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From the French franc to the euro, is there an economic impact for the CFA franc zone countries? A 'bias-corrected' synthetic control method

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ABSTRACT

This paper assesses the impact of pegging the CFA franc to the euro – at a fixed parity – on real GDP per capita in the West African Economic and Monetary Union (WAEMU) and the Central African Economic and Monetary Community (CAEMC) countries. Using a set of 35 annual country-level panel data from 1980 to 2019, we apply the 'bias-corrected' synthetic control estimators to create a 'synthetic country' (a counterfactual) for each treated CFA country. The counterfactual is a weighted average of comparable countries that best reproduces the initial trends or characteristics of the treated country before the treatment occurs. Except for Equatorial Guinea, which shows a significant positive difference between its real GDP per capita and counterfactual, our results suggest that, overall, there is no statistical evidence that real GDP per capita has increased relative to what it would have been in the absence of the pegging of the CFA to a hard currency following France's accession to the eurozone.

IMPACT STATEMENT

The aim of this paper is to address the lack of relevant literature and empirical results on the impact of the euro changeover on CFA zone economies, using the GDP per capita indicator. This evaluation is interesting at least for two reasons. First, to strengthen the debate with solid quantitative arguments, based on recent impact assessment techniques, and to bridge the positions. Second, such an assessment could guide CFA zone policymakers on appropriate choices, going beyond political-historical and/or strategic reasons, rigorously considering the performance of their countries' economies related to the pegging of the CFA Franc to the Euro.

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1. Introduction

January 1, 1999, is considered a major event in the history of monetary regimes, and more specifically for the countries of the CFA zones.¹ The advent of the Euro, on this date and its entry into the world market in 2002, changed the nature of the parity of the CFA- franc-FF; CFA- franc -Euro, from a national currency to a multinational currency, shared by 11 and, twenty European countries now. The Euro should be advantageous for the companies of the CFA franc zone since countries of the CFA zone have easier access to all European economic and monetary union countries (lower exchange costs, larger markets etc ...) (Diallo, 2002; Silguy, 1999).

However, the debate on the exchange rate regime and macroeconomic performance is far from over (Carmignani et al., 2008). The implications of the euro for the CFA zone economies are even less so, the extent to which the euro contributes or not to the economic performance of member countries is an ongoing economic question. Few research studies have addressed this issue. However, switching to the euro poses several challenges to the CFA economic zone. This is particularly true given that the

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European Central Bank's monetary policy is more restrictive than the Banque de France (Didier et al., 2008) and the euro is a strong currency. Hadjimichael and Galy (1997), an early study on the issue, shows that the shift in the currency peg from the French franc to the euro affects the economic performance of CFA zone countries. According to Bolle (1997), during the 1970s, CFA zone countries experienced gains in competitiveness thanks to the pegging of the CFA franc to the French franc. In contrast, inadequate domestic economic policies, hampered by a strong French franc (between mid-1980 and 1993), had very negative results, leading to the devaluation of the CFA franc in 1994 (Coulibaly, 2014). As a result, the weakness of the CFA zone's economic performance is largely connected to the euro's overvaluation during this period (Klau, 1998).

In any case, high growth rates are expected for CFA zone countries due to an intensive trade market with the European Economic Community (see Dearden, 1999; Hadjimichael & Galy, 1997). However, for CFA zone economies, the main uncertainty is linked to the consequences of a strong euro, which could undermine expectations following the switch of anchor currency (Zafar, 2005). To this end, a report of the French Senate (2002) states that there is no comprehensive study to clearly state whether or not the Franc CFA pegged to the Euro is an advantage or a drawback for member countries.

The main objective of this paper is to address the lack of relevant literature and empirical results on the impact of the euro changeover on CFA zone economies, using the GDP per capita indicator. This evaluation is interesting at least for two reasons. First, to strengthen the debate with solid quantitative arguments, based on recent impact assessment techniques, and to bridge the positions. Second, such an assessment could guide CFA zone policymakers on appropriate choices, going beyond political-historical and/or strategic reasons, rigorously considering the performance of their countries' economies related to the pegging of the CFA Franc to the Euro.

Thus, why should CFA zone countries keep the Euro as their anchor currency?

According to Irving (1999), the CFA zone is one of the three zones most likely to be affected by the creation of the Euro. African countries in the franc zone have a fixed parity with partners that account for more than half of their foreign exchange, and about 50% of trade between Europe and sub-Saharan Africa comes from CFA zone countries. Pegging the CFA Franc to the Euro exposes the countries of the Franc zone to the Euro-business cycle dynamics, and to possible monetary shocks from the European Union, such a regime limits the monetary policy sovereignty of member countries of the CFA zone (Elu & Price, 2008).

Some analysts argue that the CFA Franc's peg to the Euro is a major factor impeding economic development. 'Fixed exchange rate for the CFA franc and monetary integration has led to unsustainable economic losses for almost all those countries, without bringing the traditional gains that are normally expected from economic unions. The countries of the [franc] Zone would therefore be better off if they withdrew from the union and organized monetary integration on their own dependent upon willingness budgetary and political policies' (Monga, 1997, p.107).

In addition, supporters of the exit of African countries from the franc zone argue that overvaluation of the currency arises from the pegging of the CFA Franc to strong currencies (the French Franc and then to the Euro). The franc zone countries do not systematically perform better over time in terms of growth, GDP per capita or the human development index. The peg to the euro is supposed to undermine the competitiveness of franc zone countries' exports, and thus their growth. The link between the real exchange rates of CFA franc zone countries and the euro is significant and nonlinear (Couharde et al., 2013), the overvaluation of the CFA franc persisted after the 1994 devaluation, on average estimated at 25% (Etta-Nkwelle et al., 2010), then when the euro appreciates vis-à-vis the dollar, the CFA franc also appreciates. This increases the price of exports, which are mainly raw materials, which are accounted for in dollars. And thus, harm their international competitiveness and hence economic growth (Nubukpo 2007, 2019). Despite these results, an analysis by Plane and da Piedade (2022) shows that the CFA franc is not overvalued. Others assume that the peg to the Euro guarantees financial stability and credibility for price stability (Feindouno et al., 2020). It is often suggested that the CFA zone's members benefit from lower inflation and enhanced fiscal discipline compared to similar developing countries, particularly those in sub-Saharan Africa. These monetary and fiscal stabilities may explain the lengthy lifespan of the CFA zone (over more than 60 years of history). However, it is far from being an optimal monetary zone (Coulibaly & Davis, 2013).

The evolution of the money supply is matched to the real needs of the economy of the country and inflation observed in the anchor currency. Inflation is controlled at low levels reducing economic uncertainty, which has an impact on the profitability of investment, activity and the growth rate of domestic product. The fixed exchange rate regime may be most appropriate for developing countries, which have poorly developed financial markets, and whose economies are not stable enough to absorb the adverse effect of exchange rate volatility. Thus, theoretically, when a suitable regime is adopted, it can promote a better business climate and economic growth over time. Thus, Jakob (2016) argues that there is a positive and significant correlation between fixed exchange rates and GDP growth. Similarly, Elu and Price (2008) assess a positive effect on growth for the period 1999–2007 for member countries of the CFA zone. However, for Nubukpo (2019), monetary stability, low inflation, and the non-existence of exchange rate risk have scarcely made a significant contribution to the development of franc zone countries.

The article seeks to move beyond the binary debate between defenders and detractors of the CFA franc, which is largely due to differences in methods, specification and sampling. Indeed, from one point of view to another, the relevance of the CFA franc's peg to the euro needs to be carefully re-examined.

To do this, we need a reasonable counterfactual, that is, we need to know what would have happened in the CFA zone absent the Euro. To that end, we use 'bias-corrected' synthetic control estimators proposed by Wiltshire (2021) to construct for each Franc CFA treated country its counterfactual as a weighted average of comparable countries that best reproduces the initial trends or characteristics of the treated country before the treatment occurs. The synthetic control method (SCM), besides being a transparent way of choosing comparison countries, provides a more relevant comparison with the treated unit than a single control unit (Abadie, 2021).

The contribution of each potential control to the construction of the counterfactual is explicit. Despite the undeniable quality of the method, a major shortcoming remains. There is no consensus on the choice of predictor variables used to estimate the weights that define the synthetic control. In practice, if different specifications lead to very different choices of the synthetic control, Ferman et al. (2020) recommend cherry pick 'statistically significant' specifications.

We used a specification that relies among other things on the outcome variable lagged over three key pre-treatment periods (beginning of the period, after the 1994 devaluation and just before the treatment). Beyond efficiently solving the problem of choosing predictor variables, the specification, as we will see later, confers several desirable properties of SCM. Any difference between the actual real GDP per capita and its synthetic counterpart can be attributed to the CFA franc's peg to the euro as a result of France joining the Eurozone.

With the retained specification, in 12 of the 13 countries of the two studied CFA zones – the West African Economic and Monetary Union (WAEMU) and the Central African Economic and Monetary Community (CAEMC) – overall, we find that the peg of the currency to the euro did not significantly boost the real GDP per capita. Only Equatorial Guinea, a CFA country for which studies show an undervaluation of the exchange rate (Feindouno et al., 2020), benefited significantly from the peg to the euro over the 2002–2019 period. These results corroborate previous studies (Jacquemot, 2018; Nubukpo, 2007) but also the debates on the fact that the stability of the CFA franc does not benefit user countries. This article thus contributes to the debate on the possibility of re-anchoring the CFA franc. In other words, making exchange rate management more flexible should be seriously considered. Such as proposed by Gueye et al. (2019) pegging the CFA franc to a basket of international currencies to moderate the magnitude of the covariation of its value with the euro.

In this controversial binary debate, our study is original. On the one hand, we address the pegging of the CFA Franc to the Euro by country within each monetary union. This makes it possible to account for the inter- and intra-union performance differences between the two monetary unions. Similarly, we highlight the importance of credibility and show its inadequacy in ensuring the economic development of countries in the CFA zone. On the other hand, the method used. The SCM is particularly relevant for evaluating the CFA franc's peg to the Euro for several reasons. The effect can be measured for each country independently, allowing for potential heterogeneous effects across the sample. Significant disparities across countries in the economic impacts of the CFA franc's peg to the Euro would raise questions regarding the benefits of flexible or managed exchange rate regimes, and possibly challenge policy coordination within the monetary union.

The paper is organized as follows. [Section 2](#) provides the literature review, [section 3](#) a snapshot of the economic situation of CFA countries members. [Section 4](#) outlines the methodology and data. [Section 5](#) discusses experiments carried out. [Section 6](#) presents the baseline results while the next section, 7, checks their robustness. [Section 8](#) makes the general discussion before the conclusion.

2. Literature review

Does the choice of exchange rate regime matter for growth? This is an old theoretical and empirical concern. Theoretically, it is assumed that exchange rate pegging affects economic growth through the channels of investment and productivity growth (Ghosh et al., 1996); however, the literature has been far more precise and numerous on the relationship between an anchored exchange rate regime and inflation, than on the latter's relationship with economic growth. Few studies have addressed this question (Bohm & Funke, 2001; Domac et al., 2004b). This is closely linked to the absence of any effect of nominal variables on long-term growth (Levy-Yeyati & Sturzenegger, 2002), in that the expected result is price stability. In line with Barro and Gordon (1983), an expansionary monetary policy; or an exchange rate devaluation induces higher inflation without creating economic growth.

However, Levy-Yeyati and Sturzenegger (2002) show that there is a relationship between exchange rate pegging and growth, but the sign of the relationship is ambiguous. With reduced political uncertainty and lower interest rate variability, this type of regime fosters an environment conducive to growth. Indeed, Bailliu et al. (2003) point out that the impact of a fixed exchange rate regime on growth can be direct, through the effect on adjustments to shocks, or indirect, through investment, international trade and the development of the financial sector. Consequently, with the CFA pegged to the Euro, CFA zone economies can be directly or indirectly affected by the economic situation of countries using the Euro, by a drop in exports and indirectly by pressure on commodity prices (Ehrhart & Jacolin, 2012). Indeed, a stable exchange rate reduces uncertainty on relative prices, fluctuations in exports, and government revenues expressed in CFA that can raise exchange rates (Coulibaly, 2014).

Empirically, Ghosh et al. (2002) find no link between exchange rate regime and economic growth, even after correcting for simultaneity bias. Moreno (2001) points out that a pegged regime is associated with episodes of strong growth of real gross domestic product. These results differ from those of Levy-Yeyati and Sturzenegger (2003) who observe that, for emerging and developing countries, the flexible exchange rate regime produces weak growth effects. For industrialised countries, the exchange rate regime has no effect. Similarly, Larraín and Parro (2003), using the *de facto* classification of Levy-Yeyati and Sturzenegger (2005), in an analysis based on 147 non-industrialized countries from 1975 to 2000, found that the floating exchange rate regime has led to a higher per capita growth rate and lower growth volatility than other exchange rate regimes.

Klein and Shambaugh (2010) using a sample of 92 countries – 22 industrialized and 70 non-industrialized – over the 1980–1999 period, highlighted that fixed exchange rates are associated with slower growth in developing and emerging countries. In contrast, Rose (2011) with a sample of 178 countries from 1974 to 2007, observes that economies with crawling peg regimes experience significantly faster growth than those with fixed regimes. Obi et al. (2016) explored the relationship between exchange rate regimes and output growth in Nigeria from 1970 to 2014. Their results reveal that a deregulated exchange rate stimulates economic growth. Similarly, Guellil et al. (2017) examine the impact of exchange rate regimes on economic growth in 38 developing countries from 1980 to 2013 based on two types of exchange rate regimes: fixed and intermediate regimes according to Reinhart and Rogoff's classification. Beyond the positive relationship between the exchange rate regime and economic growth, they show that the fixed exchange rate regime achieves the highest growth rates.

