These are static effects and dynamic effects. Static effects are further divided into two: trade creation and trade diversion. Trade creation refers to the shifts in the origin of a product from high-cost domestic producer to a low-cost member country producer. It refers to a situation in which high-cost domestic products are replaced by low-cost imports from a member country. The rationale for trade creation is grounded in the fact that when there are no longer tariff removals the country will lose the possibility of buying the product at a low cost from the other member country and will end up paying a rather high cost. Therefore, trade creation is the shift from high domestic producer to low-cost producer in a member country when tariffs are lifted. That means a shift towards comparative advantage as production shifts to more specialization and efficient member country. In a nutshell, trade creation leads to increased trade, low price and increased income.

Figure 1: Trade creation curve



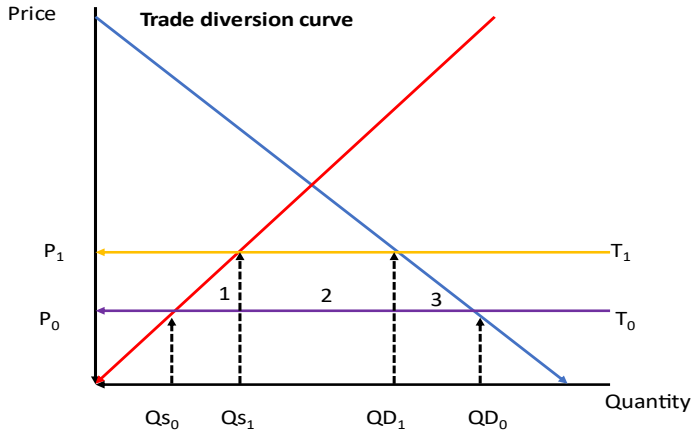
Source: Author's Own drawing, 2023

Without tariff removal, the unit product of a commodity X is sold at P_1. When the two countries form economic integration and tariffs abolished across the border the external unit price falls from P_1 to P_0 as illustrated in Figure1 above. With tariffs, the total quantity demanded is QD_1 and QS_1 is what is supplied at home country and the difference is imported. However, when the two countries form economic coalition by lifting tariffs among themselves, we observe some shifts in the curves. Firstly, the quantity demanded increase from QD_1 to QD_0 and high-cost home products are replaced by low cost or efficient products as shown by the change from QS_1 to QS_0. The two impacts are referred to as consumption effect and production gain respectively, which together constitute what is known as trade creation effect.

Triangle 1 and 3 in Figure 1 represent production gain and consumption effect respectively whereas rectangle 2 in the same Figure represents the loss in home country tariff revenues due the economic integration. In short, trade creation can lead to reduced or increased welfare depending on the net effect.

On the other hand, another static effect of customs union is trade diversion. The concept of trade diversion can be explained as a process when lower cost imports from non-member country are replaced by higher-cost imports from member countries due to the launching of the customs union. In other words, it is the shift of the origin of products from an efficient non-member producer to inefficient member producer in the integration. This results from a preferential treatment to less efficient producer located in a member country of the customs union. This consequently leads to an inefficient allocation of resources and reduced welfare. The preferential treatment goes against the principle of comparative advantage and specialization.

Figure 2: Trade diversion



Source: Author's drawing,2023

Without customs union say country A imports from country B commodity X at unit price of P_0 as indicated above. The home production supply is QS_0 and the total demanded quantity is QD_0. When customs union are established between country A and C and preferential treatment is created between these countries through abolishing tariffs between the member countries and adoption of common external tariffs, the products from non-member country B becomes relatively expensive and country A divert from B to C for the imports. In essence, trade diversion in itself is trade creation in the customs union. The shift from curve P_0T_0 to P_1T_1 leads to increased home supply from QS_0 to QS_1 and reduced total consumption from QD_0 to QD_1 as it can be observed in the Figure 2 above. Triangles 1 and 3 in Figure 2 above represent the production loss and reduced consumption respectively because of relatively increased price.

Apart from the static effects of customs union, customs union also comes with a package of dynamic effects, which may have higher implications in the welfare and economic growth. Firstly, customs union provides increased competition and best resource allocation. Firms try to enhance their efficiency as they no longer enjoy tariff protection. The firms are stimulated to invest in Research and Development (R & D) and innovation to survive and thrive the increased competition. This also helps to reduce monopoly or even abolish it. In addition, customs union expands markets allowing firms to enjoy the economies of scale. And lastly, encouraged by the stimulus to investment, both internally and externally, firms from non-member states may adopt Foreign Direct Investment (FDI) to circumvent the common external tariffs and FDI still comes with potentials of spillover to the hosting member country. The customs union theory considers cost-reduction and trade-suppression ef-

fects. The cost-reduction effect refers to a reduction in production costs by leveraging economies of scale, while trade-suppression effect occurs when higher productivity countries experience decreased output, resulting in reduction in their trade. While the cost-reduction effect increases trade between union nations, creating new trade by displacing imports, trade-suppression effect reduces trade, causing trade diversion from less efficient countries to more productive ones (Corden, 1972).

In the context of the FTA the rules of origin are important to determine the eligibility of goods to the preferential treatment of no-tariffs due to some set preferential treatment in a particular economic region. The objective is to ensure only identified goods from members countries enjoy no-tariff. The most importantly rules of origin prevent products from non-member countries to enjoy preferential treatment in a particular region through tariff circumvention. However, under FTA non-member countries can still circumvent the tariffs through the lowest tariff member country. For instance, if country A and B are in FTA and country C is non-member country, then country C products can be imported to B through A if country A levy products from C relatively less than A.

However, with establishment of common external tariffs the rules of origin are stronger and take away the room for non-member country to engage in trade deflection through lowest external tariffs members. Rules of origin play a crucial role in free trade agreements because without them, each imported good would pass via the nation with the lowest tariff. In figuring out the economic impacts of rules of origin, the duty-free treatment standard is crucial. It is demonstrated that the protection provided by each nation to producers in other free trade agreement members is really extended by the laws of origin (Krueger, 1993).

2.2 Analytical Framework

2.2.1 The Gravity Model

Fratianni (2007) in his paper titled the gravity equation in international trade, argues that the gravity model of the international trade is an equation which shows economic interaction between bilateral countries. On one hand, trade is higher between the countries that are close to each other and with higher GDP per capita. On the other hand, trade is less between the countries that are far away from each other. He further argues that the model has good statistical performance and address many intra and inter industry trade. However, the gravity equation has its caveat where it cannot account for the zero trade between two countries whose economies are not zero GDP. However, gravity equation has solid theoretical foundation and may be linked to several international trade models such as complete specialization which is enhanced by seamless trade flow.

The basic model of the gravity equation can be expressed as follows

$$E_{ab} = A_0 Y_a^{\alpha_1} Y_b^{\alpha_2} d_{ab}^{\alpha_3} F_{ab}^{\alpha_4} U_{ab} \quad \ldots\ldots (1)$$

In log liner form

$$\ln(E_{ab}) = \alpha_0 + \alpha_1 \ln(Y_a) + \alpha_2 \ln(Y_b) + \alpha_3 \ln(d_{ab}) + \alpha_4 \ln(F_{ab}) + U_{ab} \quad \ldots\ldots (2)$$

Where the definition of the symbols used in the above two equation are as follows below;

Y_a: GDP for exporting country

Y_b: GDP for importing country

d_{ab}: distance between exporting and importing countries

F_{ab}: idiosyncratic factors which can enhance or hinder trade. Takes positive values if enhancing trade flow and negative value if hinders the trade flow. These factors can be common language, common currency, terrorism, tariff and non-tariff trade barriers.

Chapter 3
Literature Review

3.1 Customs Union and Economic Growth: Evidence

One strand of literature shows the positive link between trade liberalization and customs. Some empirical evidence from the developed regions, the study by Holobiuc (2021), finds that one of the major factors in the economic growth for EU member countries is investment driven by the capital formation and exports of the goods and services in the region. In additional, a study by Akkoyunlu (2006) reveals joining of the Turkey to EU in 1995 improved production through manufacturing imports from European Union countries with less impact of production through domestic research and development (R &D). Moreover, a study by Emek (2016) on same implications of Turkey joining EU customs on foreign direct investment (FDI) and GDP per capita. The study employs the synthetic counterfactuals methodology and found that Turkey reaped benefits through increased GDP per capita in long run.

Evidence from developing countries includes Manwa et al. (2016). The authors use Southern African Customs Union (SACU) to investigates the link between trade liberalization and economic growth by examining both the short- and long-term impact of the SACU for five countries. They employ a time series autoregressive distributed lag (ARDL) with a 32 years data running from 1980-201.1. The study finds that only South Africa benefited a 0.3% increase in its international trade that can be attributed to enhanced economic growth. A non- significant impact was indicated for the rest of the four countries under study. The authors argue that this could be potentially related to the heavy reliance of the countries on South Africa's exports.

Another study by Iyoha et al. (2017) examines the impact of trade on economic growth in the ECOWAS region using panel data analysis approach. The authors used three different specifications fixed effects, random effects and pooled OLS to estimate the effect of trade on economic growth on specified macroeconomics, trade openness, inflation, GDP, population and investment. Their study reveals a positive and significant impact of the trade on GDP. However, there results suggests that there is no significant effect on the foreign direct investment. Apart from economic growth implication of the customs union literature also reveals the positive implication to trade flow. A study by Reigado (2020) on the impact of Southern American Common market commonly known as Mercado Comon del Sur (MERCOSUR) on regional intra-trade between four Southern America countries. The study using synthetic control methods finds that the (MERCOSUR) led to a substantial increase in regional trade flows for all three SNA classes, with the largest increase being accounted for final goods.

Another strand of literature shows no or negative relationship between trade liberalization and economic growth. From developed countries, study by Kunekova (2015) using pooled OLS data analysis to explore impact of customs union between Russia, Belarus and Kazakhstan whether has impact to Kazakh's economic growth, reveals that the economic growth for Kazakhstan was higher through bilateral agreements prior to the establishment of the customs union and decreased during the customs union.

The study by Manwa et al. (2019) investigating the effect of trade liberalization on economic growth employing fixed effects regressions for the same five Southern African Customs Union (SACU) countries reveals that there is weakly positive evidence that trade liberalization of SACU has positive effect on the economic growth of member countries. The authors argue the use of the time series analysis which may suffer from endogeneity

issues due to omitted variables. This implies that economic growth can be influenced by other factors such as institutional quality, human capital and investment in infrastructure. In a nutshell, the estimates relating economic growth and customs union of the countries might suffer from confounding factors which are not controlled in the model. Another study reveals mixed findings of the trade liberalization to economic growth. The assessment of economic liberalization episodes by Nannicini et al. (2013) using synthetic control approach explains economic liberalization had a positive impact on real GDP per capita in Latin America, based on feasible country experiments that took place mainly in the 1980s. In Africa the positive evidence seems to be concentrated in the first part of the sample in 1970s, while the effect of economic liberalization in Africa has no significant positive or negative effect after around 1990.

Despite, the counter arguments, vast majority of the scholars show the importance of the trade liberalization on its positive impact on the economic growth. Therefore, we now lay foundation of our study on impact evaluation of EAC customs union on economic growth through reviewing available empirical evidence in EAC region.

A study by Buigut (2016) covering the period 2000-2013 using gravity model finds that the EAC customs union has led to some positive effect on intra-EAC trade by 22.1% in relative terms. However, Buigut (2012) study on the assessment of the customs union covering the 1999-2009 using gravity model shows that there are disproportionate impacts on exports and imports of the member countries, where Kenya and Tanzania increased imports while Uganda increased its exports at least for the three years of implementation FTA after the launching of the custom unions in 2005. Furthermore, Leyaru (2021) by applying a structural gravity model to estimate impact of the customs union in Tanzania finds that East Africa Community Customs Union strengthened trade partnership between Tanzania and Kenya, However, the trade patterns are not linked with transformation and industrialization which creates unhealthy imbalance for its sustainability in the future.

Most of the studies in EAC are limited on the time frame to be able to capture any long-term impact of the customs union but also relied on traditional econometric analysis techniques which are not good at intervention at aggregate level and small sample size for applying the comparative analysis. Furthermore, there is no rigorous study on the comparison of the share of the benefits among the member countries to evaluate whether the objectives of EAC to enhance balanced economic growth for the member countries have been achieved or not. To fill the gap in literature in the context of EAC for evaluation of objectives of the customs union, we assess and compare the impacts of the launching of the EAC customs union to GDP per capita of the former member states.

3.2 Seminal Papers to Synthetic Control Design Strategy

Numerous research has been done on the effects of customs unions and other natural experiments, like policy changes and natural disasters, employing the synthetic control methodology for impact evaluation. These studies have shown the methodology to be robust and simple to use. While large samples are chosen over small in quantitative studies due to the accuracy of the numerical data, comparative case studies in qualitative techniques are based on the detailed description of the characteristics of the small sample studies. Both two traditional techniques have limitations. Firstly, how do we estimate precisely the small sample employing quantitative techniques? and how do we choose accurately the comparison units in qualitative studies to address bias concern?

Abadie et al., (2010) showed that the lack of an explicit mechanism that controls the choice of credible comparison units is the primary impediment to quantitative inference in comparative research, not the small sample size of the data. Mostly in political science units of study or comparison are in aggregate level such as countries and regions and antidote of the above concerns is synthetic control approach whose rationale is that combination of the comparison units and covariates as average weights creates the best counterfactual than any single unit. Athley et al. (2017) argues that synthetic control approach is a recent innovation in policy evaluation which built on difference in difference through relaxing parallel trend assumption by systematic and data driven architecture of counterfactual as weighted average of several similar units.

In order to lay foundation for the quantitative and flexible case studies which act like the bridge between the quantitative and qualitative studies by adding the quality of creating the counterfactual driven by the data, Abadie et al., (2010) did an incredible work in establishing both theoretical and empirical framework for synthetic control methodology (SCM) which is the state of art in the field of the causal inference. It is recent cornerstone development in causal inference in evaluating the treatment effects under circumstances when traditional experimental designs that are difficult to implement. The study by Abadie et al., (2010) on effect of tobacco control program (Proposition 99) on cigar rete consumption found that in year 2000, yearly per capita cigar rete sales in California were about 26 packs lower than what would have been without the Tobacco Control Program. These results are different from earlier projections made with the use of linear regression techniques, including the research by Fichtenberg and Glantz (2000). According to Fichtenberg and Glantz, Proposition 99 sped up the pace of fall in per-capita cigarette use in California by 2.72 packs per year between 1989 and 1992, but only by 0.67 packs per year between 1993 and 1997.

Gilchrist et al., 2023 evaluated the impact of 20th century oil discoveries in Venezuela to calculate the effect of natural resources on long-term economic success. They employed comparative economic history to understand how significant institutional and structural change has affected economic growth in GDP per capita. They find that the discovery has short term economic boom and long-term recession which is in line with natural resources curse literature. The strength of the study lies in the synthetic control specification whereby they used a wide range of economic growth predictors such as physical geography, institutional quality, demographic indicators and human capital.

Furthermore, the authors applied variety of inference techniques like in-time and in-space placebo tests along with pseudo p-values and lastly the sensitivity analysis on covariates and donor countries by dropping one after another donor with larger weights to check if the results are stable, similarly dropping high predictive covariates one after another whereas Papyrakis et al. (2023) in their study of impact of the Brexit Referendum vote on the UK employment changed the time of the intervention as a robustness check. Given that the Brexit vote was publicized over a year before it was held, to evaluate if any anticipation effects existed before the referendum and found all post-treatment have no statistical significance.

