ARTICLE

Exchange Rate Regime Choice and Economic Growth: An Empirical Analysis on African Panel Data

Anass Abouelkhair[1] and Yasser y. Tamsamani[*,2]

[1]Hassan II University, Casablanca, Morocco.
[2]Hassan II University, Casablanca, Morocco
[*] Corresponding Author: yassertamsamani@yahoo.fr

Abstract

The purpose of this paper is twofold. First, for a large panel of African countries, the thesis of currency neutrality is tested and the exchange rate regimes are classified according to their economic performance. Second, it seeks to identify the economies structural characteristics associated with a specific exchange rate regime that promotes economic growth. The results of the estimated models reject the currency neutrality hypothesis and highlight an outperformance of intermediate exchange rate regimes. Specifically, they show that the intermediate regimes are more conductive to economic growth in the case of countries that have experienced positive terms-of-trade shocks and benefited from FDI inflows. On the other hand, the opening of capital account seems incompatible with intermediate regimes, and external indebtedness does not promote economic growth regardless of the adopted exchange rate regime.

1. Introduction

The debate over the choice of the optimal exchange rate regime is ancient, but not yet worn out. Overall, it appears that the question of the superiority of one regime over the others does not result in any lasting consensus that can be generalized to all countries. Since the beginning, this question has been addressed in such a way that the optimal choice is at times conditioned by the country's internal structural characteristics and other times by the major changes affecting the international economy.

By imagining a global system governing the modalities of determining the external value of currencies, Mundell (1961) argued in favor of a flexible global market where currencies are freely exchanged, with the caveat that each of these currencies be backed by an "optimal currency zone" where the parities of the said currencies within the zone are fixed. Thus, Mundell's system foresees a nesting of different regimes whose contours of the monetary zones are conditioned by a convergence of the internal characteristics of the economies. In fact, a monetary zone is only optimal if the factors of production are perfectly mobile between the zone's member countries and which are supposed to incur similar external shocks.

At the same time, the choice of the optimal exchange rate regime was also related to the degree of economies' oppeness (McKinnon, 1963) and to their productive apparatus diversification (Kenen, 1969). By adopting a fixed exchange rate, a small but increasingly open economy would gain in terms of its internal price system stability. While, a flexible regime is more appropriate through smoothing the impact of real external shocks in case of a large and more diversified productive structure.

The recent works continue on the same positive approach by considering the economies' internal specifities in the choice of an exchange rate regime. Eichengreen and Hausmann (1999), for example, consider that countries with heavy external debts should opt for a fixed exchange rate regime in order to control their fiscal sustainability. Other authors, taking note of 1990s crises and financial integration acceleration, particularly in emerging and developing countries, conclude the instability of intermediate regimes in the medium and long terms and the irreversibility, as a corollary, of the bipolar choice (Obstfeld and Rogoff, 1995; Eichengreen, 1998; Fisher, 2001; Levy-Yeyati and Sturzenegger,2001). They argue for a flexible exchange rate regime in countries experiencing terms-of-trade shocks and characterized by nominal rigidities. In line with the level of economic development, Ferrari-Filho and De Paula (2008) and Guzman and al. (2017) argue that a managed exchange could be used as an additional lever of economic and industrial policies in developing countries. According to these authors, the possibility of currency manipulation should ensure both a stability favorable to investment and gains in competitiveness accelerating the industrialization dynamic in these countries.

Furthermore, the consensus that sometimes emerges around a particular exchange rate regime is often a direct result of major changes in the international environment (Frankel, 2017). The recent history of exchange rate regimes choice dates back to the early 1970s with the end of the Bretton Woods fixed exchange rate system, which paved the way for multiple choices of exchange rate regimes. Since then, more and more countries opted for an intermediate regime. This dynamic was doubled by an increased flexibility of the exchange rate driven by the neoliberal wave of the 1980s, which faded from the mid-1990s due to a succession of currency crises in Europe (1991), Brazil (1998), Mexico (1994) and Southeast Asia (1997). Then, with the 2002 Argentinean fixed exchange rate regime (currency board) crisis, the intermediate regime was more and more chosen to the detriment of the bipolar option (Ghosh and al., 2003).

Thus, both the academic works and history of facts are not conclusive with regard to the absolute superiority, ad vitam aeternam, of a particular exchange rate regime. It is a case-by-case choice (Frankel, 1999). In short, the choice of the optimal regime is subject to a trad-off between the stability provided by fixing the exchange rate and the expected competitiveness from a flexible exchange rate (Bénassy-Quéré and Coeuré, 2002), governed by the internal conditions of countries interacting with new trends in the international economy.

In this sense, the practical answer to the question of the exchange rate choice necessarily involves a positive empirical approach. Therefore, this article looks at the African case and aims to assess which of the exchange rate regimes is the most suitable. Instead of a direct approach that consists of identifying the probability determinants of choosing a particular exchange rate regime and then deducing from it the most appropriate regime for a given context [1], we opt for an alternative approach to judge the opportunity of choosing a such-and-such exchange regime via these real observed economic performances. Beside the possibility to capture the final effect of a particular exchange rate regime on economic growth, this approach also highlights the interactions it can have with other macroeconomic behaviors and which may affect the magnitude of its effect.