Furthermore, evidence from Ashour and Chen (2018) suggests that economic growth in fixed regimes outperforms that in intermediate or flexible regimes. Conversely, Rao (2019) discusses the effects of exchange rate regimes on growth in the BRICS countries (Brazil, Russia, India, China and South Africa). The data used covers the period from 1970 to 2012. The author shows that fixed exchange rate regimes were hardly associated with better growth performance. Frankel, Ma and Xie (2019) building on the empirical approaches of Frankel and Wei (2008) and Frankel and Xie (2010), construct a new database characterizing the *de facto* exchange rate regime for 145 countries throughout the post-Bretton Woods

period. Their results indicate significant effects of intermediate exchange rate regimes on economic growth. De Almeida Cardoso and Vilela Vieira (2020) assess the effects of exchange rate regimes on long-term economic growth for 82 countries between 1970 and 2009. Using the GMM estimation, the authors report that countries with flexible and intermediate exchange rate regimes have higher growth rates than those with fixed exchange rate regimes. In contrast, Dao and Nga (2020) use the exchange rate database constructed by Reinhart and Rogoff (2004) and employ the Generalized Method of Moments technique on unbalanced panel data to analyze the effect of the exchange rate regime on economic growth in Asian countries (23 economies) from 1994 to 2016. Their results imply that a country with a less flexible exchange rate regime will have a higher growth rate.

Using panel data from five MENA countries (Algeria, Egypt, Jordan, Morocco and Tunisia) over the 1984–2019 period, Boucheta et al. (2021) carry out an empirical study on the existence of a link between exchange rate regimes and economic growth. They highlight the positive impact of the flexible exchange rate regime on economic growth. However, Alexis (2022) shows that developing countries with a fixed exchange rate do better than other countries with other exchange rate regimes when it comes to economic growth. In the same direction, Davis (2013), used the classification of *de jure* and *de facto* regimes for 35 sub-Saharan African (SSA) countries from 1985 to 2009, after separating the effects of membership of the monetary union from those arising from pegging to the CFA franc, concludes that CFA zone countries outperform those outside the CFA zone.

3. The CFA Franc: more than 50 years of mitigated economic performance

Developing countries are generally characterized by a ‘fear of floating’, which raises the issue of the choice of an exchange rate regime, and imposes a trade-off between credibility and flexibility. Given their characteristics (high economic instability, high inflation, volatility of production), monetary strategies are moving towards the establishment of currency areas and, in the long term, the implementation of a common currency for Africa. This trend in Africa is largely influenced by the relative stability of the CFA zone² (Coulibaly & Davis, 2013).

3.1. Inflation

Imported credibility is one of the critical arguments of the peg (in this case CFA-Euro), and in this section, we will examine whether this peg has achieved price stability in the zone. To do this, we extracted data on the inflation rate from 1980 to 2021 from the World Development Indicators (WDI). We compute for WAEMU & CAEMC, the average inflation rate for each country, inflation variability, and CFA zone average inflation for sub-periods 1980–2001 and 2002–2021.

Over the study period, 1980–2002, if one excludes Guinea-Bissau which joined the WAEMU zone only in 1997, the average inflation for the zone is about 6.89%. Once Guinea-Bissau is included, average inflation over the same period stands at 11.42%. And, over the 2002–2021 sub-period, the average inflation rate in the zone is 2.62%. If Guinea-Bissau is included, the average inflation rate over the same period is 2.57%. Out of 8 countries in this group, 5 had an average inflation rate of less than 3.5% (Table 1 panel A). For CAEMC, the average inflation for the zone is about 7.45% for the sub-period 1980–2002. Over the 2002–2021 sub-period, the average inflation rate in the zone is 4.02% (Table 1, panel B).

For a comparative analysis, we have calculated the average inflation rate of a few similar non-CFA zone countries (Table 2). The average inflation rate over the 2002–2021 period is 17.69%. For all countries, the average inflation rate is higher than 8%.

Inflation variability is also a good indicator of price stability (Appendices 1 and 2). During the sub-period, 1980–2001, inflation variability is 2.14% and, from 2002–2021, it drops to 0.81% without Guinea Bissau. At the same time, for CAEMC, the average inflation variability is 3.3% (1980–2001) and 2.08% (2002–2021). For the non-Franc Zone group, the variability is about 5.02%. It is clear that, regarding inflation, CFA countries outperform non-CFA countries. In other words, the CFA agreement appears to be very effective in ensuring price stability and the credibility of low inflation (see Edwards & Savastano, 1999; Edwards 1993; Ghosh et al., 1996). We will now test whether the same is true for GDP per capita within the zone.

Table 1. CFA franc zone countries annual inflation rate (in percentage).

Panel A : WAEMU zone		
Countries	1980–2021	2002–2021
Benin	10.0886	2.1809
Burkina Faso	4.0958	2.2932
Ivory Coast	10.1524	1.8367
Guinea-Bissau	43.1412	3.0340
Mali	6.9661	3.1876
Niger	6.4709	2.8754
Senegal	4.4760	1.8880
Togo	6.0303	3.7419
Average inflation for the WAEMU zone	11.4276	2.6297
Average inflation without Guinea-Bissau	6.8971	2.5720
Panel B : CAEMC zone		
Countries	1980–2001	2002–2021
Cameroon	7.0840	1.8336
Central African Republic	6.5481	2.9473
Chad	5.2621	3.2273
Congo, Rep,	7.3655	5.9266
Equatorial Guinea	11.0392	6.8367
Gabon	7.4425	3.3846
Average inflation for the CAEMC zone	7.4569	4.0260

Source: Author's calculation based on WDI data.

Table 2. Non-CFA franc zone countries' mean annual inflation rate in percentage.

Inflation countries		
Country	1980–2001	2002–2021
Angola	550.9314	30.9267
Burundi	10.3255	9.3748
Congo, Dem, Rep,	1810.0590	15.6015
Ethiopia	5.3227	13.5142
Gambia, The	14.5303	10.2827
Ghana	36.1786	20.9123
Guinea	11.1457	14.4249
Kenya	11.8579	8.5482
Madagascar	18.4232	8.4497
Malawi	23.3364	20.9094
Nigeria	30.4076	11.0264
Sao Tome and Principe	0.0000	10.3976
Sierra Leone	47.0882	10.5106
Sudan	50.6410	38.0634
Tanzania	23.8338	7.2372
Uganda	53.1089	8.7365
Zambia	51.1202	12.3375
Zimbabwe	−1.6380	67.2388
Average inflation	152.5929	17.6940

Source: Author's calculation based on WDI data.

3.2. GDP per capita

In a sample of 74 countries, Jacob (2016) finds a positive and significant correlation between fixed exchange rates and GDP growth. Similarly, Elu and Price (2008) find positive effects on growth for the period 1999–2007 for member countries of the CFA zone. Following Feindouno et al. (2020), the fixed exchange rate introduces more qualitative effects related to inclusive growth, which seems to protect the poorest, whose well-being is not easily adjusted to inflation and macroeconomic instabilities. By comparing the performance of the franc zone in terms of GDP per capita with that of countries non-franc zone, authors note differences. It is widely accepted that CFA zone countries perform worse than other countries outside the CFA zone in terms of economic performance.

For 2002–2021 (see Figure 1), the average GDP per capita growth for CAEMC, except 2004, decreased drastically compared to WAEMU and The non-CFA countries. The mean annual GDP per capita growth (Appendices 3 and 4) decreases from 1990–2001 to 2002–2021 about (−0.0071), confirming this situation.

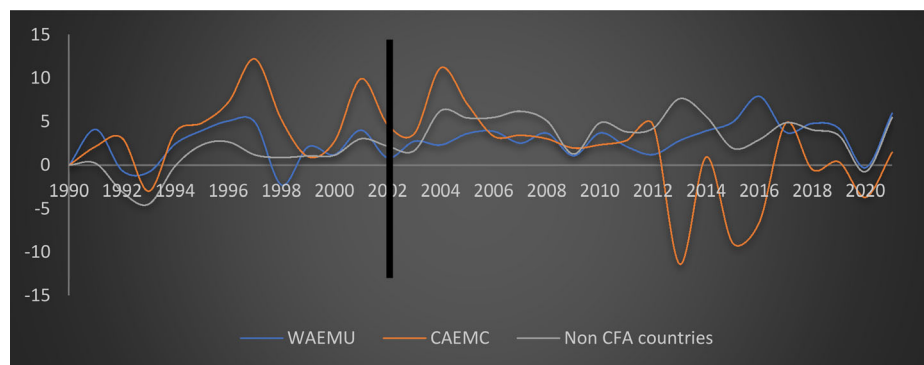


Figure 1. The evolution of GDP per capita growth during the two sub-periods: 1990–2001 and 2002–2022.
Source: Authors, based on WDI data.

WAEMU outperforms better than CAEMC and non-CFA countries, but it is not persistent. The average GDP per capita growth decreased by about (-0.0352) , from 1990–2001 to 2002–2021, while for non-CFA countries it stood at the same level of 1.38.

Overall, the results are broadly similar. They are consistent with recent studies that have found that exchange rate regimes do not explain significant differences in economic performance between countries (Klein & Shambaugh, 2010; Rose, 2011).

4. Methodology and data

This paper aims to estimate the impact of CFA pegs to the Euro. Ideally, we would like to observe what happened to the CFA zone in the absence of the Euro arrangement. In other words, we try to find out what the real GDP per capita would have been in these countries if this treatment had not taken place. Of course, this situation is not observable because the treatment was experienced by our different countries due to France's entrance into the eurozone. The presented method, based on the pre-treatment data, makes it possible to create a 'synthetic country' for each of the countries studied, defined as being the weighted average of the control countries similar to our treated country. Thus, the synthetic control is constructed in a way to follow the pre-treatment country's GDP per capita but also, at the same time, to match on actual country's GDP per capita with the values of the explanatory variables. However, because of the biases that the classic SCM may present, the 'bias-corrected' synthetic control will be used as a counterfactual. As we will see in the following subsection, the 'bias-corrected' SC (Ben-Michael et al., 2022; Wiltshire, 2021) follows the basic premise of the synthetic control method.

4.1. Synthetic control method (SCM)

Under appropriate conditions, the SCM is increasingly used by researchers. According to Abadie (2021), this is explained by a set of advantages provided by the method. It allows for building a counterfactual situation that would have been measured in the absence of the treatment because the purpose of impact assessment requires comparing the treated outcome with that obtained without the treatment. As pointed out by Gbato et al. (2018), this method is part of the classic analysis framework of Rubin (1974) defining the effect of public policy as the difference between the counterfactual and the actual situation observed in the treated unit.

The counterfactual consists of a weighted average of potential comparison countries that best reflects the initial trends or characteristics of the treated country before the treatment takes place. Unlike other regression methods, the weighted average of potential control or donor units, by fulfilling the requirement of similar characteristics, provides a more relevant comparison to the treated unit than a single control unit (Abadie, 2021). The contribution of each potential control to the construction of the counterfactual is explicit. This makes the method flexible in how to choose appropriately comparison countries that are closely matched to the treated country. And finally, the SCM makes it possible to

determine the difference between the outcome variable and the other predictive variables between the treated unit and donor pool (Abadie, 2021). In addition (Abadie et al., 2007, p. 3) claim that: ‘the choice of a synthetic control does not require access to post-intervention outcomes, the SCM allows researchers to decide on study without knowing how those decisions will affect the control of their studies’.

The SCM provides causal results based on two requirements that can overcome these weaknesses. First, the treatment must not affect any of the control countries. This is known as the Stable Unit Treatment Value Assumption (SUTVA). Second, we assume that the effects we find are only due to the treatment. None other simultaneous or subsequent treatments cause the obtained results.

As mentioned above, far from the passionate debate between those for and against the CFA, each with their arguments, the evaluation of a possible significant effect of the pegging of the CFA to a strong currency, the euro, on income lends itself to a more efficient study using the synthetic control method compared with other methods. Firstly, the method excludes any variable that might anticipate treatment. To this end, the misalignment of the CFA, whether overvalued (Nubukpo, 2017) or not (Plane & da Piedade, 2022) is not considered a control variable. Real GDP per capita is controlled only by variables highlighted in the literature and not directly related to the pegging of the CFA (the exchange rate). Thus, our results could contribute to the debate on (i) the costs of a possible over-evaluation of the CFA, which would favour imports; (ii) the potential benefits of the CFA Franc zone, such as providing its members with a stable currency and access to a large market; (iii) the costs of abandoning the CFA Franc zone, such as the possibility of higher inflation and higher transaction costs. Secondly, unlike the difference-in-difference or propensity score matching methods, which provide an estimate of the average effect of the treatment, the SCM makes it possible to estimate the evolution of the effects over each of the posttreatment periods. In this way, it is possible to detect the non-linear effect of the euro peg from the first year of treatment (2002), which is more relevant than a single average effect over the entire posttreatment period provided by the above-mentioned methods.

4.1.1. Motivating model

The effect of the conventional CFA Franc peg to the Euro (treatment) on the real GDP per capita of WAEMU and CAEMC countries (outcome) can be captured through the following model. Suppose that we observe $i = 1, \dots, 13$ countries³ experienced the treatment. T observation periods, where $t = t_1, \dots, T_0$ and $t = T_0 + 1, \dots, T$ defined respectively as the pretreatment and the posttreatment periods. $real_GDPpercapita_{it}^1$ and $real_GDPpercapita_{it}^0$, a vector of outcomes variables for the unit i at respectively the posttreatment and the pretreatment periods. Following Abadie (2021), the situation in the absence of treatment can be written as follows:

$$real_GDPpercapita_{it} = \beta X_{it} + \theta_i \mu_i + \tau_t + \varepsilon_{it} \quad (1)$$

where X_{it} is a vector of observed covariables (not affected by the treatment) for countries that vary over time. μ_i represent the fixed observed characteristics over time for a country i but whose effect θ_i may vary over time; τ_t are the time commons effects to all countries i and ε_{it} the error term, i.i.d. X represents all identified control variables appropriately in the empirical literature as factors affecting economic growth.

