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The Effect of Different Exchange Rate Regimes on
the Development of the Financial Sector of
Nations in Sub-Saharan Africa

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Abstract

In the last decade the development of Africa has been of renewed interest for many researchers, with an important part of economic development being the financial sector. This thesis examines the effect that different exchange rate regimes have on several categories of financial sector development, each with multiple indicators, in the period 2008-2020. To accomplish this, the research uses both fixed effect regressions as well as multiple synthetic control analyses which exploit the fact that Tanzania made a switch from a floating to a soft peg exchange rate arrangement in 2016. The outcome of these analyses has mixed empirical results for both the fixed effect regressions and the synthetic control method. Although some indicator variables were significantly positively or negatively affected by the type of exchange policy, other effects are observed to be insignificant. From this it is also deduced that there is no significant empirical difference found for sections of the financial sector that focus on consumers compared to private businesses. The type of exchange rate regime therefore only seems to effect parts of financial sector development while other indicators remain unaffected.

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1. Introduction

1.1 Objective and Research Question

During the last years there has been a renewed interest in the development of African nations. Not only in how Western aid tries to help the local populations, but also in how countries are developing their economies on their own. This thesis considers the difference in exchange policies of multiple African nations and how they impact their development. More specifically, how differences in exchange rate regimes in Sub-Saharan countries affect the current growth of the financial sector. This is the main research question:

“How does the choice of exchange rate regime affect the development of the financial sector in nations in Sub-Saharan Africa in the time period 2008-2020?”

To help answer the main research question of this thesis we ought to look first to various sub-questions. One question that quickly comes to mind is the question why and how these countries have different exchange rate regimes? To follow up this question is that some countries switch their exchange rate regimes. To do an analysis on the effect of the difference in regime types, it is important to know when a particular nation switches their arrangement for a different one. Therefore the question of which countries switch and when they do this, must be answered to do an analysis correctly.

The financial sector itself could also be split up in separate categories. Is the effect of different exchange rate regimes distinct in certain aspects of the finance industry? I.e. is there a significant difference in the effect of exchange rate regime on the aspect of the financial sector that is mainly focused on consumers compared to the aspect that mainly focusses on businesses as clients? This could be case since consumers and businesses are very different clients. The consumer side of the financial sector runs a smaller risk due to exchange rates with only their bank accounts with which they save their money compared with business side, which focusses on credit, lending (and often contains far larger sums of money). Therefore, understanding the way separate exchange rate policies affect these distinct aspects of the financial sector, further helps to answer the main question in how the exchange rate policy impacts the development of the financial sector as a whole.

In order to find an answer to these questions this research makes use of two different statistical methods, the fixed effect regression and synthetic control method. The first method that is used is the fixed effects (FE) regression. With this method a regression analysis with fixed effects is conducted for indicator variables of different categories of financial sector development. The second method used for this research was the synthetic control method. Here the fact that during the period 2008-2020 Tanzania switched their exchange rate policy was exploited and compared to a synthetic control group based on other economies in the region to find if there are significant differences between the nation and the synthetic control.

The empirical results are mixed for both methods. Some indicator variables seemed to be significantly affected by the type of exchange rate regime, while the effect on other indicators was insignificant using FE regressions. The treatment effects found for most indicator variables using the synthetic control method were mostly insignificant, but there are indicators of financial sector development with large significance. Hence, the empirical results of this study are mixed.

1.2 Relevance of the subject

The subject of how the exchange rate policy affects the development of the financial sector is both relevant for the society as a whole as well as for the science of economics. The societal relevance comes from the implications this research could have on the policy choices nations in Sub-Saharan Africa could potentially make. Most countries in Sub-Saharan Africa have had a history of colonization. From the first colonial arrivals and trading outposts and forts along the coastline to the later full colonization of the continent. With these new conquests also came a new form of currency. Most European imperial powers imposed colonial currencies on the territories now in their possession. E.g. the British Empire established the West African Currency Board (W.A.C.B.) in 1912. This created a monetary system that favored colonizing nations, as it put in place a constraint on the monetary policy independence of the colonies and linking the colonial currency in a fixed rate to the currency of the colonizers lowering the risk of inflation (Hopkins, 1970). Both the colonizing

power and the colonized territory profited from the development in trade this caused. However, the colony faced the problem that this system often obstructed structural economic change, since both a positive balance of payments and a strong will was required to diversify the economy of the colony, which seldom happened in practice (Hopkins, 1970).

After the Second World War and the founding of the United Nations the process of decolonization began. The W.A.C.B., which supervised the currencies of the four countries of Gambia, Sierra Leone, Nigeria and Gold Coast, now known as Ghana, became redundant as the countries slowly moved towards independence and started the deployment of their own nations' currencies, cumulating in the discontinuing of the West African Currency Board in 1965 (Qureshi & Tsangarides, 2012; The National Archives, 1974).

In contrast to the independence of the British colonies which created their own currencies, the colonies that became independent from the French went a different route. During the French control of its colonies, the colonial nations used the Franc of the Financial Community of Africa (the CFA franc) (Chown, 2003). The CFA franc consists of two types, one for West-Africa, the West African CFA franc, and one for Central-Africa, the Central African CFA franc. Both types of the CFA franc were pegged at the same fixed exchange rate to the French franc, equalizing the value of both types of the CFA franc (Bangake & Eggoh, 2009). With the adoption of the Euro, the exchange rate of the CFA franc to the French franc did not change, creating in a new pegged exchange rate to the Euro with the same value for the CFA franc as before (Coulibaly, 2014).

This difference in types of exchange rate regimes between former French and British colonial possessions is still mostly in place to this day. Some nations in the region are more successful than others. The financial sector can help bring more prosperity to a country. Understanding if and how the difference in the exchange rate regimes impacts the development of the financial sector in recent years can help these countries with their progress in becoming more affluent and is therefore relevant for the choice of exchange rate policies in these societies.

Besides the societal relevance, this thesis is also relevant for the science of economics. During the years a lot of research has been about the development of the financial sector and exchange rate regimes individually. With existing literature from Nasreen et al. (2020) finding that economic growth and the development of the financial sector are positively associated and furthermore, the impact of the choice of exchange rate regime on international trade has also been researched frequently (Klein & Shambaugh, 2006; Santana-Gallego & Pérez-Rodríguez, 2019). What has not been researched in great detail is if and how the choice of exchange rate regime impacts the development of the financial sector. This thesis helps to shine a light on the role of the exchange rate regime on the progress of enhancing the financial sector of a nation. Consequently, understanding this channel will further improve the way economists view the way international economics functions. This thesis is therefore not only significant in how societies can benefit from the understanding of this channel, but it is also scientifically relevant since it helps to further unravel the way factors of international economics are intertwined and influence each other.

2. Literature Review

2.1 Underlying theory behind types of exchange rate regimes

To answer the question of how the type of exchange rate regime impacts the development of the financial sector, it is key to differentiate between the separate types and how they differ from each other. In the Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER) published by the International Monetary Fund a distinction is made by which the different types of regimes are categorized in one of the four classifications: Soft peg regimes, hard peg regime, floating regimes and residual arrangements (Bleaney & Francisco, 2005).

2.1.1 Soft peg regimes

The first category of exchange rate arrangements is soft peg policy regimes. The most commonly known regime is the conventional pegged arrangement. In this traditional form of pegged exchange rate policy the currency of a nation is fixed to a certain rate of another currency. This is defined as a soft peg since slight deviations are permitted, whereas with

hard peg arrangements deviations are not allowed. A different way the conventional pegged arrangement can be implemented is via the use of a basket of foreign currencies to which the domestic currency is pegged. This way of implementation also allows for a slight deviation from the margin of the rate to which the domestic currency is fixed (Kokenyne et al., 2009). On this conventional manner of fixed exchange rate regimes can be further elaborated with wider margins. A pegged exchange rate with horizontal bands allows for a wider margin for deviation of the fixed exchange rate in comparison to the standard fixed exchange arrangement which only allows for a slight percentage.

Another type of soft peg policy is the stabilized arrangement. An exchange rate regime is categorized in this manner if the currency is not floating and within a 2% margin of the spot exchange rate for at least six months (Kokenyne et al., 2009).

In contrast to the former pegged exchange rate policies, the final two soft peg regimes are different in nature. The crawling peg and crawl-like arrangement are also fixed exchange regimes at first glance but are adjusted periodically. The difference between the crawl-like arrangement and the crawling peg lies in how they are adjusted. With the crawling peg the fixed exchange rate itself is adjusted in small amounts, whereas the crawl-like arrangement the exchange rate must be within a specific margin of the statistical trend during at least six months (Kokenyne et al., 2009).

Combined the conventional peg, peg with horizontal bands, stabilized arrangement, crawling peg and crawl-like arrangement, are all categorized as soft peg regimes. These are soft peg policies since the domestic currency of countries which use one of these monetary regimes is pegged to the currency of another nation but there is still a role for the traditional responsibilities of the Central Bank since, even though the rate is fixed, there is still some room for adjustments.

2.1.2 Hard peg regimes

Hard peg regimes are like the name implies policies which leave no significant room to influence monetary policy. The first of the two hard peg regimes which are categorized by the AREAER is the currency board arrangement. Monetary policy which is based on currency

board regime, is based on law. These legal obligations state to which foreign currency at a predetermined fixed exchange rate they are bound, essentially abolishing the purposes of the central bank in this manner (Masson, 2001).

The other regimes which are known as a hard peg policy are the exchange arrangements with no separate legal tender. Otherwise known as dollarization, this type of regime exists when a nation decides to fully adopt the currency of another country as the legal tender, e.g. Ecuador adopted the US dollar as its' sole legal tender in 2000 amidst an economic crisis (Alesina & Barro, 2001). It has been argued that hard peg policies such as an exchange arrangement with no separate legal tender can be very beneficial to the economies with an emerging market due to their stabilizing potential even though it forces a nation to sacrifice its monetary independence (Calvo, 2002).

The difference between hard and soft peg regimes lies in the way the Central Bank is involved with monetary policy in the economy of the country and the original fixed exchange rate. Nations with an implantation of a currency board or an arrangement with no separate legal tender have, therefore, no independent monetary control over the currency but have a greater commitment to the original fixed rate compared to soft peg policies (Markiewicz, 2006). However, even though soft and hard pegs have different implications for the control of the Central Bank, they are both still bound to a fixed exchange rate in contrast to floating regimes.

2.1.3 Floating regimes

The last designated type of exchange rate policies are the floating regimes. These types of exchange rates are not fixed by the Central Bank of a country but instead are determined by the supply and demand of the market. In this classification of regimes the IMF differentiates between floating and free floating exchange rate regimes.

A floating exchange rate regime is characterized by that it is mostly determined by market conditions and only has limited interventions. A free floating regime is a stricter definition of the floating exchange rate. It requires that interventions only take place three times per six

months and that the intervention is only occurs to correct specific market incidents (Kokenyne et al., 2009).

The final type which is categorized by the IMF are the residual variants of exchange rate regimes. Monetary regimes which do not fit any of the types mentioned under the soft peg, hard peg or floating regimes are stated as residual types of exchange rate policies. All these different types of exchange rate policies have different implications for the way the central bank conducts monetary interventions (Taylor, 2001). The policies that come with the separate regime types could impact economic factors in different way. Therefore, the way these factors are influenced by exchange rate regimes are imperative to understand.

2.2 Impact of exchange rate regimes

With the different implications that separate types of exchange rate regimes have, the impact on macroeconomic factors can thus be different. This section of the literature review will focus on how different types of exchange rate regimes affect important components of the macroeconomy. The first aspect that is of interest is how the gross domestic product is influenced.

2.2.1 Effects on GDP

In recent decades a lot of research has been done in how the choice of exchange rate regime has impacted the macroeconomy. However, it is difficult to credit the difference in economic outcomes to the separate groups of exchange rate regimes. This is since fixed exchange rates are seldom entirely fixed, being frequently fine-tuned. Moreover, floating exchange rates are also subject to repeated calibration (Collins, 1996). Collins (1996) therefore warns researchers to be careful with attributing results of GDP differences to only the separate exchange rate regimes.

The effect of exchange rate regimes on the growth of the gross domestic product is widely studied. These studies however have mostly led to mixed empirical results. Earlier studies found that the choice of exchange rate regime shows to have no significant impact on the economic growth of a country, with Baxter & Stockman (1989) and Ghosh et al. (1997)

finding only slight and insignificant empirical evidence. In addition to this de Vita & Kyaw (2011) found that there is no overall direct impact on growth in the long term due to choices in policies of exchange rates.

In contrast to these findings other studies have come to different results. When looking at nations with emerging markets and already developed nations separately, Husain et al. (2005) find that for emerging markets fixed exchange rates seem to positively impact the country, while for developed countries a floating exchange rate seems to be better due to their association in these nations with larger economic growth. In contrast to the previous study Levy-Yeyati & Sturzenegger (2003) find that more fixed regimes associated with slower growth in nations with emerging markets. Furthermore, this study finds that for already developed nations the choice of exchange rate regime does not directly impact the economic growth. Dubas et al. (2005) come to a somewhat similar conclusion, stating that nonindustrialized countries can have significant GDP growth benefits from an exchange rate regime that floats more freely. While overall a positive relationship is found between stable fixed exchange rate regimes and the growth of the gross domestic product. More recent studies have thus found more empirical relationships between the choice of exchange rate policy and the growth of the overall economy. However, this is not adequately sufficient to presume a direct relationship between exchange rate regimes and economic growth. Nevertheless, there is a strong relationship between economic growth and the development of the financial sector (Calderón & Liu, 2003; de Gregorio & Guidotti, 1995; Patrick, 1966). Thus, the choice of exchange rate regime can potentially influence the development of the financial sector through economic growth, still since the first link is not entirely certain the growth of GDP should serve as a control variable in the analyses done in this study.

2.2.2 Effects on Trade

Besides the studies on the impact on GDP growth, a lot of research has also been dedicated to study the impact on other factors by the choice of monetary exchange policy. One of these factors which has had a lot of attention is trade. Trade is for many countries one of the most important parts of their economy. Understanding how exchange rate regimes can impact trade is therefore of high importance. Baxter & Stockman (1989) found that there was little to no variability in trade volumes between floating and fixed exchange rates. In

addition Aristotelous (2001) has also found empirical evidence showing no effects on export volumes of goods between Great Britain and the United States in the period between 1889 and 1999 due to different in exchange rate regimes.

These conclusions on how trade depends on the choice of regime are at odds with other empirical result found by other researchers. There are studies have found that the choice exchange rate regime has an association with trade flows, but the sign of how trade is affected by the choice of regime are mixed. With some finding a positive while others find negative associations depending on how the exchange rate regimes of the countries are categorized (Brada & Méndez, 1988; Frankel, 2003; López-Córdova & Meissner, 2003). In addition to this Broda (2004) found that shocks in terms of trade have been found to significantly differ across exchange rate regimes. Furthermore, Ghosh et al. (1997) observed that fixed exchange rate regimes can limit the growth of trade to a certain capacity.

The empirically found effects on the gross domestic product and trade by the choice of exchange rate regime are thus still quite mixed. With some studies finding a positive association, all the while others find results with a mostly negative association with the choice of exchange rate regime. Similar to economic growth, trade also has a strong link to financial sector development, especially to financial depth (Beck, 2002; Huang & Temple, 2005). Therefore, trade could be a channel through which the choice of exchange rate policy impacts the financial sector as well. Controlling for this variable together with economic growth is therefore important for the analyses of this research. With this the effects of the choice of monetary exchange policy on different macroeconomic factors have been examined, clearing the way for the research into how it affects the development of the financial sector. However, before commencing the research it is important to look at the different aspects of financial sector development and how these are measured.

2.3 Financial sector development

2.3.1 Measurement

To find how the choice of exchange rate regime affects the development of the financial sector, it is necessary to analyze the way this development is measured. In the Global

Financial Development Database of The World Bank indicators of financial sector development are categorized into four separate indicator groups which measure the depth, access, efficiency and stability of the financial sector (Beck et al., 2010; The World Bank, 2014).

Access to the financial sector is inherently important for the development of the sector. The more people and companies have the ability to access the financial sector, the further it develops and contributes to the economic prosperity of the country (Ahmed & Ansari, 1998). Good indicators for access to the sector are the number of bank accounts per 1,000 adults, amount of bank branches or ATMs per 100,000 adults (The World Bank, 2014).