The purpose of this paper is not to reach a conclusion on the intrinsic superiority of an exchange rate regime, but rather to help guide the choice of the regime towards the one that best meets the (internal and external) structural characteristics of our panel countries. More explicitly, it seeks to

---

1. For a critical review of this direct approach, the reader can consult Russel (2012) paper

provide some answers to the following questions:

i/ Is exchange rate regime nature neutral in terms of the effect on economic growth? In other words, does the classic postulate of the dichotomy between the real and monetary spheres prove true on exchange rate policy in Africa?

ii/ What makes countries with a particular exchange rate regime record higher or lower rates of economic growth? And under which internal and external conditions, the intensity of the impact of a particular regime would have been more or less important?

After having argued, in the introduction, the fact that the debate on the choice of the exchange rate regime is not yet closed and the ambition of this article is to respond to a growing need for empirical studies on this question, the rest of the document will be organized as follows. The following section (II) will be devoted to the literature review relating respectively to the two questions raised above. In section III will be presented the data mobilized for this work and the first intuitions on the classification of exchange rate regimes in the African context that emerge from the descriptive analysis. The estimation methodology adopted as well as the results of the models, retained in order, first, to identify the causal link between exchange rate regimes and economic growth, and then to highlight the transmission channels relating to this causal effect, will be the subject of section IV. Section V concludes.

2.   Exchange rate regime and economic growth : literature review

2.1   *The postulate of the dichotomy of real and monetary spheres: the case of exchange rate*

On a theoretical level, the thesis that the monetary and real spheres are dichotomous is at the origin of the divergences between the different currents of economic thought on the question of the choice of the regime of change (Capriata and Flauzino De Souza, 2021). On the one hand, the new Keynesian school, like the new Classics one, exclude any incident of exchange rate evolution and a fortiori of the modalities of determination of its value on the long-term equilibrium. As this equilibrium being assumed stable, the shocks will end up being absorbed with the long-term disappearance of adjustment delays and rigidities. Thus, both spheres are dichotomous in the long term, and exchange rate policy, as monetary policy, is neutral. In this context, the only viable economic policy is one that removes the obstacles hindering the convergence dynamics of the economy towards its long-run equilibrium and the only exchange rate regime compatible with such a vision of the economy can only be the flexible regime.

In short run, these two schools diverge. Based on a particular set of assumptions (rational expectations, markets structure in pure and perfect competition, absence of rigidities and adjustment delays), the neoclassics go so far as to assume that not only exchange manipulation (supposing that the regime in place allows it) is still ineffective, but it is also counterproductive [2].

Otherwise, by refuting the result of the neutrality of monetary policy in both the short and long terms, the heterodox current (post-Keynesians, new structuralists) believes that exchange rate policy has a primordial role in macroeconomic management. This role is more important in the case of developing countries constituting one of their industrial policy levers (Guzman and al., 2017), which is essential to get out of the trap of sub-development (Szirmai, 2009).

As a result, the theory alone is unable to settle the debate on the real effects of exchange rate evolutions and, as a corollary, on the superiority of one or another exchange rate regime. The approach to be adopted in this debate is necessarily empirical.

The first empirical works on exchange rate neutrality go back to Baxter and Stockman (1989) and Baxter (1991). Comparing the real performances of a group of 42 countries before and after the

---

2. A monetary injection, for example, on the foreign exchange market in order to create a competitive depreciation of the value of the domestic currency should result, according to a pre-established normative scheme, in an increase in inflation (in the absence of any monetary illusion) which drives down consumption and increases savings (to keep real cash balances constant). The drop in consumption then offsets the export surplus generated by this policy. In the end, the effect on real output is zero, but with a higher level of inflation

collapse of the Bretton Woods system. In their works, they reject any causal link between the nature of the exchange rate regime and macroeconomic aggregates dynamic. For that, they resorted to Real Business Cycle model (RBC), whose constructive assumptions fall under the new Classics' standards that eliminate any real persistant impact of any macroeconomic policy. Apart from exogenous shocks to productivity, the economy is forced to return to its initial steady state. By abandoning the normative approach based on canonical models for a positive approach, Ghosh and al. (1997) reach the same conclusion of real exchange rate neutrality for a large panel of 136 countries. On a larger panel also, the same authors (Ghosh and al., 2003) confirm the absence of any real impact of the nature of the exchange rate regime on macroeconomic performances. Similarly, on time series data treating the countries separately, Mills and Wood (1993) and Rose (1994) find no causal link between the change of exchange rate regime, after the collapse of the Bretton Woods system, and growth respectively in the United Kingdom and Germany.

The conclusions of these works, which can be described as the first generation studies, are limited in scope and have several limitations. In the Ghosh and al. (1997) study, for example, growth regressions on the exchange rate regime do not eliminate the effect of other traditional determinants of growth, and the estimators used may be biased. In addition, it adopts a de jure classification of exchange rate regime relating to official statements of countries that do not necessarily converge with their actual policies. This explains the fact that empirical works that followed the first generation have systematically used a de facto classification of exchange rate regimes (Calvo and Reinhart, 2002; Rogoff and al., 2003; Levy–Yeyati and Sturzenegger, 2003; Husain and al., 2005; Miles, 2006; Aghion and al., 2009; Petreski, 2009; De Vita, and Kyaw, 2011). Some autors went so far as to develop their own de facto classifications (Reinhart and Rogoff, 2004; Dubas and al., 2005; Levy–Yeyati and Sturzenegger, 2005, 2016).