For each treated unit i , the treatment effects on the economic growth at time t can be written as follows:

$$\delta_{it} = real_GDPpercapita_{it}^1 - \sum_{j=2}^{13} w_j^* real_GDPpercapita_{it}^0 \quad (2)$$

w_j^* is a set of non-negative weights whose sum makes 1 and which makes it possible to minimize the pretreatment distance between the treated unit and the control units. The weight of w_j is chosen such that:

$$w_j^* = argum(X_{it}^1 - X_{it}^0 w)' V (X_{it}^1 - X_{it}^0 w) \quad (3)$$

where X_{it}^1 and X_{it}^0 are two vectors – respectively $(k-1)$ and $(k-J)$ – composed of outcome and covariate variables respectively of the treated and control units before treatment. The symmetric V matrix, positive definite, weights the relative importance of the different covariates of X as predictors of the outcome

variables. Several methods can be used to determine W and V , but we follow the recommendation of Abadie et al. (2010) and Abadie (2021) which consists in choosing W and V such that they minimize the RMSPE (Root Mean Square Prediction Error) of the posttreatment outcome variable.

4.1.2. SCM bias correction

A synthetic control estimator compares the outcome of a treated unit to the outcome of a weighted average of untreated units that best matches the characteristics of the treated unit before the intervention. However, as emphasized by Abadie and L'Hour (2021), in the synthetic control construction procedure, interpolation biases (pairwise matching discrepancies) may appear. This problem is further highlighted by Wiltshire (2021). The author affirms that bias may affect the synthetic control estimated marginal treatment effects because of discrepancies between the predictor variable values in each treated unit and its synthetic control in the values of matching variables. This, therefore, biases the estimated average treatment effect of the 'classic' SCM (Abadie & L'Hour, 2021; Ben-Michael et al., 2022). Wiltshire (2021) proposes a synthetic control bias-correction procedure ('bias-corrected' SC estimators) that automates the implementation of several extensions to the 'classic' CS estimators. However, as pointed out by the author, the pretreatment fit of the outcome variable will not be necessary to improve, the 'bias-corrected' SCM will address discrepancies between a treated unit and its donor pool in the values of all specified linear combinations of predictor variables, including the covariates. Thus, SC bias correction offers:

- Automated calculation of bias-corrected synthetic control gaps;
- Automated calculation of RMPSE p-values from in-space placebo tests;
- expanded graphing functionality;
- Uniqueness diagnostics (e.g. warns if the W matrix is unlikely unique).

Empirically, to correct any bias procedure for inexact matching of predictor values between a treated unit and its synthetic control donors, we re-estimate the classic SCM by using the Stata command `allsynth`.⁴

4.2. Inference

One issue economists often have with case studies in the absence of randomization and the small size of the control group is the lack of significance tests for the results (Firpo & Possebom, 2018). Abadie et al. (2010) address this issue and show that placebo studies provide a way to assess the statistical significance of the results. Placebo studies assume that the control group that did not undergo the treatment should have smaller trends, like the CFA franc countries, in outcome variables in the posttreatment period. Otherwise, the validity of the SCM will be severely undermined, and it could imply the effect was observed by chance. Specifically, the placebo test aims to see whether the deterioration in the ability of the control to match the CFA franc-zone countries post-2002 is largely relative to random deviations using the procedure where there was no intervention.

There are two types of placebo tests. First, in-time placebo by reassigning the time of the intervention. In our case, we could assume that the two CFA franc-zone countries peg their single currencies to the euro as a result of France joining the Eurozone in 1995 instead of 2002. This 'false treatment' should not result in significant treatment effects. Otherwise, it will be difficult to attribute the 'false treatment', pegging the CFA franc to the euro from 1995, as a reason for the observed trends in our outcome variables. Second, in-place placebos conduct sequentially the control synthetic analysis for all countries in the control group and compare the results with those obtained for our treated unit. Since the countries in the control group did not experience the treatment in 2002, we would observe a smaller treatment effect on our control units. Thus, our main results generated by the SCM on the treated unit are valid if there are no significant changes in the predictability of the control group outcomes.

In this paper, we assess the statistical significance of our results by adopting the alternative statistical inference procedure introduced by Galiani and Quistorff (2017), the in-place placebo tests. As mentioned by Wiltshire (2021), the 'bias-correction' SC command, `allsynth`, includes an in-space placebo test and

their inference (p-value) is obtained by comparing the estimated main effect with the distribution of in-place placebo effects.

4.3. Data and sample

We use annual country-level panel data over the period 1980–2019. Each CFA Franc country that experienced the treatment of its single currency as a consequence of France joining the Eurozone, is controlled by 21 developing countries to construct the synthetic counterpart. One of the major difficulties in public policy comparison exercises lies in identifying the units of the control group. The latter in our sample include African countries with the same socioeconomic characteristics as the treated countries (Botswana, Cabo-Verde, Eswatini, Lesotho, Mauritius, Morocco, Namibia, and Seychelles). However, to maximize the probability of finding the best match with the ‘counterfactual’, countries outside the continent, but with the same level of development as treated units (WB ranking, 2022), have been introduced (Bangladesh, Barbados, Buthan, Bolivia, Dominican Rep., Ecuador, Grenade, Laos, Oman, Panama, Saint Kitts & Nevis, and Saint-Lucia). From a technical point of view, the first requirement of the control group is not distorted. No control country has experimented with the treatment. And, empirically, these donor pool counties are chosen to match the pretreatment socioeconomic characteristics of the treated country as far as possible so that in the pretreatment period, the two graphs (actual and synthetic) should practically overlap. In other words, the outcome variable for the synthetic unit is as similar as possible to the actual outcome variable of the treated unit.

Bouvet et al. (2022) underline that the choice of pretreatment characteristics should include variables that can approximate the path of the treated country, but that do not anticipate the effects of the treatment. However, there is no strategy for the covariables selection. According to Andersen (2022), this lack of consensus is particularly pertinent when it comes to economic growth⁵ and, thus, for the researcher, the most important thing is to choose ‘appropriate’ predictors which in fine will make it possible to obtain specifications which give ‘better’ results. However, as Andersen (2022) points out, a question remains: whether alternative specifications lead to similar synthetic control estimators. If so, the problem of specification searches becomes (asymptotically) irrelevant (Ferman et al., 2020). In what follows, we have experimented with a wide set of additional growth predictors – such as inflation, manufacturing, export, import, schooling, rural population, tax revenue, central government debt, consumption ... – but their inclusion did not change our results substantively.⁶

Thus, to determine the effects of pegging the CFA to the euro on income, real GDP per capita, we control with a vector of explanatory variables drawn from both theoretical and empirical literature. To increase GDP per capita, we need to increase productivity or global factor productivity. In other words, increase the efficiency of the production process. In this way, real GDP per capita is controlled by the capital factor – gross fixed capital formation rate (GFCF as % of GDP), government expenditure (% of GDP), official development assistance (% of GDP), Foreign development aid (FDA as % of GDP) – and the labour factor (captured by employment, i.e. the proportion of the population in work).

GDP per capita trajectory depends on many factors, such as the discovery of natural resources – which can be captured here through government expenditures–, structural policies, governance, institutional quality, and shocks experienced during the study period. Thus, we introduce the political regime characteristics and transitions (institutions) but also agriculture and industry-added values (as % of GDP). Moreover, to take into account the effects of the devaluation of the CFA franc in January 1994, we introduce a dummy variable taking the value 1 if and only if the country is treated. About the outcome variable trend, we introduce their lagged values as explanatory variables. Some studies include the entire pre-treatment period as covariates, but this specification of synthetic control is problematic. It leaves no room for other explanatory variables (Kaul et al., 2016). Past values of the outcome variable almost exclusively determine the choice of control countries. As a result, while the pre-treatment period is well predicted, the prediction of future developments is not. In our specifications, like Abadie et al. (2021), we decided to introduce the lagged outcome variable as a covariate only over three periods 1980, 1995 and 2001 corresponding respectively to the income of the first pretreatment period, the one just after the devaluation of 1994 and finally that of the last pretreatment period. For more detail see Appendix 5.

The new pegging of their single currency of the single currency at a fixed parity to the euro has been effective with the introduction of the euro on January 1, 2002, giving a reasonable pretreatment (22 years) and posttreatment (19 years) information thereby avoiding the risk of bias in the marginal distribution of the marginal statistic (Ferman et al. 2020; Ferman & Pinto, 2017). With all the requirements for SCM application, we conduct separately 14 quasi-experiments representing the two CFA zones countries which have experienced the intervention.

One of the main difficulties in public policy comparison exercises is identifying the units in the control group. Like Bouvet et al. (2022) and Strong (2021), our choice of control countries obeys four rules to reinforce the similarity with the treated units, CFA franc countries. First, the donors should not have adopted the treatment, and they should not be influenced by the adoption of the treatment in the treated country. Secondly, for a suitable donor pool, only low -and middle-income countries are chosen. Thirdly, we fix that the income of the donor country must not be five times higher -or lower- than that of the treated unit. Fourthly, in addition to the statistical inspection of the database on the socio-economic structure of our countries, except for Ecuador and Panama which are dollarized economies, we retain only countries with a fixed exchange rate regime (IMF's annual report on exchange rate regimes and exchange restrictions (AREAER, 2019)) and which have not experienced a financial crisis during the period.

5. The experiment

This section explains how we construct a synthetic version for each treated Franc CFA zone country.

For each separately conducted experiment, a synthetic treated unit will be constructed that mirrors the actual outcome treated unit's pretreatment record from 1980 to 2002 for the outcome variable, the real GDP per capita. In addition to the outcome variable, real GDP per capita, delayed over three periods – 1980, 1995 and 2001–, nine (9) covariates were introduced to construct the control. Except for the share of industry in GDP and the 1994 devaluation, most of the covariates have a significant effect on real GDP per capita (Appendix 6). This significance test, besides empirical literature, justifies the model used for our different countries treated.

Following the technique described above, Table 3 lists the country weights generated by the synthetic control method to create a synthetic for each treated country for the considered experiment. So, the resulting counterfactual synthetics best reproduce the values of the predictors of income in each CFA Franc country in the pretreatment period. Columns show the estimated weight for the synthetic of

Table 3. Estimated synthetic control weights by outcome variable – real GDP per capita – for each treated country.

	Benin	Burkina F	Ivory Coast	Guinee B	Mali	Niger	Senegal	Togo	Cameroon	CAR	Congo	Gabon	E. Guinea	Chad
Bangladesh	.441	.359	0	0	.1	.116	.9	.209	.283	0	0	0	0	.54
Barbados	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bhutan	0	0	0	.223	0	0	0	0	0	0	.292	0	.885	0
Bolivia	.053	0	.251	0	0	0	0	0	.048	0	0	0	0	0
Botswana	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cabo Verde	.008	0	0	0	0	0	0	0	0	0	0	0	0	0
Dominica	0	0	0	0	0	0	0	0	0	0	0	0	.09	0
Ecuador	0	0	.289	0	0	0	0	0	.144	0	.263	.377	0	0
Eswatini	0	0	0	0	0	0	0	0	.125	0	0	0	0	0
Grenada	.008	0	0	0	0	0	0	0	0	0	0	0	0	0
Laos	.489	.599	0.46	.777	.575	0.884	0	.791	.399	.93	0.048	0	0	.46
Lesotho	0	.042	0	0	.325	0	0	0	0	.07	.396	0	0	0
Mauritius	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Morocco	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Namibia	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oman	0	0	0	0	0	0	0	0	0	0	0	.623	.025	0
Panama	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Saint Kitts & N.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Saint-Lucia	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Seychelles	0	0	0	0	0	0	.1	0	0	0	0	0	0	0

Note. Donors that receive a positive weight are in bold for the reader to more easily identify. Values are rounded, so the columns may not sum to.

Here, CAR for Central African Republic.

each treated unit labelled at the top of the column. The column represents the outcome variable, real GDP per capita. Values are in percentage points. The weights obtained are from a cross-validation technique.

We estimated the basic model and a supposed unbiased model following the recommendation of Ferman and Pinto (2016). When comparing the real GDP per capita of the treated unit with its synthetic control counterpart during the pretreatment period, we select the synthetic control results that minimize the root mean square prediction error. As mentioned by Abadie et al. (2021), the control synthetic method provides a quantitative tool to select or validate comparison units. In Table 3, we can see each treated country, and in order of significance, its potential comparison countries. Thus, for each country treated, it is possible to closely reproduce its economic characteristics before the 2002 intervention without extrapolating outside of the support of the data for the donor pool (Abadie, 2021).

In 10 estimates out of the 14 treated CFA franc countries, Laos accounts for a substantial positive weight. For Burkina, Guinea, Mali, Niger, Togo, and the Central African Republic, Laos accounts for more than 55% of the weight. At the same time, this weight is also not negligible for Benin, the Ivory Coast, Cameroon and Chad. Bouvet et al. (2022) point out that the significant weight in the construction of CFA country's synthetic control is partly explained by the fact that Laos' income levels over the pretreatment period are closer to those of the CFA franc-zone countries than most other countries included in the control group. Another Asian country with socioeconomic characteristics similar to the countries of the CFA zone, Bangladesh, finds itself with a significant weighting in the construction of the synthetic of 8 countries (in order of weighting: Senegal, Chad, Benin, Burkina, Cameroon, Togo, Niger and Mali). For Senegal, whose statistics show convergence with Bangladesh, the counterpart of its outcome variable before treatment includes Bangladesh at 90%. Bolivia, the 56th world oil producer, weighs the synthetic control of two 'small producers' of oil in the CFA area, the Ivory Coast and Cameroon. Moreover, in this poor South American economy, cash crops (sugar cane, cotton, coffee, corn, rice and wheat) represent 20% of the GDP and employ more than half of the working population. If the weight of Bhutan in Congo and synthetic Equatorial Guinea could be explained by their status as an oil producer in the GDP per capita, the weight of Ecuador, in addition to the two countries mentioned, in the Ivory Coast and Cameroon synthetics could be explained by the importance of the primary sector in socio-economic activities. Their status could explain the weight of Oman, an oil monarchy, in synthetic Gabon as an oil producer which boosts the inhabitants' income. The other countries that make up the 'synthetic countries', to a lesser extent, are three African countries (Cape Verde, Lesotho and Eswatini).