Another important factor with which the development of the financial sector is measured is depth. This measures the impact of how deep the financial sector is connected and integrated to the overall economy (Ang & McKibbin, 2007; Asongu et al., 2016). Indicators that can be utilized as a proxy for financial depth are the amounts of private credit held by domestic commercial banks and the total assets held by commercial banks, both as a percentage of the GDP (Ang & McKibbin, 2007; The World Bank, 2014).

The last two categories with which the development can be measured are the efficiency and stability of the financial sector. An appropriate indicator for efficiency is the net interest margin, defined as the net interest revenue of commercial banks as a percentage of its interest-bearing assets (Saksonova, 2014; The World Bank, 2014). The loss of economic efficiency is linked with higher net interest margins, which often comes with a less competitive banking sector (López-Espinosa et al., 2011; Sensarma & Ghosh, 2004). A lower net interest margin is therefore an indicator for a more efficient financial sector. Stability can be measured using the share of bank credit to bank deposits of domestic money banks. Stability can also be measured using the probability of a default of the nations' commercial banking system, which is captured using Z-scores, with higher Z-scores implying a lower probability (The World Bank, 2014).

All the four categories contain indicators of the development of the financial sector. It is therefore important to analyze the effect of exchange rate regime on the indicators of the

four categories individually to see if there is an overall effect of the choice of regime. Furthermore, by analyzing different indicators, it is possible to identify if the choice of monetary regime policy has separate effects for indicators of financial sector development which are more focused on consumers compared to ones which are more focused on businesses.

2.3.2 Risk

In the financial sector risk management is a key aspect of research with many theories and empirical studies (Singh, 2014). The impact of exchange rate volatility risk on trade flows is still ambiguous, with different empirical studies coming to different results (McKenzie, 1999). However in the case of the financial sector and its' development is not hard to argue that risk minimization in the financial sector favors an arrangement policy which has the lowest exchange rate volatility. This reasoning leads to the presumption that economies with a type of fixed exchange policy potentially have higher developed financial sectors in comparison to nations with nonfixed policies.

3. Data

The data that was used to analyze the of the impact of exchange rate regimes on financial sector development comes from multiple sources. The Global Financial Development Database (GFDD) of the World Bank contains data about 106 indicators of financial sector development from over 200 countries worldwide which is updated annually (Cihák et al., 2012). The African continent has been separated by the World Bank into different regions. Since 2011 the Sub-Saharan region consists of 48 nations after the independence of South Sudan. All the indicators containing information about these countries are separated into the four aforementioned categories of financial sector development and a residual category: depth, efficiency, access, stability and other (Čihák et al., 2013). Each indicator has been labeled using a code, with different identifiers for each of the four categories. An example of this is the number of bank branches per 100,000 adults, which has the code 'ai02'. This code signals that it is the second indicator in the category 'ai', which is the indicator category for access.

The database is a collection of data made up from a variety of sources, which vary per indicator. The most prominent sources are the International Monetary Fund (IMF), Financial Access Survey (FAS), Global Financial Inclusion (Global Findex) and the World Bank itself (The World Bank, 2022). The amount of data differs per country, with some nations in the dataset not fully represented by an indicator. However, there are also indicators for which data on virtually every country of interest is available. Therefore, an analysis on these indicators for all countries of interest is possible. Table 3.1 presents the descriptive statistics of these indicator variables for the time period 2008 until 2020. It shows that are on average just over 332 bank accounts per 1,000 adults in the time period based on 390 observations from 48 countries in Sub-Saharan Africa.

Besides the data from the Global Financial Development Database, the World Bank also collects data on other factors of nations. These indicators of the economy that can have an influence on the development of the financial sector and that are used in this research are the annual growth rate of the gross domestic product, net inflows of foreign direct investment to overall GDP, trade as percentage of GDP, education completion rates, government spending to GDP and the rate of inflation in countries.

Table 3.2 contains descriptive statistics on all these indicators in the time period between 2008 and 2020 for the economies of Sub-Saharan nations. Data on education in Sub-Saharan Africa is sparse, with data on secondary and tertiary education levels being virtually nonexistent. However, the World Bank has data on the primary completion rate from 2010 to 2020 provided by the UNESCO Institute of statistics as of 2021. The primary completion rate is defined as the number of new enrollments in the last grade of primary education divided by the population at the entrance age for the last grade of primary education (The World Bank, 2022). Still this data is far from complete for every nation each year. This is also clearly visible in table 3.2, with the primary education completion rate having the lowest number of observations of all the observed variables (n=401).

Table 3.1 Descriptive statistics of indicator variables by category of financial sector development in the time period between 2008 and 2020

Category	Variable	Obs.	Mean	Std. Dev.	Min.	Max.
Access	Bank accounts per 1,000 adults	390	332.070	439.776	19.660	2424.760
	Bank branches per 100,000 adults	500	7.060	9.367	0.490	55.070
	ATMs per 100,000 adults	477	12.842	17.662	0.070	89.990
Depth	Private credit by deposit money banks to GDP (%)	562	30.757	83.568	0.430	986.120
	Deposit money banks' assets to GDP (%)	560	36.204	68.884	0.490	820.340
	Deposit money bank assets to central & deposit money bank assets (%)	552	81.596	16.288	12.80	99.950
	Liquid liabilities to GDP (%)	552	35.699	30.551	6.620	224.770
	Central bank assets to GDP (%)	552	6.539	13.556	0.010	130.420
	Financial system deposits to GDP (%)	549	29.900	39.423	3.930	770.260
	Insurance company assets to GDP (%)	335	7.050	13.261	0.100	69.0490
	Private credit by deposit money banks & other financial institutions to GDP (%)	562	32.673	84.894	0.430	986.120
Efficiency	Domestic credit to private sector to GDP (%)	540	22.353	23.879	0.500	145.941
	Bank net interest margin (%)	423	6.251	2.672	1.680	14.110
	Bank noninterest income to total income (%)	438	43.877	12.217	13.590	89.940
	Bank overhead to total assets (%)	430	5.332	2.185	1.220	12.820
	Bank return on assets (% , after tax)	428	1.793	1.760	-23.260	6.780
	Bank return on assets (% , before tax)	430	2.468	2.234	-27.630	11.0670
	Bank return on equity (% , after tax)	421	16.862	10.65	-18.070	78.840
Stability	Bank return on equity (% , before tax)	426	23.042	14.073	-16.610	86.820
	Bank Z-score	439	14.517	6.108	2.130	37.350
	Bank credit to bank deposits (%)	542	71.125	32.231	6.710	564.580
Other	Liquid assets to deposits and short term funding (%)	444	35.988	16.316	11.770	108.280
	Bank concentration (%)	441	72.996	18.564	32.520	100
	Bank deposits to GDP (%)	549	29.895	39.425	3.930	770.260
	Banking crisis	480	0.017	0.128	0	1

Note: This table shows the descriptive statistics of indicator variables of financial development per overarching category in the time period between 2008 and 2020 for 48 African economies in the Sub-Saharan region.

Table 3.2 Descriptive statistics of economic indicators for Sub-Saharan African nations in the time period between 2008 and 2020

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
GDP per capita (US\$)	605	2454.822	3425.794	198.353	22942.610
Government expenditures to GDP (%)	551	15.112	7.329	2.047	79.169
GDP growth (%)	603	3.520	5.253	-46.082	20.716
FDI net inflows to GDP (%)	601	5.085	9.120	-11.199	103.337
Primary education completion rate (%)	401	71.456	18.126	27.437	112.646
Inflation rate (%)	575	9.768	32.324	-4.295	557.202
Trade to GDP (%)	561	71.125	34.166	0.785	225.023

Note: This table reports descriptive statistics of seven variables in the time period between 2008 and 2020 for 48 African economies in the Sub-Saharan region.

Data about the type of exchange rate regime which is used by each specific country comes from the IMF, more specifically the Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER), which is updated on an annual basis. In this report the IMF reports the classifications of which type of exchange rate regime is used by each IMF member country. The 48 countries that are indicated by the World Bank to be part of Sub-Saharan Africa are also members of the IMF, implicating that no nations in the region are therefore left out of the analysis. The AREAER data comprises of the members' *dé facto* exchange arrangements, as analyzed by IMF staff. As a consequence of this a discrepancy with the officially stated exchange rate regime reported by a country might occur (International Monetary Fund, 2020). This data analyzed by the IMF is consequently separated into the four overarching types of exchange rate regime indicated by the literature: soft peg arrangements, hard peg arrangements, floating regimes and other managed arrangements.

Today most countries in the Sub-Saharan region in Africa use a soft peg exchange rate regime. Table 3.3 shows the distribution of exchange arrangements used. Most nations in the region use a form of the soft peg fixed exchange arrangements, increasing from 57.45% in 2010 to 77.08% in 2020. This while the countries which a type of floating exchange regime decrease from 12.77% in 2010 to only 8.33% in 2020. In 2010 and 2015 the only country to have a hard peg exchange rate regime implemented was Zimbabwe, which had

an exchange arrangement with no separate legal tender until 2016 (International Monetary Funds, 2017; Watambwa, 2021).

Table 3.3 Overarching types of exchange rate classifications used by Sub-Saharan African nations in percentages per year

Type of exchange arrangements	Year		
	2010	2015	2020
Soft peg	57.45	58.33	77.08
Hard peg	2.13	2.08	0.00
Floating	27.66	27.08	14.58
Residual	12.77	12.50	8.33
Observations	47	48	48

Note: This table reports the percentages up to two decimals of the overarching types of exchange rate arrangements used by Sub-Saharan African countries at three different points in time: 2010, 2015 and 2020. In 2010 there is one observation less than in the other years, this is due to the independence of South Sudan in 2011.

4. Methodology

4.1 Fixed effects regression

The first method used for the statistical analysis of the effect of exchange rate regimes is the method of fixed effects (FE) regression. The dataset consists of panel data. For this type of data the use of FE regressions is conventionally better suited than regressions based on ordinary least squares (OLS). An estimation based on fixed effects uses variation within the individual country. The fixed effects of the individual nations capture the time-invariant variables and therefore only control variables that vary during time can and are used as a control. A standard fixed effects regression model is depicted in model 1:

$$(1) \quad Y_{it} = \alpha_i + \beta_0 X_{it} + \varepsilon_{it} \text{ where } i = 1, 2, \dots, n \text{ \& } t = 1, 2, \dots, T$$

In this model Y_{it} and X_{it} represent the dependent and independent variable for country i at time t respectively. The effect of X_{it} on Y_{it} is measured by the estimator β_0 . The coefficient α_i is the specific intercept for country i , this coefficient causes every individual nation to have an individual intercept capturing unobserved time-invariant variables. Lastly, the error

term of the regression is represented by ε_{it} . An important assumption of this model is the conditional independence assumption. This states that the independent variable of interest and the error term are uncorrelated, implying that the effect of X_{it} on Y_{it} is free from intervention stemming from the error term ε_{it} .

The dependent variables that are used in the analyses are a large quantity of selected indicators from the GFDD for which the data is relevant and is adequately available. These variables are listed in table 3.1 where they are sorted by category of financial sector development. Each FE regression consist of one of these variables as the dependent variable. The longer definition of each variable is listed in the note encompassing all tables and figures based on their description in the Global Financial Development Database. The independent variables are the overarching types of exchange rate arrangements. The overarching type of regimes are soft peg arrangements, hard peg arrangements, floating regimes and other managed arrangements. Floating regimes consist of the floating and free floating arrangements. Soft peg arrangements consist of conventional pegged, pegged with horizontal bands, stabilized arrangements and the crawling peg and crawl-like arrangements. Hard peg regimes consist of currency board arrangements or exchange regimes with no separate legal tender. All other types of regimes are categorized as other managed arrangement. These independent variables are all dummy variables, they are either as such type of regime or they are not. If all of these variables would be inserted into the regression the problem of multicollinearity would arise. To solve this, one of the independent variables is not explicitly included in the regression, but serves as a reference, i.e. the estimators of the variables that are included in the regression depicts the average estimated difference between the reference and the included variables. Since most countries have an exchange rate regime which is classified as a soft peg arrangement, this is used as the reference variable in the FE regressions.

Besides these variables, the analysis also utilizes other independent variables as controls. The control variables are composed using the research done by Creane et al. (2004) and consist of the annual growth rate of the gross domestic product, net inflows of foreign direct investment to overall GDP, trade as percentage of GDP, education completion rates, government spending to GDP and the rate of inflation in countries. Another control which

has slightly been altered is the GDP per capita income categories. Since a FE regression cannot make use of variables that are time-invariant, income category classifications per country (low income, lower-middle income) are not considered in the regression. As a solution the analyses make use of the numerical data on GDP per capita which does fluctuate each year. The last control variable is another dummy variable and it shows if country i at time t experiences a banking crisis. Combining all these variables into one model gives us the final FE regression model:

$$(2) \quad Y_{it} = \alpha_i + \beta_0 \text{Hard peg}_{it} + \beta_1 \text{Floating regime}_{it} + \beta_2 \text{Other arrangement}_{it} + \beta_3 \text{GDP per capita}_{it} + \beta_4 \text{Government expenditures}_{it} + \beta_5 \text{GDP growth}_{it} + \beta_6 \text{FDI}_{it} + \beta_7 \text{Education}_{it} + \beta_8 \text{Inflation}_{it} + \beta_9 \text{Trade}_{it} + \beta_{10} \text{Banking crisis}_{it} + \varepsilon_{it} \quad \text{where } i = 1, 2, \dots, n \text{ \& } t = 1, 2, \dots, T$$

4.2 Synthetic control analysis

In recent years Tanzania has changed its exchange rate regime. On January 6th 2016 Tanzania went from a floating arrangement to a soft peg fixed exchange regime (IMF, 2017). The synthetic control method (SCM) a procedure which can potentially demonstrate how Tanzania's financial sector would have developed with the exchange rate regime previously used. It is done using a weighted average of indicators of financial sector development of other economies which resemble the development of the financial sector of Tanzania preceding the transition of the exchange arrangement. This creates a mirroring of the financial sector compared to the one of Tanzania before the switch exchange rate regime. Analyzing the fluctuation between the financial sector development of the weighted average mirrored economy and the actual state of financial development in Tanzania at the later date shows the difference caused by the transition of the exchange arrangement.

For this method the same time range from the dataset is used. With the period from 2008 to 2015 being the period pre transition and the period 2016-2020 being the post transition period. To generate the synthetic control the same control variables as in the FE regression are used. Besides the control variables, lags of the variable of interest for creating the synthetic control. Including several lags of the variable of interest helps to balance the synthetic control in the pretreatment period (Ferman et al., 2020; McClelland & Gault,

2017). However including lags for all pretreatment years may lead to bias (Kaul et al., 2022). For this reason this analysis will include only the lags of the variable of interest in the start year of the dataset, 2008, one in the middle, 2012, and a final lag in the last period before the intervention, 2015. The year 2015 is the last period before the intervention since even though the switch of exchange arrangement takes place in 2016, data about 2016 is gathered later in the year after intervention has already taken place.

During the time period of 2008-2020 every country is required to have datapoints for each year in the time period for the variable of interest and at least one datapoint in the time period for the control variables in order to analyze the effect using the synthetic control method. Only countries for which this data is available have been included in the synthetic control analysis. In each table and figure the number of countries used for the synthetic control is listed in the encompassing note. For this reason the category of access in the Global Financial Development Database is not analyzed since Tanzania does not have data listed in this category of the database.

It is not possible to analyze the effects via the use of figures only. The significance of the difference between Tanzania and the synthetic control is assessed using placebo tests based on all the weighted control countries of the synthetic group and their standardized p-values. Here the p-values are adjusted for the possible poor fit of the synthetic controls of the placebo tests, giving a more precise p-value compared to traditional exact p-values (van Kippersluis, 2022).

5. Results

5.1 Fixed effects regressions

The found regression result for the relationship between different overarching exchange rate arrangements and indicator variables for the category access, mostly related to consumers, of financial sector development are reported in table 5.1. This table shows that there is a significant effect of having a hard peg exchange rate regime compared to a soft peg exchange rate arrangement, with the estimation that on average the number of bank

accounts per 1,000 adults in Sub-Saharan countries is 246,5 lower and the number of bank branches per 100,000 adults is 6,302 higher keeping all other variables constant.