This new empirical literature verifying the theory of neutrality of the choice of the exchange rate regime also remains inconclusive. Petreski (2009) and De Vita and Kyaw (2011), for example, approve the neutrality thesis using panel data. Whereas for Husain and al. (2005), the choice of exchange rate regime is not neutral and economic growth is positively sensitive to flexible regimes.

Other authors find more nuanced results and make them depend on the level of development of the countries: Levy–Yeyati and Sturzenegger (2001, 2003) and Dubas (2005) only take up this thesis of neutrality in the case of industrialized countries and reject it for the developing countries. According to them, a fixed exchange rate regime is associated in developing countries with a low rate of growth and contained inflation. Rogoff and al. (2003), for their part, show that fixed regimes in developing countries do not present any obstacle to growth, but on the contrary, they provide a certain credibility of institutions propitious to investment and growth. Similar results were obtained in the case of Southeast and Central European countries by De Grauwe and Schnabl (2005).

One of the major limitations of these empirical works that we found in litterature, which reduces the scope of their results, is that they only conceive of a causal relationship between the choice of the exchange rate regime and economic growth in a unidirectional frame. However, this causal link can be very well bidirectional and the non–treatment of this effect of return of the exchange rate regime, if it is the case, leads to the biased regressions. After correcting this endogeneity bias in their regressions, using adapted econometric techniques, Levy–Yeyati and Sturzenegger (2003), Miles (2006), and Aghion and al. (2009) refute the neutrality thesis and demonstrate that the link between the economic growth rate and the exchange rate regime is statistically significant.

2.2   Exchange rate regime, economic structure and development

If the exchange rate neutrality thesis remains an unresolved debate subject in the advanced countries that are close to their full employment, its rebuttal should, in principle, be more implicit in the case of developing countries where full employment, if it exists, is suboptimal. The actual effect of the choice of the exchange rate regime is well established in developing countries (Guzman and al., 2017)

and is conditioned by economic, financial and institutional context in these countries.

Indeed, the exchange rate regime choice impact on economic growth in developing countries depends on the cross effect of this regime with the nature of external shocks (positive versus negative, real versus financial) combined to the intensity of internal rigidities, the financial development (Aghion and al., 2009), the external debts, the Foreign Direct Investment (FDI) weight, the capital account openness (Bailliu and al., 2003) and the existence or not of a parallel change market (Miles, 2006).

In absolute terms, flexible exchange rate regime is renowned for its ability to absorb external shocks, but at the risk of financial instability and inflationary pressures negatively affecting growth. In the event of a real negative shock, adjusting the parity of the currency avoids to the economy the cost of distortions linked to the slowness of the resources reallocation due to the domestic price rigidity (Freidman, 1953; Bailliu and al., 2003). On the other hand, the scope of a positive shock is reduced in a flexible regime due to the appreciation of the domestic currency external value.

Facing the same negative shock, a flexible regime also saves to the economy the potential cost of a rise in the interest rate that would have occurred in case of a fixed exchange rate. Indeed, for an unchanged balance sheet size, the Central Bank would opt for a sterilization operation in order to maintain the parity of its domestic currency imposed by the fixed regime. This operation consists of withdrawing the national currency from the foreign exchange market and injecting foreign currency; it ultimately results in a rise in interest rates compared to their pre-shock level.

In an extensive empirical study, covering 183 countries, Edwards and Levy-Yeyati (2003), and Levy-Yeyati and Sturzenegger (2003) demonstrate that exchange rate flexibility is conducive to economic growth in the case of developing countries and reduces half of the negative impact of a deterioration of the terms of trade. In advanced countries, the nature of exchange rate regime has no real effect. Miles (2006) takes on his behalf the results of the latter works for developing countries and nuances them, considering that these countries suffer already from internal distortions negatively impacting growth regardless of the nature of the chosen exchange rate regime. By crossing fixed regime with an approximate variable of the internal distortions (Black Market Permium) in a regression of economic growth, it shows that the negative effect of the fixed regime goes through these distortions that characterize at least a part of the developing countries. These distortions take the form of rampant inflation, unsustainable macroeconomic imbalances, poor quality of institutions or all of this together (Calvo and Mishkin, 2003).

As for the risk of financial instability inherent to the exchange rate volatility in a flexible regime and its negative impact on the real economy, Aghion and al. (2009) make it depends on the ability of companies to finance themselves and invest in order to improve their productivity. The authors clearly differentiate the case of developing countries, where the financial market is shallow and financial institutions are risk-averse, from advanced countries. For the first category of countries, they show that productivity is negatively related to the degree of flexibility of the exchange and consider preferable the adoption of a fixed regime. The inflation risk is not to be discarded in case of flexible exchange. The inflationary spiral can be triggered by imported inflation, but the magnitude of which will depend on the penetration rate, the price elasticity of imports and productivity gains which are low in developing countries.

In addition, the choice of the exchange rate regime also affects economic growth according to the debt structure of the economy (Eichengreen and Hausmann, 1999). The higher the private and public external debt, the more exchange rate flexibility may hinder growth in the event of a negative external shock (Calvo, 2000). The latter is emphasised in the presence of a flexible exchange rate by a depreciation of external value of currency, increasing immediately the internal cost of debt and tightening the vice of the sustainability constraint. Eventually, the risk premium increases for the next round of foreign currency fundraising jeopardizing further the programming of investment projects and, as a result, potential growth.