Table 4 presenting the pretreatment characteristics between the actual outcome treated country and the 'synthetic country', shows that, apart from institutions (opposite sign) and industry, the values of the post-treatment synthetic characteristics correspond fairly well to those of the country. The characteristics are adjusted, and the synthetic control provides a good fit in terms of pre-treatment outcomes and observed covariates. This also confirms to what extent the weighted combination of the control pool is likely to reproduce the trajectory of the real GDP per capita of the treated country before the effective peg of the currency to the euro in 2002.

Moreover, for any variables that can be considered not adjusted, recent work on synthetic control methods posits the primacy of matching on pre-treatment outcomes rather than on the balance of observed predictor values. Botosaru and Ferman (2019) show that a specification whose estimated values of the predictors are not fitted is not necessarily problematic, even when the predictors are relevant in determining the potential results. As Andersen (2022) points out, this demonstration is made based on the famous application of Abadie et al. (2015) on reunification in Germany. By focusing only on the matching of the preprocessing outcome variables (actual and counterfactual), Botosaru and Ferman (2019) come up with identical results compared to a synthetic control experiment which also approximates the treated unit in terms of numerous covariates. Therefore, the counterfactual estimated using only the pretreatment outcomes is very close to the original one that corresponds directly to these predictors.

Table 4. The average of the Predictor of per-capita GDP before treatment for franc-CFA zone countries and pool control countries.

Covariables	Benin actual	Benin synth	Burkina	Burkina synth	Chad	Chad synth	Cameroon	Cameroon synth
Agriculture	30.04073	26.4032	27.23431	27.40018	41.1814	26.87521	19.82546	23.31198
Industry	15.99823	23.34616	21.74132	23.36579	14.02381	23.18142	27.98465	26.047804
Government	1.642252	1.582268	1.280902	1.676705	0.749158	1.473834	1.1513584	1.1729046
Investment	1.464882	2.059665	1.540666	2.13311	1.338309	2.042431	1.1495049	1.198895
ODA	8.242362	6.241135	11.80253	6.810809	10.3219	5.676904	3.696265	5.370352
FDI	1.104255	1.1493395	1.1100267	1.1415737	0.932318	1.525401	0.726887	1.425758
labour	2.488525	12.19684	4.666861	9.579602	3.34609	15.33056	6.249838	10.85498
Institutions	2.820513	-2.424846	-2.538462	-3.700154	-2.230769	-2.515385	-5.25641	-2.221077
Devaluation 1994	0.025641	0	0.025641	0	0.025641	0	0.025641	0
Real GDP per capita (1980)	378.0443	397.1006	282.6859	388.7716	228.8225	345.7445	774.1852	737.0012
Real GDP per capita (1995)	367.3877	407.2905	235.8322	358.3908	206.2607	344.9293	798.8813	818.5633
Real GDP per capita (2001)	518.0674	443.8607	267.0976	361.8709	197.1461	375.3927	687.6481	756.8909

Covariables	Ivory Coast	Ivory C. synth	Gabon	Gabon synth	Mali	Mali synth	Niger	Niger synth	CAR	CAR synth
Agriculture	21.56174	22.02763	6.310693	7.035862	35.96882	23.17076	36.04983	30.15423	38.22261	29.50049
Industry	18.81818	26.69135	51.98367	46.6368	18.76487	24.8251	20.76442	23.08981	8.960847	23.43981
Government	1.561551	1.980066	1.731122	1.925073	2.267485	2.018874	2.097858	1.906491	1.975878	2.042902
Investment	0.886782	2.048521	1.652156	2.525734	1.241067	2.201	1.1621974	2.271727	1.184897	2.2315959
ODA	4.630464	5.767511	1.443046	7.716212	14.28346	8.332005	11.05083	8.260345	14.39514	8.945771
Labour	4.947632	4.883337	3.799407	2.658771	3.587896	3.385728	4.923273	4.674918	1.377802	2.343753
Institutions	-2.76923	7.7242051	-3.53846	-2.77548	1.564103	-3.30128	1.025641	-6.054154	-7.9487	-6.3789
Devaluation 1994	0.025641	0	0.025641	0	0.025641	0	0.025641	0	0.025641	0
FDI	1.459756	1.374157	0.790182	2.492877	0.967499	1.271676	1.00155	1.274255	0.609893	1.208567
Real GDP per capita (1980)	1266.624	1076.333	5892.099	4072.086	248.1891	409.1505	418.8553	459.5419	362.4001	478.2006
Real GDP per capita (1995)	997.4788	936.1037	4570.571	4705.185	282.341	413.6759	208.3771	337.1605	346.1082	375.3474
Real GDP per capita (2001)	997.4788	936.1037	3993.031	5994.799	307.7058	361.3168	208.3771	337.1605	250.5762	332.4482

Covariables	Senegal	Senegal synth	Togo	Togo synth	Equa. Guinea	Equa. Guinea synth	DRC	DRC synth	Guinea B	Guinea B. synth
Agriculture	11.27865	23.20434	32.53139	29.45159	5.00784	23.38972	7.891784	16.45307	46.88025	29.76493
Industry	20.78047	31.78484	19.25387	23.10944	55.00117	32.59882	52.07516	30.17035	13.75433	25.3405
Government	1.826579	3.121148	1.581985	1.813778	3.089052	3.304908	3.346866	2.396506	2.712447	2.242669
Investment	4.451363	3.782886	1.832138	2.222592	1.473769	3.513008	2.298496	2.632495	1.017682	2.648837
ODA	23.8637	12.70928	9.001099	7.706751	17.44801	12.12897	6.206908	8.060002	33.02647	9.974081
Labour	3.375063	3.26919	2.000675	7.931617	2.263649	2.175944	1.090125	1.833755	4.784167	1.868964
Institutions	5.717949	-4.4589	-3.82051	-5.29584	-6.25641	-4.17730	-4.128205	6814615	-230769	-6.68551
Devaluation 1994	0	0	0.025641	0	0.025641	0	0.025641	0	-	-
FDI	1.73211	1.1612805	0.983536	1.328072	0.934027	1.478636	0.0576188	1.362058	0.048092	1.1261758
Real GDP per capita (1980)	501.1375	517.6503	417.6691	435.1567	202.6274	424.4321	959.4275	832.0547	141.5594	451.2432
Real GDP per capita (1995)	1261.103	1163.865	309.8183	356.6788	285.5526	858.5761	781.525	946.0339	233.2433	403.8911
Real GDP per capita (2001)	1292.227	1454.303	292.8231	345.3531	2313.166	1201.568	869.1005	897.8115	319.9575	424.5023

6. Results

The results of our experiments are presented for each CFA franc zone. The two currency zones, WAEMU and CAEMAC, differ in their economic structures and are heterogeneous (Gnimassoun, 2012, 2017) which does not allow for a comparison between zones.

Our estimate of the effect of pegging the common currency to the euro for treated CFA franc country is given by the difference between the actual real GDP per capita and its 'bias-corrected' SC over the 2002–2019 period. A positive (negative) posttreatment value indicates that the actual real GDP per capita of a treated CFA franc country is higher (lower) than the real GDP per capita level of the bias-corrected SC.

In [Figures 2](#) and [3](#) of the results which will be presented for the two CFA franc zones, the position of the broken line relative to zero before the 2022 reform captures the quality of the pretreatment fit reached by the 'bias-corrected' SC method algorithm. So, the closer to zero the broken line is in the 1980–2002 pretreatment period, the better the fit, and therefore the more confident one can be that any real GDP per capita difference measured post-2002 would be the result of the experiment. Close fit both for the pretreatment real per-capita income and its predictors show that our pool donor provides a country combination that can reproduce the economic attributes of the CFA franc-treated countries before the 2002 treatment period.

6.1. WAEMU results

[Figure 2](#) below presents the results of our experiments for the seven WAEMU countries. Concerning the eighth of the countries in the zone, Guinea Bissau, as mentioned above, we have chosen not to retain it because of its late accession to the WAEMU zone in 1997. Consequently, we do not have a sufficiently robust pretreatment period.

Overall, for all treated WAEMU countries, we can affirm that our 'bias-corrected' SC estimators do an excellent job in the construction of the 'synthetic' which corresponds to real GDP per capita before 2002 ([Figure 2](#)). The differences observed because of bias, essentially not very substantial, are taken into account in the bias-corrected SC model. The pretreatment differences observed are not very substantial and practically tend to settle over time, particularly from 1987 onwards.

After 2002, the gap which represents the difference between the two series (the trajectory of the full black lines) highlights mixed fortunes within WAEMU countries.

A first sub-group of countries including Mali and Burkina Faso for which our estimated results seem to suggest that pegging the CFA Francs to a strong currency, the euro, as a result of France joining the eurozone, had a positive impact on these countries' real GDP per capita. These positive effects, actual outcomes greater than bias-corrected synthetic outcomes, are less marked in the first pretreatment periods. The positive divergence between the two series increases over time after the years 2008 and 2012 respectively for Mali and Burkina Faso. [Appendix 7](#) presents the statistical significance of our results. As outlined above, we run in-place placebo tests where we assign the treatment to all control countries and compute p values, using the distribution of our placebos tests. Significance tests show that any gaps between this first sub-group actual posttreatment and their 'bias-corrected' SC are statistically insignificant at a 10% level or better.

A second sub-group composed of Benin, Niger, and Togo for which, immediately after 2002, their actual outcomes positively diverge from their bias-corrected synthetic outcomes. However, we observe that towards the end of the pretreatment period, the gap curves dip and even pass slightly below the abscissa axis. At 10% or better, for Benin, the p-value from the placebo tests in [Appendix 7](#) reveals that pegging the CFA to the euro leads to a statistically significant increase in real GDP per capita only over three posttreatment periods (2009, 2010 et 2011). The other pre-treatment periods are not significant. The same insignificant results of our placebo tests are also highlighted for Togo throughout the entire pretreatment period except for 2019. For Niger, our placebo test results indicate that the effects found are negatively significant only over the last three posttreatment periods (2017, 2018 and 2019).

Finally, for the third and last sub-group composed of the two main WAEMU economies, Ivory Coast and Senegal, even if during the first posttreatment period they seem to have benefited from the

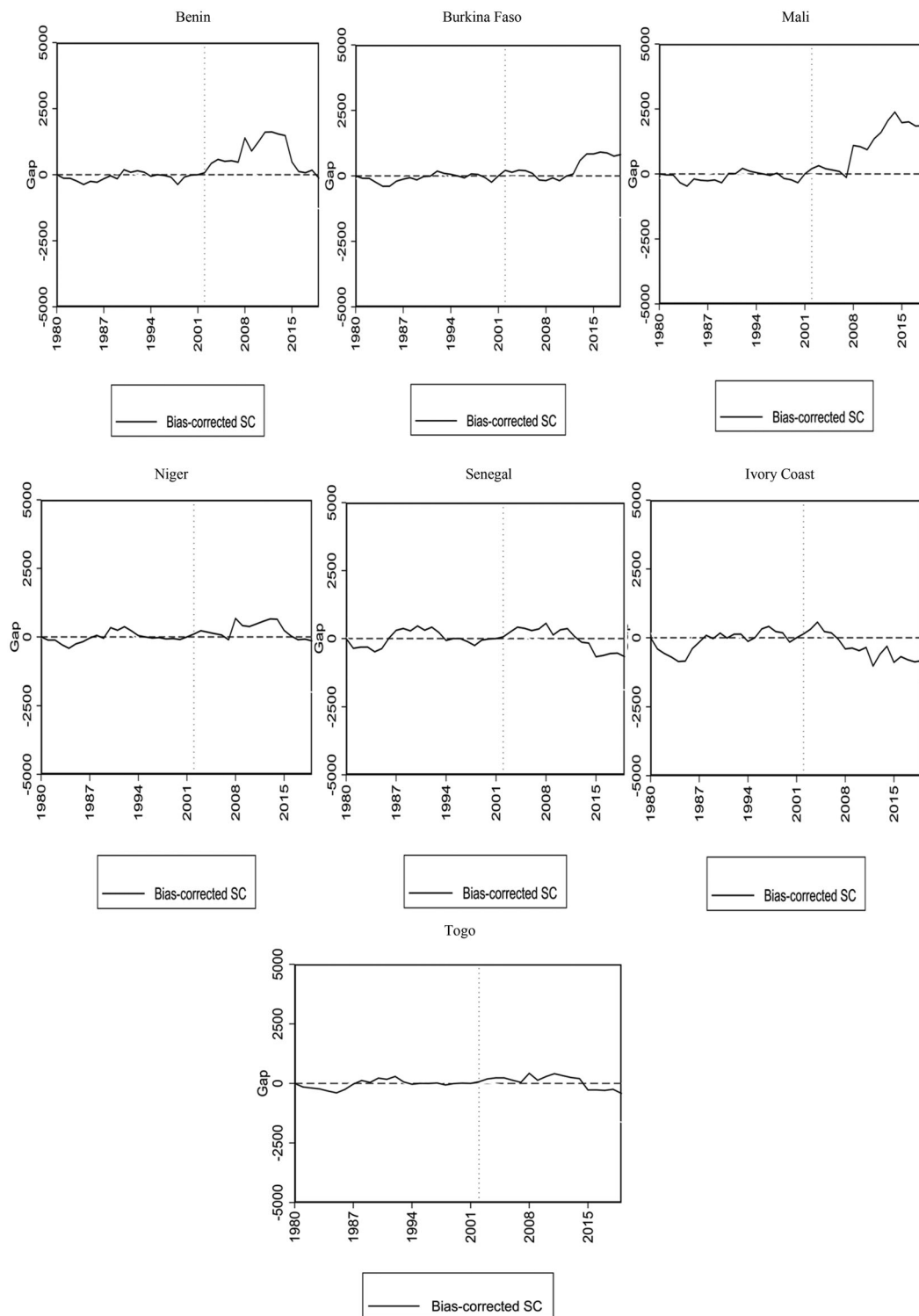


Figure 2. Real GDP per capita gap between actual WAEMU countries and their 'bias-corrected' synthetic counterparts.
Note. The gaps drawn between actual, and bias-corrected SC real GDP per capita are expressed in US\$.