However it is important to note that the number of observations on countries with a hard peg regime is very low, with the only country being Zimbabwe. Hence the coefficient for hard peg arrangements in these and all other FE regressions in the analysis is probably showing the idiosyncratic differences between this nation and the other economies in Sub-Saharan Africa. Besides this exchange rate variable some control variables also seem to be relevant. In the regressions the variable banking crisis is highly significant, with a positive estimated effect. This implies that it is estimated that on average the number of bank accounts per 1,000 is 198.4 higher when the economy experiences a banking crisis. The difference with floating arrangements does not seem to be significant. In regression (2) GDP per capita is also significant and in (4) the inflation rate is likewise very significant. The other variable which is categorized as an access indicator is the number of ATM machines per 100,000 adults. This variable is shown in table A.1 in the appendix. Difference between a hard peg and soft peg arrangements is also significant but only on a 10% significance level. Other control variables seem to be significant as well.

Table 5.1 Fixed effects regression results on the relationship between exchange rate regime and bank accounts and branches per 1,000 and 100,000 adults respectively

Variable	(1)	(2)	(3)	(4)
	Bank accounts per 1,000 adults	Bank accounts per 1,000 adults	Bank branches per 100,000 adults	Bank branches per 100,000 adults
Hard peg exchange rate regimes	-400.200*** (44.990)	-246.500*** (51.380)	3.664*** (0.495)	6.302*** (0.496)
Floating exchange rate regimes	-15.450 (33.280)	78.040 (75.970)	-0.346 (0.431)	0.066 (0.359)
Residual managed arrangements	-75.660 (50.900)	15.790 (30.720)	-0.561 (0.528)	-0.058 (0.430)
GDP per capita (US\$)		0.183*** (0.038)		0.000 (0.000)
Government expenditures to GDP (%)		4.993 (7.248)		0.011 (0.034)
GDP growth (%)		-3.473 (2.580)		-0.034 (0.030)
FDI net inflows to GDP (%)		-1.704 (2.458)		-0.029 (0.018)
Primary education completion rate (%)		0.171 (1.745)		0.008 (0.012)
Inflation rate (%)		-4.161 (2.700)		-0.067*** (0.019)

Trade to GDP (%)		-1.250 (2.237)		-0.006 (0.011)
Banking crisis		198.400*** (8.806)		0.408*** (0.109)
Constant	348.900*** (10.390)	-42.090 (119.000)	7.206*** (0.176)	7.186*** (1.300)
Observations	389	220	497	274
R-squared	0.047	0.545	0.062	0.269
Number of countries	38	34	45	40
Country FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES

Note: In FE regressions (1) and (2) the number of bank accounts per 1,000 adults is the dependent variable whereas in FE regressions (3) and (4) this is the number of commercial bank branches per 100,000 adults. Robust standard errors are represented in parentheses. Significance of the estimators is represented by the asterisks: *** p<0.01, ** p<0.05, * p<0.1

The depth category of financial sector development contains many more variables than the previous category. The two variables were a significant relationship with the choice of exchange rate regime was found are reported in table 5.2. There seems to be a significant positive effect of hard peg regimes compared to soft peg arrangements on both the domestic credit provided to the private sector to GDP and deposit money bank assets as a share of Central Bank and deposit money bank assets, but the validity of this coefficient is dubious as is mentioned before. FE regression (3) depicts floating regimes to have significant positive effects as well, but this is only significant at a 10% significance level and disappears when control variables are added in (4). For both dependent variables table 5.2 the controls banking crisis and inflation rate are significant. Additionally the control variables GDP growth and government expenditures are significant on 10% and 1% significant levels respectively. GDP per capita is also significant in regression (4). All variables that are indicators for the financial sector development category depth are reported in the tables A.2, A.3 and A.4 in the appendix.

Table 5.2 Fixed effects regression results on the relationship between exchange rate regime and domestic credit to private sector and share of bank assets to total assets

Variable	(1)	(2)	(3)	(4)
	Domestic credit to private sector to GDP (%)	Domestic credit to private sector to GDP (%)	Deposit money bank assets to central & deposit money bank assets (%)	Deposit money bank assets to central & deposit money bank assets (%)
Hard peg exchange rate regimes	4.658*** (0.614)	5.152*** (1.247)	13.250*** (3.336)	9.819*** (2.529)
Floating exchange rate regimes	-0.964 (0.790)	1.677 (1.216)	6.345* (3.338)	6.131 (3.668)
Residual managed arrangements	-0.516	1.846	-0.575	-3.426

	(0.630)	(1.135)	(3.639)	(2.347)
GDP per capita (US\$)		0.001 (0.001)		0.002*** (0.001)
Government expenditures to GDP (%)		0.592*** (0.172)		-0.013 (0.432)
GDP growth (%)		-0.122* (0.068)		0.0133 (0.111)
FDI net inflows to GDP (%)		-0.022 (0.056)		0.065 (0.067)
Primary education completion rate (%)		0.0519 (0.056)		0.012 (0.075)
Inflation rate (%)		-0.186*** (0.066)		-0.233* (0.122)
Trade to GDP (%)		0.027 (0.031)		0.068 (0.057)
Banking crisis		-1.236*** (0.367)		2.656*** (0.530)
Constant	22.640*** (0.259)	5.344 (6.669)	79.980*** (1.176)	71.840*** (11.540)
Observations	539	272	551	285
R-squared	0.013	0.247	0.043	0.184
Number of countries	47	39	46	40
Country FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES

Note: In FE regressions (1) and (2) credit provided to the private sector by deposit money banks as a share of GDP is the dependent variable whereas in FE regressions (3) and (4) this is the total assets held by deposit money banks as a share of sum of Central Bank and deposit money bank assets. Robust standard errors are represented in parentheses. Significance of the estimators is represented by the asterisks: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

The bank net interest margin and overhead expenses to total assets are indicator variables of the category efficiency and their relationship with the type of exchange rate regime is depicted in table 5.3. Both variables are found to be significant positively affected by hard peg regimes compared to soft peg arrangements. For both regressions the variable banking crisis which served as a control was significant with a negative association on the net interest margin and a positive estimated effect on overhead costs. The control variables GDP per capita and primary education completion rate also significantly affect the bank overhead expenses albeit that the effects are very limited in size. Regression (3) also shows a significant estimator for floating exchange arrangements compared to soft peg regimes when controls are lacking, however when these are included in (4) the size of the positive effect is reduced and the effect is no longer significant. Other dependent variables of the category efficiency are reported in tables in the appendix. Table A.5 reports the noninterest income of banks to their total income. Regression (1) of this table reports significant effects due to the choice of a floating or residual exchange rate arrangement. This effect disappears

once control variables are added and only hard peg exchange regimes seem to be significant. Results on the relationship of the return on assets and equity for banks, both pre and post-tax, are reported in table A.6. Neither for return on equity nor for return on assets significant effects were found for the chosen exchange rate regimes with an exception for post-tax return on assets where residual managed arrangements had a significant positive effect at the 10% significance level.

Table 5.3 Fixed effects regression results on the relationship between exchange rate regime and the bank net interest margin and bank overhead costs to total assets

Variable	(1) Bank net interest margin (%)	(2) Bank net interest margin (%)	(3) Bank overhead costs to total assets (%)	(4) Bank overhead costs to total assets (%)
Hard peg exchange rate regimes	2.860*** (0.366)	2.092*** (0.360)	3.721*** (0.430)	2.407*** (0.437)
Floating exchange rate regimes	0.721 (0.444)	-0.632 (0.402)	1.731** (0.707)	0.430 (0.416)
Residual managed arrangements	-0.607 (0.409)	-0.362 (0.361)	0.598 (0.431)	-0.178 (0.412)
GDP per capita (US\$)		0.000 (0.000)		-0.000** (0.000)
Government expenditures to GDP (%)		-0.019 (0.062)		-0.034 (0.030)
GDP growth (%)		-0.013 (0.039)		0.030 (0.020)
FDI net inflows to GDP (%)		-0.019 (0.019)		-0.019 (0.018)
Primary education completion rate (%)		-0.019 (0.016)		-0.031** (0.012)
Inflation rate (%)		0.059 (0.037)		0.042 (0.029)
Trade to GDP (%)		0.007 (0.009)		-0.003 (0.011)
Banking crisis		-4.240*** (0.101)		4.423*** (0.081)
Constant	6.058*** (0.160)	7.202*** (1.397)	4.681*** (0.244)	8.677*** (1.331)
Observations	423	237	429	237
R-squared	0.072	0.142	0.101	0.247
Number of countries	40	36	40	36
Country FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES

Note: In FE regressions (1) and (2) the value of banks' net interest revenue as a share of interest-bearing assets is the dependent variable whereas in FE regressions (3) and (4) this is the overhead costs of banks as a share of total assets held. Robust standard errors are represented in parentheses. Significance of the estimators is represented by the asterisks: *** p<0.01, ** p<0.05, * p<0.1

All three indicator variables of the last category, stability, and their relationship with the choice of exchange rate regime are reported in table 5.4. Regressions (1) and (5) depict a

significant effect of hard peg arrangements compared to soft peg regimes for bank Z-scores and liquid assets to deposits and for short term funding but these effects lose their relevance once control variables are added in (2) and (6). A significant effect of floating exchange rate regimes is found for bank Z-scores albeit only at a 10% significance level. The inflation rate is also significant at the same level in this regression. Important to note is that due to collinearity the dummy variable banking crisis was omitted. With this dummy being highly significant in other FE regressions, the real significance of the other variables is therefore questionable. In regressions (3) and (4) credit provided to the private sector by domestic money banks as a share of total deposits is the dependent variable. Floating exchange regime variable is not significant, however the hard peg compared to the soft peg arrangements is as well as the rate of inflation.

Table 5.4 Fixed effects regression results on the relationship between exchange rate regime and the bank Z-scores, credit to deposits and liquid assets to short term funding

Variable	(1) Bank Z- score	(2) Bank Z- score	(3) Bank credit to bank deposits (%)	(4) Bank credit to bank deposits (%)	(5) Liquid assets to deposits and short term funding (%)	(6) Liquid assets to deposits and short term funding (%)
Hard peg exchange rate regimes	-1.484** (0.640)	0.022 (0.704)	35.710*** (8.558)	53.220*** (18.78)	-5.673** (2.325)	-6.075 (3.725)
Floating exchange rate regimes	-1.286* (0.741)	-1.020* (0.565)	4.199 (7.501)	7.214 (12.08)	1.802 (2.967)	2.988 (4.190)
Residual managed arrangements	-0.362 (0.747)	-0.107 (0.628)	9.503 (9.833)	23.29 (19.94)	0.090 (2.662)	-1.414 (3.426)
GDP per capita (US\$)		0.001 (0.000)		0.000 (0.002)		-0.002 (0.002)
Government expenditures to GDP (%)		-0.004 (0.086)		-0.107 (0.863)		-0.359 (0.372)
GDP growth (%)		-0.054 (0.050)		-0.294 (0.231)		0.118 (0.163)
FDI net inflows to GDP (%)		0.034 (0.030)		0.603 (0.430)		0.142 (0.127)
Primary education completion rate (%)		-0.013 (0.025)		0.265 (0.294)		-0.154 (0.125)
Inflation rate (%)		-0.064* (0.034)		-0.469* (0.265)		0.226 (0.167)
Trade to GDP (%)		0.021 (0.021)		-0.048 (0.150)		0.000 (0.079)
Banking crisis		-		1.608 (1.156)		-47.430*** (0.848)
Constant	15.010*** (0.256)	13.770*** (2.738)	68.770*** (2.855)	54.700* (29.060)	35.280*** (1.009)	53.530*** (14.030)

Observations	437	240	541	285	442	245
R-squared	0.016	0.067	0.015	0.049	0.005	0.213
Number of countries	40	36	47	40	41	37
Country FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES

Note: In FE regressions (1) and (2) the Z-score of banks is the dependent variable whereas in FE regressions (3) and (4) this is credit provided to the private sector by domestic money banks as a share of total deposits. In FE regressions (5) and (6) liquid assets as a share of total deposits and short term funding is the dependent variable. In regression (2) the variable Banking crisis was omitted by Stata due to collinearity. Robust standard errors are represented in parentheses. Significance of the estimators is represented by the asterisks: *** p<0.01, ** p<0.05, * p<0.1

5.2 Synthetic Control Analysis

In contrast to the fixed effects regressions, the data analysis based on the synthetic control method (SCM) has fewer dependent variables since more complete data is required on both Tanzania and the Sub-Saharan the countries that make up the synthetic control. As a consequence of this the financial sector development category of access could not be researched. Deposit money bank assets to GDP is an indicator variable of the category depth and is depicted using the SCM in figure 5.1. In this figure it can be observed that after the intervention the two lines diverge. In the period after the intervention the negative treatment effect in both 2018 and 2020 is significant at a 10% and 5% significance level respectively, as is also reported in table B.1 in the appendix.

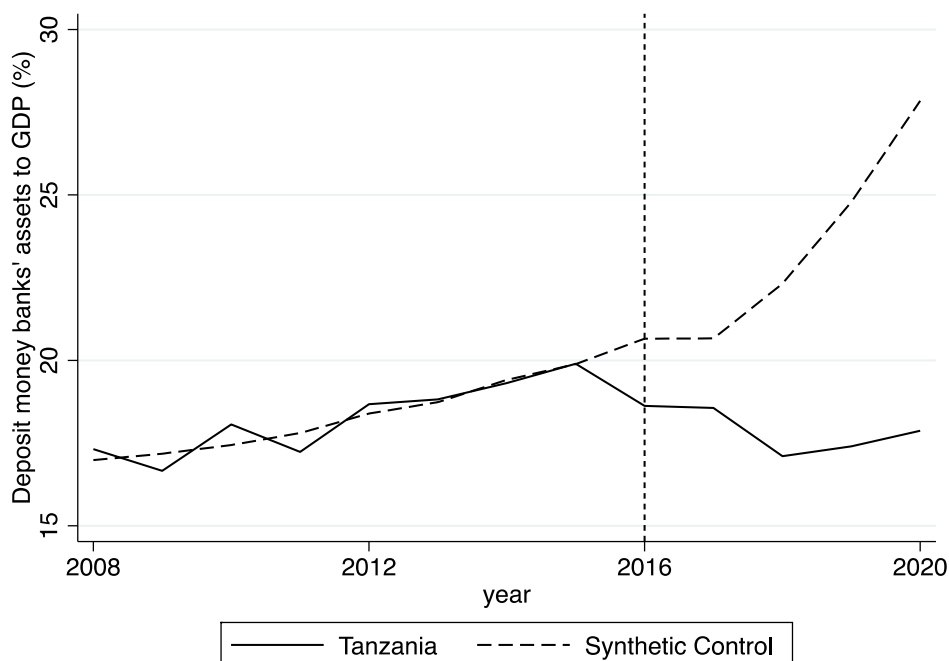


Figure 5.1 Deposit money bank assets to GDP in percentages for Tanzania and the synthetic control from 2008-2020

Note: This figure shows the overall trends of total assets held by deposit money banks as a share of GDP in the period 2008-2020. The years between 2008 and 2020 are noted on the x-axis and share of GDP on the y-axis.

The legenda shows which line belongs to each group and the vertical dashed line shows the year of the switch of exchange rate regime. The synthetic control group is based on 25 weighted other countries in Sub-Saharan Africa. The data was derived from the AREAER and the Global Financial Development Database from the World Bank.

A similar trend as is depicted for deposit money bank assets to GDP in figure 5.1 is also visible for liquid liabilities to GDP reported in figure 5.2. As is the previous figure, the trends diverge after intervention with the synthetic control scoring far higher percentages for the dependent variable than Tanzania itself. The treatment effect and accompanying standardized P-values are reported in table B.2 in the appendix. This table shows that the negative treatment effect tends to become larger over time periods post-intervention, with the maximum being reached in 2020 with a treatment effect of -9.096%. Additionally the significance of the treatment effect is observed to be increasing with the treatment effect in 2016 and 2017 being significant at the 10% level and in 2018, 2019 and 2020 being highly significant at the 1% level.