Synthetic control as combination of comparison units is a superior method for analyzing a case of interest at aggregate level. It involves a weighted average of all feasible comparison units, lagged outcomes, and auxiliary covariates that predict the development most closely resembling the treated group. This approach is better than regression-based comparative case studies and difference in difference which heavily rely on the parallel trend assumptions which in practical world rarely holds, furthermore it avoids extrapolation and give data-driven estimated outcomes.

The post-treatment result gap may be caused by something else, apart from the intervention of interest, such as missing variables, alternative shocks, or policy changes that invoke pre-existing trends and make the estimated gap problematic if the treated and control

units' outcome trajectory shows a poor match in the pretreatment period. The antidote for this challenge is to cross-check with other traditional causal inference methodologies such as difference in difference where the parallel trend assumptions can be tested (Gilchrist et al., 2023)

Moreover, some units in comparison group should also be eliminated if they may have experienced significant idiosyncratic shocks to the outcome variable under study throughout the research period if such shocks would not have had similar impact on the treated unit in the absence of the treatment. Finally, it is crucial to limit the donor pool to units with traits comparable to the treated unit in order to prevent interpolation biases. To prevent overfitting, the donor pool should be kept small and only comparable units to the treated unit should be taken into account. Overfitting occurs when idiosyncratic differences in a large sample of unaffected units are combined to artificially mimic the features of the unit impacted by the intervention or event of interest (Abadie et al., 2015)

Chapter 4
Research Methodology

4.1 Data

We will make use of a recent comparative case study analysis known as synthetic control approach which is a data driven and hence quantitative research methodology, secondary data from reliable data base World Bank-World Development Indicator (WDI) which also provides with economic growth indicators such as, trade openness, GDP per capita, inflation rates, infrastructure and population. The data on several GDP growth predictors were collected and assessed on the quality of data in terms of the missing points and the requirements of our study. After thorough examination of the credibility of our data we finally remained with five variables. Our independent variable is GDP per capita and the four covariates are population growth, industry share, inflation and gross domestic investment. We finally cleaned and appended the data before being converted into suitable form for rigorous data analysis using statistical software STATA.

4.1.1 Data Description

The data are collected from World Bank national accounts data files. We keep comparable countries in the same region to the treated units by using Sub-Saharan Africa countries low-income countries. Due to data availability and constraints of our study we dropped countries to 18 in our donor pool most of which are from West Africa. Here below, is the descriptions of the variables in our three panel data sets.

a. GDP per capita

Gross domestic product per person is calculated as the ratio of GDP to midyear population. GDP is calculated as the total gross value added by all producers who are residents of the economy, plus any applicable product taxes, minus any unaccounted-for subsidies. It is estimated without taking into account the degradation and depletion of natural resources or the depreciation of manufactured assets. Data are in constant 2015 U.S. dollars. The data collected from world development indicators in the world bank national accounts data

b. Industry share as percentage of the GDP

Manufacturing is included in industry (ISIC divisions 10–33), which includes building (ISIC divisions 05–43). It includes value added in manufacturing, construction, power, water, gas, and manufacturing (sometimes presented as a separate subcategory). After summing up all outputs and deducting any intermediary inputs, value added is a sector's net output. It is estimated without taking into account for depreciation of fabricated assets or depletion and degradation of natural resources. The International Standard Industrial Classification (ISIC), edition 4, identifies the source of value added.

c. Inflation, GDP deflator (annual %)

Inflation is measured by the annual growth rate of the GDP implicit deflator shows the rate of price change in the economy as a whole. The GDP implicit deflator is the ratio of GDP in current local currency to GDP in constant local currency.

d. Gross Domestic Investment or Gross Capital Formation as percentage of GDP

Gross capital formation, formerly known as gross domestic investment, is made up of expenditures for new fixed assets for the economy as well as net changes in inventory levels.

Purchasing plant, machinery, and equipment; creating roads, trains, and similar structures; and building schools, offices, hospitals, private residences, commercial, and industrial structures are all examples of fixed assets. Fixed assets also include land improvements (fences, ditches, drains, and so forth). Stocks of items kept in reserve by businesses to cover short-term or unforeseen swings in production, sales, and work-in-progress. Net acquisitions of valuables are also regarded as capital formation in accordance with the 1993 System of National Accounts (SNA).

e. Population growth

Annual population growth rate for t is the exponential rate of growth of midyear population from year t-1 to t, expressed as a percentage. The de facto definition of population is used, which includes all residents regardless of citizenship or legal status.

Note: Derived from total population. Population source: (1) United Nations Population, Division. World Population Prospects:2022 Revision, (2) Census reports and other statistical publications from national statistical offices.

4.2 Potential biases and Research Design

One of the common potential biases in causal inference is selection bias. This happens when two groups or units are not comparable from the baseline. Therefore, their difference after treatment may suffer upward or downward bias. The synthetic control methodology (SCM) address this by giving the flexibility and robust way of creating credible counterfactual. Contrary to use of simple average and use difference in mean for causal inference for policy change. SCM uses weighted average from donors and covariates and carry several iterations for quality match in pre-treatment period. In addition, this technique also mitigates potential omitted variable bias through using several best predictors of the outcome variable. The quality of credible counterfactual is always determined by the best fit in the pre-treatment period.

Another potential bias is spillover effects which result when treatment effects apart from affecting the treated unit only also affect the control unit and consequently call into question the credibility of counterfactual under consideration and leads to bias of our estimates. Our research design has tried to account for spillover effects by using about 80% of the donor countries from west region which has no significant economic interaction with EAC. Furthermore, the spirit of the customs union itself further favor the economic interaction in EAC and decreases from non-member countries through its key policy infrastructures of free trade within regions and adoption of CET. Under this circumstance even few neighboring countries in our donor pool may not have benefited through this policy intervention. And lastly our study accounts for the potential time trends impacts on our outcome variable through falsification which also serves as one of our robust tests of our results.

4.3 Identification strategy

Outcome variable

- GDP per capita

Covariates upon which counterfactual is created from the donor pool.

We use the following below covariates driven by data availability and literature as they are among the good predictors for the GDP per capita and have been extensively applied in literature when it comes to linkages of GDP per capita and policy intervention. Furthermore,

it helps to account for time varying confounders of GDP per capita and validity of our counterfactual and improves the accuracy of our estimates.

Nannicini et al. (2013) used several covariates to construct the synthetic control and assess the impact of economic liberalization on real GDP per capita. These covariates include secondary school enrollment, population growth, investment share, inflation, democracy, and pretreatment real GDP per capita whereas Emek (2016) used pretreatment characteristics used by Abadie and Gardeazabal in 2003 which are industry share, schooling, inflation, population growth and current account balance.

- Population growth
- Augmented or lagged-GDP per capita
- Inflation, GDP deflator (annual %)
- Industry share (% of GDP)
- Gross Domestic formation or Gross Domestic Investment (GDI)

We consider J+1 units for the period $\mathbf{1,2,3,4,\ldots T_0, T_0+1, T_0+2, T_0+3,\ldots+T_0+T}$

Where, T_0 is the time when the custom union was launched and, in the current case, it is 2005. Under these circumstances, we can observe impact of EAC-2005-CU at least when $t > T_0$. We only allow unit J=1 to be treated in time T_0. The treated units, Tanzania, Kenya and Uganda are in turn to be exposed to intervention and the rest of J units remain in the donor pool. Whenever one of the three countries is under study, the remaining two countries will not be part of the donor pool countries as this will cause a noise in donors. Furthermore, for similar reason as Kenya and Uganda, Rwanda and Burundi are not included in donor pool under all three analyses as they joined EAC customs union soon after implementation of the launching of the common market or when customs went from transitional period to full-fledged operation.

Let Y_{1t}^N be the would be the outcome of interest for treated unit without intervention at time $t > T_0$ in case of policy intervention and on the other hand, Y_{1t}^I is the outcome of treated unit at time $t > T_0$ after intervention has taken place.

If α is the impact of the Customs union in time t for the treated unit i then

$$\hat{\alpha}_{1t} = Y_{1t}^I - Y_{1t}^N \quad \text{..... (i)}$$

In our case we let unit $j = 1$ to be the case under Custom Union, which is treated unit. Because of the intervention to the treated unit, we cannot observe what would be the outcome for the treated unit without intervention. This is where the synthetic control methodology comes in handy to use potential donors to create counterfactual or synthetic treated unit which is the would-be treated unit in the absence of the Customs Union through assigning weights on the donors and the covariates.

Based on covariates used for matching, several iterations are carried by giving weights to different countries is run in STATA software and optimal one is selected applying the rule of minimization of the Root Mean Squared Predicted Error (RMSPE). In other words, the best synthetic control is the one that leads to minimum error especially when comparison of treated and corresponding counterfactual is well matched specifically during pre-intervention periods. Abadie et al. (2010) established a bias bound under the factor model below upon which credibility and the reliability of the synthetic control estimates are founded on the extent to which counterfactual fit well the treated unit trajectory for the extended pre-treatment period.

$$Y_{1t}^N = \theta_t Z_i + \lambda_t U_i + \epsilon_{it}$$

Where Z_i are observable features

U_i are unobserved features

ϵ_{it} unit level transitory shock (random noise).

Let X_1 be a (k×1) vector of the pre-treatment characteristics for the treated unit. Similarly, X_0 be a (k × J) vector which contains the same variables of the untreated units. We choose the vector of weight, $W^* = w_2^*, \ldots, w_{J+1}^*$ to minimize

$|| X_1 - X_0 W ||$ in accordance to the weight constraints.

Therefore,

$Y_{1t}^N = \sum_{j=2}^{J+1}(w_j^* Y_{jt})$ ……(ii)

Hence

$$\hat{\alpha}_{1t} = Y_{1t} - \sum_{j=2}^{J+1}(w_j^* Y_{jt})$$

Given that,

$0 \leq w_j < 1$…… (iii)

And,

$w_2 + w_3 + \cdots + w_{j+1} = 1$……(iv) Abadie et al. (2015)

The above (iii) and (iv) two conditions only allow interpolation and not extrapolation of data. To establish the significance of estimates from the synthetic control, we can either use pseudo-P-values constructed from ranking order or run the placebo tests where we assign weighted donors in turn to check what would be the impact to the group on the customs union. This is to check whether the results we found is really coming from the data and not by chance. If the placebos are outperformed by treated unit, we can conclude that the results are statistically significant. On the other hand, if the impact on the placebos is equal to or outperform that for the treated unit, we will conclude that the results are insignificant.

Chapter 5
Results and Discussions

5.1 Descriptive statistics

To get impression of our data we first carry out summary statistics for our outcome variable, GDP per capita for both treated countries and donor countries. From our data we categorize our outcome variable into 5 quintiles and tabulate mean and standard deviation for each country as shown in table below. The numbers in the bracket are standard deviation. We calculate the difference between third and firth quintiles record as first change and similarly the difference between fourth and fifth quintiles as second change and record the results in the last two rightmost columns in table below.

Our first changes indicate among the top countries that have registered the largest difference are Mauritania, Chad, Eswatini, Uganda and Tanzania. Although, Mauritania and Eswatini have the largest changes GDP per capita of 236$ and 481$ compared to Uganda and Tanzania which are 137$ and 127$ respectively. The values for Uganda and Tanzania are relatively larger when we calculate percentage in terms of changes due to relatively smaller GDP of Tanzania and Uganda compared to Eswatini and Mauritania.

Table 1*: Descriptive statistics*

	Mean of GDP per capita Quintiles						
Country	**Q1 1990-94**	**Q2 1995-99**	**Q3 2000-04**	**Q4 2005-09**	**Q5 2010-15**	**Δ1**	**Δ2**
Benin	778.2	834.9	916.7	952.8	1003.7	36.1	50.9
	(6.3)	(24.1)	(18.9)	(23.6)	(40.4)	4.8	16.8
Burkina Faso	345.8	398.4	454.1	522.0	604.7	67.9	82.7
	(7.9)	(30.1)	(18.9)	(14.4)	(26.6)	-4.5	12.2
Cameroon	1180.2	1085.6	1186.6	1270.5	1327.7	83.9	57.2
	(128.9)	(30.3)	(46.8)	(13.7)	(48.4)	-33.1	34.7
Chad	428.0	399.9	459.4	665.8	746.1	206.3	80.3
	(31.9)	(8.0)	(88.4)	(9.4)	(28.7)	-79.0	19.3
Comoros	1177.0	1112.2	1207.2	1229.1	1311.7	21.9	82.6
	(48.3)	(14.6)	(3.4)	(14.4)	(26.1)	11.0	11.7
Congo, DRC	635.9	423.9	331.7	368.2	434.9	36.6	66.7
	(137.8)	(36.5)	(9.3)	(12.3)	(34.7)	2.9	22.5
Eswatini	2135.5	2331.7	2507.3	2988.9	3416.8	481.6	427.9
	(30.1)	(51.3)	(102.9)	(125.4)	(158.3)	22.5	32.9
Guinea-Bissau	675.2	660.6	549.7	551.7	578.3	2.0	26.6
	(8.7)	(108.7)	(13.3)	(4.5)	(12.2)	-8.8	7.7
Kenya	1252.7	1223.7	1180.5	1269.4	1415.5	88.9	146.1

	(47.9)	(11.1)	(14.0)	(31.8)	(55.7)	17.8	23.9
Madagascar	496.2	460.6	454.1	476.3	453.2	22.2	-23.0
	(30.0)	(4.6)	(28.4)	(16.1)	(2.5)	-12.3	-13.6
Mali	493.0	535.2	621.6	679.8	700.7	58.2	20.9
	(16.5)	(31.3)	(39.3)	(10.9)	(17.4)	-28.4	6.5
Mauritania	1360.7	1368.7	1256.0	1492.4	1496.4	236.3	4.1
	(42.5)	(36.9)	(36.1)	(82.0)	(41.8)	45.9	-40.2
Mozambiq	216.4	255.4	337.4	434.2	541.8	96.7	107.6
	(7.6)	(31.4)	(31.3)	(33.0)	(39.3)	1.7	6.3
Niger	439.3	410.1	398.9	414.8	459.5	15.9	44.7
	(15.4)	(10.2)	(8.6)	(8.5)	(20.4)	-0.1	11.9
Senegal	993.4	1007.2	1095.2	1148.7	1177.1	53.6	28.4
	(23.6)	(34.4)	(22.2)	(6.5)	(34.2)	-15.6	27.6
Sierra Leone	496.5	401.9	416.3	495.4	629.8	79.1	134.4
	(51.5)	(16.3)	(41.2)	(23.8)	(91.4)	-17.3	67.5
Tanzania	524.3	525.0	595.7	722.8	863.0	127.1	140.3
	(14.6)	(14.0)	(37.4)	(36.5)	(49.6)	-0.9	13.1
Togo	634.9	690.9	675.7	614.6	701.3	-61.1	86.8
	(62.4)	(38.5)	(12.9)	(11.9)	(44.6)	-0.9	32.6
Uganda	385.1	476.4	545.0	682.8	825.8	137.8	143.0
	(15.0)	(25.0)	(31.7)	(57.7)	(32.1)	26.0	-25.6
Zimbabwe	1594.9	1731.3	1467.1	982.6	1331.6	-484.5	348.9
	(88.8)	(69.8)	(236.2)	(113.1)	(134.5)	-123.1	21.4

Source: Owner field data, 2023

Similarly, the changes between the last two quintiles indicates all former EAC countries have largest GDP changes which are 140, 143and 146 for Tanzania, Uganda and Kenya respectively. The other countries include Eswatini and Sierra Leone which register highest GDP per capita changes which may be driven by policies changes within the countries. For instance, Sierra Leone GDP per capita was boosted by the discovery of iron ore mines in early 2010. Finally, we observe across the individual treated countries, the changes in mean GDP per capita are significant in fourth and fifth quintiles. These preliminary findings are in agreement with regional GDP per capita growth guideline. For sustained EAC economic growth tailored to addressing social challenges, the region's GDP per capital must grow at about 6% (McAuliffe, 2014).