treatment, our experiments suggest an overall negative effect on income. For Ivory Coast, the zone's leading exporting economy, the negative impact on real GDP per capita of pegging at a fixed parity the CFA to a hard currency, the euro, is observed after 4 post-treatment years, unlike Senegal where the negative impact on income is less significant and can be observed from 2013. The results of our placebo test show that, in Senegal and Ivory Coast, none of the 17 treatment periods is significant at the 0.10 level or better. Pegging the CFA franc to the euro as a result of France joining the Eurozone produce

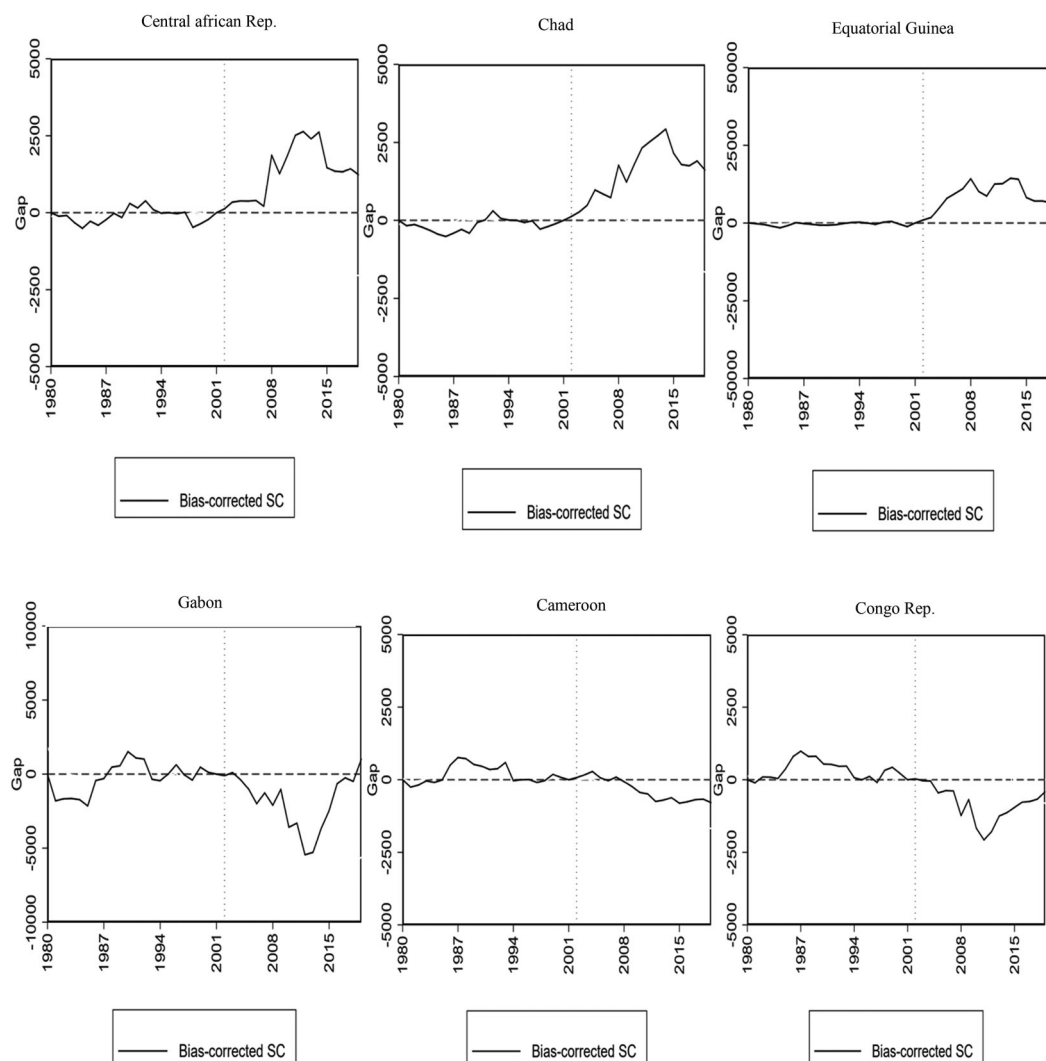


Figure 3. Real GDP per capita gap between actual CAEMC countries and their 'bias-corrected' synthetic counterparts.

Note 1: The gaps drawn between actual, and bias-corrected SC real GDP per capita are expressed in US\$.

any statistical difference in the income of these two leading WAEMU economies throughout the post-treatment period.

6.2. CAEMAC results

Comparing during the pretreatment period, 1980–2001, the actual pretreatment outcomes and its 'bias-corrected' SC performed very similarly for Equatorial Guinea. For the Central African Republic and Chad, Figure 3 shows that the actual outcome variable and 'bias-corrected' SC closely follow each other despite some slight differences observed over some pretreatment periods. For the other three remaining countries, over a large part of the pretreatment period, we cannot say that their 'Bias-corrected' SC matches the trajectory of their real GDP per capita. For Cameroon and Congo Republic, the 'bias-corrected' SC is slightly below the actual outcome over the period 1987–1994 (the year of the devaluation) before becoming almost similar in Cameroon and slightly above it in Congo. In Gabon, the beginning of the pretreatment period until 1987 is marked by a 'bias-corrected' SC below the actual outcome results. This pretreatment trajectory rises above before doing a very well job.

Also, in the CAEMC zone, a heterogeneity of situations of the treatment effects on income is highlighted. However, two major trajectories can be retained.

Situation 1 includes the Central African Republic (CAR), Chad and Equatorial Guinea. In these countries, after 2002, the actual outcome variable and 'bias-corrected' SC immediately start to diverge, with

the actual outcome greater than 'bias-corrected' SC as represented by the trajectory of the gap curve (Figure 3). So, our results suggest that pegging the CFA franc to the euro boosts the real GDP per capita contrary to what would have been observed without the treatment. We conducted statistical significance tests by running the in-place placebo: the probability that this would happen by chance (Appendix 8). The p-values for each year show that the large estimated differences between actual posttreatment experience and its 'bias-corrected' SC were statistically significant at the 0.10 level or better in 2 of the 17 years examined for CAR (2011 & 2012), Chad (2011 & 2012). For Equatorial Guinea, the p values are significant from 2004 to 2019 at the 5% level.

In situation 2, we find Cameroon, Gabon, and Congo Rep. where, initially, the two series are quite close before diverging. Our results suggest that the intervention did not boost income. Actual real GDP per capita is lower than their 'bias-corrected' SC ones. After 2002, pegging the CFA to the euro would have a substantially zero effect on income before the negative gap between the two series grows 3 years after treatment. This negative effect fades over time for Congo Rep. while in Gabon, the treatment is beginning to bear fruit since 2016. The p values from the distribution of in-place placebo results indicate that these differences between actual outcomes and 'bias-corrected' SC are not statistically significant both in any country and year in our posttreatment period.

7. Robustness tests

In this section, we run robustness checks to test the sensitivity of our main results a change in the country weight, W^* .

Based on estimated weights calculated for each treated country in creating the synthetic control (Table 1), like Bouvet et al. (2022), we re-estimate the baseline model to construct for each treated CFA franc country a 'bias-corrected' SC excluding in the iterations the control country that received a substantial non-zero weight in Table 1. According to Abadie (2021), by proceeding this way, we certainly sacrifice some goodness of fit, but this sensitivity check allows us to evaluate to what extent our results are driven by any particular control country.

In this robustness check, at first, the expected decline in the goodness of fit is moderate for all treated countries. Indeed, the comparison of the predictors of real GDP per capita in the countries treated and their synthetic control shows that despite the omission of the country which contributed the most in the synthetic control, the covariates remain adjusted. Then, except for the matching for Gabon, the new results (Appendices 9 and 10) are fairly similar to the previous baseline ones. The exclusion of the most weighted country did not cause a substantial change in the gap between the two series trend. Finally, these robustness tests come to confirm the potential gains from using combinations of countries rather than a single country as comparison cases in evaluation studies.

8. Discussions

The debate on the advisability of maintaining the franc of the African Financial Community (CFA) is becoming more and more pressing. Indeed, for decades, the CFA franc has fueled a virulent debate between, on the one hand, its detractors who denounce it as a 'post-colonial' currency that perpetuates France's influence in Africa. Thus, the two monetary unions do not promote trade between member countries (−15% in the WAEMU zone and this rate is below 10% in CAEMC) even less the higher incomes of the populations. And, on the other hand, its defenders praise the monetary stability it brings. In counterpart to the supposed macroeconomic stability offered by the Euro peg, these countries have little leeway in terms of price competitiveness, the evolution of which depends largely on that of the anchor currency. The issue of misalignments is acute for these countries which are small open economies with weak institutions. They face a double uncertainty: that is linked to the evolution of the terms of trade and that linked to the evolution of the anchor currency (Gnimassoun, 2017).

With the recent global crises and their extremely detrimental impact on developing countries, the question of the role exchange rate regime role appears interesting. In particular, one could wonder whether countries that have anchored their currency to an international benchmark are doing better, are more resilient to shocks or react better or not. In the case of the CFA pegged to the euro, its almost

mechanical misalignment leading to a tendency to overvaluation (Nubukpo, 2015) is likely to persist due to poor economic performance in the Eurozone. This continues to fuel questions about the future of their fixed exchange rate regime which ties their hands to a hard currency, the euro.

Our article attempts to contribute to the renewed debate on the viability and relevance of the CFA zone by bringing some elements to the debate, often passionate, of a slowing effect of the anchored currency, the CFA Franc, on the economics of user countries. As having a currency pegged to the euro is likely to be a source of shocks to output, we assess the 20 years of pegging to the euro as a result of France joining the eurozone by applying a synthetic control method. It compares the outcome of a treated unit to the outcome of a weighted average of untreated units that best resembles the characteristics of the treated unit before the intervention. Overall, our empirical analysis shows that in 12 of the 13 countries of the two studied CFA zones, CAEMC and UEMOA, the peg of the currency to the euro did not significantly boost the real GDP per capita. Only Equatorial Guinea, a CFA country for which studies show an undervaluation of the exchange rate (Feindouno et al., 2020), benefited significantly from the peg to the euro over the period 2004–2019. These results corroborate previous studies (Jacquemot, 2018; Nubukpo, 2007; Nubukpo et al., 2016) but also the debates on the fact that the stability of the CFA franc does not benefit user countries. Furthermore, our results contribute to the theoretical debate on the transmission channels of the fixed exchange rate regime on the economy and the determinants of growth. In our sample of countries, the fixed exchange rate regime does not produce convincing results on economic growth, showing that traditional channels have not met theoretical expectations. At the same time, this highlights the ineffectiveness of the 2% inflation target applied by the zone's central banks in contributing to economic growth. Our results are in line with some empirical work (Gueye et al., 2019; Nubukpo 2015) which suggests that the exchange rate regime could be reorganized to enable CFA zone countries to achieve growth gains, in addition to monetary policy autonomy, and to benefit from monetary conditions adapted to their economic structure. A managed float will enable countries to contain the effects of asymmetric external shocks while considering national differences. This can be achieved by adopting a basket of international currencies with major trading partners.

However, even if the overvaluation of the currency resulting from the pegging of the CFA franc to strong currencies (French franc then Euro) is often singled out as one of the origins of the lack of competitiveness of the economies of the CFA countries, the latter should not just be limited to the real exchange rate of the CFA. Indeed, studies (Gueye et al., 2019) go in the direction of a lack of international competitiveness in the two monetary zones of West Africa is less explained by their belonging or not to the Franc zone, than by structural factors (export and investment) of countries' economic performance. Evidenced by the primary integration into the international economy through agricultural and mining products characterized by low levels of complexity and high price instability.

The originality of the article comes from two elements. On the one hand, the method used. The synthetic control method allows us for constructing a counterfactual situation, i.e. it can show what would have happened to the treated unit if not experienced the treatment. On the other hand, contrary to most of the papers which evaluate the effects of the currency from the devaluation of 1994, we assess the 20 years of pegging to the euro, a study, to our knowledge, has never been done. The study helps us to understand the effects of the misalignment of the CFA exchange rate as evidenced by a study by the International Monetary Fund on imbalances in international payments: 'The euro is too strong by 6.8% for France and too low by 18% for Germany'. This state of affairs is transmitted to the CFA countries formerly anchored at a fixed parity to the French Franc. Thus, the overvaluation of the currency anchored to the euro about our economic performance and our needs could result in a deterioration of the countries' foreign trade.