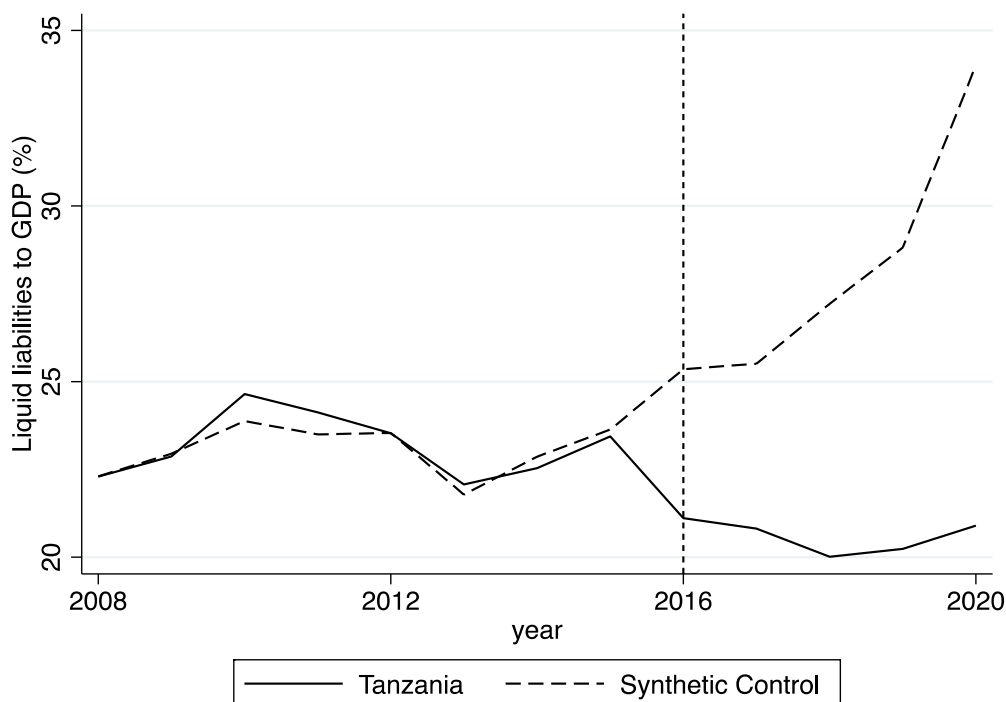


Figure 5.2 Liquid liabilities to GDP in percentages for Tanzania and the synthetic control from 2008-2020

Note: This figure shows the overall trends of the ratio of total liquid liabilities held as a share of GDP in the period 2008-2020. The years between 2008 and 2020 are noted on the x-axis and share of GDP on the y-axis. The legenda shows which line belongs to each group and the vertical dashed line shows the year of the switch of exchange rate regime. The synthetic control group is based on 24 weighted other countries in Sub-Saharan Africa. The data was derived from the AREAER and the Global Financial Development Database from the World Bank.

In addition to the previous two indicator variables, the variable financial system deposits to GDP in figure 5.3 also depicts a similar diverging trend after the switch of exchange rate policy. The size of the reported treatment effects in table B.3 is increasing with 5% significance in the years 2016, 2018 and 2019, and 10% and 1% in 2017 and 2020 respectively. Combined these three figures show a clear trend where the dependent variables of interest for Tanzania itself stay lower compared to the values for the synthetic control. This, however, cannot be said for other indicator variables belonging to the financial sector category of depth. Figures B.1 up to B.4 in the appendix do not contain any significant treatment effects and in figure B.5 which depicts the trends for the variable domestic credit to private sector to GDP only the initial treatment effect, in 2016, is significant with a standardized P-value of 0.042. Therefore, the results for the depth category are clearly mixed.

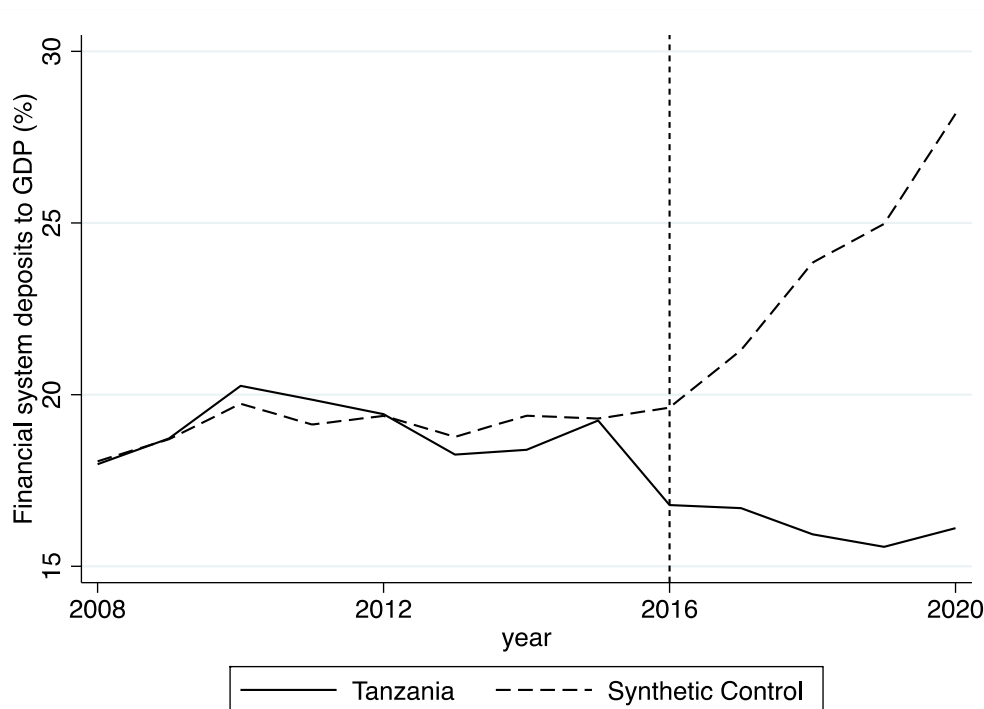


Figure 5.3 Financial system deposits to GDP in percentages for Tanzania and the synthetic control from 2008-2020

Note: This figure shows the overall trends of demand, time and saving deposits held in deposit money banks and other financial institutions as a share of GDP in the period 2008-2020. The years between 2008 and 2020 are noted on the x-axis and share of GDP on the y-axis. The legend shows which line belongs to each group and the vertical dashed line shows the year of the switch of exchange rate regime. The synthetic control group is based on 25 weighted other countries in Sub-Saharan Africa. The data was derived from the AREAER and the Global Financial Development Database from the World Bank.

The second category of financial sector development analyzed is stability. In this category three dependent indicator variables were analyzed using the synthetic control method. The

trends for bank credit to bank deposits have been set out in figure 5.4. In the pre-intervention period both trends seem to be matched quite well. These trends diverge substantially after the transition to a different exchange rate policy. In contrast to the trend of the synthetic control which depicts a relative decrease in bank credit each post-intervention year, the trend for Tanzania shows a relative strong increase in credit to deposits after treatment. This divergence in trends is observed to be highly significant as well, with table B.4 in the appendix reporting treatment effects increasing all post-transition years accompanied by standardized P-values that imply significance at the 1% significance level. This particularly significant result is in contrast to the results found for the other two indicator variables for financial sector stability. Figures B.6 and B.7 depict the very different trends for bank Z-scores and liquid assets to deposits and short term funding respectively. For both these variables the pre-intervention trends do not seem to fit as well together as in figure 5.4. Additionally the treatment effects for these indicators are relatively small and insignificant compared to the finds for bank credit to deposits. As a consequence, the results for financial sector stability cannot be generalized into a single conclusion.

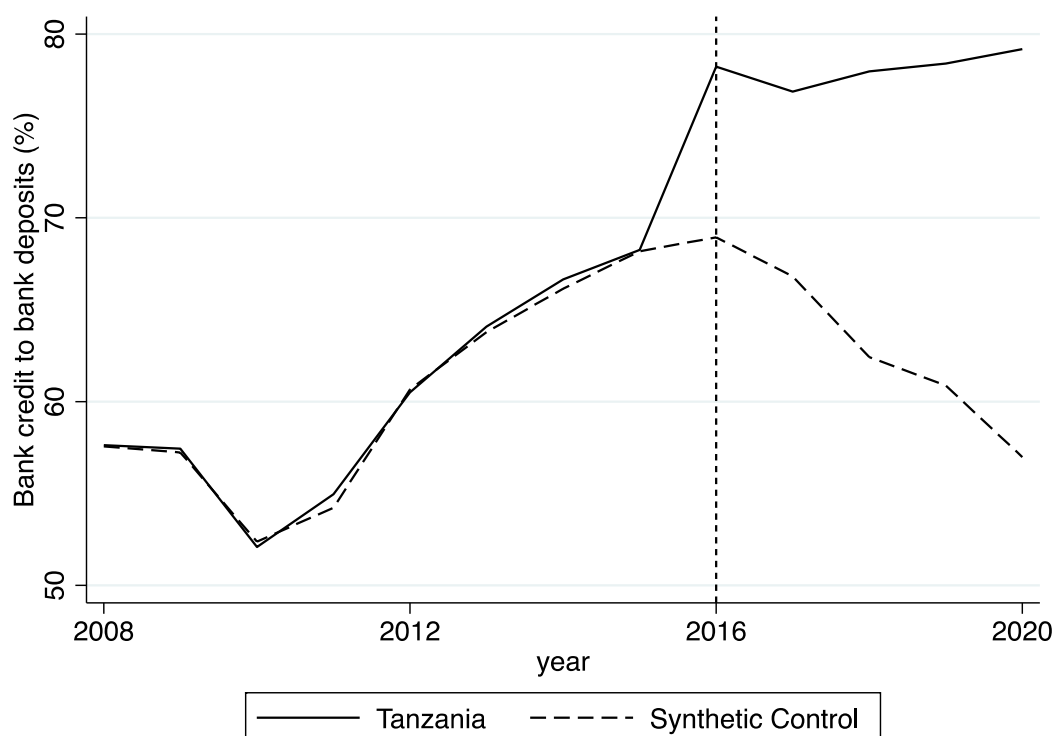


Figure 5.4 Bank credit to bank deposits in percentages for Tanzania and the synthetic control from 2008-2020

Note: This figure shows the overall trends of credit provided to the private sector by domestic money banks as a share of total deposits in the period 2008-2020. The years between 2008 and 2020 are noted on the x-axis

and share of total deposits on the y-axis. The legenda shows which line belongs to each group and the vertical dashed line shows the year of the switch of exchange rate regime. The synthetic control group is based on 18 weighted other countries in Sub-Saharan Africa. The data was derived from the AREAER and the Global Financial Development Database from the World Bank.

The final category analyzed using synthetic controls is the efficiency of the financial sector. The method was used on seven indicator variables. The return on equity for banks pre-tax is shown in figure 5.5. Post-intervention the trends start separate. Table B.5 in the appendix reports the found treatment effects via the use of placebo tests. Only the negative treatment effects in 2018 and 2019 seem to be relevant and both have are significant at the 1% significance level. When looking at the data for return on equity after taxes the size of the effects is smaller but still significant as can be observed in figure B.13 and table B.18 in the appendix. No significant results were found for return on assets for banks, both pre and post-tax. Furthermore, for the bank net interest margin, noninterest income to total income and overhead expenses to total assets, reported in figures B.8, B.9 and B.10 respectively, no significant results were found. This results in the return on equity being the only variable where significant effects were found in the period after intervention.

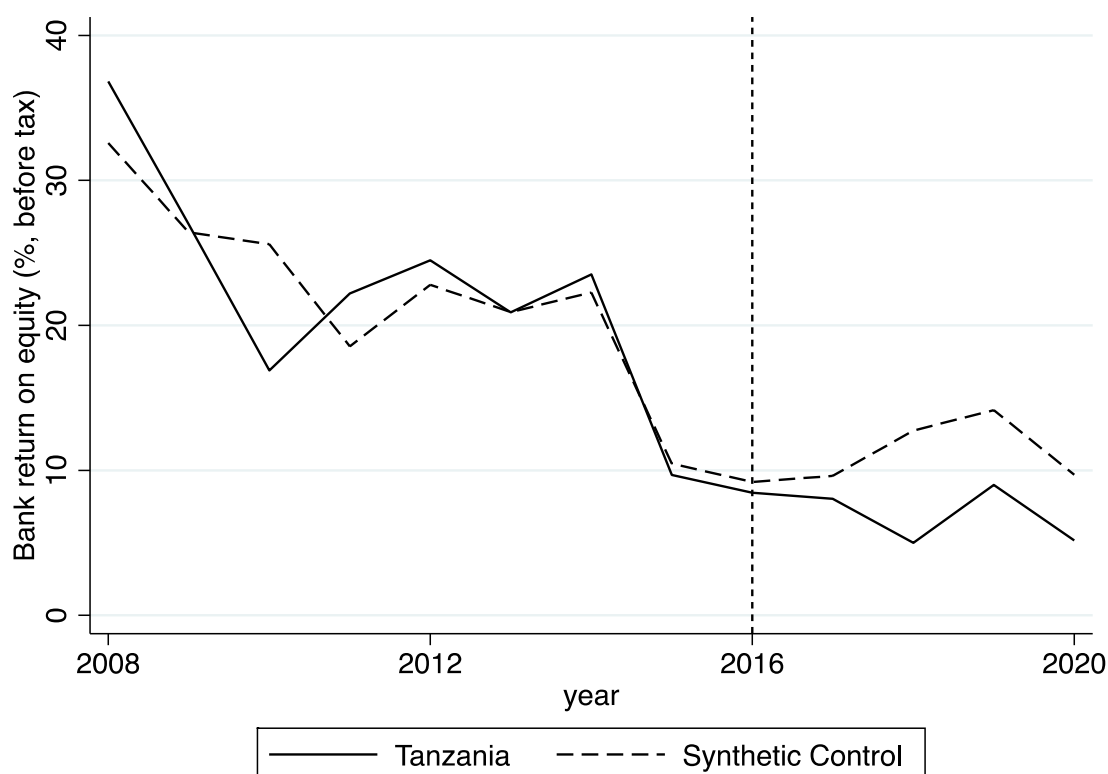


Figure 5.5 Bank return on equity before taxes in percentages for Tanzania and the synthetic control from 2008-2020

Note: This figure shows the overall trends of pre-tax net income as a share of total equity of commercial banks in the period 2008-2020. The years between 2008 and 2020 are noted on the x-axis and return on equity

on the y-axis. The legenda shows which line belongs to each group and the vertical dashed line shows the year of the switch of exchange rate regime. The synthetic control group is based on 10 weighted other countries in Sub-Saharan Africa. The data was derived from the AREAER and the Global Financial Development Database from the World Bank.

6. Discussion & Conclusion

Limitations and recommendations

This thesis researched how different types of exchange rate regimes affected the development of the financial sector in different countries in Sub-Saharan Africa in period of 2008-2020. It did so via the use of fixed effect regressions and the synthetic control method. Even though these methods have advantages, they also come with several limitations. In the case of the fixed effect regressions only time-varying variables could be used for the estimations. Therefore the variables that do not vary over time but are constant cannot be used in the analysis. Furthermore, unobserved variables that differ over time can therefore also lead to omitted variable bias. Another point worth discussing is the fact that in many FE regressions the effects of a multitude of control variables were not significant. This leads to question if all the necessary control variables were added to the analyses. Since this cannot be stated with certainty, there is no certainty that the conditional independence assumption holds in the conducted FE regressions. Another limitation that was apparent with these analyses was the fact that only one nation had a hard peg exchange regime. This leads to the fact that the found effects of hard peg arrangements are most likely not systematic and due to the exchange rate policy, but that they are characteristics of this single economy, clouding the real effect of the policy on the development of the financial sector.

Besides the FE regressions the synthetic control method has limitations as well. To execute the synthetic control method using the statistics software Stata required additional restrictions on data. This meant that during the time period of 2008-2020 every country was required to have datapoints for each year in the time period for the variable of interest and at least one datapoint in the time period for the control variables. Data on nations in Sub-Saharan Africa is far from complete. Many data on variables at a certain time are missing with for some nations virtually no data was available. This caused that there were not the same number of countries for every indicator variable for which a synthetic control analysis was used. For far less countries the required data was available for the categories stability

and efficiency in the synthetic control analyses compared to depth and since for Tanzania itself no access indicators were available this also could not be researched.

There are therefore recommendations for future research. An aid in improving the research done in this thesis could be to include more variables which could be associated with both the dependent variable and the choice of exchange rate regime. Additionally a longer period of time could be analyzed instead of only the recent years used in this thesis. Another possibility is to research a different region in world. The region of Southeast Asia could be an interesting option if substantial amount of data is available, since the nations in this region has also been developing their financial sector in recent years and researching the impact of exchange rate arrangements could potentially provide further interesting results.