Another internal characteristic to be considered in assessing the ability of a particular exchange rate regime to generate growth, but which has received very little attention in the economic literature, is FDI behavior. The variation in FDI would theoretically have two opposite effects on real output, depending on the degree of flexibility of the exchange rate regime. On the one hand, a net inflow of FDI in a flexible regime leads, ceteris paribus, to an appreciation of the exchange rate and a control of imported inflation favorable to consumption and therefore to growth ; on the other hand, if the Marshall-Lerner condition is verified, this exchange rate appreciation ends up reducing production in the medium and long terms by undermining the cost competitiveness. In the presence of a fixed exchange rate, the adjustment goes through interest rate which reacts to the decline and consequently favors the investment.

The capital account openness is another channel through which the exchange rate regime choice affects growth. In the aftermath of the 1990s crises, the first factor to blame was capital account openness and its incompatibility with the intermediate regimes prevailing in the countries that were at the heart of these crises. For some authors (Obstfeld and Rogoff, 1995; Fisher, 2001; Eichengreen, 1998), corner regimes are the only solutions able to avoid currency crises in a context of financial integration at an international level. For others (Bénassy-Quéré and Coeuré, 2002; Williamson, 1999, 2000), none of the exchange rate regimes is immune to speculative attacks.

3.   Exchange rate regimes in Africa: data and descreptive analysis

The data is macroeconomic in nature, mainly from the World Bank's (Africa Development Indicators) database and covers the period from 1980 to 2010 [3]. The following table regroups the variables of interest and control introduced in the different regressions, their description, as well as the sources of informations. The variables of interest represent the different exchange rate regimes and the control variables were chosen from among the standard recurrent determinants found in growth theory (Barro and Sala-i-Martin, 2004).

The paper studies the behavior of the choice of exchange rate regime for a panel composed of 30 African countries. With exception of a few countries with a very rich basement (Mauritius Gabon, Botswana and Algeria), the rest of the panel countries have a relatively comparable level of development and are broadly in terms of per capita GDP between the average of the lower middle-income countries and that of the low-income countries (see red bars in Figure 1). In fact, any economic policy, including the one relating to the choice of the exchange rate regime, should be designed in a logic of economic catch-up and judged in the light of its ability to put these countries on a higher growth trajectory The exchange rate regimes distribution in Africa remains dominated in 2010 by fixed regimes, but its share has been declining since the abandonment of the Bretton Woods system in the early 1970s (Figure 2). Migration to the flexible regime only began in the 1980s under the auspices of international institutions under the structural adjustment programs and stopped abruptly in the aftermath of the currency crises of the 1990s. Since then, the actual choice has shifted more and more to the intermediate regime, although some of these countries have continued to declare a float (Calvo and Reinhart, 2002).

The gradual abandonment of fixity in the 1970s was marked by a particular international situation, characterized by a drop in the demand for raw materials and energy due to the rise in their price and the economic slowdown of the formerly industrialized countries. This reversal of the international situation has reduced foreign exchange inflows in African countries and made it difficult to maintain fixed exchange rates.

The observation of descriptive statistics crossing the economic performances of African countries with the exchange rate regimes in place already provides a first idea of the classification of exchange rate regimes. They show that the middle regime outperforms on average the corner regimes in

---

3. The data used for this work stop in 2010, because the Reinhart and Rogoff's exchange rate regimes classification available at the time when we carry out the estimates only covers up to that date.

Table 1: Variables, Descriptions and Sources [a]

|	Variables	Variables description	Sources
Interest variables	Fixed	1 if ERR is fixed; 0 if not	Reinhart and Rogoff (2010)
	Intermediate	1 if ERR is intermediate; 0 if not	
	Flexible	1 if ERR is flexible; 0 if not	
	Free Falling	1 if the country in a hyperinflation situation ; 0 if not	
	Monetary Union	If the country is a mumber of CFA Zone ; 0 if not	
Control variables	Real GDP per capita growth	Real GDP per capita growth rate	World Bank (Africa Development Indicators)
	Initial GDP	Real GDP per capita level in 1980	
	Investment	Investment ratio to GDP	
	Trade openness	Trade ratio to two times GDP	
	Public expenditures	Public expenditure in final Consumption ratio to GDP	
	Inflation	Inflation	
	Δ Terms of trade	Change in terms of trade	
	Reserves / broad money	Reserves ratio to broad money	
	External debts	Stock of external debts to GNI	
	Domestic credit	Domestic credit	
	FDI	Foreign direct investment ratio to GDP	
	Natural resources	Rent derived from natural resources ratio to GDP	
	Size of the economy	Country's GDP ratio to the sum of all panel countries GDP	
	Schooling	Average number of years of schooling	Barro and Lee (2013)
	Capital account	Capital account openness index of Chinn-ito	Chinn and ito (2008)
	Institutional quality	Institutional quality index of Kuncic, A.	Kuncic (2012)
	Terms of trade volatility	Average of the absolute values of Deviations from the trend	Authors
	GDP volatility	Average of the absolute values of Deviations from the trend	Authors
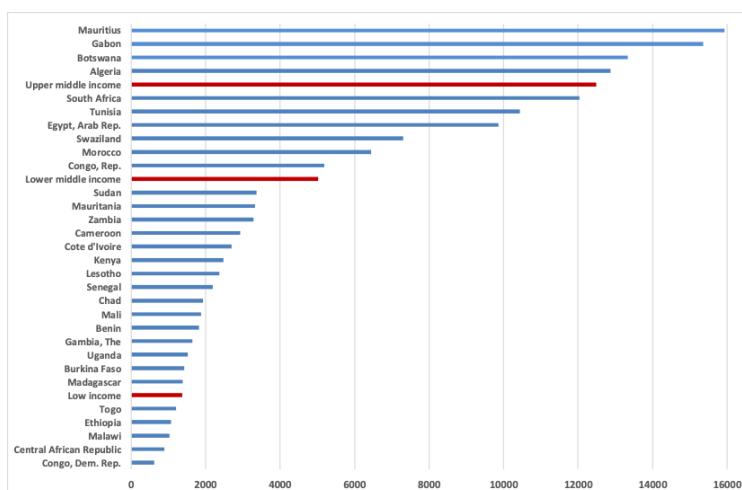
Figure 1. Ranking of African countries by GDP per capita in 2010 (in dollars and PPP). Source: World Development Indicators