Our findings should, in the context of the announced launch of the eco in the WAEMU zone and an agitated devaluation of the currency in the CAEMC zone, push towards an in-depth reform of the CFA franc. Monetary policymakers should reconsider the fixed exchange rate of the currency against the strong currency, the euro. For example, they could move toward a managed exchange rate with a ceiling and a floor, respectively, above and below which the monetary authority will intervene. This regulated flexibility of the exchange rate should make it possible to avoid the structural misalignment of the currency. Therefore, the currency should better reflect the economic fundamentals of the member countries. As pegged regimes seem to have adverse effects and/or ambiguous results on growth, a monetary

union without pegging to an external currency (or with an exchange rate regime more flexible than that of the CFA zone as a whole) may be a better option.

Finally, new perspectives are opened by our paper. First of all, it would be interesting to analyze, as an outcome variable, other less usual transmission channels (productivity, investment, trade, etc.). Then, in the treatment, it would also be interesting to better take into account the aspect of the country producing oil or not. Finally, it would also be interesting to emphasize a possible misalignment of the exchange rate of the CFA countries about the euro.

9. Conclusion

This paper assesses the impact of pegging the CFA franc to the euro – at a fixed parity – on real GDP per capita in the West African Economic and Monetary Union (WAEMU) and the Central African Economic and Monetary Community (CAEMC) countries. Using a set of 35 annual country-level panel data from 1980 to 2019, we apply the ‘bias-corrected’ synthetic control estimators to create a ‘synthetic country’ (a counterfactual) for each treated CFA country. We arrive at the following result. Except for Equatorial Guinea, which shows a significant positive difference between its real GDP per capita and counterfactual, our results suggest that, overall, there is no statistical evidence that real GDP per capita has increased relative to what it would have been in the absence of the pegging of the CFA to a hard currency following France’s accession to the eurozone.

In terms of economic policy implications, this quantitative work, which fills a void, fuels a recurring debate regarding the pegging of the CFA to the euro and the survival of the two monetary zones. Economists are increasingly suggesting the adoption of a semi-flexible exchange rate that would allow member countries of the CFA Franc zone the possibility of conducting an independent monetary policy. Indeed, this crawling peg to the basket of currencies of our main trading partners would result, on the one hand, in monetary conditions adapted to our economic situation. On the other hand, the possibilities of reacting not only to asymmetric external shocks but also to take into account the differences between national economic policies. However, the break with the fixed exchange rate for countries that are mainly importers and not very diversified first requires changes in the productive and financial structures of the economies of the CFA countries.

Notes

1. It was created on December 26, 1945, around fifteen years before the independence of the French colonies. It was then called ‘franc of the French colonies of Africa’. It will subsequently take the name ‘African Financial Community franc’ for West Africa and ‘Central African Financial Cooperation franc’ for Central Africa. Note that CFA zone creation was the result of a political decision between France and its former colonies in sub-Saharan Africa, and is therefore exogenous to economic concerns. In particular, it was created when the economic conditions necessary for the creation of a monetary zone were not met (Dufrénot and Sugimoto, 2009). Since Guinea-Bissau joined the zone in 1997, we excluded it from our study.
2. West African Economic and Monetary Union (WAEMU): Benin, Burkina Faso, Ivory Coast, Guinea-Bissau, Mali, Niger, Togo, Senegal.
Economic and Monetary Community of Central Africa (CAEMC): Cameroun, Central African Republic, Congo, Gabon, Equatorial Guinea, Tchad.
3. Guinea Bissau is excluded because of its late integration into the WAEMU zone in 1997.
4. Wiltshire (2021) argues that the `allsynth` command automates implementation of several extensions to the classic approach while retaining the syntax of `synth` (classic CS).
5. The title of a recent meta-analysis by Colagrossi et al. (2020) says it all: ‘*Does democracy cause growth? A meta-analysis (of 2000 regressions)*’.
6. Ferman et al. (2020) show that appropriate conditions different specifications will lead to asymptotically equivalent synthetic control estimators.

Author contributions statement

The conception and design: Diallo and Ba; analysis and interpretation of the data: Diallo and Ba; the drafting of the paper: Diallo and Ba, revising it critically for intellectual content: Diallo and Ba; and the final approval of the version to be published: Diallo and Ba; and that the authors, Diallo and Ba, agree to be accountable for all aspects of the work.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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Date availability statement

Data available on request from the authors.

References

- Abadie, A. (2021). Using synthetic controls: Feasibility, data requirements, and methodological aspects. *Journal of Economic Literature*, 59(2), 391–425. <https://doi.org/10.1257/jel.20191450>
- Abadie, A., Diamond, A., & Hainmueller, J. (2010). Synthetic control methods for comparative case studies: Estimating the effect of California's tobacco control program. *Journal of American Statistical Association*, 105(490), 493–505. <https://doi.org/10.1198/jasa.2009.ap08746>
- Abadie, A., Diamond, A., & Hainmueller, J. (2015). Comparative politics and the synthetic control method. *American Journal of Political Science*, 59(2), 495–510. <https://doi.org/10.1111/ajps.12116>
- Abadie, A., & L'hour, J. (2021). A penalized synthetic control estimator for disaggregated data. *Journal of the American Statistical Association*, 116(536), 1817–1834. <https://doi.org/10.1080/01621459.2021.1971535>
- Alexis, C. R. (2022). Exchange arrangements and economic growth: What relationship is there? *Journal of Economics and Political Economy*, 9(3), 238–256.
- Andersen, T. B. (2022). The cost of a currency peg during the great recession. *Open Economies Review*, 34(2), 255–279. <https://doi.org/10.1007/s11079-022-09670-w>
- Ashour, M., & Chen, Y. C. (2018). The impact of exchange rate regimes on economic growth: Empirical study of a set of developing countries during the period 1974–2006. *The Journal of International Trade & Economic Development*, 27(1), 74–90. <https://doi.org/10.1080/09638199.2017.1339117>
- Bailliu, J., Lafrance, R., & Perrault, J.-F. (2001). Exchange rate regimes and economic growth in emerging markets. In *Revisiting the case for flexible exchange rates* (pp. 317–345). Bank of Canada.
- Barro, R. J., & Gordon, D. B. (1983). A positive theory of monetary policy in a natural rate model. *Journal of Political Economy*, 91(4), 589–610. <https://doi.org/10.1086/261167>
- Ben-Michael, E., Feller, A., & Rothstein, J. (2022). Synthetic controls with staggered adoption. *Journal of the Royal Statistical Society Series B: Statistical Methodology*, 84(2), 351–381. <https://doi.org/10.1111/rssb.12448>
- Bohm, H., & Funke, M. (2001). Does the nominal exchange rate regime matter for investment? *CESifo Working Paper*, 578, 1–25.
- Bolle, P. (1997). Devaluation of the CFA franc four years on: Economic integration and employment agenda. *International Labour Reviews*, 136(3), 401–417.
- Botosaru, I., & Ferman, B. (2019). On the role of covariates in the synthetic control method. *The Econometrics Journal*, 22(2), 117–130. <https://doi.org/10.1093/ectj/utz001>
- Boucheta, Y., Adouka, L., & Benbayer, H. (2021). The current exchange rate regimes effect's on the economic growth: Case studies of MENA Ccountries. *Management Dynamics in the Knowledge Economy*, 9(4), 419–431. <https://doi.org/10.2478/mdke-2021-0028>
- Bouvet, F., Bower, R., & Jones, J. C. (2022). Currency devaluation as a source of growth in Africa: a synthetic control approach. *Eastern Economic Journal*, 48(3), 367–389. <https://doi.org/10.1057/s41302-022-00211-4>

- Carmignani, F., Colombo, E., & Tirelli, P. (2008). Exploring different views of exchange rate regime choice. *Journal of International Money and Finance*, 27(7), 1177–1197. <https://doi.org/10.1016/j.jimonfin.2008.06.004>
- Colagrossi, M., Rossignoli, D., & Maggioni, M. A. (2020). Does democracy cause growth? A meta-analysis (of 2000 regressions). *European Journal of Political Economy*, 61, 101824. <https://doi.org/10.1016/j.ejpoleco.2019.101824>
- Couharde, C., Coulibaly, I., & Damette, O. (2013). Anchor currency and real exchange rate dynamics in the CFA franc zone. *Economic Modelling*, 33, 722–732. <https://doi.org/10.1016/j.econmod.2013.05.005>
- Coulibaly, I. (2014). Competitiveness and growth within the CFA franc zone: Does the switch to the euro matter? *International Economics*, 139, 1–18. <https://doi.org/10.1016/j.inteco.2014.02.001>
- Coulibaly, I., & Davis, J. (2013). Exchange rate regimes and economic performance: Does CFA zone membership benefit their economies?. Exchange rate regimes and economic performance: Does CFA zone membership benefit their economies? Munich Personal RePEc Archive (uni-muenchen.de).
- Cruz-Rodríguez, A. (2022). Exchange arrangements and economic growth. What relationship is there? MPRA_paper_113897.pdf (uni-muenchen.de)
- Dao, T. T. H., & Nga, T. H. (2020). Exchange rate regime and economic growth in Asia: Convergence or divergence. *Journal of Risk and Financial Management*, 13(1), 9. <https://doi.org/10.3390/jrfm13010009>
- De Almeida Cardoso, C., & Vilela Vieira, F. (2020). Economic growth and exchange rate regime: Panel data analysis. *Análise Econômica*, 38(75), 277–303. <https://doi.org/10.22456/2176-5456.61135>
- Dearden, S. J. H. (1999). The CFA and European Monetary Union. DSA Discussion paper, No. 14.
- Diallo, O. (2002). L'arrimage du franc CFA à l'euro. Institut Européen de L'Université de Genève.
- Didier, M., Bénassy-Quéré, A., Bransbourg, G., & Henriot, A. (2008). Politique de change de l'euro. *Conseil d'analyse économique, rapport, décembre*.
- Domac, I., Peters, K., & Yuzefovich, Y. (2004a). Does the exchange rate regime matter for inflation? Evidence from transition economies. *Policy Research Working Paper*, 1–29. <https://core.ac.uk/download/pdf/7061528.pdf>
- Edwards, S. (1993). Exchange rates, inflation and disinflation: Latin American experiences.
- Edwards, S., & Savastano, M. A. (1999). Exchange Rates in Emerging Economies: What do we know? What Do we Need to Know?.
- Ehrhart, H., & Jacolin, L. (2012). L'impact de la crise de la zone euro sur la zone franc: analyse des canaux de transmission. *Bulletin de la Banque de France* No. 190.
- Elu, J. U., & Price, G. N. (2008). The impact of the Euro-CFA Franc zone on economic growth in Sub-Saharan Africa. In *Globalisation, Institutions, and African Economic Development: Proceedings of the African Economic Conference*, 255–272.
- Etta-Nkwelle, M., Jeong, J. G., & Fanara, P. (2010). Misalignment of the real exchange rate in the African Financial Community (CFA zone) and its policy implications. *Applied Financial Economics*, 20(15), 1205–1215. <https://doi.org/10.1080/09603101003800826>
- Feindouno, S., Guérineau, S., Guillaumont, P., Guillaumont, S., & Plane, P. (2020). *Zone franc, croissance économique et réduction de la pauvreté*.
- Ferman, B., & Pinto, C. (2016). Revisiting the synthetic control estimator.
- Ferman, B., & Pinto, C. (2017). Placebo tests for synthetic controls.
- Ferman, B., Pinto, C., & Possebom, V. (2020). Cherry picking with synthetic controls. *Journal of Policy Analysis and Management*, 39(2), 510–532. <https://doi.org/10.1002/pam.22206>
- Firpo, S., & Possebom, V. (2018). Synthetic control method: Inference, sensitivity analysis and confidence sets. *Journal of Causal Inference*, 6(2), 20160026. <https://doi.org/10.1515/jci-2016-0026>
- Frankel, J., Ma, X., & Xie, D. (2019). *The impact of exchange rate regimes on economic growth with continuous classification of de facto regimes*. Mimeo. Harvard University.
- Frankel, J., & Wei, S.-J. (2008). Estimation of de facto exchange rate regimes: Synthesis of the techniques for inferring flexibility and basket weights. *IMF Staff Papers*, 55(3), 384–416. <https://doi.org/10.1057/imfsp.2008.18>
- Frankel, J., & Xie, D. (2010). Estimation of de facto flexibility parameter and basket weights in evolving exchange rate regimes. *American Economic Review*, 100(2), 568–572. <https://doi.org/10.1257/aer.100.2.568>
- French Senate. (2002). "Rapport d'information fait au nom de la commission des finances (1) sur le franc CFA", Session extraordinaire, (729).
- Galiani, S., & Quistorff, B. (2017). The synth_runner package: Utilities to automate synthetic control estimation using synth. *The Stata Journal: Promoting Communications on Statistics and Stata*, 17(4), 834–849. <https://doi.org/10.1177/1536867X1801700404>
- Gbato, A., Lemou, F., & Brun, J. F. (2019). Réformes et mobilisation des recettes en Afrique: les Administrations de recettes semi-autonomes (SARAs) sont-elles efficaces?.
- Ghosh, A. R., Gulde, A. M., Ostry, J. D., & Wolf, H. (1996). *Does the exchange rate regime matter for inflation and growth?* (Vol. 2). International Monetary Fund.
- Ghosh, A. R., Gulde, A.-M., & Wolf, H. C. (2002). *Exchange rate regimes: Choices and consequences*. The MIT Press.
- Ghosh, A. R., Ostry, J. D., Gulde, A. M., & Wolf, H. C. (1997). Does the exchange rate regime matter for inflation and growth? *IMF Economic Issues*, 2, 1–19.
- Gnimassoun, B. (2012). Mésalignements du franc CFA et influence de la monnaie ancre. *Économie & Prévision*, n° 200-201(2), 91–119. <https://doi.org/10.3917/ecop.200.0091>