Concluding remarks

From fixed effect regressions in the access category it is observed that there is no significant empirical difference between floating and soft peg arrangements. However, significant effects are observed for hard peg and residual arrangements. Hard peg arrangements are linked to lower amounts of bank accounts in contrast to higher numbers of ATM machines and bank branches. For some variables in the depth category this effect of floating regimes not having a significant impact while hard peg arrangements do. Therefore, there does not seem to be a significant difference in how the exchange rate regime affects the aspect of the financial sector that is focused mainly on access and consumers compared to the aspect that mainly focusses on businesses provided with credit as clients. Another interesting find is that hard peg policies are observed to have a significant positive effect on both banks' net interest margin as well on overhead expenses to total assets. Important to mention for the found coefficients for hard peg regimes is the fact that in the dataset there was only one country with this type of regime. Therefore, all coefficients for this variable likely show the idiosyncratic difference of this economy compared to the other nations in the region instead of the effect of the different type of exchange rate arrangement. This implies that the findings for hard peg regime coefficients are most likely showing the characteristics of this single economy and not the effect of the policy. Besides this, floating regimes are found to have a significant negative effect on bank Z-scores, implying that the probability of a

countries banking system defaulting is greater when a country has a floating exchange rate policy. However, beside these significant findings there are also many indicator variables for no significant estimated effect was found. Therefore, by focusing only the significant finds one would overlook fact that the found effect of exchange policy from the FE regressions have empirical mixed results. In addition to the FE regressions the research made use of the synthetic control method as well. Based on the fact that Tanzania made a transition from a floating to a soft peg exchange rate policy at the beginning of 2016 the synthetic control method was implemented. The research found that most indicator variables in the categories of financial sector development had insignificant empirical results based on placebo tests with standardized P-values. Nevertheless, there are also indicator variables for highly significant treatment effects were found. Implying that the transition could have indeed impacted several indicators

To conclude even though the research has limitations the results of this thesis help to understand the way the exchange rate regime impacts the development of the financial sector and provides empirical evidence for mixed results for various indicators.

Furthermore, the results could be built upon by future research by expanding the range of both control variables and the time period and it could be of interest to analyze the effect of different exchange rate regimes on the development of the financial sector for a different region in the world.

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Appendix

A. Fixed effects regressions

Access

Table A.1 Fixed effects regression results on the relationship between exchange rate regime and the number of ATM machines per 100,000 adults

Variables	(1)	(2)
	ATMs per 100,000 adults	ATMs per 100,000 adults
Hard peg exchange rate regimes	-2.438*** (0.547)	3.339* (1.725)
Floating exchange rate regimes	-2.032** (0.976)	1.034 (2.265)
Residual managed arrangements	-1.194** (0.554)	2.501** (1.105)
GDP per capita (US\$)		0.002* (0.001)
Government expenditures to GDP (%)		0.375* (0.215)
GDP growth (%)		-0.212* (0.106)
FDI net inflows to GDP (%)		-0.093 (0.058)
Primary education completion rate (%)		-0.003 (0.058)
Inflation rate (%)		-0.206*** (0.054)
Trade to GDP (%)		-0.102* (0.052)
Banking crisis		3.759*** (0.455)
Constant	13.600*** (0.303)	11.470** (5.655)
Observations	476	262
R-squared	0.007	0.336
Number of countries	45	40
Country FE	YES	YES
Year FE	YES	YES

Note: Robust standard errors are represented in parentheses. Significance of the estimators is represented by the asterisks: *** p<0.01, ** p<0.05, * p<0.1

Depth

Table A.2 Fixed effects regression results on the relationship between exchange rate regime and private credit by banks and all financial institutions to GDP and domestic credit to private sector to GDP

Variable	(1) Private credit by deposit money banks to GDP (%)	(2) Private credit by deposit money banks to GDP (%)	(3) Private credit by deposit money banks & other financial institutions to GDP (%)	(4) Private credit by deposit money banks & other financial institutions to GDP (%)	(5) Domestic credit to private sector to GDP (%)	(6) Domestic credit to private sector to GDP (%)
Hard peg exchange rate regimes	16.460 (11.080)	22.830 (14.190)	16.430 (11.080)	23.380 (14.210)	4.658*** (0.614)	5.152*** (1.247)
Floating exchange rate regimes	5.832 (6.558)	9.770 (7.946)	5.813 (6.558)	10.010 (7.973)	-0.964 (0.790)	1.677 (1.216)
Residual managed arrangements	13.600 (12.660)	17.570 (13.630)	13.570 (12.670)	17.830 (13.640)	-0.516 (0.630)	1.846 (1.135)
GDP per capita (US\$)		0.001* (0.001)		0.002** (0.001)		0.001 (0.001)
Government expenditures to GDP (%)		0.866** (0.341)		0.938*** (0.343)		0.592*** (0.172)
GDP growth (%)		-0.312 (0.201)		-0.326 (0.205)		-0.122* (0.068)
FDI net inflows to GDP (%)		-0.073 (0.107)		-0.069 (0.106)		-0.0221 (0.056)
Primary education completion rate (%)		0.070 (0.100)		0.076 (0.100)		0.052 (0.056)
Inflation rate (%)		-0.333* (0.185)		-0.343* (0.186)		-0.186*** (0.066)
Trade to GDP (%)		0.0310 (0.051)		0.0116 (0.052)		0.0268 (0.031)
Banking crisis		-3.474*** (0.958)		-3.428*** (0.959)		-1.236*** (0.367)
Constant	27.560*** (3.220)	-3.432 (11.610)	29.490*** (3.220)	-2.873 (11.69)	22.64*** (0.259)	5.344 (6.669)
Observations	561	285	561	285	539	272
R-squared	0.015	0.119	0.015	0.123	0.013	0.247
Number of countries	47	40	47	40	47	39
Country FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES

Note: In FE regressions (1) and (2) credit provided to the private sector by deposit money banks as a share of GDP is the dependent variable whereas in FE regressions (3) and (4) this is credit

provided to the private sector by deposit money banks and other financial institutions as a share of GDP. In FE regressions (5) and (6) domestic credit provided to the private sector as a share of GDP is the dependent variable. Robust standard errors are represented in parentheses. Significance of the estimators is represented by the asterisks: *** p<0.01, ** p<0.05, * p<0.1

Table A.3 Fixed effects regression results on the relationship between exchange rate regime and financial system deposits to GDP and insurance company assets to GDP

Variable	(1) Financial system deposits to GDP (%)	(2) Financial system deposits to GDP (%)	(3) Insurance company assets to GDP (%)	(4) Insurance company assets to GDP (%)
Hard peg exchange rate regimes	5.298 (9.007)	11.57 (11.56)	- -	- -
Floating exchange rate regimes	3.248 (5.284)	8.188 (6.183)	-0.223 (0.244)	0.0893 (0.152)
Residual managed arrangements	11.55 (10.30)	15.60 (11.12)	-0.592 (0.555)	0.0271 (0.181)
GDP per capita (US\$)		0.00136* (0.000683)		-0.000130 (0.000215)
Government expenditures to GDP (%)		0.758** (0.316)		-0.00227 (0.0607)
GDP growth (%)		-0.342** (0.163)		-0.0257* (0.0131)
FDI net inflows to GDP (%)		-0.200* (0.115)		0.0190 (0.0161)
Primary education completion rate (%)		0.0444 (0.0857)		0.00981 (0.0100)
Inflation rate (%)		-0.343** (0.154)		-0.0202** (0.00964)
Trade to GDP (%)		0.0802 (0.0587)		-0.000499 (0.0106)
Banking crisis		0.577 (0.857)		-0.271*** (0.0962)
Constant	27.80*** (2.561)	4.428 (9.025)	7.174*** (0.125)	5.298*** (1.554)
Observations	548	285	335	207
R-squared	0.064	0.140	0.009	0.041
Number of countries	46	40	34	31
Country FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES

Note: In the FE regressions (3) and (4) the dummy for hard peg exchange rate regimes was omitted because of multicollinearity due to the fact that for this indicator far less data was available. This difference is also observable when comparing the observations between the FE regressions (1) and (2) to (3) and (4). Robust standard errors in parentheses Significance of the estimators are represented by the asterisks: *** p<0.01, ** p<0.05, * p<0.1

Table A.4 Fixed effects regression results on the relationship between exchange rate regime and bank assets to GDP, bank assets to Central Bank and deposit money banks assets, liquid liabilities to GDP and Central Bank assets to GDP

Variable	(1) Deposit money banks' assets to GDP (%)	(2) Deposit money banks' assets to GDP (%)	(3) Deposit money bank assets to central bank & deposit money bank assets (%)	(4) Deposit money bank assets to central bank & deposit money bank assets (%)	(5) Liquid liabilities to GDP (%)	(6) Liquid liabilities to GDP (%)	(7) Central bank assets to GDP (%)	(8) Central bank assets to GDP (%)
Hard peg exchange rate regimes	13.750 (13.080)	21.110 (16.780)	13.250*** (3.336)	9.819*** (2.529)	7.945 (12.870)	16.890 (16.650)	1.302 (7.188)	4.197 (9.320)
Floating exchange rate regimes	5.074 (7.614)	10.030 (9.110)	6.345* (3.338)	6.131 (3.668)	4.834 (7.391)	11.000 (8.856)	1.388 (4.153)	2.366 (4.891)
Residual managed arrangements	16.680 (14.960)	20.730 (16.050)	-0.575 (3.639)	-3.426 (2.347)	15.700 (14.760)	21.550 (16.020)	9.384 (8.248)	10.840 (8.806)
GDP per capita (US\$)		0.002** (0.001)		0.002*** (0.001)		0.002* (0.001)		-0.000 (0.000)
Government expenditures to GDP (%)		1.071** (0.446)		-0.013 (0.432)		0.880** (0.421)		0.315 (0.297)
GDP growth (%)		-0.451* (0.243)		0.013 (0.111)		-0.424* (0.221)		-0.204 (0.128)
FDI net inflows to GDP (%)		-0.154 (0.142)		0.065 (0.067)		-0.237 (0.144)		-0.138 (0.119)
Primary education completion rate (%)		0.084 (0.118)		0.012 (0.075)		0.060 (0.098)		0.004 (0.040)
Inflation rate (%)		-0.382 (0.237)		-0.233* (0.122)		-0.398* (0.204)		-0.037 (0.107)
Trade to GDP (%)		0.056 (0.068)		0.068 (0.057)		0.107 (0.072)		0.021 (0.028)
Banking crisis		-2.155* (1.202)		2.656*** (0.530)		1.916* (1.132)		-0.323 (0.638)
Constant	32.940*** (3.745)	-2.037 (12.940)	79.980*** (1.176)	71.840*** (11.540)	32.780*** (3.557)	3.494 (11.460)	5.205** (1.987)	-1.521 (5.459)
Observations	559	285	551	285	551	285	551	285
R-squared	0.037	0.124	0.043	0.184	0.062	0.129	0.083	0.117
Number of countries	47	40	46	40	46	40	46	40
Country FE	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES

Note: In FE regressions (1) and (2) the total assets held by deposit money banks as a share of GDP is the dependent variable whereas in FE regressions (3) and (4) this is total

assets held by deposit money banks as a share of sum of Central Bank and deposit money bank assets. In FE regressions (5) and (6) the ratio of total liquid liabilities held as a share of GDP is the dependent variable. In regressions (7) and (8) the ratio of assets held by the Central Bank as a share of GDP serves as dependent variable. Robust standard errors are represented in parentheses. Significance of the estimators is represented by the asterisks: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Efficiency

Table A.5 Fixed effects regression results on the relationship between exchange rate regime and bank noninterest income to total income

Variable	(1) Bank noninterest income to total income (%)	(2) Bank noninterest income to total income (%)
Hard peg exchange rate regimes	-2.030 (1.786)	-4.011** (1.731)
Floating exchange rate regimes	5.441** (2.142)	3.962 (2.499)
Residual managed arrangements	6.094*** (1.893)	2.337 (1.804)
GDP per capita (US\$)		-0.002*** (0.000)
Government expenditures to GDP (%)		-0.022 (0.278)
GDP growth (%)		0.399** (0.157)
FDI net inflows to GDP (%)		-0.079 (0.082)
Primary education completion rate (%)		0.112 (0.105)
Inflation rate (%)		0.014 (0.158)
Trade to GDP (%)		-0.000 (0.044)
Banking crisis		18.360*** (0.474)
Constant	41.490*** (0.801)	37.600*** (10.190)
Observations	437	245
R-squared	0.051	0.093
Number of countries	41	37
Country FE	YES	YES
Year FE	YES	YES

Note: Robust standard errors are represented in parentheses. Significance of the estimators is represented by the asterisks: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table A.6 Fixed effects regression results on the relationship between exchange rate regime and bank return on assets pre and post-tax and bank return on equity pre and post-tax

Variable	(1) Bank return on assets (% after tax)	(2) Bank return on assets (% after tax)	(3) Bank return on assets (% before tax)	(4) Bank return on assets (% before tax)	(5) Bank return on equity (% after tax)	(6) Bank return on equity (% after tax)	(7) Bank return on equity (% before tax)	(8) Bank return on equity (% before tax)
Hard peg exchange rate regimes	-1.208*** (0.287)	-0.375 (0.340)	-2.159*** (0.342)	-0.628 (0.375)	-1.657 (1.553)	0.151 (4.489)	-6.212*** (1.910)	-1.782 (5.061)
Floating exchange rate regimes	0.021 (0.474)	-0.067 (0.539)	0.168 (0.525)	0.154 (0.638)	2.465 (4.571)	-2.657 (8.217)	4.906 (5.165)	0.122 (9.818)
Residual managed arrangements	-0.253 (0.319)	0.441* (0.249)	-0.355 (0.378)	0.313 (0.270)	4.038* (2.149)	5.959 (3.723)	4.521* (2.433)	5.297 (4.275)
GDP per capita (US\$)		0.000 (0.000)		0.000 (0.000)		-0.002* (0.001)		-0.004* (0.002)
Government expenditures to GDP (%)		-0.011 (0.049)		-0.065 (0.058)		-0.005 (0.468)		-0.813 (0.656)
GDP growth (%)		-0.001 (0.037)		0.024 (0.040)		0.065 (0.376)		0.359 (0.431)
FDI net inflows to GDP (%)		-0.004 (0.016)		-0.005 (0.018)		-0.091 (0.105)		-0.093 (0.142)
Primary education completion rate (%)		0.015 (0.013)		0.011 (0.017)		0.270 (0.185)		0.218 (0.226)
Inflation rate (%)		0.036* (0.021)		0.046 (0.029)		0.536** (0.227)		0.595* (0.320)
Trade to GDP (%)		0.015 (0.013)		0.016 (0.015)		0.028 (0.106)		0.013 (0.126)
Banking crisis		-11.920*** (0.100)		-14.740*** (0.114)		-		-
Constant	1.824*** (0.156)	-0.628 (1.832)	2.480*** (0.176)	0.938 (2.213)	15.670*** (1.326)	-1.442 (17.950)	21.140*** (1.522)	23.350 (23.620)
Observations	427	235	429	237	420	231	425	234
R-squared	0.005	0.184	0.011	0.195	0.016	0.145	0.020	0.125
Number of countries	40	36	40	36	40	36	40	36
Country FE	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES

Note: In FE regressions (1) and (2) the after-tax net income as a share of total assets of commercial banks is the dependent variable whereas in FE regressions (3) and (4) this is pre-tax net income as a share of total assets of commercial banks. In FE regressions (5) and (6) the after-tax net income as a share of total equity of commercial banks is the dependent variable. In regressions (7) and (8) the pre-tax net income as a share of total equity of commercial banks serves as dependent variable. Robust standard errors are represented in parentheses.