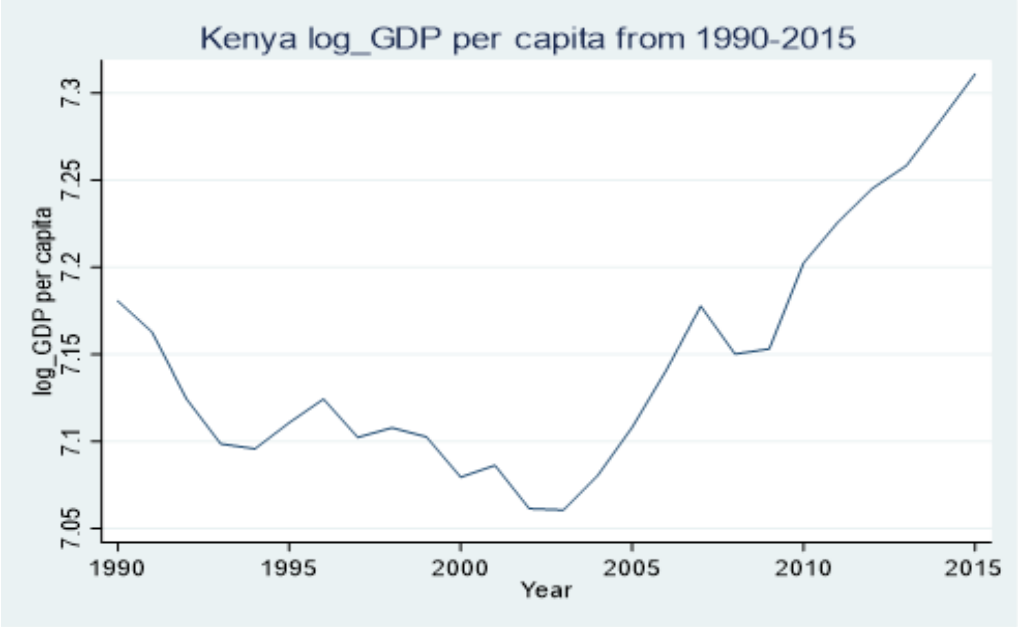
We then plot the time series lines for the three countries to visually observe the pattern of GDP per capita from 1990-2015.

Figure 3a: Trends in growth of GDP per capita in Tanzania (1990-2015)

Source: Own field data, 2023

GDP per capita for Tanzania exhibits an upward trend from mid 1990s as shown in Figure 1a above whereas in the case of Uganda we observe a stable upward trend of GDP per capita throughout the period of our analysis as shown the Figure 1c below. All the three countries show an upward trend of GDP per capita soon after 2005, most importantly Uganda and Kenya show a sharp increase in the trend after 2005.

Figure 3b: Trends in growth of GDP per capita in Kenya (1990-2015)



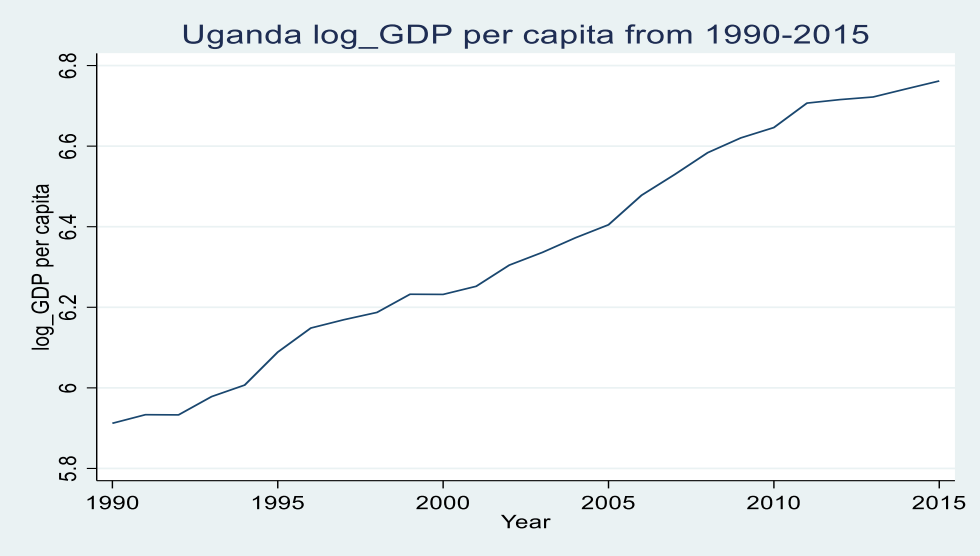
Source: Own field data, 2023

However, GDP per capita for Kenya shows a downward trend from 1990s to early 2000s. Oil crisis in early 1970s affected economic growth for three countries, and all countries undertook series of economic reforms to rescue their economic growth. Of all three countries Uganda in 1980s rescued their GDP per capita growth as can be seen by figure 1c

below, followed by Tanzania in mid 1990s. Contrary to Uganda and Tanzania Kenya delayed to rescue her GDP growth crisis compounded by import substitution policy and Oil Crisis in 1970s which aimed to enhance domestic industry built on the protectionism. In 1993 country adopted economic liberalization which only caused temporal growth as can be seen in Figure 1b above.

The radical reforms were done in early 2000 by new government of Mwai Kibaki in collaboration with international financial institutions which led to the growth of the GDP per capital. In 2008 due to post-election conflict and global economic crisis also led to fall in GDP per capita as indicated in 1b above.

Figure 3c: Trends in growth of GDP per capita in Uganda (1990-2015)



Source: Own field data, 2023

5.2 Pooled OLS Regression

We now carry out our first pooled OLS estimates in two model specifications for all three countries. The first model is simple pooled OLS trying to capture the impact of the customs union to the growth of the GDP per capita. And our second model specification further control for year fixed effects to capture if GDP per capita is also affected with specific time fixed events.

Table 2 : OLS regressions with and without year fixed effects for TKU respectively

	Tanzania		Kenya		Uganda	
	log_ GDP per capita		log_ GDP per capita		log_ GDP per capita	
	spec (1)	spec (2)	spec (1)	spec (2)	spec (1)	spec (2)
treated	0.378***	0.242***	0.11	-0.026	0.495***	0.359***
	(-0.068)	(-0.063)	(-0.067)	(-0.063)	(-0.068)	(-0.064)
constant	6.634***	6.625***	6.678***	6.675***	6.625***	6.604***
	(-0.008)	(-0.036)	(-0.008)	(-0.036)	(-0.008)	(-0.036)
With year FEs	NO	YES	NO	YES	NO	YES
Adj R-squared	0.9158	0.9311	0.919	0.9333	0.9152	0.93
Observations	468	468	468	468	468	468

Source: Own field data, 2023

We use Low-income countries in Sub-Saharan Africa in the donor pool and drop Nigeria whose GDP per capita was doing far beyond the other countries in the period 2000 to 2015 which seem to be a case of an outlying economic performance compared to others. When we consider the study by Abadie et al. (2015), they used 16 OECD countries to study the economic implications of the reunification of Germany on the GDP per capita of West Germany. The authors explain that, to prevent interpolation bias and overfitting they keep donors with comparable traits and small sample size respectively. According to data availability and restriction to Low-income countries our donor pool is limited to 17 countries.

We estimate the effect of the treated unit compared to untreated unit accounting for individual specific differences by running two pooled OLS model specifications for each of the three countries of interest. We find a statistically significant effect of the intervention at 1% for only two countries, Tanzania and Uganda, as shown in specification 1 of Table 1 above for both countries. Our results suggests that on average a unit increase in one year leads to 38 and 50 percentage increase in GDP per capita due to EAC customs union. When we control for time fixed effects, we still find our coefficient of treatment dummy statistically significant at 1% with a reduced magnitude for the two countries, Tanzania and Uganda. The findings suggests that a unit increase in year leads to 24 and 40 percentage increase in GDP per capita for Tanzania and Uganda respectively due to customs union when controlling for year fixed effects.

This indicates that our previous analyses seem to have overestimated the effect of the intervention (customs union) and some portion of the GDP per capita growth is captured by the year fixed effects which show growth in GDP per capita across time to a particular country outside the intervention. Although almost all the year dummies estimate coefficient are statistically insignificant this yet suggest that there is part of the GDP per capita growth which is explained by the specific year fixed effects. However, for Kenya the introduction of the customs union within the EAC suggests that there is no significance impact of the customs union in both model specifications even after controlling for year fixed effects. This may not be surprising as we observe a non -linear pattern in the relationship between GDP per capita and time for Kenya (see Figure 1b above). If anything, the relationship follows a quadratic pattern where we observe a fall in GDP per capita for the period between 1990s and early 2000s before assuming a rising pattern.

5.3 Synthetic Control Estimates

In our synthetic estimation, we first run a simple synthetic model with only one outcome and one covariate, that is growth in GDP per capita (logarithmic transformed) with all three treated countries in turn from their respective three data sets. Our year of treatment is 2005, pretreatment period 1990-2004 where matching of counterfactual and treated units is done, and results period we limit it to 2015 to avoid noise from our pool of donor countries from West Africa, which also established customs union under ECOWAS in 2015.

Although, we find minimal value of Root Mean Squared Predicted Error (RMSPE) and well-balanced treatment and counterfactual. The visual impression shows the quality of matching in pre-treatment period for the three countries can be further improved, which is at the heart of the synthetic control causal inference. This makes our findings based on only one covariate questionable. According to Abadie et al. (2010), there is no pre-intervention guarantee on the fit, if the fit is poor. They recommend against the use of the synthetic control counterfactual methodology.

To deal with the non-fit concern from using only one covariate, we then control for other covariates. These are inflation, population growth, gross domestic investments and industry share, which are better predictors of economic growth. We use these covariates among others from the literature as they qualify due to their data availability quality within the period of our analysis.

We find slight improvement of RMSPE, which becomes slightly lower compared to the previous one for all the three countries. The balance between treated and counterfactual on covariates also improves with exception of one covariate, which is inflation. The visual impression indicates that there is a clear gap between the treated and counterfactual after 2005 although the pre-treatment matching between control and treated group can still be improved further. We further and finally adopt advanced and robust matching in pre-treatment period by adding nested all options which gives robust results at the expense of the computation time period of about three to five minutes.

We find the more improved RMSPE which is way lower than the previous specifications and now all covariates are well balanced, and the visual impression shows good quality of matching in the pre-treatment period as shown below. We only present the tables and figures for the final robust results.

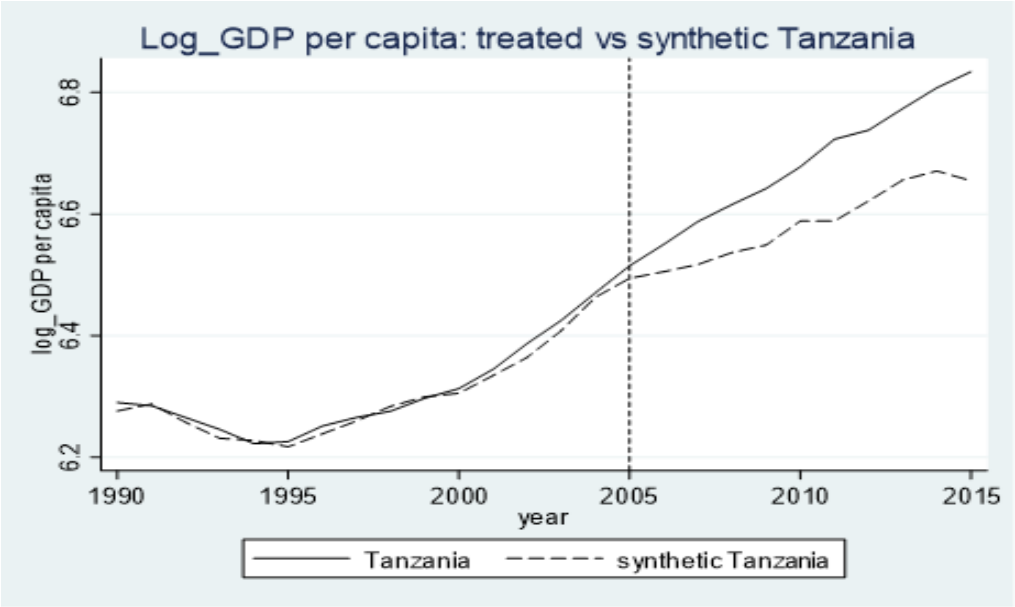
Table 3: Weight of the synthetic control group for TKU respectively

Treated unit	**Tanzania**	**Kenya**	**Uganda**
Countryname	**Donor Weight**	**Donor Weight**	**Donor Weight**
Benin	0.009	0	0
Burkina Faso	0.172	0	0.547
Cameroon	0.058	0.093	0
Chad	0.156	0.022	0
Comoros	0.147	0.171	0
Congo, DRC	0.003	0.016	0
Cote d'Ivoire	0.005	0.235	0
Eswatini	0.01	0	0.157
Gambia, The	0.109	0	0
Guinea-Bissau	0.004	0	0
Mali	0.08	0	0
Mauritania	0.006	0.401	0
Mozambique	0.123	0	0.296
Niger	0	0.062	0
Sierra Leone	0.101	0	0
Togo	0.016	0	0
Zimbabwe	0	0	0

Source: Own field data, 2023

The following graphical representations give visual impression of our estimates for impact of customs union on GDP per capita for Tanzania. It clearly shows the good pre-treatment match and significant gap after year 2005 which is attributed to customs union. Our gaps analysis against the donor countries for causal inference done in order ranking in table 6 suggest on average the customs union led to about 10 percentage significant increase in GDP per capita in Tanzania at least 10 years after its inception.

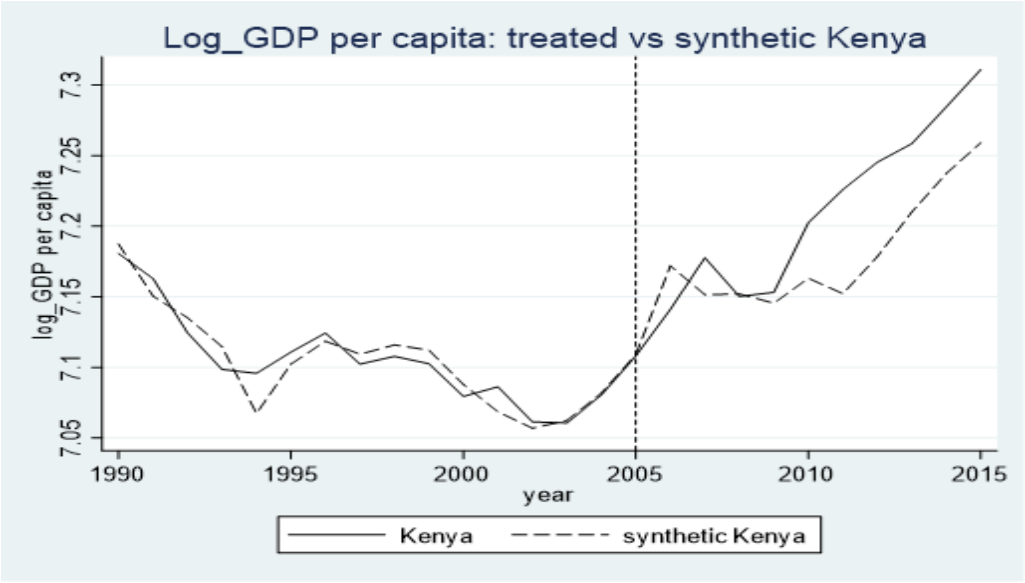
Figure 4a: Trends in ln-GDP per capita for Tanzania: Treated vs Counterfactual



Source: Own field data, 2023

For Kenya whose GDP was under downward trend before early 2000 and later upward trends our pre-treatment match is still good. The diagram indicates that the impact for customs union to her GDP per capita growth did not materialize early. Contrary to OLS regression which assumes linear relationship SCM suggests the effect came after like 5 years and significant impact is observed later on as Figure 2b below. Our results suggest that on average the customs union has led to about 4 percentage significant increase in GDP per capita in Kenya for at least 10 years after its launching as can be observed in table 7.