---

a. Schooling variable is only available in 5 years periods. We had to make it annual on the assumption that the growth rate remains constant within each 5-year interval.

terms of economic growth, regardless of the country's level of development and its degree of trade openness (Table 2). On the other hand, the choice between a fixed and a flexible regime seems to depend on the level of development: if these two regimes are valid for the countries situated on the upper bracket of median income, the fixed exchange rates generate better economic performances in the low-income countries. By referring to the degree of trade openness, between the two corner regimes, the fixity is more compatible with higher economic growth.
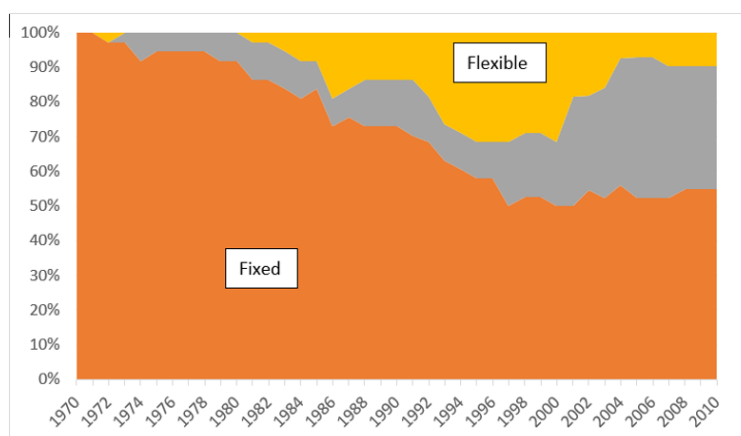

Figure 2. Weight of de facto exchange rate regimes in Africa between 1970 and 2010. Source: constructed by Authors based on Reinhart and Rogoff ranking criteria (2004)

By widening the observation of statistical data to other macroeconomic aggregates, the latter finding of the superiority of the intermediate regimes seems to be confirmed, without however concluding, at this stage, the existence of a causal link between the intermediate regime and economic performance (this link will be further econometrically tested). Thus, the highest investment rate is associated with the panel countries having opted for an intermediate exchange rate regime. Inflation, for its part, is between a floor level that prevailed in the fixed-rate countries and a high level characterizing countries whose value of money is determined by the market (Table 3).

Table 2: Median growth rate by group of African countries according to the nature of their exchange rate regime, their level of development and their degree of trade openness over the period 1980 – 2010

		Exchange rate regimes		
Economic growth rates...		Fixed	Intermediate	Flexible
... for all panel		**1.1**	**2.9**	**0**
... for countries with the	Low	1.2	2.8	-0.4
income is relatively	high	0.9	2.9	0.9
... by degree of	Low	1.1	2.8	-1
trade openness	Intermediate	0.9	2.3	1
	High	1.2	3.4	-0.7

Source: constructed by Authors based on Africa Development Indicators

Table 3: Median growth rate by group of African countries according to the nature of their exchange rate regime, their level of development and their degree of trade openness over the period 1980 – 2010

	Exchange rate regimes		
	Fixed	Intermediate	Flexible
Investment rate	19	23.5	16
Inflation rate	4.1	7.4	17.9

Source: constructed by Authors based on Africa Development Indicators

4. Exchange rate regimes and economic growth in Africa: methodology and estimations

Two types of econometric models are estimated. The first is linear and aims to evaluate the reaction of growth to different exchange rate regimes.

$$\gamma_{i,t} = c + \sum_{l=1}^{L} \beta_l X_{l,i,t} + \sum_{m=1}^{M} \gamma_m Z_{m,i,t} + \alpha_i + \varepsilon_{i,t}$$

The second is non–linear and introduces cross-variables with exchange rate regimes in order to identify which of the internal features of the economies are compatible with a particular exchange rate regime. It is written in the following canonical form:

$$\gamma_{i,t} = c + \sum_{l=1}^{L} \beta_l X_{l,i,t} + \sum_{m=1}^{M} \gamma_m Z_{m,i,t} + \sum_{n=1}^{N} \varphi_n \left(X_{n,i,t} * Z'_{n,i,t} \right) + \alpha_i + \varepsilon_{i,t}$$

Where $\gamma_{i,t}$ designates GDP per capita growth rate in country i at date t, $X_{l,i,t}$ is a line vector of variables of interest with L terms representing the nature of the exchange rate The intermediateregime being the omitted modality. The control variable line vector Z is of dimension M and includes all the classical determinants of economic growth. β, γ and φ are column vectors of sensitivity coefficients to estimate. α_i is a random component representing the individual effect specific to each country, $\varepsilon_{i,t}$ the term of the error and c a common constant to all the individuals in the sample.