Significance of the estimators is represented by the asterisks: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

B. Synthetic Control Analyses

Table B.1 Estimated treatment effects for deposit money bank assets to GDP in percentages using placebo tests with standardized P-values for each year post intervention

Year	Treatment effect (%)	Standardized P-values
2016	-1.857	0.160
2017	-1.239	0.280
2018	-3.690*	0.080
2019	-5.108	0.120
2020	-7.024**	0.040

Note: This table reports the estimated treatment effect for the total assets held by deposit money banks as a share of GDP in the years after intervention. The placebo tests are conducted with the 25 countries from the synthetic control. The significance of the estimated treatment effect is represented by the asterisks and based on the standardized P-values reported in the third column: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table B.2 Estimated treatment effects for liquid liabilities to GDP in percentages using placebo tests with standardized P-values for each year post intervention

Year	Treatment effect (%)	Standardized P-values
2016	-4.581*	0.083
2017	-4.096*	0.083
2018	-6.165***	0.000
2019	-6.788***	0.000
2020	-9.096***	0.000

Note: This table reports the estimated treatment effect for the ratio of total liquid liabilities held as a share of GDP in the years after intervention. The placebo tests are conducted with the 24 countries from the synthetic control. The significance of the estimated treatment effect is represented by the asterisks and based on the standardized P-values reported in the third column: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table B.3 Estimated treatment effects for financial system deposits to GDP in percentages using placebo tests with standardized P-values for each year post intervention

Year	Treatment effect (%)	Standardized P-values
2016	-3.066**	0.040
2017	-3.555*	0.080
2018	-6.059**	0.040
2019	-7.696**	0.040
2020	-9.637***	0.000

Note: This table reports the estimated treatment effect for the demand, time and saving deposits held in deposit money banks and other financial institutions as a share of GDP in the years after intervention. The placebo tests are conducted with the 25 countries from the synthetic control. The significance of the estimated treatment effect is represented by the asterisks and based on the standardized P-values reported in the third column: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table B.4 Estimated treatment effects for bank credit to deposits in percentages using placebo tests with standardized P-values for each year post intervention

Year	Treatment effect (%)	Standardized P-values
2016	9.565***	0.000
2017	10.354***	0.000
2018	18.498***	0.000
2019	21.236***	0.000
2020	26.098***	0.000

Note: This table reports the estimated treatment effect for the private sector by domestic money banks as a share of total deposits in the years after intervention. The placebo tests are conducted with the 18 countries from the synthetic control. The significance of the estimated treatment effect is represented by the asterisks and based on the standardized P-values reported in the third column: *** p<0.01, ** p<0.05, * p<0.1

Table B.5 Estimated treatment effects for bank return on equity before taxes in percentages using placebo tests with standardized P-values for each year post intervention

Year	Treatment effect (%)	Standardized P-values
2016	-9.700	0.333
2017	-9.570	0.333
2018	-14.471***	0.000
2019	-14.173***	0.000
2020	-12.014	0.444

Note: This table reports the estimated treatment effect for the pre-tax net income as a share of total equity of commercial banks in the years after intervention. The placebo tests are conducted with the 10 countries from the synthetic control. The significance of the estimated treatment effect is represented by the asterisks and based on the standardized P-values reported in the third column: *** p<0.01, ** p<0.05, * p<0.1

Depth

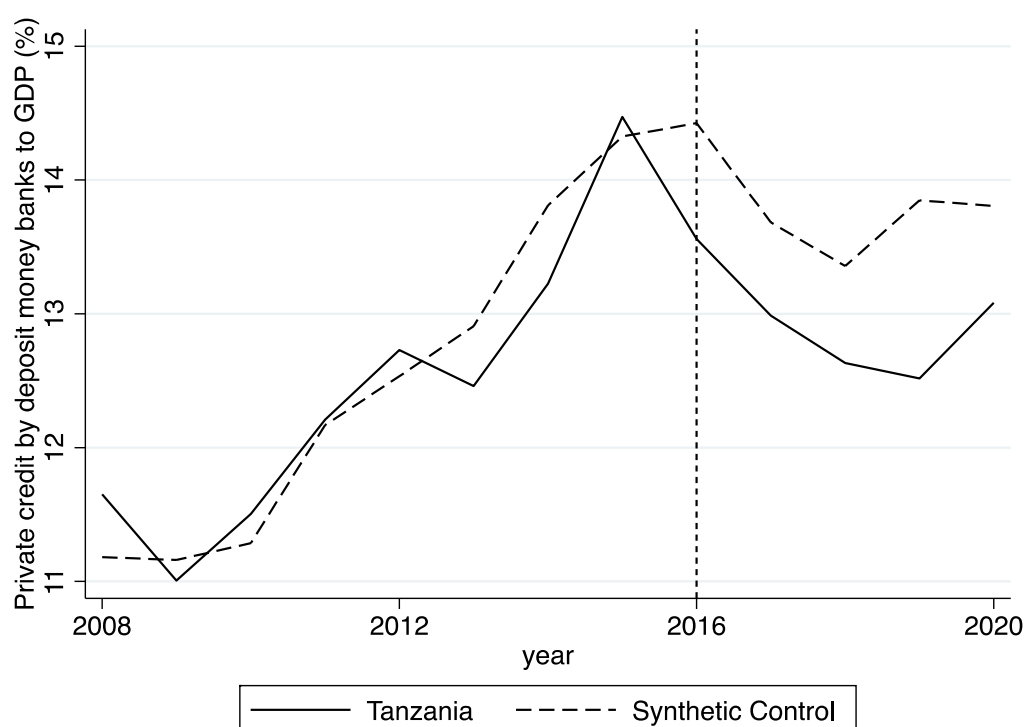


Figure B.1 Private credit by deposit money banks to GDP in percentages for Tanzania and the synthetic control from 2008-2020

Note: This figure shows the overall trends of credit provided to the private sector by deposit money banks as a share of GDP in the period 2008-2020. The years between 2008 and 2020 are noted on the x-axis and share of GDP on the y-axis. The legend shows which line belongs to each group and the vertical dashed line shows the year of the switch of exchange rate regime. The synthetic control group is based on 25 weighted other countries in Sub-Saharan Africa. The data was derived from the AREAER and the Global Financial Development Database from the World Bank.

Table B.6 Estimated treatment effects for private credit by deposit money banks to GDP in percentages using placebo tests with standardized P-values for each year post intervention

Year	Treatment effect (%)	Standardized P-values
2016	-0.812	0.400
2017	-0.814	0.480
2018	-0.332	0.800
2019	-1.192	0.440
2020	0.470	0.800

Note: This table reports the estimated treatment effect for the credit provided to the private sector by deposit money banks as a share of GDP in the years after intervention. The placebo tests are conducted with the 25 countries from the synthetic control. The significance of the estimated treatment effect is represented by the asterisks and based on the standardized P-values reported in the third column: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

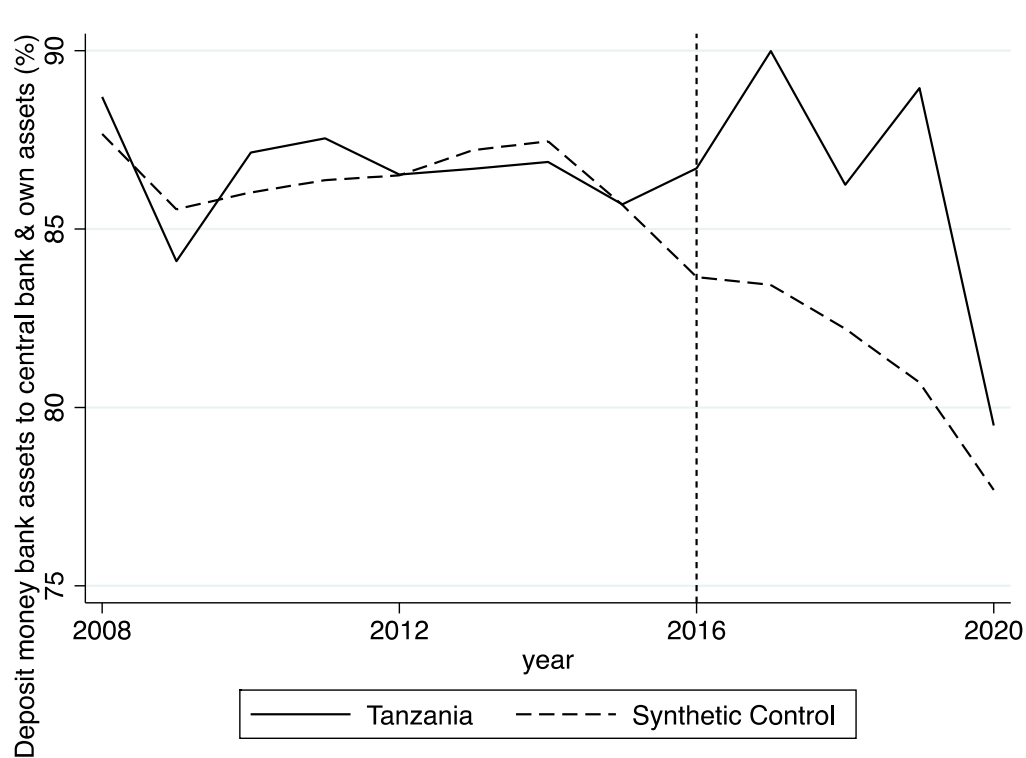


Figure B.2 Deposit money bank assets to Central Bank & deposit money bank assets in percentages for Tanzania and the synthetic control from 2008-2020

Note: This figure shows the overall trends of total assets held by deposit money banks as a share of sum of Central Bank and deposit money bank assets in the period 2008-2020. The years between 2008 and 2020 are noted on the x-axis and share of total assets on the y-axis. The legend shows which line belongs to each group and the vertical dashed line shows the year of the switch of exchange rate regime. The synthetic control group is based on 24 weighted other countries in Sub-Saharan Africa. The data was derived from the AREAER and the Global Financial Development Database from the World Bank.

Table B.7 Estimated treatment effects for deposit money bank assets to Central Bank & deposit money bank assets in percentages using placebo tests with standardized P-values for each year post intervention

Year	Treatment effect (%)	Standardized P-values
2016	2.662	0.500
2017	6.163	0.292
2018	3.963	0.583
2019	8.1668	0.417
2020	5.325	0.583

Note: This table reports the estimated treatment effect for the total assets held by deposit money banks as a share of sum of Central Bank and deposit money bank assets in the years after intervention. The placebo tests are conducted with the 24 countries from the synthetic control. The significance of the estimated treatment effect is represented by the asterisks and based on the standardized P-values reported in the third column: *** p<0.01, ** p<0.05, * p<0.1

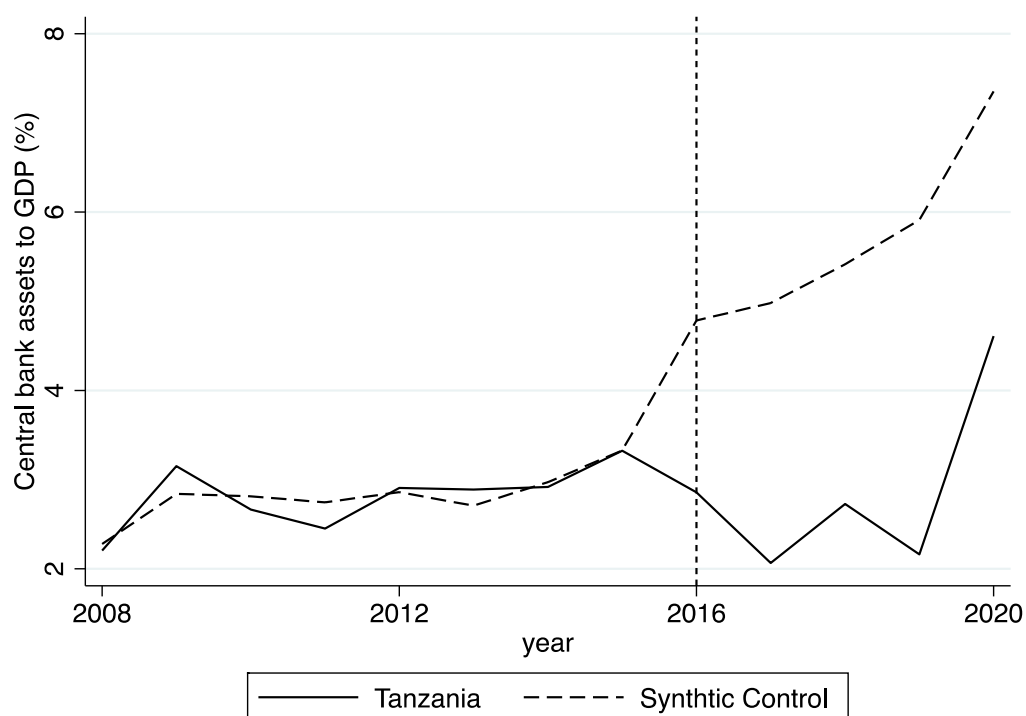


Figure B.3 Central Bank assets to GDP in percentages for Tanzania and the synthetic control from 2008-2020

Note: This figure shows the overall trends of the ratio of assets held by the Central Bank as a share of GDP in the period 2008-2020. The years between 2008 and 2020 are noted on the x-axis and share of GDP on the y-axis. The legend shows which line belongs to each group and the vertical dashed line shows the year of the switch of exchange rate regime. The synthetic control group is based on 24 weighted other countries in Sub-Saharan Africa. The data was derived from the AREAER and the Global Financial Development Database from the World Bank.

Table B.8 Estimated treatment effects for Central Bank assets to GDP in percentages using placebo tests with standardized P-values for each year post intervention

Year	Treatment effect (%)	Standardized P-values
2016	-0.694	0.583
2017	-1.363	0.250
2018	-0.887	0.542
2019	-1.707	0.250
2020	-1.214	0.417

Note: This table reports the estimated treatment effect for the ratio of assets held by the Central Bank as a share of GDP in the years after intervention. The placebo tests are conducted with the 24 countries from the synthetic control. The significance of the estimated treatment effect is represented by the asterisks and based on the standardized P-values reported in the third column: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

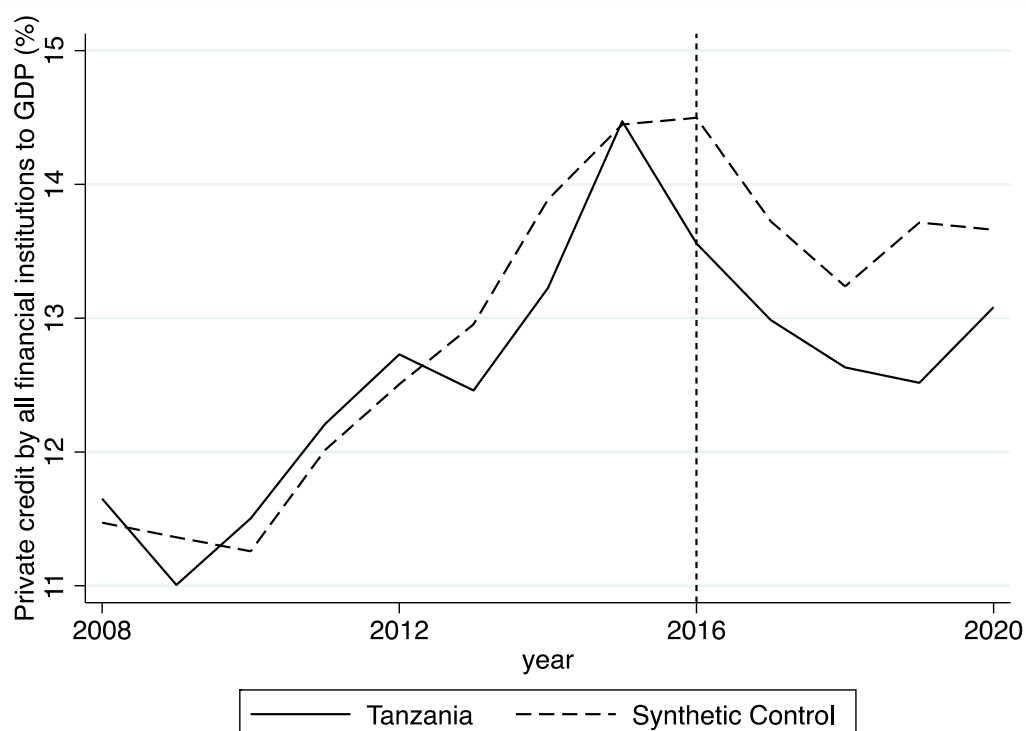


Figure B.4 Private credit by all financial institutions to GDP in percentages for Tanzania and the synthetic control from 2008-2020

Note: This figure shows the overall trends of credit provided to the private sector by deposit money banks and other financial institutions as a share of GDP in the period 2008-2020. The years between 2008 and 2020 are noted on the x-axis and share of GDP on the y-axis. The legend shows which line belongs to each group and the vertical dashed line shows the year of the switch of exchange rate regime. The synthetic control group is based on 25 weighted other countries in Sub-Saharan Africa. The data was derived from the AREAER and the Global Financial Development Database from the World Bank.