Figure 4b: Trends in ln-GDP per capita for Kenya: Treated vs Counterfactual

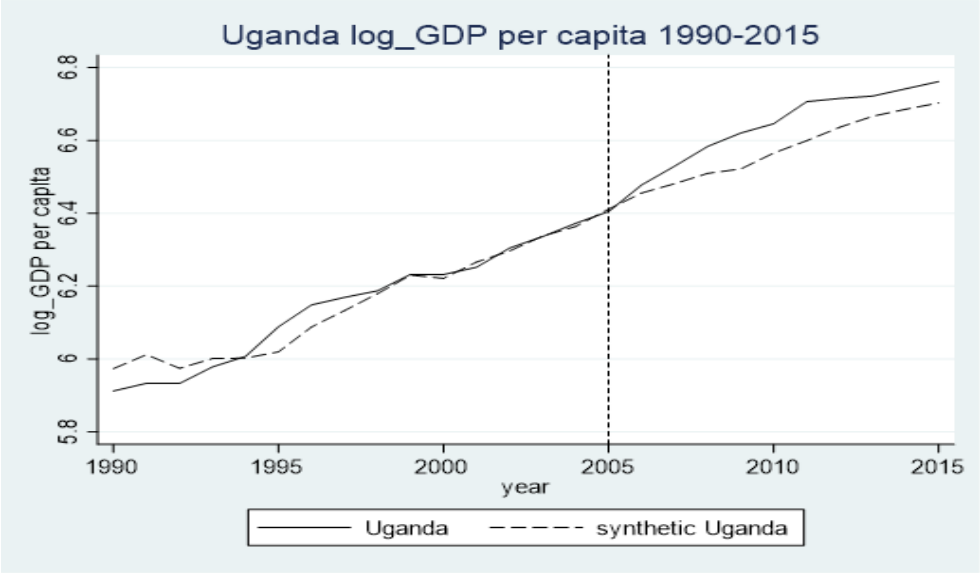


Source: Own field data, 2023

Lastly, although we observe that unlike Kenya impact of customs union to Uganda GDP per capita was immediate like Tanzania yet is way minimal compared to Tanzania and Kenya. This suggests that there is disproportionate impact of the customs union to three

former EAC countries. Table 8 results suggest that customs union has led to 2 percentage insignificant increase in GDP per capita for Uganda.

Figure 4c: Trends in ln-GDP per capita for Uganda: Treated vs Counterfactual



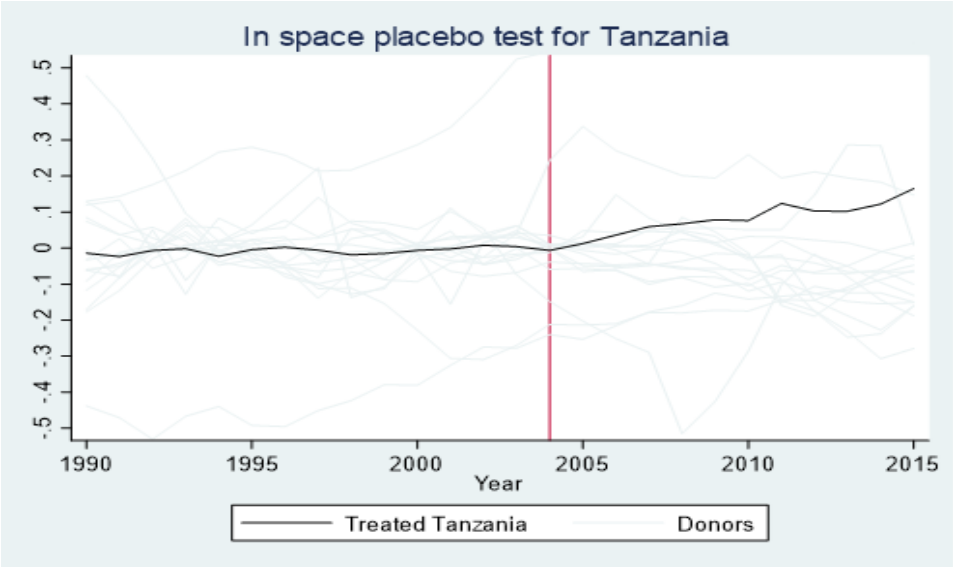
Source: Own field data, 2023

5.4 Statistical Significance

Turning our attention to the test on the statistical significance of the gap, we observe significance using the several approaches used in the synthetic control methodology literature. To test significance on the impact of the EAC-2005-Customs union for the three countries, we allow all the countries in the donor pool with pre-RMSPE of at most two times that of the treated unit in turn to undergo the treatment in 2005. In other words, we allow the treated units and control units in the donor pool to be treated in 2005. Basically, our aim here is to evaluate how often do we get an estimate with similar magnitude to the treated unit when selecting a random country from the donor pool and assigning the same year of intervention.

As shown in Abadie et al. (2015), the effect of West Germany reunification is deemed significant if the effect is relatively larger compared to the placebo's effect. They found that the effect was unusually relatively larger than other countries for West Germany. We consider the effect of the EAC-2005-Customs Union significant if the effect is relatively larger compared to the placebo GDP per capita projections.

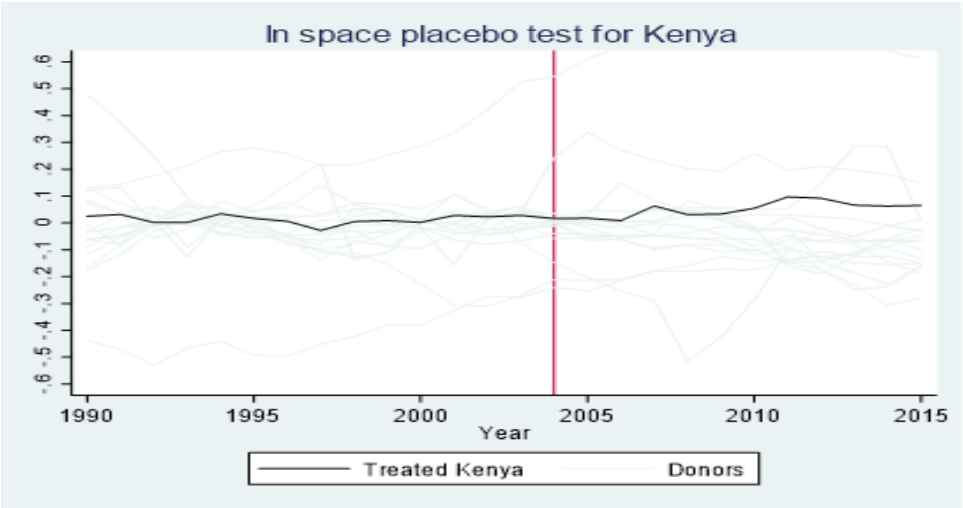
Figure 5a: In space placebo tests analysis for Tanzania



Source: Own field data, 2023

We run placebo tests by assigning 2005 as treatment for all donor countries and including them in the treated unit. We can confidently state that we have plausible findings of our study on GDP per capita when the treated unit's GDP per capita trajectory lies above the placebo for all other donor countries. Our findings show that there is only one country with better economic performance, even before 2005. However, a recession took over later for this country and overtaken by Tanzania. The Tanzania GDP per capita started to stand out from other donor countries after 2005 and get even wider after 2010 as shown in Figure 3a above.

Figure 5b: ***In space placebo tests analysis for Kenya***

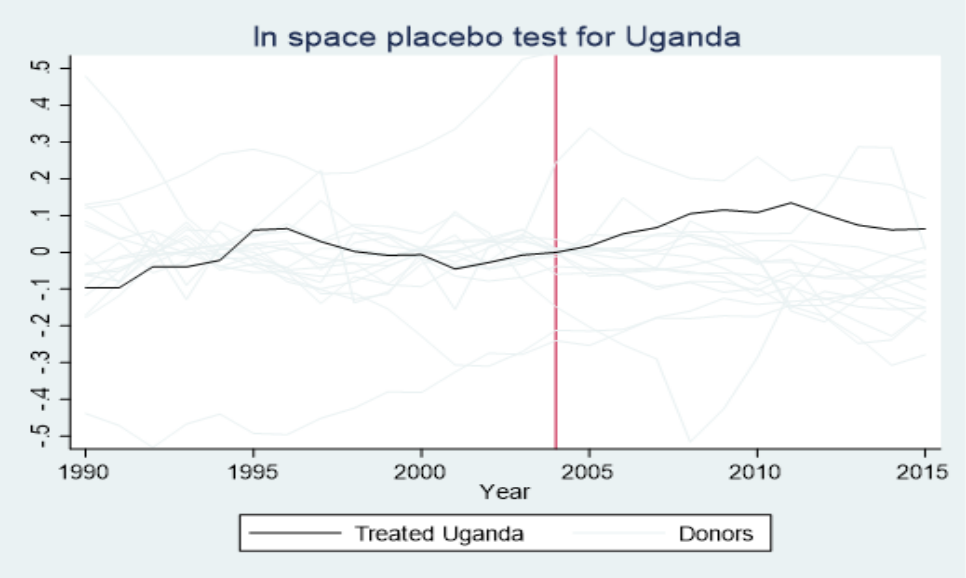


Source: Own field data, 2023

Similarly, the gaps for Kenya and Uganda as shown in figure 3b and 3c respectively. Kenya GDP per capita pathway stand out from placebo around 2010 indicating the impact of customs union did not materialize immediately. The placebo test in Figure 3c below suggests that the impact of the customs union is significant on economic growth for Uganda whose GDP per capita stands out of the donor countries after 2005. In nutshell the three

countries, from this in-space placebo analysis seemed to have benefited significantly from the customs union.

Figure 5c: In space placebo tests analysis for Uganda



Source: Own field data, 2023

5.5 Order Ranking

As a check for second significance of causal inference of our findings, we follow the permutation tests and order-ranking. We test the null hypothesis that, "The launching of the EAC-2005-Customs union has no significant impact on growth of GDP per for the three founding member countries of the EAC". Abadie et al. (2010) suggest using the ratio of the pre and post treatment RMSPE as test static for inferencing.

Table 4: Rank of Tanzania in placebo ratios of post to pre-RMSPE

Country	Pre-RMSPE (A)	Post-RMSPE (B)	B/A	Rank	P-value
Tanzania	**0.00914**	**0.09541**	**10.43415**	**1**	**0.0555**
Zimbabwe	0.07068	0.26797	3.79136	2	0.1111
Gambia	0.05296	0.16080	3.03601	3	0.1666
Mali	0.04455	0.13300	2.98459	4	0.2222
Niger	0.04351	0.10924	2.51098	5	0.2777
Chad	0.09334	0.22634	2.42476	6	0.3333
Mauritania	0.02976	0.06621	2.22462	7	0.3888
Eswatini	0.30892	0.68202	2.20768	8	0.4444
Benin	0.02671	0.05721	2.14209	9	0.5
Code d'Voire	0.04512	0.09347	2.07165	10	0.5555
Cameroon	0.05222	0.10521	2.01473	11	0.6111
Sierra Leone	0.08248	0.13450	1.63061	12	0.6666
Togo	0.06108	0.06923	1.13332	13	0.7222
G/Bissau	0.10170	0.11210	1.10222	14	0.7777
B/Faso	0.03848	0.03325	0.86400	15	0.8333
Comoros	0.06464	0.05376	0.83163	16	0.8888
Congo, DRC	0.23824	0.15810	0.66358	17	0.9444
Mozambique	0.41486	0.15437	0.37209	18	1

Source: Own field data, 2023

We use the results from the synth-runner software which iteratively assigns treatment to all donor countries including treated unit(s) in the year of the treatment and produces both pre and post RMSPE. We calculate the ratio of the post to pretreatment RMSPE and then rank the ratios from the highest to the lowest. The intuition behind this method is that for the treated unit we will have a relatively larger ratio and ranking at the top positions due to the gap after treatment which increases the corresponding post RMSPE. However, the gaps appearing to the other countries will be due to matching errors which are relatively the same in pre and post treatment period which consequently makes their corresponding ratios to be relatively smaller.

We finally calculate pseudo-P-values as the ratio of the rank to the total number of the countries particularly to the treated unit. The P-values try to mimic the traditional inferencing techniques to state to what extent the impact is significant which tells us the probability that if one country were to be picked randomly from the sample of all countries under placebo study, what is the chance it will produce the ratio or impact as large as that of the treated unit. If the treated country is ranked at least as the topmost two or three positions, the lower the P-value and suggesting that the gap that we observe is uniquely coming from the intervention. We run this separately for the three countries and prepare the ranking tables.

Table 5: Rank of Kenya in placebo ratios of post to pre-RMSPE

Country	Pre-RMSPE(A)	Post-RMSPE(B)	B/A	Rank	P-value
Zimbabwe	0.07067	0.26796	3.79136	1	0.0555
Kenya	**0.01687**	**0.06025**	**3.57062**	**2**	**0.1111**
Gambia	0.05296	0.16079	3.03600	3	0.1666
Mali	0.04455	0.13297	2.98458	4	0.2222
Niger	0.04350	0.10924	2.51098	5	0.2777
Chad	0.09334	0.22633	2.42476	6	0.3333
Mauritania	0.02976	0.06620	2.22462	7	0.3888
Eswatini	0.30892	0.68201	2.20768	8	0.4444
Benin	0.02670	0.05721	2.14209	9	0.5
Code d'Voire	0.04511	0.09346	2.07165	10	0.5555
Cameroon	0.05222	0.10521	2.01473	11	0.6111
Sierra Leone	0.08248	0.13449	1.63061	12	0.6666
Togo	0.06108	0.06922	1.13332	13	0.7222
G/Bissau	0.10169	0.11209	1.10222	14	0.7777
B/Faso	0.03848	0.03324	0.86400	15	0.8333
Comoros	0.06464	0.05375	0.83163	16	0.8888
Congo, DRC	0.23824	0.15810	0.66358	17	0.9444
Mozambique	0.41486	0.15437	0.37209	18	1

Source: Own field data, 2023

We find that Tanzania and Kenya ranked first and second respectively as shown in table 6 and 7 above, suggesting that there is significant impact of the customs union to these countries. However, Uganda is ranked at the eleventh position as indicated in table 8 below which suggest that the EAC-2005 Customs union has impact to Uganda GDP per capita but not significantly different when compared to other countries in donor pool that had no any intervention. This can be also attributed to the poor pre-treatment matching that we observed in Figure 2c above, especially in the period 1990-2000. Furthermore, the poor matching can be visually observed through wider pretreatment gaps as shown in Figure 4c for the period under consideration as compared to the counterparts, Tanzania and Kenya.

Our analysis therefore rejects the null hypothesis that EAC customs union has no significant impact to the economic growth for former EAC members. Analysis suggests that there is significant impact to Kenya and Tanzania however insignificant impact for Uganda.