The estimation method is that of a panel data random–effect model, as applied by Dubas and al. (2005) to address the same kind of questions. However, a special treatment has been reserved for endogeneity. In contrast to the Ordinary Least Squares (OLS) model used by Levy-Yeyati and Sturzenegger (2003), which assumes a perfect homogeneity of the individuals in the panel, even at the level of the variables of interest, the random effect model, considering a specific individual effect for each individual in the panel, is most appropriate for the heterogeneous nature of the choice of exchange rate regime between countries.

In addition, the fixed-effect model as used by De Vita and Kyaw (2011) to assess exchange rate performance in a panel of countries is not the most appropriate. The reason is that the variables transformation (in deviation from the individual mean) required to validate the hypothesis of no correlation between the individual effects and the explanatory variables ($cov(\alpha_i, Z_{i,t}) = 0$) cannot be applied to structural qualitative variables, in this case, exchange rate regimes.

Thus, the random effect model is the most appropriate for data that show variability among panel members, but some inertia over time. Which is the case for our variables of interest. That said, the composite structure of the error term with a time–invariant term is a source of autocorrelation whose processing involves the use of the Generalized Least Squares estimator (GLS), which consists in applying the method of OLS to a well-transformed model captures the interindividual variability.

As for the risk of the endogeneity of the variables of the exchange rate regime, we tested it by

adopting a two–step approach, inspired by the work of Yougbaré (2009)[4]. First, we estimated a Logit model of the determinants of exchange rate choice in order to identify the relevant variables to retain as instruments in a linear instrumental variable regression model (see Table 6 in appendix). Subsequently, to test the endogeneity of the variables of interest, we used the two-step instrumental variable method (IV–GMM) applied to pooled data. Angrist and Krueger (2001) argue that the consistency of the instrumental variable estimator in the second stage is persistent regardless of the specification of the model in the first stage. The convergence of the estimated coefficients in the second step is ensured, disregarding the functional form of the "true" model of the first stage whether linear or not (Angrist, 2001).

Finally, the estimation of the determinants of economic growth by the instrumental variables method (see Table 7 in appendix) shows that the instruments used are valid (in terms of Hansen's orthogonality conditions) and the endogeneity assumption is rejected (according to the Durbin-Wu-Hausman test). Several model variants have been tested and conclude that there is no endogeneity bias in our application case.

4.1   Estimations 1: exchange rate regimes and economic growth

In this section, it is a question of estimating the explanatory models of economic growth in Africa by highlighting the effect of the exchange rate regime. Table 4 summarizes the results of the retained estimates (M1 to M5) which, after eliminating the role of traditional determinants of growth, test the hypothesis of exchange rate neutrality and rank exchange rate regimes according to their economic performance. The models from M1 to M4 are estimated on annual data. The M5 model tests the stability of the results of the first regressions over the long term and introduces the variables as means over 5 years.

Overall, the control variables are statistically significant in all models and come out with the expected sign. The coefficient related to the initial GDP variable takes a negative value, in line with the economic catch–up dynamics à la Solow. The investment, the trade openness, the changes in terms of trade and the FDI flows have a positive impact on economic growth in Africa. The public expenditures, the inflation and the abundance of natural resources have a recessive effect. The positive impact of the schooling only appears when the potential effect of the curse of natural resources is captured (M2), otherwise the two effects compensate for the non–significance of the schooling variable in the rest of the models.

Interest variables relating to the exchange rate regimes are of a qualitative nature, interpreted in relation to the omitted variable which is, in this case, the intermediate regime. The M1 and M2 estimates conclude that intermediate regime is superior in terms of its ability to generate economic growth compared to corner regimes. This result reinforces the conclusions of some of the work on the question pleading for an intermediate regime (Bleaney and al., 2021), in the particular case of developing countries (Williamson, 1999, 2000; Bénassy-Quéré and Coeuré, 2002; Ferrari-Filho and De Paula, 2008; Guzman and al., 2017). The recurring argument in favor of this choice of regime is that it brings together the advantages of the corner regimes, while reducing the scope of their respective negative effects.

---

4. To deal with this endogeneity bias, other authors (Petreski, 2009; De Vita and Kyaw, 2011) have opted for an alterative method, like that of the GMM system estimator applied to panel data. However, this approach poses a problem in the case of sctructural dummy variables because the transformation into a first difference of these variables does not make it possible to distinguish between the countries having respectively opted for different exchange rate regimes for two consecutive periodes.