Table B.9 Estimated treatment effects for private credit by all financial institutions to GDP in percentages using placebo tests with standardized P-values for each year post intervention

Year	Treatment effect (%)	Standardized P-values
2016	-0.484	0.600
2017	-1.059	0.320
2018	-0.893	0.600
2019	-1.525	0.400
2020	-0.998	0.640

Note: This table reports the estimated treatment effect for the credit provided to the private sector by deposit money banks and other financial institutions as a share of GDP in the years after intervention. The placebo tests are conducted with the 25 countries from the synthetic control. The significance of the estimated treatment effect is represented by the asterisks and based on the standardized P-values reported in the third column: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

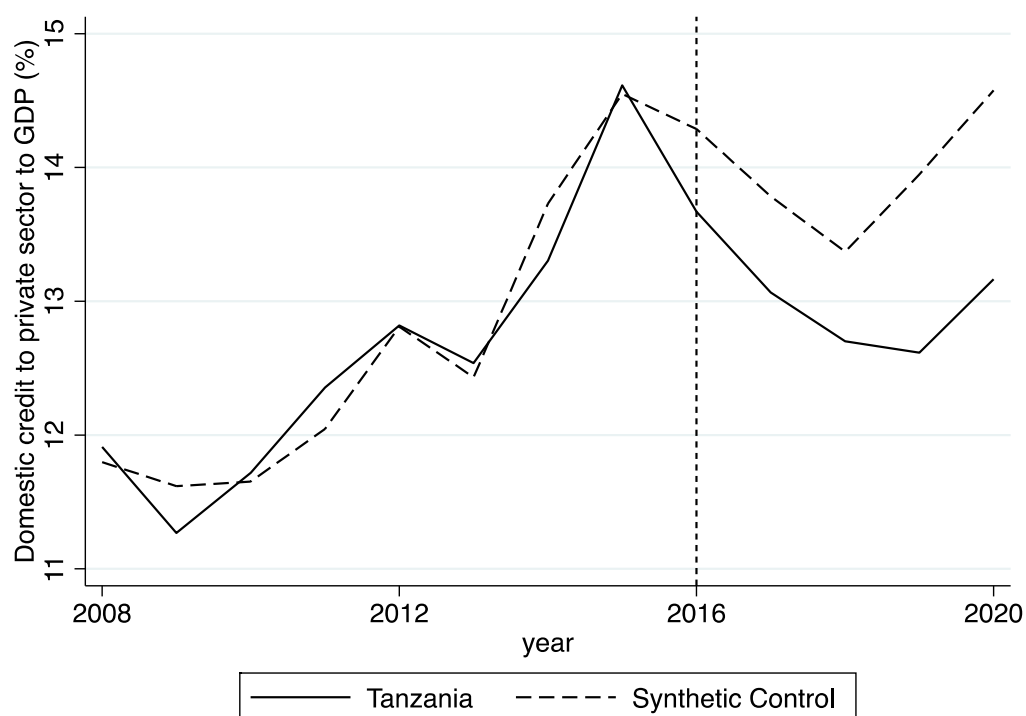


Figure B.5 Domestic credit to private sector to GDP in percentages for Tanzania and the synthetic control from 2008-2020

Note: This figure shows the overall trends of domestic credit provided to the private sector as a share of GDP in the period 2008-2020. The years between 2008 and 2020 are noted on the x-axis and share of GDP on the y-axis. The legend shows which line belongs to each group and the vertical dashed line shows the year of the switch of exchange rate regime. The synthetic control group is based on 24 weighted other countries in Sub-Saharan Africa. The data was derived from the AREAER and the Global Financial Development Database from the World Bank.

Table B.10 Estimated treatment effects for domestic credit to private sector to GDP in percentages using placebo tests with standardized P-values for each year post intervention

Year	Treatment effect (%)	Standardized P-values
2016	-1.101**	0.042
2017	-0.813	0.125
2018	-0.448	0.375
2019	-0.857	0.208
2020	-0.622	0.583

Note: This table reports the estimated treatment effect for the domestic credit provided to the private sector as a share of GDP in the years after intervention. The placebo tests are conducted with the 24 countries from the synthetic control. The significance of the estimated treatment effect is represented by the asterisks and based on the standardized P-values reported in the third column: *** p<0.01, ** p<0.05, * p<0.1

Stability

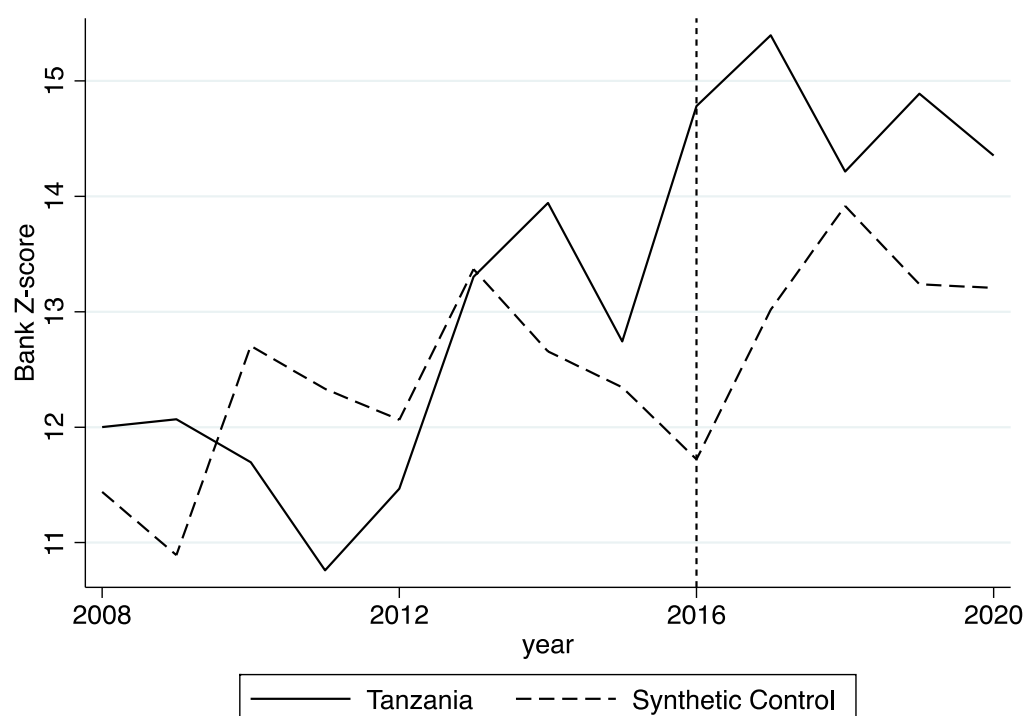


Figure B.6 Bank Z-scores for Tanzania and the synthetic control from 2008-2020

Note: This figure shows the overall trends of probability of a country's banking system defaulting in the period 2008-2020. Higher Z-scores imply a lower chance of insolvency (The World Bank, 2015). The years between 2008 and 2020 are noted on the x-axis and bank Z-scores on the y-axis. The legend shows which line belongs to each group and the vertical dashed line shows the year of the switch of exchange rate regime. The synthetic control group is based on 11 weighted other countries in Sub-Saharan Africa. The data was derived from the AREAER and the Global Financial Development Database from the World Bank.

Table B.11 Estimated treatment effects for bank Z-scores using placebo tests with standardized P-values for each year post intervention

Year	Treatment effect (%)	Standardized P-values
2016	3.539	0.182
2017	3.734	0.273
2018	1.537	0.455
2019	2.906	0.273
2020	3.199	0.364

Note: This table reports the estimated treatment effect for the probability of a country's banking system defaulting in the years after intervention. The placebo tests are conducted with the 11 countries from the synthetic control. The significance of the estimated treatment effect is represented by the asterisks and based on the standardized P-values reported in the third column: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

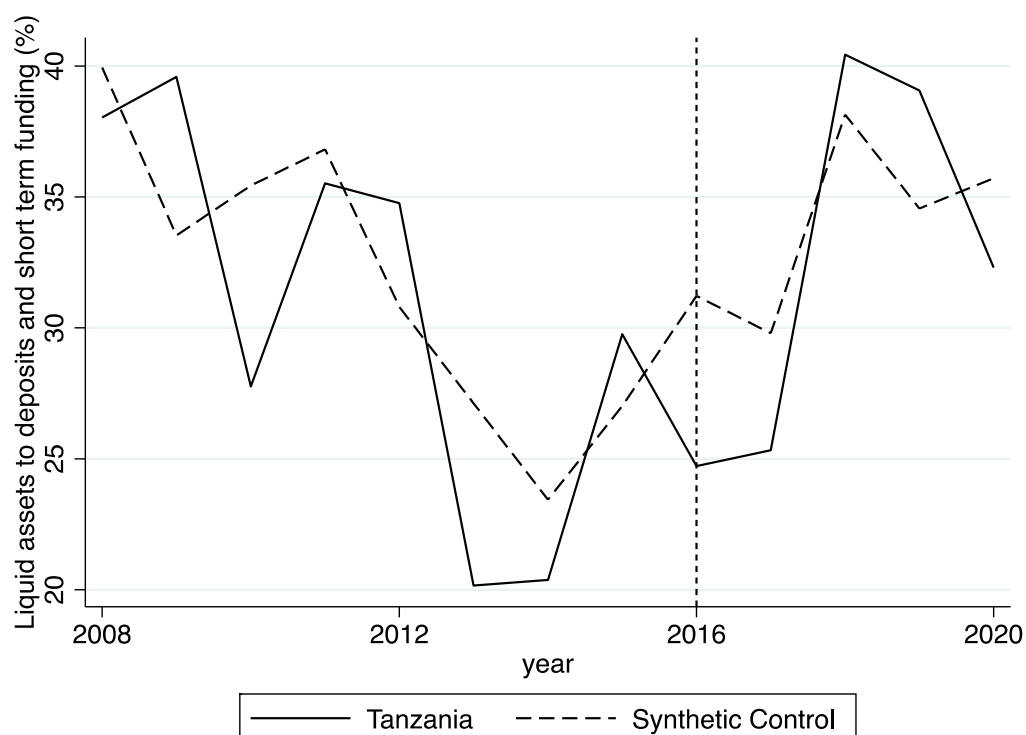


Figure B.7 Liquid assets to deposits and short term funding in percentages for Tanzania and the synthetic control from 2008-2020

Note: This figure shows the overall trends of liquid assets as a share of total deposits and short term funding in the period 2008-2020. The years between 2008 and 2020 are noted on the x-axis and share of total deposits and short term funding on the y-axis. The legend shows which line belongs to each group and the vertical dashed line shows the year of the switch of exchange rate regime. The synthetic control group is based on 24 weighted other countries in Sub-Saharan Africa. The data was derived from the AREAER and the Global Financial Development Database from the World Bank.

Table B.12 Estimated treatment effects for liquid assets to deposits and short term funding in percentages using placebo tests with standardized P-values for each year post intervention

Year	Treatment effect (%)	Standardized P-values
2016	-8.714	0.083
2017	-7.703	0.500
2018	1.864	1.000
2019	3.610	0.917
2020	-5.205	0.667

Note: This table reports the estimated treatment effect for the liquid assets as a share of total deposits and short term funding in the years after intervention. The placebo tests are conducted with the 24 countries from the synthetic control. The significance of the estimated treatment effect is represented by the asterisks and based on the standardized P-values reported in the third column: *** p<0.01, ** p<0.05, * p<0.1

Efficiency

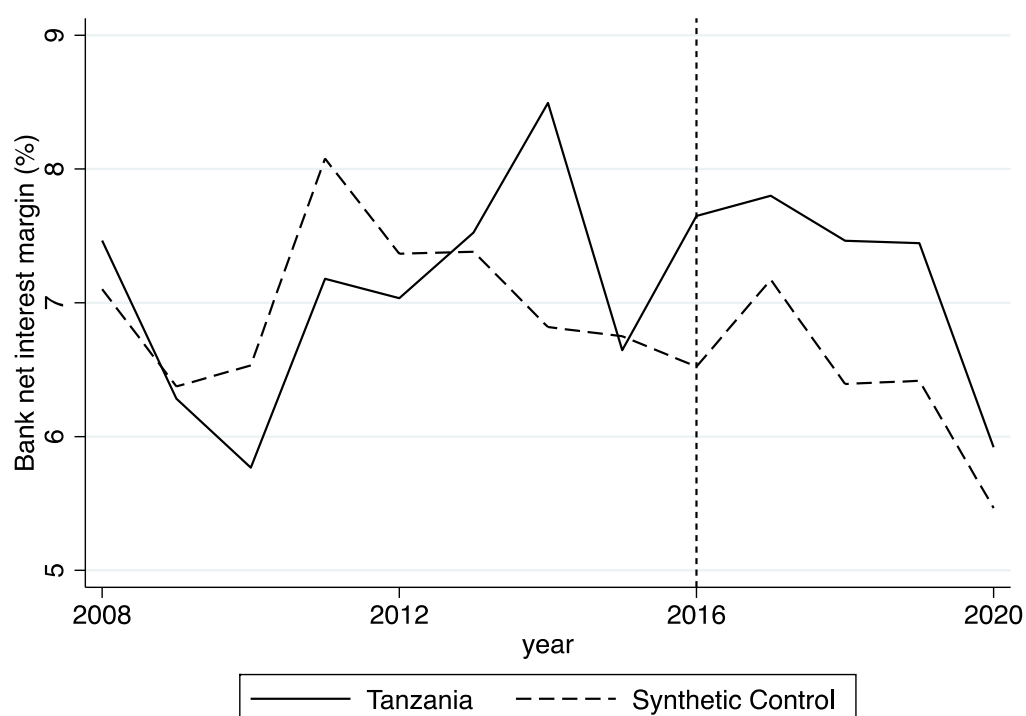


Figure B.8 Bank net interest margin in percentages for Tanzania and the synthetic control from 2008-2020

Note: This figure shows the overall trends of the value of banks' net interest revenue as a share of interest-bearing assets in the period 2008-2020. The years between 2008 and 2020 are noted on the x-axis and net interest margin on the y-axis. The legend shows which line belongs to each group and the vertical dashed line shows the year of the switch of exchange rate regime. The synthetic control group is based on 10 weighted other countries in Sub-Saharan Africa. The data was derived from the AREAER and the Global Financial Development Database from the World Bank.

Table B.13 Estimated treatment effects for bank net interest margin in percentages using placebo tests with standardized P-values for each year post intervention

Year	Treatment effect (%)	Standardized P-values
2016	1.152	0.300
2017	0.868	0.700
2018	0.961	0.400
2019	0.419	0.900
2020	0.317	1.000

Note: This table reports the estimated treatment effect for the value of banks' net interest revenue as a share of interest-bearing assets in the years after intervention. The placebo tests are conducted with the 10 countries from the synthetic control. The significance of the estimated treatment effect is represented by the asterisks and based on the standardized P-values reported in the third column: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

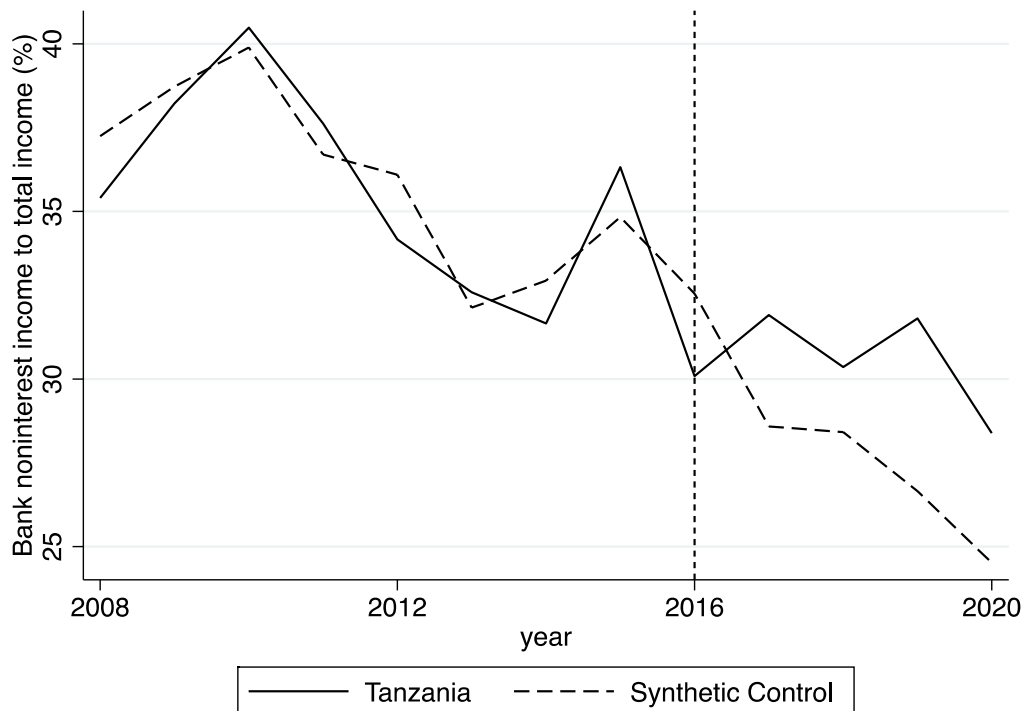


Figure B.9 Bank noninterest income to total income in percentages for Tanzania and the synthetic control from 2008-2020

Note: This figure shows the overall trends of income generated by noninterest activities of banks as a share of total income in the period 2008-2020. The years between 2008 and 2020 are noted on the x-axis and share of total income on the y-axis. The legenda shows which line belongs to each group and the vertical dashed line shows the year of the switch of exchange rate regime. The synthetic control group is based on 12 weighted other countries in Sub-Saharan Africa. The data was derived from the AREAER and the Global Financial Development Database from the World Bank.