- Gnimassoun, B. (2017). Exchange rate misalignments and the external balance under a pegged currency system. *Review of International Economics*, 25(5), 949–974. <https://doi.org/10.1111/roie.12290>
- Guellil, Z., Marouf, F. Z., & Benbouziane, M. (2017). *Exchange rate regimes and economic growth in developing countries: An empirical study using panel data from 1980 to 2013* [Paper presentation]. Management International Conference, Mimeo.
- Gueye, F., Mbaye, A. A., & Mballa, C. (2019). Quitter ou réformer la zone Franc? *Interventions Economiques*, (61) <https://doi.org/10.4000/interventionseconomiques.5502>
- Hadjimichael, M. T., & Galy, M. (1997). *The CFA franc zone and the EMU* (IMF Working Paper, 97/156). <https://doi.org/10.5089/9781451857368.001>
- Irving, J. (1999). Varied impact on Africa expected from new European currency. *African Recovery*, 12(4), 24–29.
- Jacquemot, P. (2018). Franc CFA. *Diplomatie*, (92), 74–78.
- Jakob, B. (2016). Impact of exchange rate regimes on economic growth. *Undergraduate Economic Review*, 12(1), 11.
- Kaul, A., Klößner, S., Pfeifer, G., & Schieler, M. (2016). *Synthetic control methods: Never use all pre-intervention outcomes as economic predictors*. Unpublished. http://www.oekonometrie.uni-saarland.de/papers/SCM_Predictors.pdf.
- Klau, M. (1998). *Exchange rate regimes and inflation and output in Sub-Saharan countries* (BIS Working Paper, 53).
- Klein, M. W., & Shambaugh, J. C. (2010). *Exchange rate regimes in the modern era*. The MIT Press.
- Larraín, F., & Parro, F. (2003). ¿Importa la opción de régimen cambiario? Evidencia para países en desarrollo. *Cuadernos De Economía*, 40(121), 635–645. <https://doi.org/10.4067/S0717-68212003012100035>
- Levy-Yeyati, E., & Sturzenegger, F. (2002). *To float or to trail: Evidence on the impact of exchange rate regimes*. Universidad Di Tella. Mimeographed document.
- Levy Yeyati, E., & Sturzenegger, F. (2003). To float or to fix: Evidence on the impact of exchange rate regimes on growth. *American Economic Review*, 93(4), 1173–1193. <https://doi.org/10.1257/000282803769206250>
- Levy-Yeyati, E., & Sturzenegger, F. (2005). Classifying exchange rate regimes: Deeds vs. words. *European Economic Review*, 49(6), 1603–1635. <https://doi.org/10.1257/000282803769206250>
- Monga, C. (1997). A currency reform index for Western and Central Africa. *The World Economy*, 20(1), 103–126. <https://doi.org/10.1111/1467-9701.00060>
- Moreno, R. (2001). Pegging and stabilization policy in developing countries. *Economic Review of the Federal Reserve Bank of San Francisco*, 12(99), 17–29.
- Nubukpo, K. (2007). Politique monétaire et servitude volontaire: la gestion du franc CFA par la BCEAO. *Politique Africaine*, N° 105(1), 70–84. <https://doi.org/10.3917/polaf.105.0070>
- Nubukpo, K. (2015). Le franc CFA, un frein à l'émergence des économies africaines? *L Economie Politique*, N° 68(4), 71–79. <https://doi.org/10.3917/leco.068.0071>
- Nubukpo, K., Ze Belinga, M., Tinel, B., & Dembélé, D. M. (2016). Sortir l'Afrique de la servitude monétaire. À qui profite le franc CFA? La Dispute, hors collection, 248. p.
- Nubukpo, K. (2017). *Misalignment of exchange rates: What lessons for growth and policy mix in the WAEMU?* (126) (GEG Working Paper).
- Nubukpo, K. (2019). *L'urgence africaine: changeons le modèle de croissance!* Edition Odile Jacob, septembre 2019, Paris.
- Obi, K. O., Oniore, J. O., & Nnadi, K. U. (2016). The impact of exchange rate regimes on economic growth in Nigeria. *Journal of Economics and Sustainable Development*, 7(12), 115–127.
- Plane, P., & da Piedade, C. (2022). *Are the CFA francs at their equilibrium level?* HAL.
- Rao, B. (2019). Exchange rate regimes and its impact on growth: An empirical analysis of BRICS countries. *Theoretical and Applied Economics*, XXVI(2), 157–172.
- Reinhart, C., & Rogoff, K. S. (2004). The modern history of exchange rate arrangements: A reinterpretation. *The Quarterly Journal of Economics*, 119(1), 1–48. <https://doi.org/10.1162/003355304772839515>
- Rose, A. K. (2011). Exchange rate regimes in the modern era: Fixed, floating, and flaky. *Journal of Economic Literature*, 49(3), 652–672. <https://doi.org/10.1257/jel.49.3.652>
- Rubin, D. B. (1974). Estimating causal effects of treatments in randomized and nonrandomized studies. *Journal of Educational Psychology*, 66(5), 688–701. <https://doi.org/10.1037/h0037350>
- Silguy, Y. T. D. (1999). L'association du franc CFA et de l'euro: un gain de sécurité. *Afrique Contemporaine*, (189), 1er trimestre 1999, 3–5.
- Strong, C. O. (2021). Did Mali benefit from joining the CFA zone? An analysis using the synthetic control method. *Review of Development Economics*, 25(2), 931–955. <https://doi.org/10.1111/rode.12733>
- Wiltshire, J. C. (2021). Allsynth: Synthetic control bias-correction utilities for stata. 2021 *Stata Conference* (No. 15). Stata Users Group.
- Zafar, A. (2005). *The impact of the strong euro on the real effective exchange rates of the two francophone African CFA zones* (WBPR Working Paper, 3751).

Appendix

Appendix 1. Average Inflation volatility in CFA franc zone countries during the during the two sub-periods.

Panel A : inflation volatility in WAEMU countries

Country	1980–2001	2002–2021
Benin	2.6215	0.4915
Burkina Faso	1.2670	0.6885
Ivory Coast	3.3127	0.5479
Guinea-Bissau	7.0205	1.2247
Mali	2.1362	0.8422
Niger	2.2991	0.6673
Senegal	1.6262	0.5737
Togo	1.7687	1.8881
Average inflation volatility for the UEMOA zone	2.7565	0.8655
Average inflation volatility without Guinea-Bissau	2.1473	0.8142

Panel B : inflation volatility in CAEMC countries

Country	1980–2001	2002–2021
Cameroon	2.5780	0.2836
Central African Republic	2.1627	0.7863
Chad	2.6690	1.8347
Congo, Rep,	3.7918	3.3578
Equatorial Guinea	5.2214	3.9519
Gabon	3.4115	2.2967
Average inflation volatility for the CAEMC zone	3.3057	2.0852

Source: Author's calculation based on WDI data.

Appendix 2. Average volatility of inflation in non-CFA franc countries during the two sub-periods.

Country	1980–2001	2002–2021
Angola	250.3693	10.1202
Burundi	2.2688	1.5636
Congo, Dem, Rep,	1208.9600	2.8264
Ethiopia	2.1000	2.0767
Gambia, The	6.2061	4.4592
Ghana	5.0961	3.8537
Guinea	2.7717	4.7706
Kenya	1.8062	1.4853
Madagascar	2.8364	0.9830
Malawi	3.4509	5.5379
Nigeria	9.7100	1.4470
Sao Tome and Principe	0.0000	1.2994
Sierra Leone	9.0538	1.3043
Sudan	8.3528	11.5199
Tanzania	4.2266	0.8272
Uganda	14.3712	4.1240
Zambia	9.5753	1.1474
Zimbabwe	2.1746	34.3620
Average inflation	85.7405	5.2060

Appendix 3. Franc CFA area countries' mean annual GDP per capita growth.

Panel A: WAEMU countries

Country	1990–2001	2002–2021
Benin	1.0926	0.9788
Burkina Faso	1.3596	1.1837
Ivory Coast	1.5770	1.2331
Guinea-Bissau	1.0983	1.0334
Mali	1.3686	1.2112
Niger	0.5919	0.6312
Senegal	0.8622	0.9010
Togo	0.8648	1.3316
Average GDP per capita for the WAEMU area	1.1019	1.0630
Average GDP per capita without Guinea-Bissau	1.1024	1.0672

Panel B : CAEMC countries

Country	1980–2001	2002–2021
Cameroon	1.0130	1.0974
Central African Republic	0.9709	1.3902
Chad	1.5066	1.3389
Congo, Rep,	1.0954	1.7012
Equatorial Guinea	3.0314	2.3296
Gabon	1.1992	0.9167
Average GDP per capita for the CEMAC zone	1.4694	1.4623

Source: Author's calculation based on WDI data.

Appendix 4. Non franc CFA countries' mean annual GDP per capita growth.

GDP per capita, countries

Country	1990–2001	2002–2021
Angola	1.6114	1.6114
Burundi	0.8708	0.8708
Congo, Dem, Rep,	1.2652	1.2652
Ethiopia	1.9121	1.9121
Gambia, The	0.8842	0.8842
Ghana	1.7991	1.7991
Guinea	1.2551	1.2551
Kenya	1.6413	1.6413
Madagascar	1.1014	1.1014
Malawi	1.2710	1.2710
Nigeria	1.5345	1.5345
Sao Tome and Principe	1.1618	1.1618
Sierra Leone	1.512041	1.512041
Sudan	1.211221	1.211221
Tanzania	1.377759	1.377759
Uganda	1.181793	1.181793
Zambia	1.443792	1.443792
Zimbabwe	1.897712	1.897712
Average GDP per capita	1.3851	1.3851

Source: Author's calculation based on WDI data.

Appendix 5. Data description and sources.

Variables	Description	Sources
Agriculture	As a % of GDP	WDI, PennWorld Tables
Industry	As a % of GDP	WDI, PennWorld Tables
Government	Share of government consumption at current PPPs	WDI, PennWorld Tables
Investment	Share of household consumption at current PPPs	WDI, PennWorld Tables
Official development Assistance	Net official development assistance is disbursement flows (net of repayment of principal) that meet the DAC definition.	
Institutions	Political regime Characteristics and Transitions, 1980–2019, annual, cross-national, time series, and polity case formats coding democratic and autocratic 'patterns of authority' and regime changes in all independent countries with total population greater than 500,000 in 2018	Polity5 for Center of Systemic Peace
Foreign development investment (FDI)	Foreign direct investment refers to direct equity investment flows into the reporting economy. It is the sum of equity, reinvestment of earnings and other capital.	WDI
Labour (employment)	proportion of the population in work	WDI
Devaluation 1994	The devaluation of the CFA franc in 1994, captured by a dummy variable taking the value 1 if the country is both a CFA franc Country and during the year 1994. Otherwise, 0.	Authors
Real GDP per-capita (1980)	Output-side real GDP at current \$	WDI, PennWorld Tables
Real GDP per-capita (1995)	Output-side real GDP at current \$	WDI, PennWorld Tables
Real GDP per-capita (2001)	Output-side real GDP at current \$	WDI, PennWorld Tables
Real GDP per capita	Output-side real GDP at current \$	WDI, PennWorld Tables

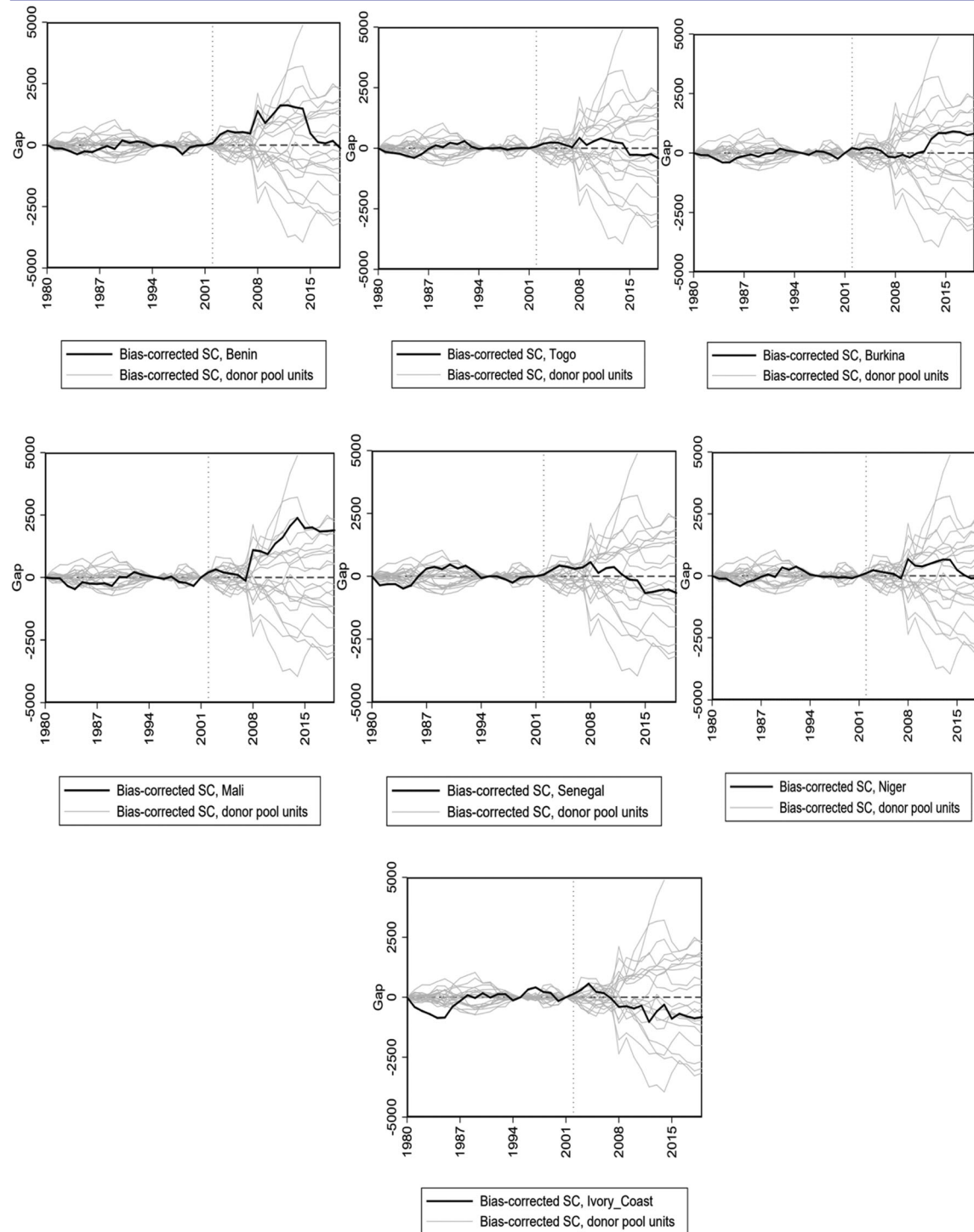
Appendix 6. OLS fixed effect estimates of real GDP per capita parameters of CFA franc-zone countries.