Table 6: *Rank of Uganda in placebo ratios of post to pre-RMSPE*

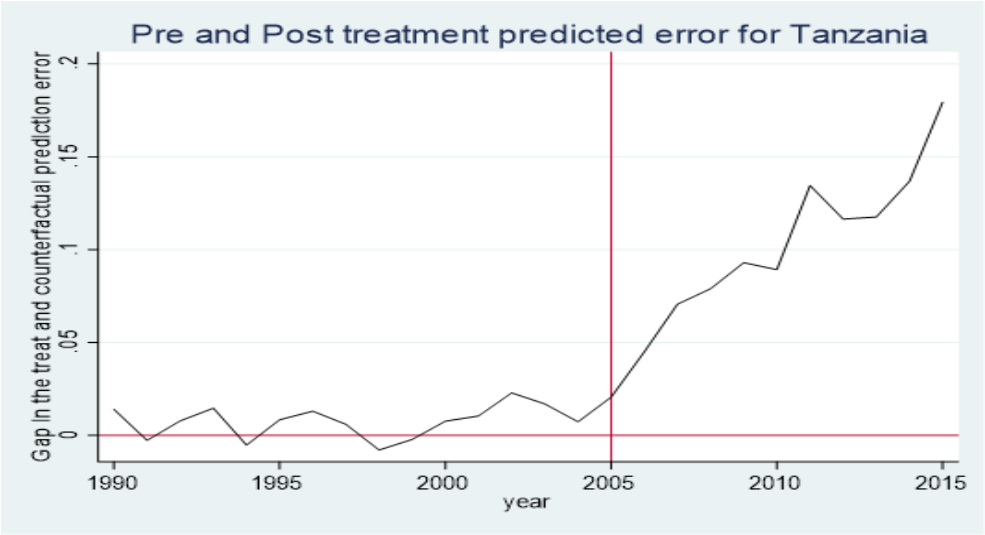
Country	Pre-RMSPE (A)	Post-RMSPE (B)	B/A	Rank	P-value
Zimbabwe	0.07067	0.26796	3.79136	1	0.0555
Gambia	0.05296	0.16079	3.03600	2	0.1111
Mali	0.04455	0.13297	2.98458	3	0.1666
Niger	0.04350	0.10924	2.51098	4	0.2222
Chad	0.09334	0.22633	2.42476	5	0.2777
Mauritania	0.02976	0.06620	2.22462	6	0.3333
Eswatini	0.30892	0.68201	2.20769	7	0.3888
Benin	0.02670	0.05721	2.14209	8	0.4444
Co. d'Voire	0.04511	0.09346	2.07165	9	0.5
Cameroon	0.05222	0.10521	2.01473	10	0.5555
Uganda	**0.04555**	**0.08803**	**1.93239**	**11**	**0.6111**
S/ Leone	0.08248	0.13449	1.63061	12	0.6666
Togo	0.06108	0.06922	1.13333	13	0.7222
G/Bissau	0.10169	0.11209	1.10222	14	0.7777
B/Faso	0.03848	0.03324	0.86400	15	0.8333
Comoros	0.06464	0.05375	0.83163	16	0.8888
C/ DRC	0.23824	0.15810	0.66359	17	0.9444
Mozambiq.	0.41486	0.15437	0.37209	18	1

Source: Own field data, 2023

We then estimate the gap between the treated and control before and after treatment year as shown in Figure 4 above followed by a comparison of these gaps with what is produced by the placebo's distribution and finally estimating the significance of the gaps shown in appendices 4-6. The gap figures indicate the difference between treated and synthetic before treatment. As can be visualized, in pre-treatment period, the difference wiggles around zero but just after the intervention we see a TKU growing gap for log- GDP per capita for TKU reaching up to 18, 7 and 11 percentage points in year 2015, 2012 and 2011 respectively, as compared to what it would be without the intervention. In other words, the highest changes GDP per capita for TKU post-treatment, increased up to 20%, 7% and 12% in year 2015, 2012 and 2011 respectively. However, for Uganda pre-treatment matching quality is evident to be poor as the predicted errors are relatively larger during the period 1990-2000 which messes up the ranking and consequently the P-value estimates based on the principle they are derived.

To estimate the significance of the gaps after intervention year, we use the pseudo-P values. According to Gilchrist et al. (2023) P-values from random permutation based on the placebos effects shows the share of the donor units with placebo gap as large as that for the treated unit which mimics the interpretation of the statistical significance based on the conventional well founded statistical inferences.

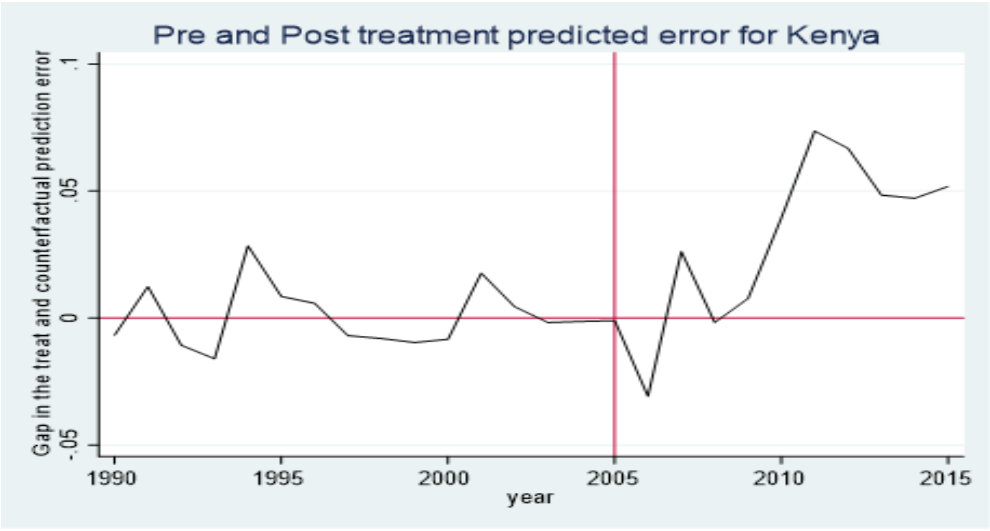
Figure 6a: The gap distribution between counterfactual and treated Tanzania (1990-2015)



Source: Own field data, 2023

The strength of these P-values is found in their ability to measure the significance of the gaps over time. We, therefore, run the pseudo-P values to determine the significance the gaps in respective years after intervention, where intervention year is referred to as lead 1 and one year after intervention as lead 2 and so on. We find that most of the gaps between counterfactual and treated Kenya are statistically significant as shown in appendix 5 in appendices. Contrary to the findings in Kenya, most of the gaps for Uganda are statistically insignificant as can be visualized in appendix 6. The lack of significance for Uganda can be attributed to various potential reasons.

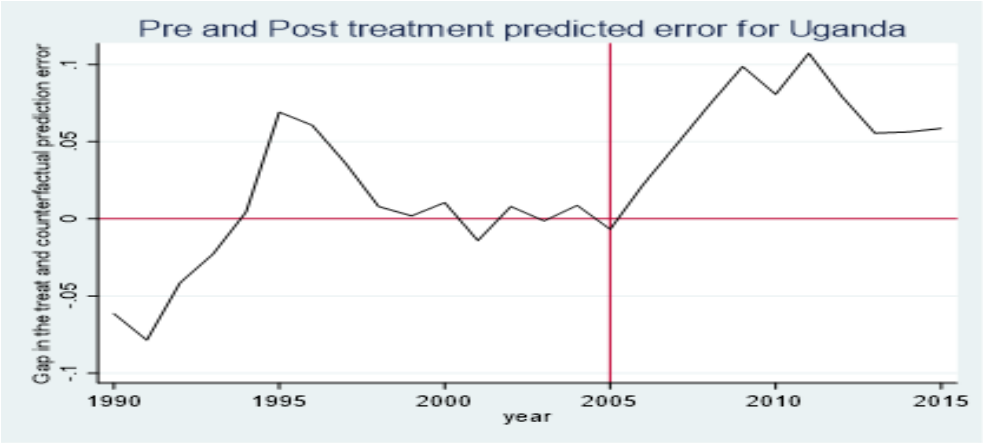
Figure 6b: The gap distribution between counterfactual and treated Kenya (1990-2015)



Source: Own field data, 2023

Firstly, from our data pre-RMSPE is relatively poor compared to the two counterparts (see appendices 1-3) and Figure 4c for Uganda below. It is unfortunate that the software did not produce P-values results for Tanzania as shown in Figure 5(a) appendix. This will not be much of a concern as were able to show the significance effect for in most of the tests performed so far.

Figure 6c: The gap distribution between counterfactual and treated Uganda (1990-2015)



Source: Own field data, 2023

5.6 Falsification

Falsification is a crucial step in SCM for testing the robustness and making sure that estimates on treatment effects are not by accident. The spirit of falsification lies in assigning treatment in time or variable that should not be affected by treatment. If falsification yield significant estimates as treatment ones then it calls into question significance of the estimates. on the other hand, if it gives insignificant estimates, which is usually expected, then it suggests the findings are attributed to the treatment.

To check for potential pre-trends and robustness of our findings, firstly and purposefully we assign a wrong treatment year, and estimate results for 6 leads which is from 2000-2005 and cut off the data at 2005. We conduct both OLS and synthetic estimates for the first falsification.

Table 7: Falsification-OLS with and without time fixed effects for TKU respectively

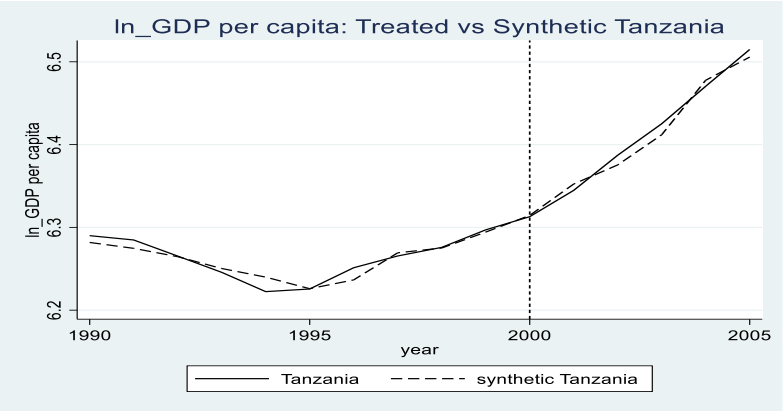
	Tanzania		**Kenya**		**Uganda**	
	log_GDP per capita		**log_GDP per capita**		**log_GDP per capita**	
	spec(1)	**spec(2)**	**spec(1)**	**spec(2)**	**spec(1)**	**spec(2)**
treated	0.162**	0.136*	-0.038	-0.063	0.259***	0.234***
	(-0.068)	(-0.07)	(-0.068)	(-0.07)	(-0.069)	(-0.072)
Constant	6.58***	6.63***	6.63***	6.68***	6.57***	6.60***
	(-0.008)	(-0.03)	(-0.008)	(-0.03)	(-0.008)	(-0.03)
With Fes	NO	YES	NO	YES	NO	YES
Adj R-squared	0.9552	0.9551	0.9565	0.9563	0.9547	0.9542
Observations	288	288	288	288	288	288

Source: Own field data, 2023

The first regression, specification 1, shows significance at the 5% level of significance for treated Tanzania without controlling for time fixed effects. However, after controlling for time fixed effects we find significance at 10% level of significance with a decrease in the size of the interest coefficient. This suggests that part of the impact is coming from year fixed effects although the year dummies are statistically insignificant. For Kenya, the coefficient for treated in both specifications are statistically insignificant suggesting that there are no pre-trends and year fixed effects. The surprising results are shown for Uganda whereby all coefficients are statistically significant at the 1% level of significance. The effect suggests a strong pre-trend and minimal impact is accounted by time fixed effects as after controlling for the time fixed effects in the model specification 2 the coefficient is slightly reduced from 0.259 to 0.234.

We now present synthetic control estimates on falsification in the Figure 6 below for the three countries respectively. This accounts for our in-time placebo tests. Abadie et al. (2015) deliberately allocated Germany reunion in 1975 to conduct in-time placebo analysis, around 15 years earlier than the happening of the actual reunification to test the credibility of their findings on the implications of reunification on West Germany on GDP per capita.

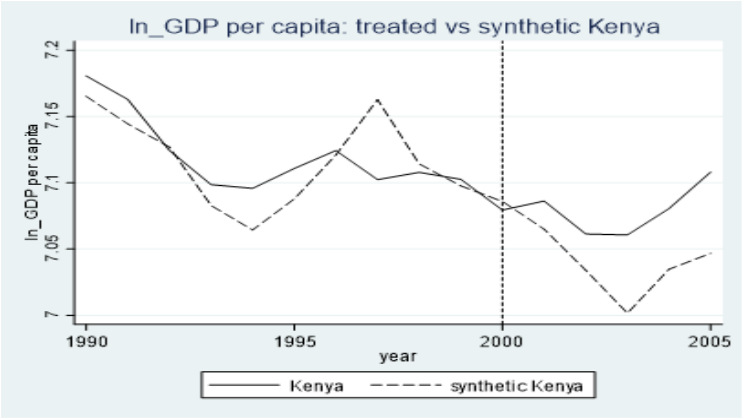
Figure 7a: Placebo GDP per capita trends: treated vs synthetic Tanzania



Source: Own field data, 2023

As indicated in Figure 6b and 6c, the trends for Kenya and Uganda indicate some gaps after 2000. In the case of Uganda, the observed trend can be attributed to the preexisting growth in GDP per capita which is also shown by the OLS results provided in Table 9 above. In addition, it can be argued that the gap can also be due to the poor quality of pre-treatment matching which can be observed from Figure 6c below.

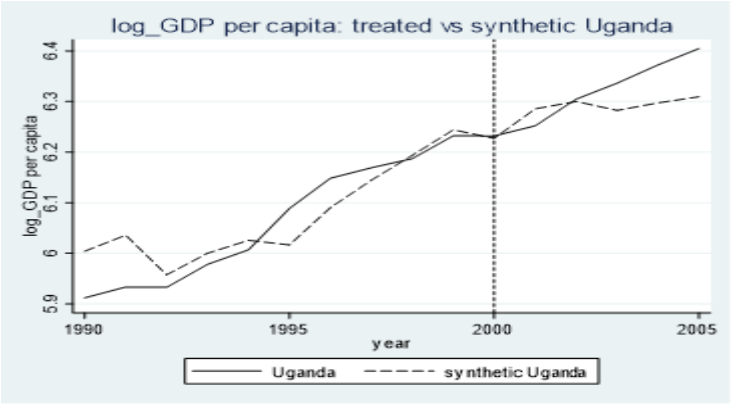
Figure 7b: Placebo GDP per capita trends: treated vs synthetic Kenya



Source: Own field data, 2023

For Kenya, there was radical policy change to rescue the degrowth in the economy around 2003. It is highly likely that the gap that we observe is due to the reforms which led to growth in GDP per capita. This is also shown in the descriptive statistics provided in Figure 1. In short, the gap we observe for Kenya can be explained by the radical economic reforms implemented in early 2000.

Figure 7c: Placebo GDP per capita trends: treated vs synthetic Uganda



Source: Own field data, 2023

We then test the significance of treatment in the 2000 results. The results suggest that there several countries which are performing economically better after year 2000 than treated TKU. In addition to that, Tanzania's economy underwent recession in early 2000s whereas Uganda and Kenya GDP per capita seems to have some growth around 2003 but yet outperformed by significant share of other countries after year 2000 as shown in Figure 7(a)-7(c) in appendix. The falsification shows that there is no significant impact on the economic growth of treated TKU compared to the countries in the donor pool after deliberate wrong assignment of the treatment in 2000 indicating the robustness of our findings. Even the gaps we observe for Uganda and Kenya are not significant when compared to other countries in the donor pool.