Table B.14 Estimated treatment effects for bank noninterest income to total income in percentages using placebo tests with standardized P-values for each year post intervention

Year	Treatment effect (%)	Standardized P-values
2016	1.152	0.750
2017	3.295	0.250
2018	-0.384	0.917
2019	2.847	0.500
2020	1.061	0.833

Note: This table reports the estimated treatment effect for the income generated by noninterest activities of banks as a share of total income in the years after intervention. The placebo tests are conducted with the 12 countries from the synthetic control. The significance of the estimated treatment effect is represented by the asterisks and based on the standardized P-values reported in the third column: *** p<0.01, ** p<0.05, * p<0.1

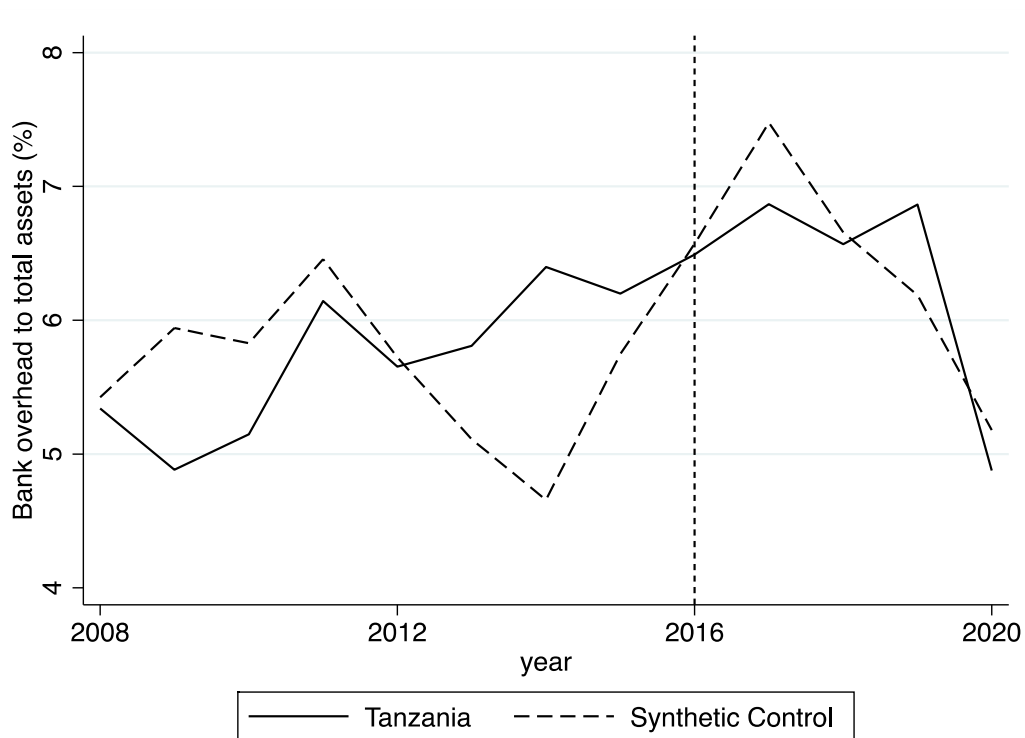


Figure B.10 Bank overhead costs to total assets in percentages for Tanzania and the synthetic control from 2008-2020

Note: This figure shows the overall trends of overhead costs of banks as a share of total assets held in the period 2008-2020. The years between 2008 and 2020 are noted on the x-axis and share of total assets on the y-axis. The legenda shows which line belongs to each group and the vertical dashed line shows the year of the switch of exchange rate regime. The synthetic control group is based on 10 weighted other countries in Sub-Saharan Africa. The data was derived from the AREAER and the Global Financial Development Database from the World Bank.

Table B.15 Estimated treatment effects for bank overhead costs to total assets in percentages using placebo tests with standardized P-values for each year post intervention

Year	Treatment effect (%)	Standardized P-values
2016	1.542	0.400
2017	1.372	0.700
2018	1.558	0.700
2019	2.142	0.500
2020	0.999	0.600

Note: This table reports the estimated treatment effect for the overhead costs of banks as a share of total assets held in the years after intervention. The placebo tests are conducted with the 10 countries from the synthetic control. The significance of the estimated treatment effect is represented by the asterisks and based on the standardized P-values reported in the third column: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

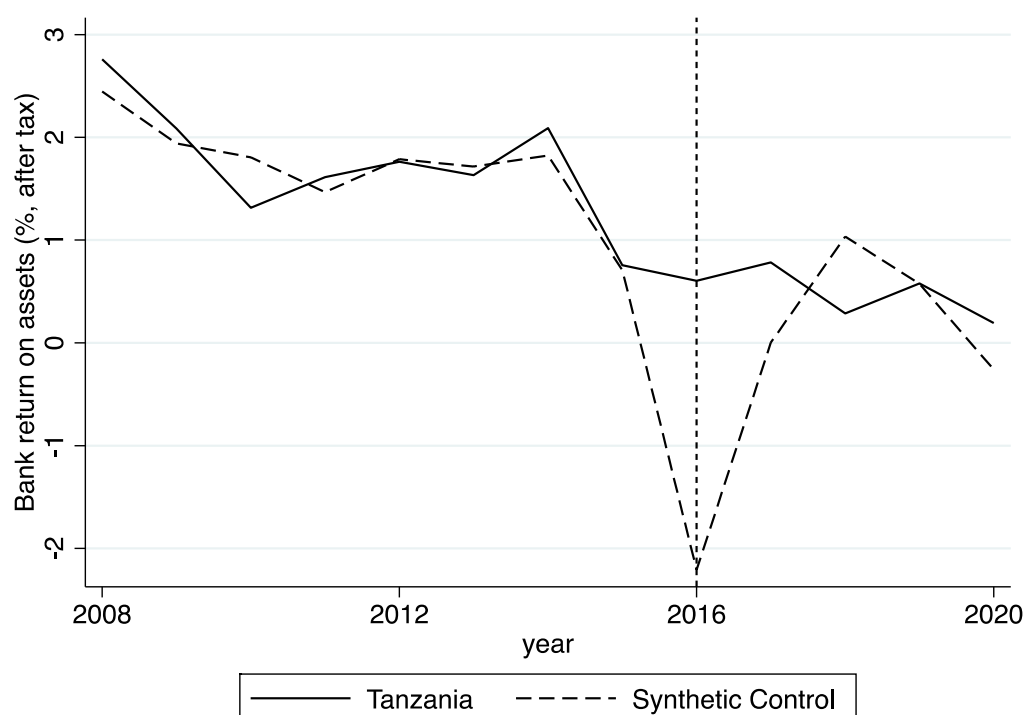


Figure B.11 Bank return on assets after taxes in percentages for Tanzania and the synthetic control from 2008-2020

Note: This figure shows the overall trends of after-tax net income as a share of total assets of commercial banks in the period 2008-2020. The years between 2008 and 2020 are noted on the x-axis and return on assets on the y-axis. The legend shows which line belongs to each group and the vertical dashed line shows the year of the switch of exchange rate regime. The synthetic control group is based on 9 weighted other countries in Sub-Saharan Africa. The data was derived from the AREAER and the Global Financial Development Database from the World Bank.

Table B.16 Estimated treatment effects for bank return on assets after taxes in percentages using placebo tests with standardized P-values for each year post intervention

Year	Treatment effect (%)	Standardized P-values
2016	0.205	0.900
2017	0.228	1.000
2018	-0.990	0.600
2019	-1.198	0.600
2020	-0.646	0.700

Note: This table reports the estimated treatment effect for the after-tax net income as a share of total assets of commercial in the years after intervention. The placebo tests are conducted with the 9 countries from the synthetic control. The significance of the estimated treatment effect is represented by the asterisks and based on the standardized P-values reported in the third column: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

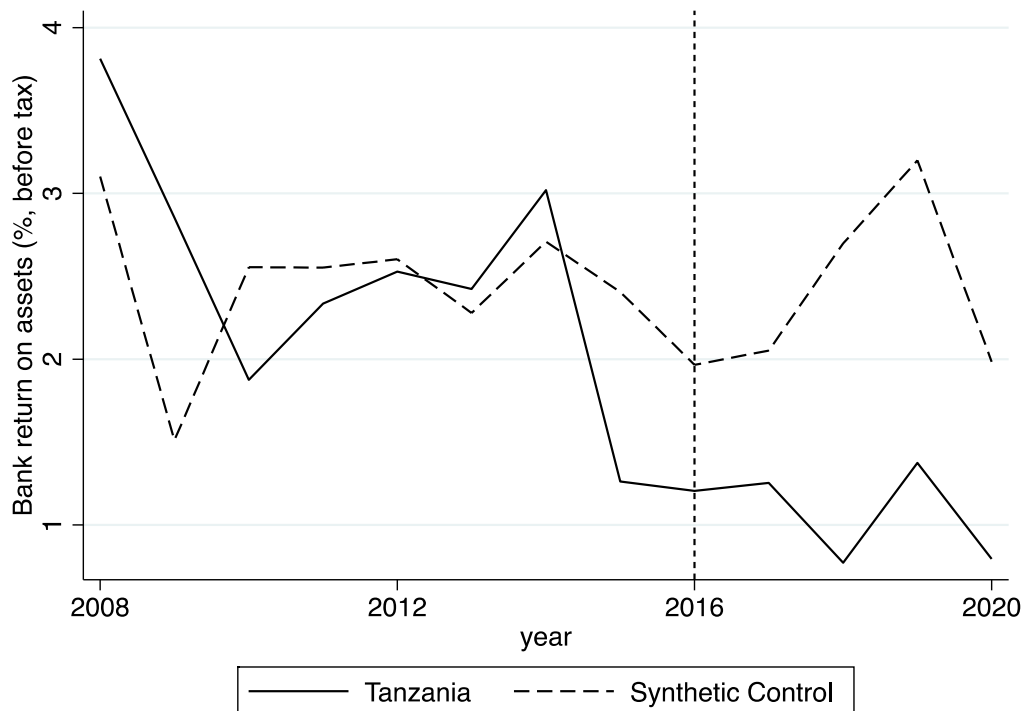


Figure B.12 Bank return on assets before taxes in percentages for Tanzania and the synthetic control from 2008-2020

Note: This figure shows the overall trends of pre-tax net income as a share of total assets of commercial banks in the period 2008-2020. The years between 2008 and 2020 are noted on the x-axis and return on assets on the y-axis. The legend shows which line belongs to each group and the vertical dashed line shows the year of the switch of exchange rate regime. The synthetic control group is based on 9 weighted other countries in Sub-Saharan Africa. The data was derived from the AREAER and the Global Financial Development Database from the World Bank.

Table B.17 Estimated treatment effects for bank return on assets before taxes in percentages using placebo tests with standardized P-values for each year post intervention

Year	Treatment effect (%)	Standardized P-values
2016	0.602	1.000
2017	0.251	1.000
2018	-1.043	0.500
2019	-1.042	0.700
2020	-0.432	0.800

Note: This table reports the estimated treatment effect for the pre-tax net income as a share of total assets of commercial in the years after intervention. The placebo tests are conducted with the 9 countries from the synthetic control. The significance of the estimated treatment effect is represented by the asterisks and based on the standardized P-values reported in the third column: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

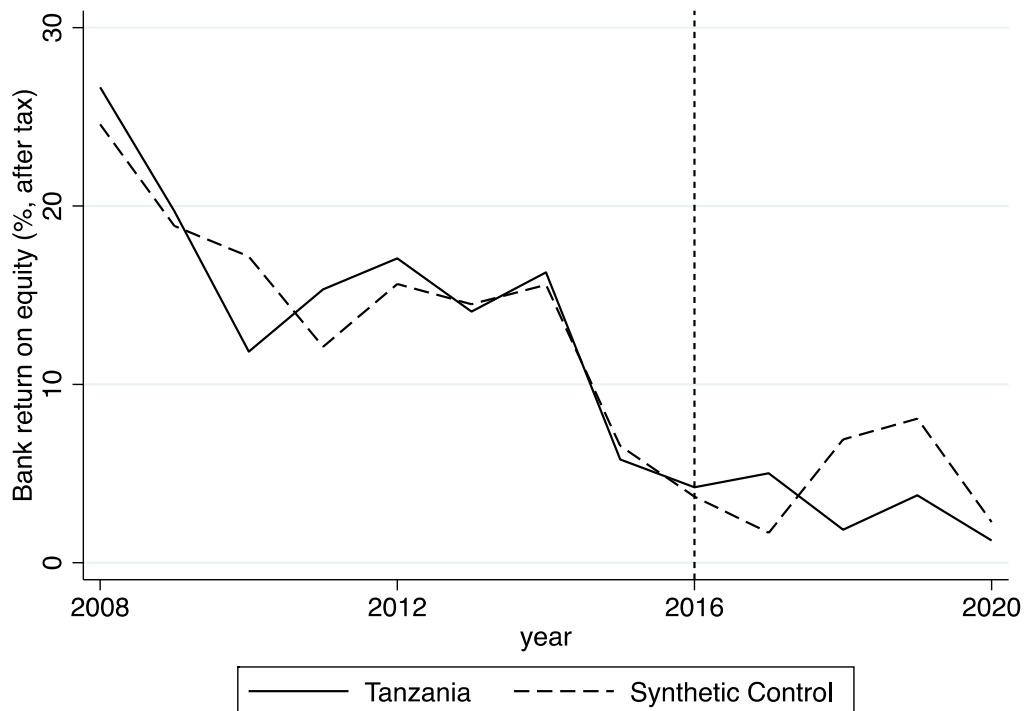


Figure B.13 Bank return on equity after taxes in percentages for Tanzania and the synthetic control from 2008-2020

Note: This figure shows the overall trends of after-tax net income as a share of total equity of commercial banks in the period 2008-2020. The years between 2008 and 2020 are noted on the x-axis and return on equity on the y-axis. The legend shows which line belongs to each group and the vertical dashed line shows the year of the switch of exchange rate regime. The synthetic control group is based on 10 weighted other countries in Sub-Saharan Africa. The data was derived from the AREAER and the Global Financial Development Database from the World Bank.

Table B.18 Estimated treatment effects for bank return on equity after taxes in percentages using placebo tests with standardized P-values for each year post intervention

Year	Treatment effect (%)	Standardized P-values
2016	-5.954	0.222
2017	-7.352	0.111
2018	-11.635***	0.000
2019	-9.604***	0.000
2020	-6.119	0.667

Note: This table reports the estimated treatment effect for the after-tax net income as a share of total equity of commercial banks in the years after intervention. The placebo tests are conducted with the 10 countries from the synthetic control. The significance of the estimated treatment effect is represented by the asterisks and based on the standardized P-values reported in the third column: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$