Real GDP per capita Regressors	Franc-CFA zone countries (WAEMU and CAEMC)													
	Benin	Burkina	CAR	Cameroon	Chad	Ivory Coast	Gabon	Mali	Niger	Senegal	Togo	Equ.Guinea	DRC	Guinea Biss
Agriculture	-105.9*** (23.02)	-109.*** (22.73)	-83.5*** (20.3)	-103.8*** (22.58)	-86.*** (20.2)	-91.*** (21.3)	-109.*** (23.3)	-117.*** (22.7)	-113.*** (22.4)	-108.*** (23.4)	-95.5*** (21.8)	-70.1*** (25.4)	-118.2*** (22.7)	-110.1*** (22.3)
Industry	-24.643 (19.37)	-30.02 (19.4)	-24.0 (19.1)	-23.97 (19.08)	-27.3 (19.0)	-13.4 (18.2)	-19.7 (18.3)	-31.3 (19.4)	-31.5 19.18	-21.23 (19.5)	-20.2 (18.9)	60.9*** (18.7)	-28.4* (16.7)	-21.7 (19.4)
Government	-2997.6** (1361.5)	-3367.** (1392.)	-3247.** (1400.3)	-2900.1** (1373.)	-3265.** (1394.)	-2811.** (1368.)	-3401.2** (1378.0)	-1894. (1263.)	-2964.8** (1371.)	-2456.* (1366)	-3582.1*** (1376.5)	-5785.3*** (1548.9)	-3013.** (1158.)	-3372.9** (1392.7)
Investment	5439.2*** (1315.5)	5548.*** (1322.1)	6303.*** (1220.3)	5617.9*** (1315.2)	6239.*** (1213.2)	5424.9*** (1297.3)	6112.6*** (1298.0)	5300.*** (1323.)	5243.*** (1290.)	4497.*** (1288.)	5325.3*** (1277.9)	6293.9*** (1516.5)	4341.9*** (1136.3)	5054.7*** (1316.1)
ODA	-47.06** (23.03)	-47.1*** (23.2)	-69.3*** (20.7)	-53.99** (23.0)	-70.5** (20.6)	-59.0*** (22.4)	-48.5** (23.5)	-42.0** (22.6)	-46.2** (22.6)	-43.7* (23.48)	-44.8** (22.6)	-92.0*** (20.8)	-34.3 (20.8)	-2.8 (15.9)
Labour	-123.40*** (24.16)	-121.10*** (24.23655)	-123.2*** (24.24)	-121.24*** (24.16)	-94.17*** (23.77)	-118.1*** (24.19)	-130.9*** (24.79)	-118.7*** (24.13)	-119.8*** (24.09)	-120.2*** (24.28)	-116.*** (24.10)	-145.25*** (30.674)	-113.*** (24.12)	-119.14*** (24.32)
Institutions	46.25** (20.9)	53.9** (22.0)	53.7** (22.72)	49.33** (22.5)	54.0*** (22.6)	36.4* (21.4)	61.7*** (22.1)	37.4* (21.7)	50.9** (21.)	35.79 (22.24)	56.2** (22.7)	21.8 (25.9)	54.5** (21.5)	62.4*** (22.2)
Devaluation 1994	536.44 (2045.3)	1158.7 (2037.9)	332.2 (2053.)	323.5 (2033.2)	315.1 (2046.1)	-1064.2 (2089.)	-821.9 (2055.9)	242.3 (2046.)	-281.9 (2048.)	902.9 (2054.)	527.8 (2039.8)	-3146.6 (2457.8)	-340.8 (2090.9)	-
FDI	17015.4*** (1752.0)	16147.1*** (1790.8)	16102.*** (1813.)	16358.*** (1829.7)	15816.2*** (1802.7)	17069.*** (1771.)	15890.2*** (1836.4)	17005.*** (1806.)	16395.*** (1765.)	-43.7*** (23.4)	16578.2*** (1809.8)	16354.6*** (2154.1)	16723.9*** (1778.9)	17244.6*** (1818.2)
Constant	1405.7 (887.4)	1845.6** (889.3)	1326.2 (891.)	1525.2* (872.8)	1577.6 (880.6)	991.5 (822.)	1696.3* (886.9)	1628.* (898.)	1922.** (880.)	1296. (904.6)	1435.6 (877.0)	-217.3 (1022.6)	1964.7** (875.3)	1388.3 (890.5)
R ²	0.617	0.651	0.59	0.64	0.63	0.65	0.52	0.65	0.64	0.62	0.63	0.43	0.63	0.57
Observation	751	751	751	751	751	751	751	751	751	751	751	751	751	751

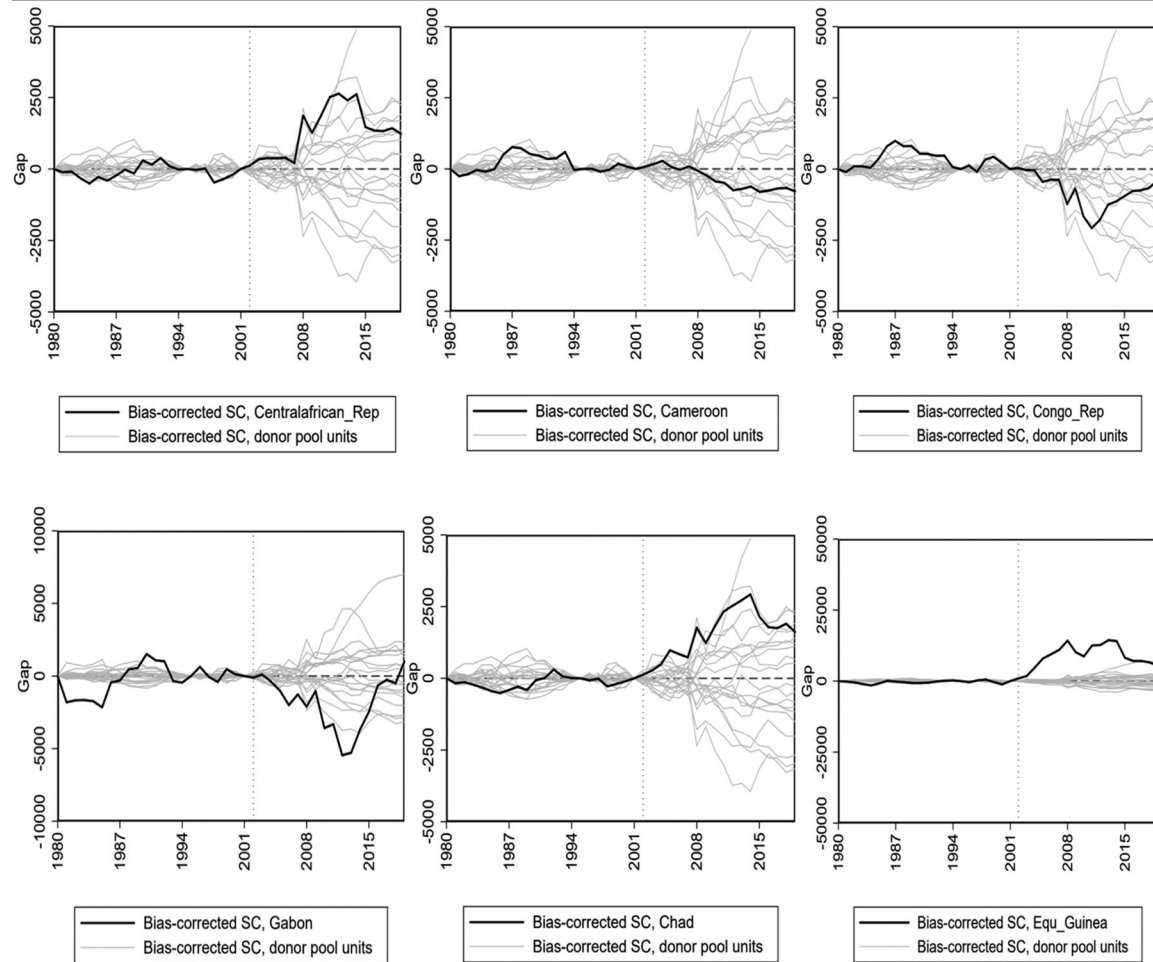
Note. The dependent variable is the real GDP per capita. The estimation periods are over 1990–2019.

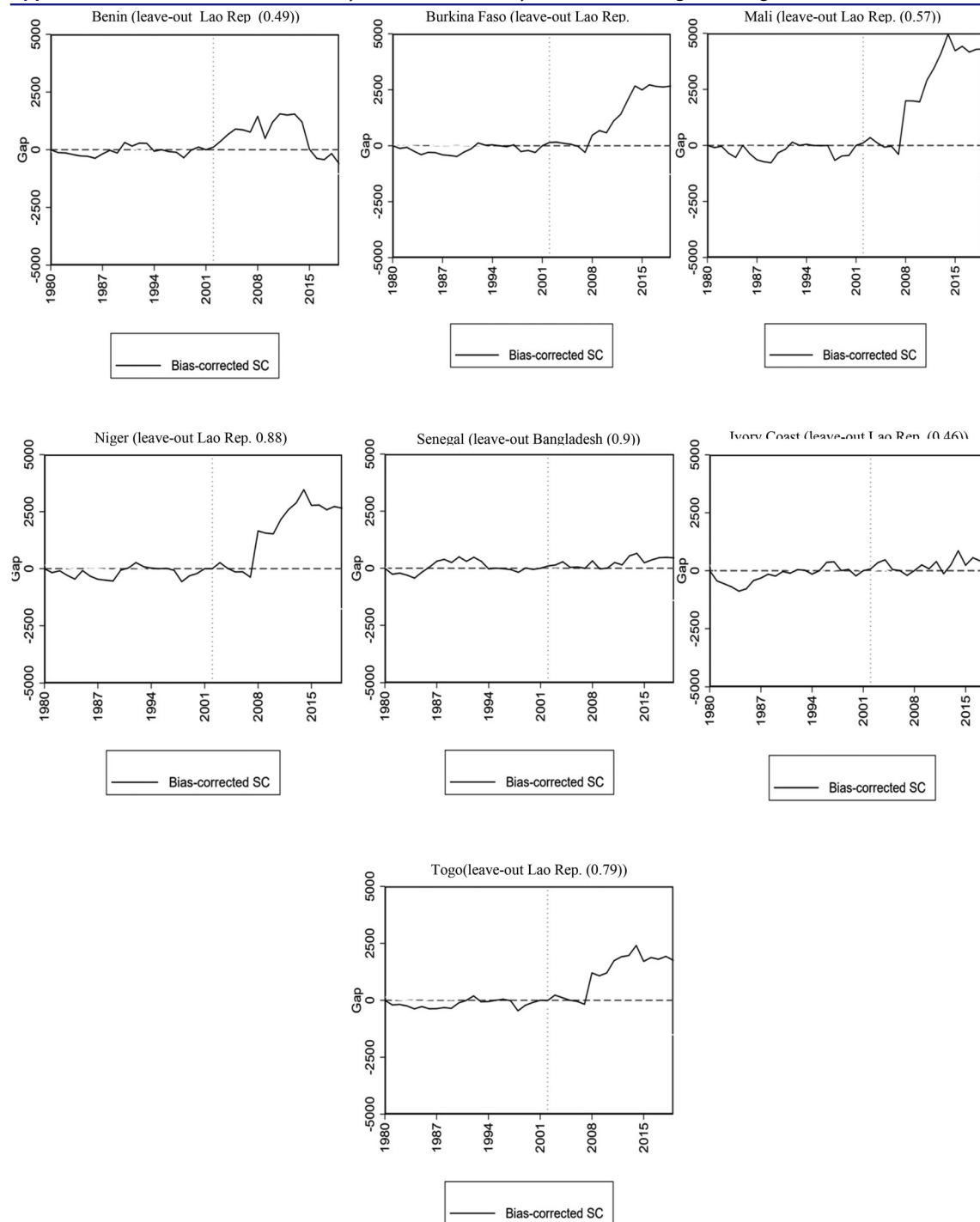
Column gives estimates. (.): Robust Standard Error.

***, **, and * denote statistical significance at the 1, 5, and 10 per cent levels, respectively.

Appendix 7. Estimated 'bias-corrected' SC gap and placebo gaps in WEAMU countries.

Appendix 8. Estimated 'bias-corrected' SC gap and placebo gaps in CAEMC countries.



Appendix 9. Robustness test, sensitivity of WAEMU country results to the highest weight.

Appendix 10. Robustness test, sensitivity of CAEMC country results to the highest weight.