Table 4: Effect of Nature of Exchange Rate Regimes on Economic Growth in Africa[a]

	M1	M2	M3	M4	M5
Fixed	-0.0147***	-0.0183***	-0.0145***	-0.0201**	-0.0123**
	(-3.51)	(-4.19)	(-3.23)	(-2.26)	(-2.44)
Flexible	-0.0202***	-0.0176***	-0.0145***	-0.0131***	-0.0240***
	(-5.15)	(-4.29)	(-3.70)	(-3.60)	(-4.23)
Free Falling		-0.0337***	-0.0338***		
		(-6.64)	(-5.67)		
Monetary Union			-0.00694*		
			(-1.77)		
Initial GDP	0.00647***	-0.00639**	0.00731***	0.00841***	-0.00471*
	(-2.77)	(-2.18)	(-3.13)	(-3.67)	(-1.94)
Investment	0.0126**	0.0166***	0.0114*	0.00981	0.0112*
	(2.41)	(3.35)	(1.92)	(1.56)	(1.95)
Trade openness	0.00919**	0.0149**	0.0111***	0.0128**	0.00733*
	(2.44)	(2.11)	(2.99)	(2.26)	(1.82)
Public expenditures	-0.0221***	-0.0159***	-0.0220***	-0.0217***	0.00218***
	(-3.88)	(-2.79)	(-3.74)	(-3.53)	(-4.05)
Δ terms of trade	0.0165*	0.0216**	0.0165*	0.0188**	
	(1.73)	(2.26)	(1.74)	(2.16)	
Inflation	-0.0240***	-0.0151***	-0.0206***	-0.0195***	0.00280***
	(-11.54)	(-4.82)	(-7.62)	(-5.89)	(-12.19)
Schooling	0.00111	0.00277**	0.000801	0.000261	0.000512
	(0.73)	(2.07)	(0.54)	(0.15)	(1.37)
FDI	0.0975***	0.0782**	0.0914***	0.0900**	
	(2.77)	(2.15)	(2.66)	(2.53)	
Natural ressources		-0.0255*			
		(-1.84)			
GDP volatility					0.00218***
					(-4.05)
Terms of trade volatility					-0.0300*
					(-1.71)
c	0.0399**	-0.00376	0.0417**	0.0416*	0.0393*
	(2.02)	(-0.11)	(2.13)	(1.91)	(1.94)
N	625	593	625	624	141
Overall	0.2930	0.2877	0.1964	0.2952	0.5583
Between	0.8379	0.8485	0.5956	0.8318	0.8786
Within	0.1506	0.2877	0.1084	0.1485	0.2640
Autocorrelation	0.5397	0.6567	0.5449	0.5545	0.1591

*, **, *** significant at a 10 %, 5 % and 1 % level. i) t-student between brackets; ii) M1, M3, M4 and M5 include dummy variables to control for regional concentration effects.

a. The statistical properties of the models are satisfactory: the heteroscedasticity is corrected upstream on STATA and the autocorrelation hypothesis is rejected. The Durbin–Wu–Hausman test associated with the IV–GMM method does not reject the null hypothesis of exogeneity of the explanatory variables, including those relating to exchange rate regimes (Table 7 in appendix).

Indeed, between a fixed exchange rate ensuring macroeconomic stability through the control of

inflation and a floating exchange isolating the economy from negative external shocks and improving cost competitivenes, the intermediate regime gives the faculty to dose the intensity of fixity / flexibility to be introduced in the system by adapting to the specificities of each country and to the reversals in the international economic situation [5] .

The M3 model reevaluates the previous result of the underperformance of the flexible regime compared to the intermediate regime by separating from the group of countries opting for flexibility those characterized by galloping inflation (grouped under the Free Falling regime). This result remains unchanged and the superiority of the intermediate regime is confirmed. The M4 model goes into more detail by separating the CFA franc zone from the fixed regime assuming, a priori, that the adoption of a single currency encourages trade and growth. The estimation of this model hardly alters the first result of relative superiority of the middle regime.

However, the negative impact on the growth of the monetary union is less than that of the fixed regime outside the monetary union. The M5 model tests the robustness of the results over the long term, neutralizing the effect of changes in economic conditions on the behavior of variables. As the regression is enriched by volatility variables in terms of GDP and terms of trade, the short-term result remains robust and the intermediate regime dominates the corner regimes in the case of African countries.

4.2   Estimations 2: exchange rate regimes, structural characteristics and economic performances

Now that the effect of the choice of exchange rate regime on growth has been empirically proven, it is necessary to establish explanatory models of growth that make it possible to identify the economic characteristics compatible with one or other exchange rate regime. In order to do this, cross-variables were introduced in the growth rate regressions (Table 5), testing the combined effect of the exchange rate regime with the variations of terms of trade (M6), FDI weight (M7), the degree of openness of the capital account (M8) and external debt weight (M9). Flexible

As for the first group of models (M1 to M5), the classic determinants of growth are, for the most part, statistically significant in this second group of regressions (M6 to M9) and stand out with the expected signs. In these regressions (Table 5), the intermediate exchange rate regime outperforms, in absolute, the corner regimes (first two rows of the table), but its positive effect on growth is more pronounced in the presence of a positive shocks of the terms of trade (M6), a FDI inflows (M7) and a controlled opening of the capital account (M8). This result confirms the superiority of the intermediate regime as shown by our statistical analysis (see above) and is consistent with econometric works supporting the same thesis (Williamson, 1999, 2000; Bénassy-Quéré and Coeuré, 2002; Ferrari-Filho and De Paula, 2008; Guzman and al., 2017).

Moreover, external indebtedness negatively affects African economic growth regardless of the nature of the chosen exchange rate regime. Nevertheless, its impact in fixed regime is slightly less important in absolute value than in flexible regime.

The model results (Table 5) also argue that between the two corner regimes, he preference for more flexibility (versus fixity) in African countries would be dictated by the occurrence of positive (versus negative) external shocks, the presence of positive (versus negative) FDI flows, the openness (versus closure) of the capital account, and the high (versus low) external debt burden. These results are consistent with those found in the literature.