After comparing the gap between counterfactual and treated, we calculate the pseudo-P values. Appendix 10 indicates that the gap between the treated and control wiggles about mean zero before 2000 for all the three countries, particularly for Tanzania. However, after 2000 the results for Kenya and Uganda indicates move away from mean zero but not significantly different when compared to the pre-treatment period. We find a mixed interpretation of the gaps in the results period. On the one hand, for Tanzania, we find no positive impact after 2000. On the other hand, some positive gaps can be visualized for Kenya as can

be observed in appendix 10. This can be attributed to the economic reforms implemented in the country. In addition, we also observe positive gaps for Uganda which can be attributed to poor matching which can be visualized in the pre-treatment as shown in appendix 10.

To test for significance of the yearly gaps using pseudo-P-values is provided in appendix 11. The P-values confirm that all the gaps for Kenya and Uganda are not statistically significant. However, for Tanzania the software was not able to generate the P-values. Therefore, we use the rank order which in principle is the general way of assessing the significance of the estimates in synthetic control approach to compliment as test statistic which indicates no significance for all the three countries. as shown in appendices 12-14 for Tanzania, Kenya and Uganda respectively.

For the second falsification we carry computerized random sampling of our observations to assign treatment in one of country in the donor pool by random chance. From 442 observations after excluding treated units, we draw 7 random samples with 200, 100,50,10,5,2and 1 samples respectively. Sierra Leone stood the chance to win the lottery. Our synthetic estimates suggest insignificant contribution of the pseudo-intervention in year 2005 as shown in Figure 15 and 16 in appendices for Sierra Leone. There is a sharp rise in GDP per capita in 2011 for Sierra Leone which is accounted by the discoveries of iron ore mines (African development report, 2014). The Sierra Leone deep fall in GDP per capita was driven by the Ebola outbreak around 2014-2016.

5.7 Leave-One-Out Analysis

To further check for robustness of our results, we employ another approach of leave-one-out analysis where we iteratively run four estimates each time dropping one country from the donor pool. We consider four countries that were assigned highest weight in pre-treatment matching by starting from the highest to the lowest from the selected candidates of the four. Considering the study by Abadie et al. (2015), they used the Netherlands, Switzerland, Japan, United States and Austria in ascending order of the weight assigned from the 16 OECD donor countries in the baseline comparison.

To test to what extent results are overly dependent on a particular country, if any, they iteratively dropped one country each time and compared if there were significant changes from the baseline estimates. They found that the results, to greater extent, were strong and stable from leave-one-out analysis. However, the magnitude of the estimates slightly reduced when United States was dropped from the analysis, but yet large and substantive impact was still observed.

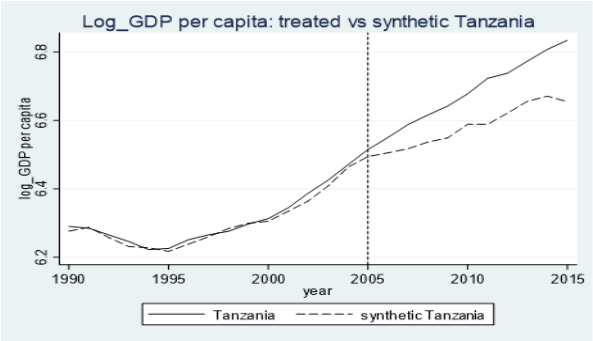
We conduct the leave-one-out analysis for the three treated countries as follows below.

(A) Leave-one-out analysis for Tanzania

In the baseline robust matching of nesting all options we adopted, we have Burkina Faso, Chad, Mozambique and Comoros with the highest synthetic weight of 17%, 16%, 15% and 12% of all 17 countries in the donor pool respectively. We dropped from the highest to the lowest to check for sensitivity of our analysis as shown by the following Figures below. We find that our results are still stable even with the leave-one-out analysis which implies that our results are not overly dependent on a particular country even when those with largest assigned weight are dropped from the analysis. These results suggest generalization of our results at least within our sample as it is not affected by inclusion and exclusion of a particular country as evidenced from our leave-one-out analysis which follows iteratively excluding one country from our estimates. However, the leave-one out analysis comes at the expense of a slight increments in the pre-RMSPE.

(i) Baseline results

Figure 8: No country is left in the donor pool

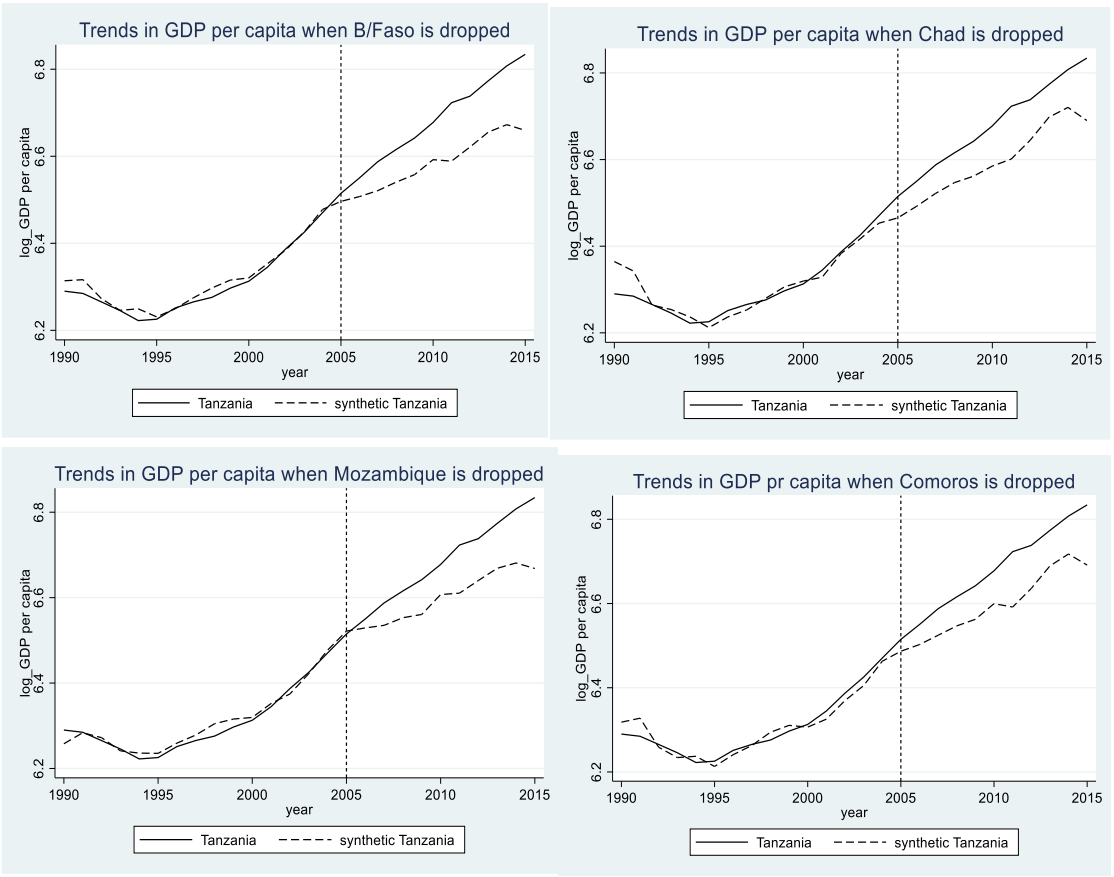


Source: Own field data, 2023

(ii) Leave-one out analysis

We drop Burkina Faso, Chad, Mozambique and finally Comoros as shown in Fig 11(a)-11(d) respectively

Figure 9: Leave-one-out, Burkina Faso, Chad, Mozambique and finally Comoros are dropped in turn as shown below.



Source: Own field data, 2023

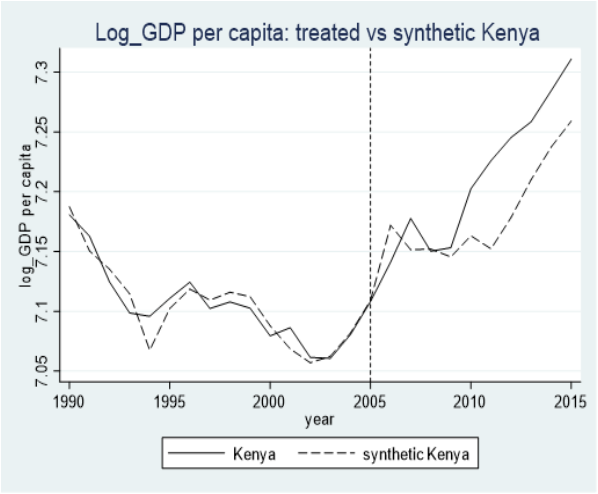
(B) Kenya leave-one-out analysis

In the baseline robust matching of nested all options for Kenya, we have Mauritania, Cote d'Ivoire, Comoros and Cameroon with the highest synthetic weight with 40%, 24%, 17% and 1% of all 17 countries in the donor pool respectively. We drop one country after another to check for sensitivity of our analysis as shown in the Figures below. In other words, at first, we drop Mauritania, then cote d'Ivoire and finally Cameroon. Our results compared to the baseline results suggest our results are not overly dependent on the inclusion of a particular country, even with those that have a substantially large weight. However, when Mauritania is dropped from the donor pool, we find no impact at the end period of our analysis. Almost similar results are observed when we drop Comoros.

Notwithstanding the observed changes when dropping Mauritania and Comoros from our analysis, on average the substantive results are observed in comparison to our baseline as shown in the Figures below. Once again, these results suggest that the impact of the EAC on growth of GDP per capita is not limited to inclusion or exclusion of a particular country as evidenced from our leave-one-out analysis is realized by iterative exclusion of one country from our analysis. However, the leave-one-out comes with compromise in the goodness of fit as can be observed form the Figures below.

(i) Baseline results

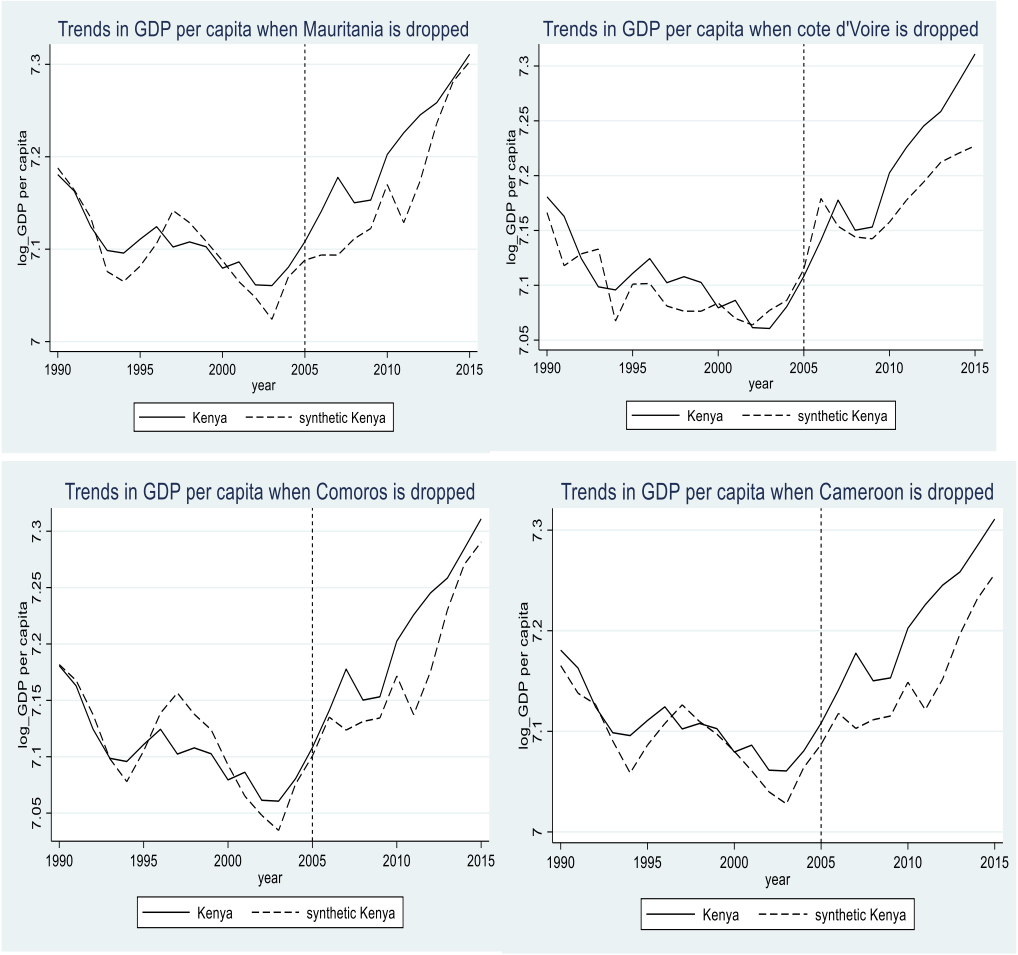
Figure 10: No country is left in the donor pool



Source: Own field data, 2023

(ii) Leave-one-out analysis

Figure 11: Leave-one-out, Mauritania, cote d'Ivoire, Comoros and Cameroon are dropped in turn as shown below



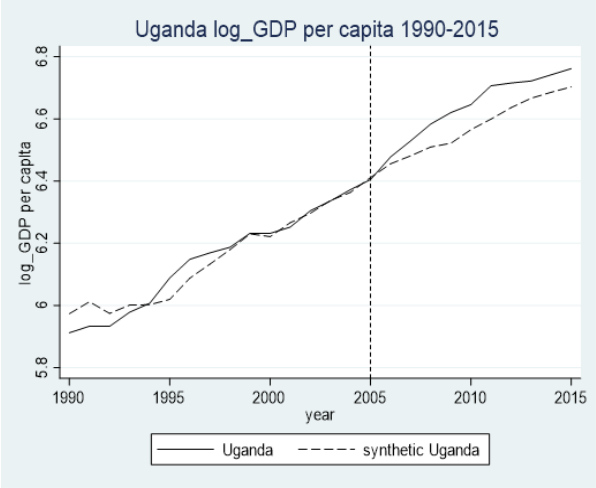
Source: Own field data, 2023

(C) Uganda leave-one-out analysis

In the baseline robust matching of nested all options we adopted, we have Mozambique, Benin, Zimbabwe, and Eswatini with the largest synthetic weights of 58%, 31%, 8% and 1% of all 17 countries in the donor pool respectively. Employing similar techniques, we check for the sensitivity of our results by iteratively, dropping one country from the highest to the lowest. The results from these iterative tests for Uganda are provided in the following Figures. Relatedly, our results remain stable which once again imply that our results are not limited to the particular country although the pre-RMPSE slightly deteriorated. In summary, our results from leave-one out analysis suggest robustness and reliability of our estimates at least within our sample as the estimates are not limited to presence of a particular country. Notwithstanding the robust result, leave-one out comes with an expense of a slight increasing in the pre-RMSPE, which is not surprising as we are leaving out best options-countries in the donor pool that lowers the pre-RMSPE.

(i) Baseline results

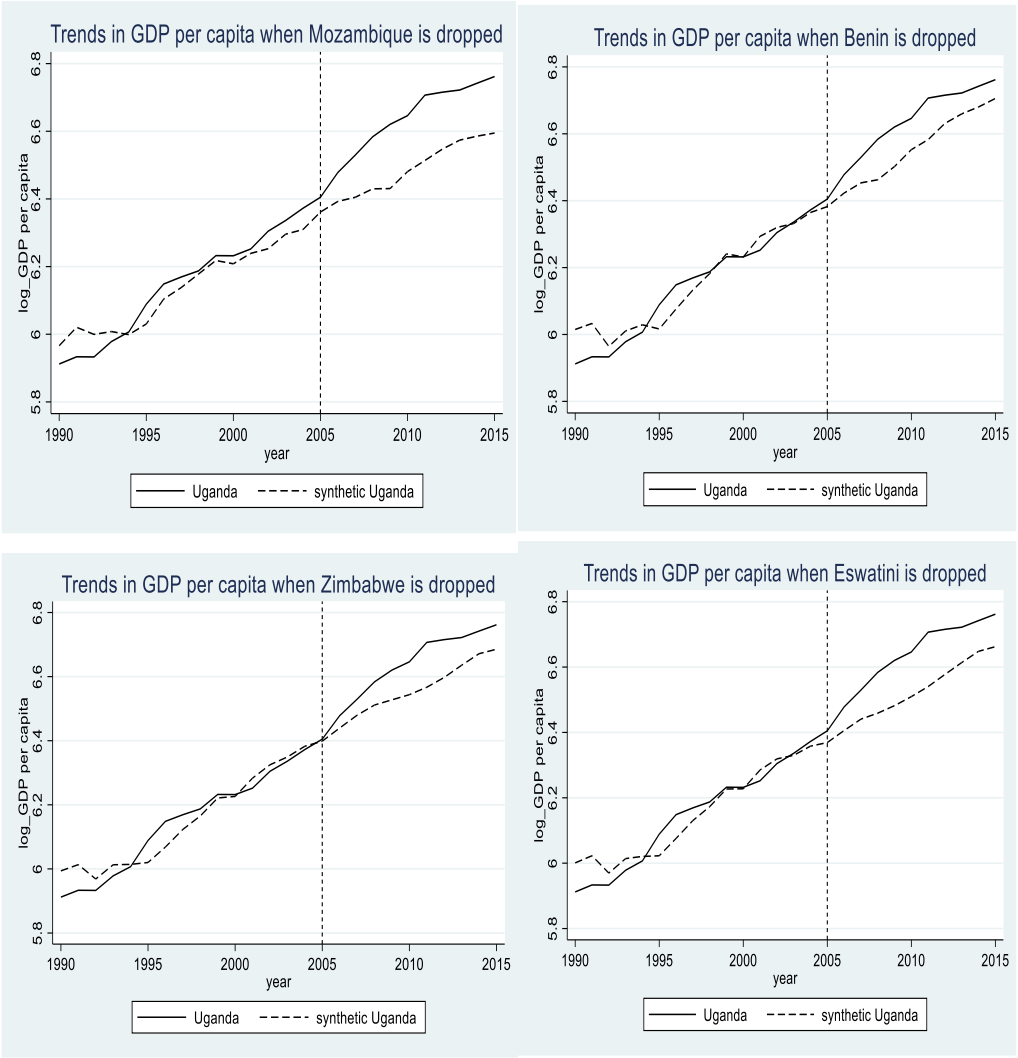
Figure 12: No country is left in the donor pool



Source: Own field data,2023

(ii) Leave-one-out analysis

Figure 13: Leave-one-out, Mozambique, Benin, Zimbabwe and Eswatini are dropped in turn as shown below



Source: Own field data, 2023

Chapter 6
Conclusions

We took advantage of the launching of the EAC customs union in year 2005 as a policy change which aimed to foster balanced economic growth among the member states through removing the existing trade barriers among the states and establishing common external tariffs.

The current study aimed to assess if the customs union had significant impact on the economic growth of the three founding member states, Tanzania, Kenya and Uganda and if impact is equitable across the three countries. For at least a decade of our analysis since inception of the EAC Customs Union has led on average percentage increase of 2%, 4% and 10% growth of GDP per capita for Uganda, Kenya and Tanzania respectively compared to what would have happened without the launching of the customs union in 2005 for a decade since its launching.

Our results are robust and suggest that there is significant impact on GDP per capita growth for Tanzania and Kenya and weakly significant increase in GDP per capita in Uganda. Furthermore, our results are on one hand, on aggregate in agreement with the economic theory of establishing customs union to enhance economic growth through static effects of trade creation, trade diversion and dynamic effects of economies of scale and increased industry competition. On other hand, in agreements with several studies conducted in the EAC region to try to assess the implications of the customs union on trade facilitation and economic growth in individual countries and directions of the impact. According to Boiwo et al. (2015) the study reveals that the formation of the EAC customs union substantially increased trade volume and economic growth (GDP) in Kenya.

Further The study finds unit increase in trade volume leads to 1% increase in GDP. Furthermore, Chimilila (2014) reveals that the introduction of the customs union has significantly contributed to the trade and export performance for all EAC countries. However, Tanzania leads the way of all EAC countries to FDI inflows and contribution of the exports to her GDP. For Uganda, the establishment of the EAC customs union had minimal impact on macro-economic indicators in Uganda with less than 0.2% in real GDP and less than 3% in total trade volume. In additional to that the study finds welfare reduction to the poor (Okello 2008). Our approach rigorously analyzes the EAC customs union benefit share on GDP among EAC members over a long time with robust tool in political comparative studies.

Similarly, we find the impact for Uganda is much smaller in magnitude as compared to that for Tanzania and Kenya. This is of concern to EAC customs union policy objective on enhancing balanced economic growth for all member states. Malefane (2021) explains there is no link between exports and economic growth for Lesotho which is least developed country in SACU. He further argues that export-oriented economic growth policies must be tailored to enhance trade capacity and addressing trade key issues. More specifically, the EAC-2005-CU has significantly contributed to the economic growth of the two EAC countries which are Kenya and Tanzania at least after 10 years of implementation. To Uganda we find there is positive but weakly significant impact of the EAC-2005-CU which is evident from most of the robust tests we carried out to make a causal inference. In particular our study suggests, about 7%, 12% and 20% highest growth in GDP per capita for Kenya, Uganda and Tanzania in 2012, 2011 and 2015 respectively can be attributed to the implementation of the EAC customs union. The caveats in our analysis emanate from the use of few covariates. In addition, as most of the donor countries are from West Africa, we limited

the period for our analysis until 2015 as during the same year ECOWAS launched customs union among its member countries, implying extending our analysis beyond 2015 would lead to bias of our estimates from 2015 onwards. Consequently, this limited broader and long-term assessment of impacts of the customs union to the GDP per capita growth.

The future studies can extend period of analysis and broadly evaluate EAC Customs Union by examining the linkages of the exports and imports with customs union and extends analysis for all EAC countries when there is enough data for other countries for analysis. In addition, future studies can carry rigorous analysis also on Customs Union implications to Foreign Direct Investment (FDI) to check whether region integration enlarged markets and access to human and natural resources which are driving forces for FDI.

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Appendices

(A) Covariates balance between treated and counterfactual TKU in pre-treatment period (1990-2004)

Table 1: Predictor balance between treated and synthetic Tanzania

Predictor balance	**Tanzania**	
RMSPE=0.0085	**Treated**	**Synthetic**
Inflation, GDP deflator	20.7851	19.8646
population growth	2.7164	2.7138
Log_GDP per capita avg (1993-1996)	6.2363	6.2286
Log_GDP per capita (2000)	6.3129	6.3053
Log_GDP per capita (1992)	6.2654	6.2576
Log_GDP per capita (2004)	6.4704	6.4632
Industry share avg (1995-2004)	18.5717	18.5439
GDI avg (1995-2004)	18.9417	18.9388

Source: Own field data,2023

Appendix 2: ***Predictor balance between treated and synthetic Kenya***

Predictor balance	**Kenya**	
RMSPE=0.0118	**Treated**	**Synthetic**
Inflation, GDP deflator	11.8391	30.5704
population growth	2.8014	2.6768
Log_GDP per capita avg (1993-1996)	7.1204	7.1169
Log_GDP per capita (1992)	7.1024	7.1093
Log_GDP per capita (2000)	7.0795	7.0878
Log_GDP per capita (2004)	7.0805	7.0819
Industry share avg (1995-2004)	15.3940	21.6779
GDI avg (1995-2004)	16.8966	15.8621

Source: Own field data, 2023

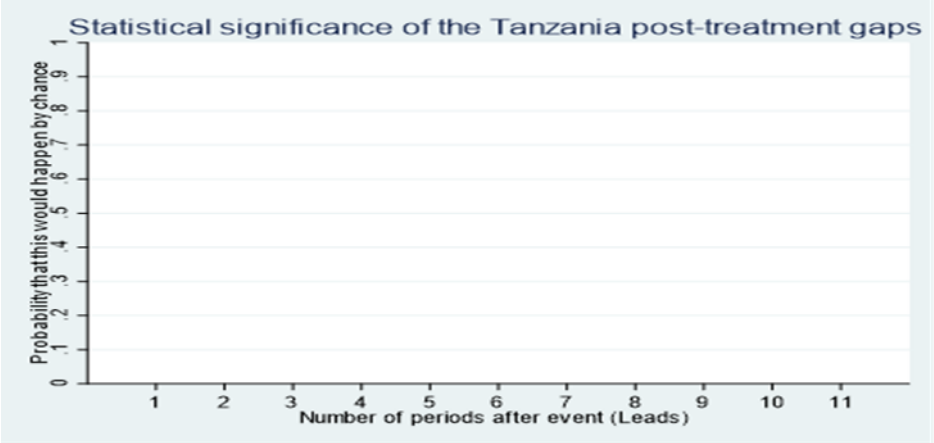
Appendix 3: ***Predictor balance between treated and synthetic Uganda***

Predictor balance **RMSPE=0.0387**	**Uganda** **Treated**	 **Synthetic**
Inflation, GDP deflator	11.5041	7.7485
population growth	3.0161	2.5791
Log_GDP per capita avg (1993-1996)	6.0557	6.0278
Log_GDP per capita (2000)	6.2320	6.2215
Log_GDP per capita (1992)	5.9330	5.9744
Log_GDP per capita (2004)	6.3725	6.3638
Industry share avg (1995-2004)	18.7105	22.4868
GDI avg (1995-2004)	18.6893	22.3594

Source: Own field data, 2023

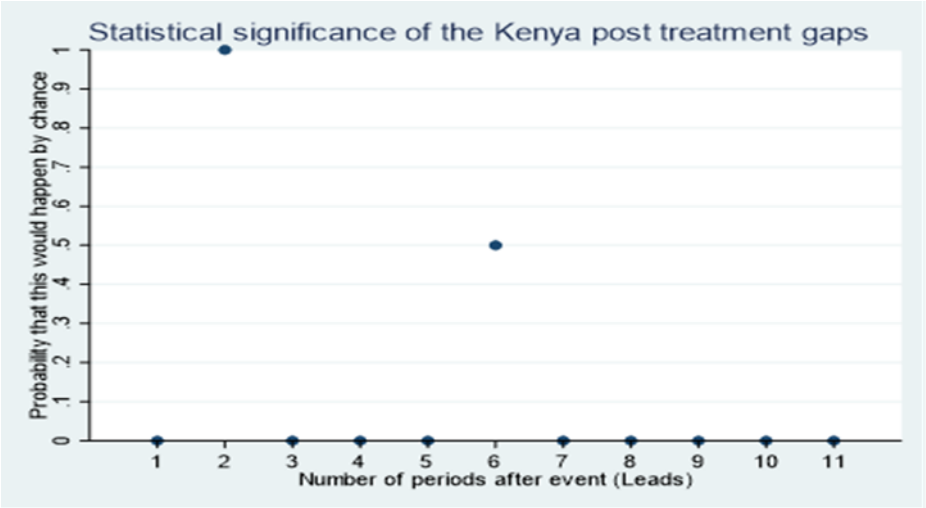
(B) Statistical significance of the post treatment gaps for TKU from 2005-2015

Appendix 4: Tanzania Post treatment gaps P-values



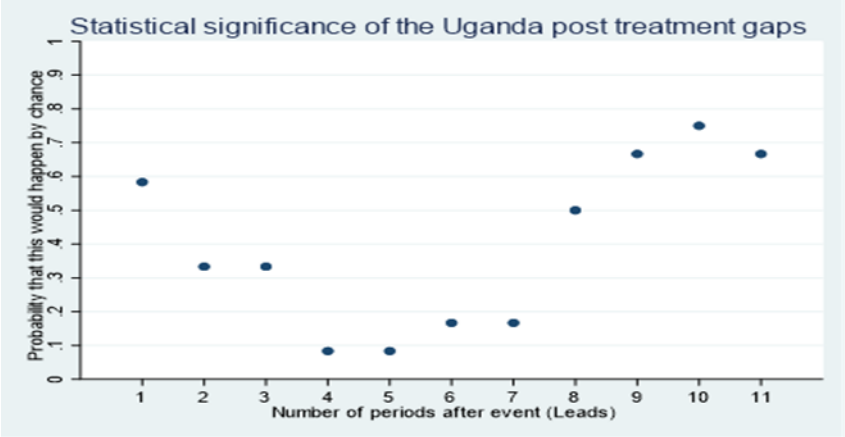
Source: Own field data, 2023

Appendix 5: Kenya Post treatment gaps P-values



Source: Own field data, 2023

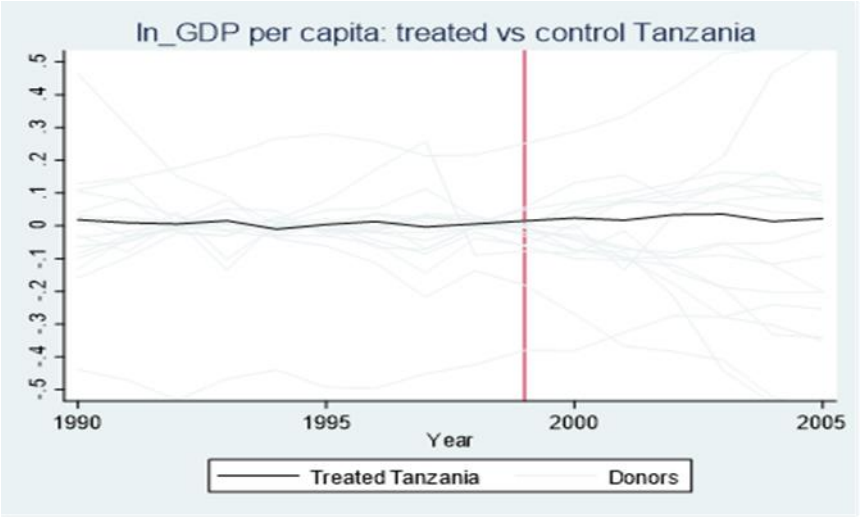
Appendix 6: Uganda Post treatment gaps P-values



Source: Own field data, 2023

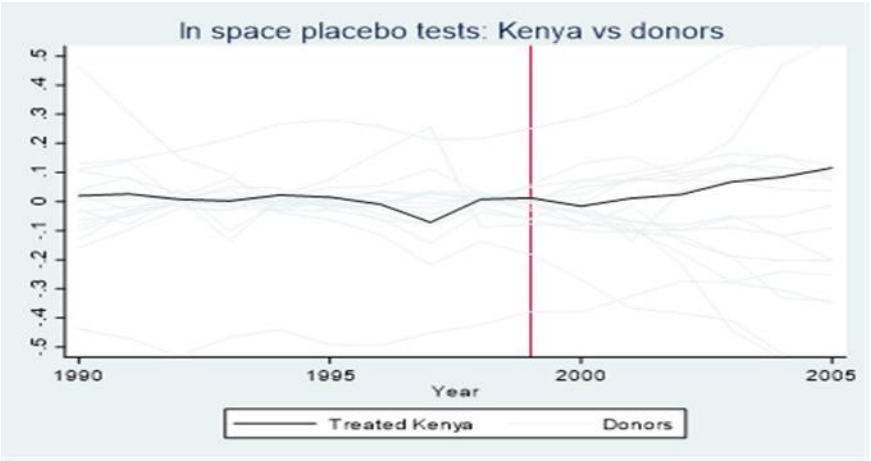
(C) Falsification -In space placebo tests analysis for TKU countries

Appendix 7: In space placebo test for Tanzania



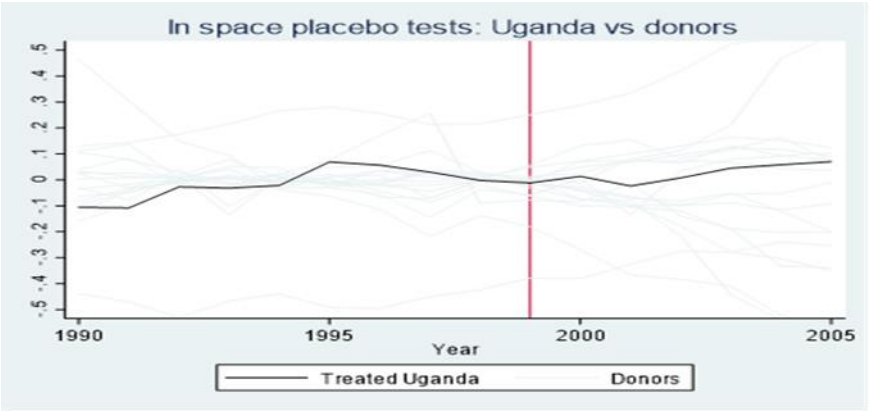
Source: Own field data,2023

Appendix 8: In space placebo test for Kenya



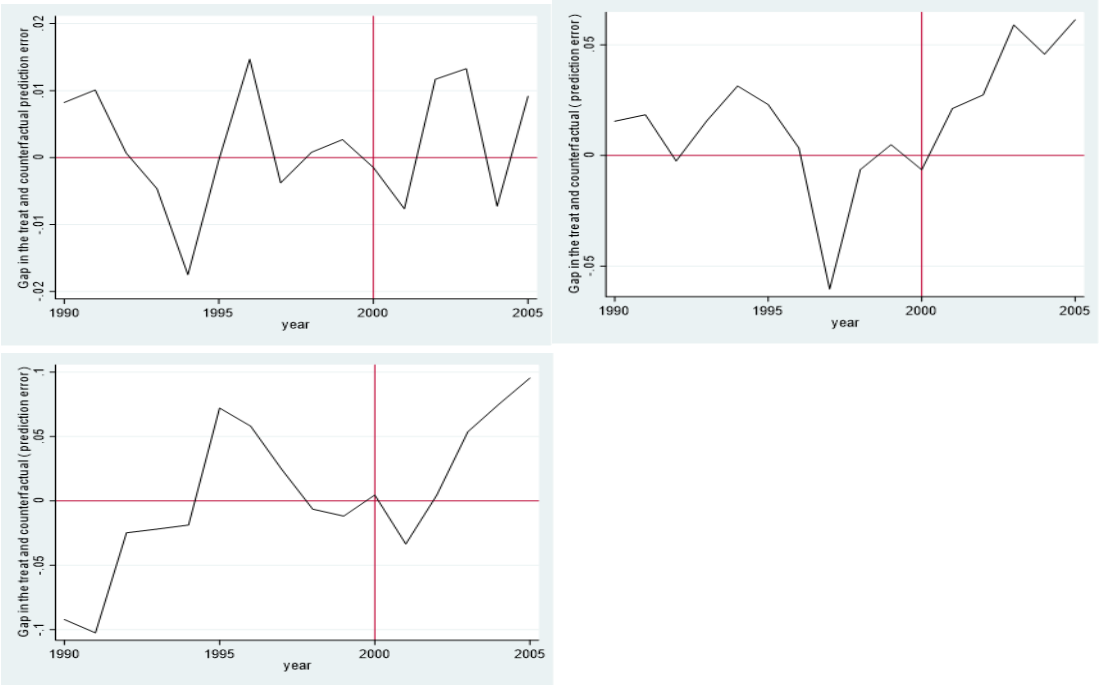
Source: Own field data,2023

Appendix 9: In space placebo test for Uganda



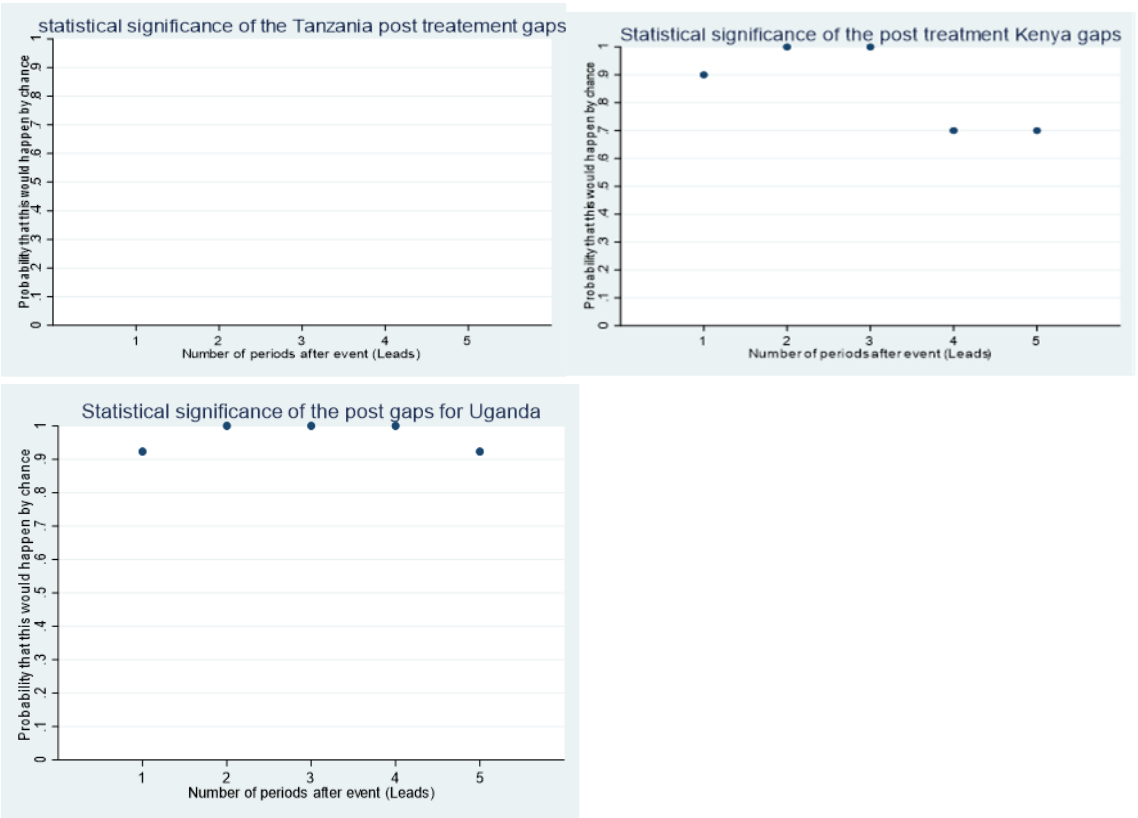
Source: Own field data, 2023

Appendix 10: Falsification-In space placebo gaps distribution between treated and counterfactual TKU countries respectively



Source: Own field data, 2023

Appendix 11: Falsification- In time placebo; Statistical significance of the post treatment gaps for TKU from 2000-2005



Source: Own field data, 2023

Appendix 12: Order-Ranking of the falsification placebos and treated Tanzania in 2000

Countryname	Pre__rmspe (A)	post_rmspe (B)	B/A	rank
Zimbabwe	0.03819	0.40355	10.56565	1
Cote d'Ivoire	0.02383	0.23618	9.90697	2
Niger	0.03429	0.22234	6.48370	3
Chad	0.05683	0.31415	5.52794	4
Gambia	0.02637	0.12516	4.74553	5
Mali	0.02674	0.08913	3.33293	6
Benin	0.03060	0.09489	3.10034	7
cameroon	0.04227	0.12787	3.02483	8
Tanzania	**0.00864**	**0.02572**	**2.97571**	**9**
Mauritania	0.02928	0.07132	2.43509	10
B/Faso	0.03850	0.08596	2.23248	11
Eswatini	0.22054	0.46876	2.12548	12
Congo, DRC	0.21371	0.43257	2.02407	13
Togo	0.06070	0.10829	1.78386	14
G/Bissau	0.12309	0.15473	1.25702	15
Comoros	0.05110	0.06252	1.22344	16
Sierra Leone	0.08106	0.08213	1.01314	17
Mozambique	0.46051	0.29583	0.64239	18

Source: Own field data, 2023

Appendix 13: Order-Ranking of the placebos and treated Kenya in 2000

Countryname	Pre rmspe (A)	pre_rmspe (B)	B/A	Rank
Zimbabwe	0.03819	0.40355	10.5656	1
Cote d'Ivoire	0.02383	0.23618	9.9069	2
Niger	0.03429	0.22234	6.4837	3
Chad	0.05683	0.31415	5.5279	4
Gambia	0.02637	0.12516	4.7455	5
Mali	0.02674	0.08913	3.3329	6
Benin	0.03060	0.09489	3.1003	7
Cameroon	0.04227	0.12787	3.0248	8
Mauritania	0.02928	0.07132	2.4350	9
Kenya	**0.02707**	**0.06592**	**2.4345**	**10**
B/Faso	0.03850	0.08596	2.2324	11
Eswatini	0.22054	0.46876	2.1254	12
Congo, DRC	0.21371	0.43257	2.0240	13
Togo	0.06070	0.10829	1.7838	14
G/Bissau	0.12309	0.15473	1.2570	15
Comoros	0.05110	0.06252	1.2234	16
Sierra Leone	0.08106	0.08213	1.0131	17
Mozambique	0.46051	0.29583	0.6423	18

Source: Own field data, 2023

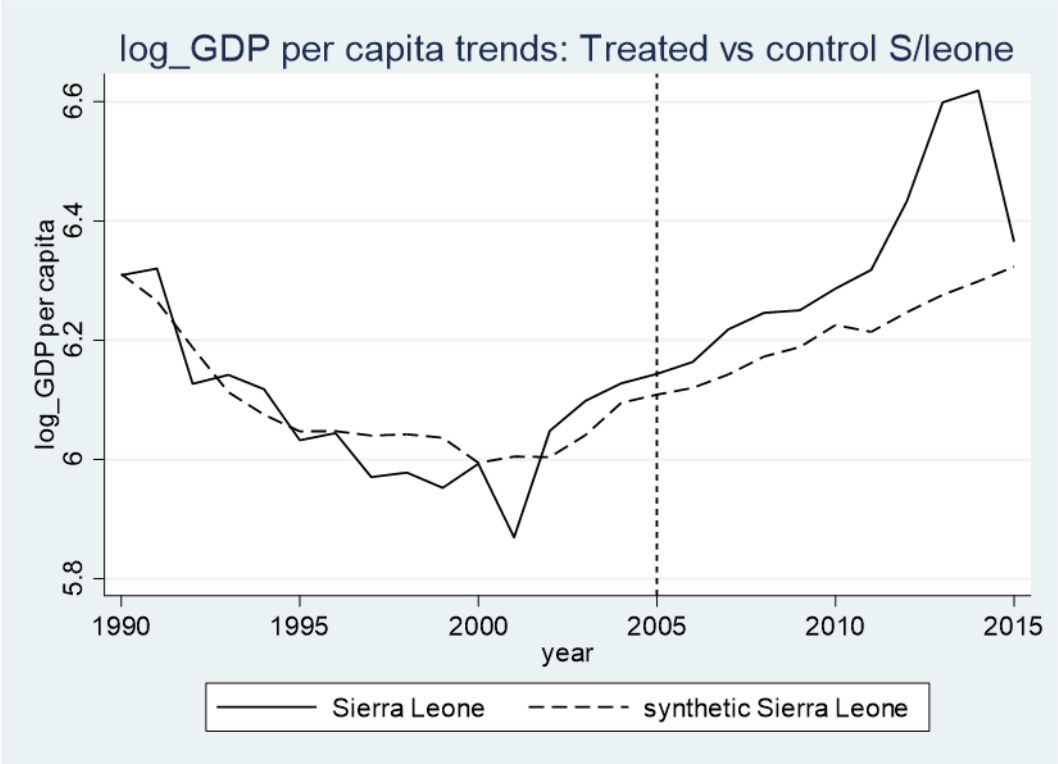
Appendix 14: Order-Ranking of the placebos and treated Uganda in 2000

Countryname	pre_rmspe (A)	pre_rmspe (B)	B/A	Rank
Zimbabwe	0.03819	0.40355	10.5656	1
Cote d'Ivoire	0.02383	0.23618	9.9069	2
Niger	0.03429	0.22234	6.4837	3
Chad	0.05683	0.31415	5.5279	4
Gambia	0.02637	0.12516	4.7455	5
Mali	0.02674	0.08913	3.3329	6
Benin	0.03060	0.09489	3.1003	7
Cameroon	0.04227	0.12787	3.0248	8
Mauritania	0.02928	0.07132	2.4350	9
B/Faso	0.03850	0.08596	2.2324	10

Eswatini	0.22054	0.46876	2.1254	11
Congo, DRC	0.21371	0.43257	2.0240	12
Togo	0.06070	0.10829	1.7838	13
G/Bissau	0.12309	0.15473	1.2570	14
Comoros	0.05110	0.06252	1.2234	15
Sierra Leone	0.08106	0.08213	1.0131	16
Uganda	**0.05853**	**0.04315**	**0.7373**	**17**
Mozambiq	0.46051	0.29583	0.6423	18

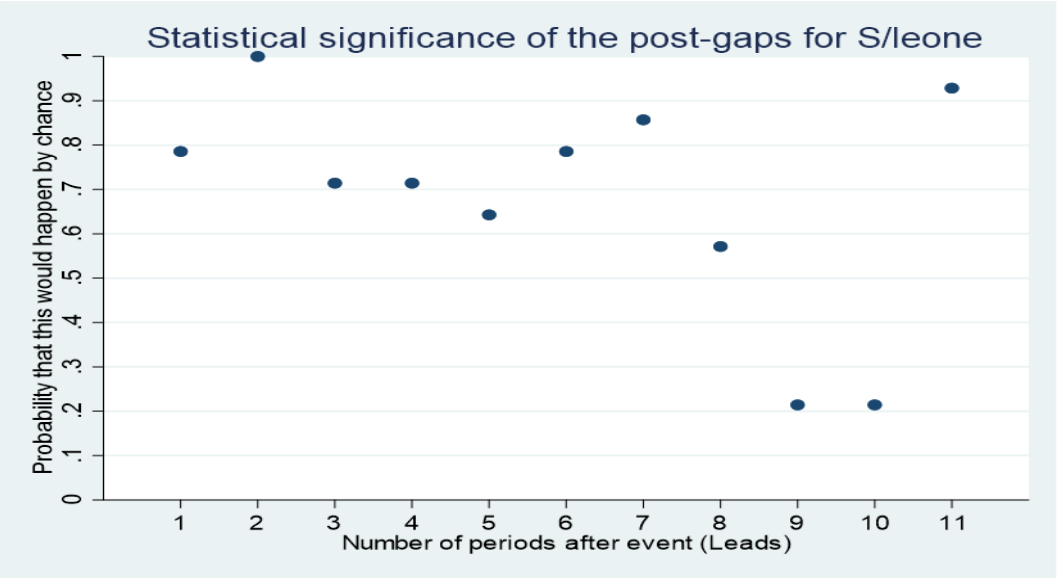
Source: Own field data, 2023

Appendix 15: The trends of the GDP per capita between treated and counterfactual S/Leone



Source: Own field data, 2023

Appendix 16: Post treatment gaps significance between treated and counterfactual S/Leone



Source: Own field work, 2023