---

5. Another argument found in the literature used to guide the choice of the exchange rate regime is the independence of monetary policy and its ability to smooth the economic cycle that the flexibility supposed to ensure. This argument is increasingly challenged and Mundell's trilemma tends to be reduced to a dilemma because of increased financial integration and trade openness (Rey, 2015; Han and Wei, 2016): the independence of monetary policy in the peripheral countries is not guaranteed by a floating exchange rate and is possible if and only if the capital account is managed. Edwards (2015), for example, highlights clearly the presence of a contagion effect of US monetary policy on that of South American countries having recently chosen the flexible exchange rate regime.

Table 4: Modeling the transmission channels of the effect of the nature of the exchange rate regime on economic growth in Africa

	M6	M7	M8	M9
Fixed	-0.0183***	-0.0158***	-0.0156***	-0.0218***
	(-4.11)	(-3.56)	(-2.88)	(-2.97)
Flexible	-0.0163***	-0.0204***	-0.0148***	-0.0148*
	(-3.97)	(-3.53)	(-3.09)	(-1.69)
Fixed* Δ Terms of trade	0.0354**			
	(2.28)			
Intermediate * Δ Terms of trade	0.0344*			
	(1.96)			
Flexible * Δ Terms of trade	-0.0129			
	(-1.60)			
Fixed*FDI		0.0410		
		(1.04)		
Intermediate *FDI		0.122***		
		(3.84)		
Flexible* FDI		0.228 ***		
		(2.97)		
Fixed * Capital account			0.00263	
			(0.63)	
Intermediate* Capital account			−0.00267**	
			(−2.12)	
Flexible*Capital account			0.00436***	
			(2.84)	
Fixed* External debts				-0.0106***
				(−3.36)
Intermediate*External debts				−0.0145**
				(−2.10)
Flexible* External debts				−0.0142***
				(-4.05)
Initial GDP	-0.00654**	-0.00566*	-0.00723**	-0.00706**
	(-2.31)	(-1.80)	(-2.07)	(-2.41)
Investment	0.0164***	0.0158***	0.0138***	0.0134***
	(3.44)	(3.13)	(2.64)	(2.85)
Trade openness	0.0152**	0.0149**	0.0169**	0.0155**
	(2.15)	(2.02)	(2.17)	(2.29)
Public expenditures	-0.0154***	-0.0151**	-0.0156**	-0.0115*
	(-2.69)	(-2.54)	(-2.48)	(-1.91)
Inflation	-0.0173***	-0.0136***	-0.0151***	-0.0109***
	(-5.77)	(-4.32)	(-4.70)	(-2.91)
Schooling	0.00270**	0.00261*∗	0.00320**	0.00121
	(1.99)	(1.89)	(2.24)	(0.80)
Delta Terms of trade		0.0213**	0.0197**	0.0221**
		(2.21)	(2.05)	(2.36)
FDI	0.0771*		0.0760**	0.0504
	(2.11)		(2.20)	(1.56)
Natural resources	−0.0259′)	-0.0256*	-0.0170	0.00104
	(-1.84)	(-1.90)	(-1.07)	(0.07)
c	-0.00390	-0.00935	-0.000565	0.0111
	(-0.12)	(-0.27)	(-0.01)	(0.40)
N	593	593	593	579
Overall	0.2018	0.1991	0.1961	0.2228
Between	0.6737	0.6572	0.5887	0.7994
Within	0.1008	0.1012	0.1091	0.1019
Autocorrelation p value	0.6591	0.5617	0.6728	0.6050

*, **, *** significant at a 10 %, 5 % and 1 % level. i) t-student between brackets; ii) M1, M3, M4 and M5 include dummy variables to control for regional concentration effects.The statistical properties of the models are satisfactory: the heteroscedasticity is corrected upstream on STATA and the autocorrelation hypothesis is rejected.

Indeed, the much-vaunted advantage of exchange rate flexibility in much of the literature (Bailliu and al., 2003; Edwards and Levy-Yeyati, 2003; Levy-Yeyati and Sturzenegger, 2003) is its ability to absorb external shocks. Our results confirm this, as terms of trade shocks, associated with a flexible exchange rate regime, have no effect on growth. Except that this insulation of the economy through flexibilisation also concerns positive external shocks. In relation to the combined effect of FDI and the exchange rate regime on growth has received very little attention in the literature. Rather, it is the direction and extent of causality between these two variables that is the subject of much work (Among the latest works, the reader can refer to those of Taşdemir (2020) and Lu and al. (2022)), without looking at their cross effect on growth.

In addition, as in Obstfeld and Rogoff (1995), Eichengreen (1998), and Fisher (2001), we show on African data that opening the capital account is rather compatible with a flexible exchange rate regime. And in line with our results, several authors (Eichengreen and Hausmann, 1999; Calvo, 2000) have highlighted the recessionary effect of a negative external shock in the case of countries with high foreign debt and a floating currency. The example of the Asian crisis in the mid-1990s is a textbook case.

5.   Conclusion

The story of exchange rate regime choice has not yet reached a consensus. Between early works on the subject (Mundell, 1961; McKinnon, 1963) and the most recent (Frankel, 2017; Guzman and al., 2017), no superiority of one specific foreign exchange regime over the others has been established ad vitam aeternam. This paper fits into this context and responds empirically to the need to define the practical conditions for migration from one exchange rate regime to another.

The purpose of this paper is twofold. First, it tests on a panel data concerning 30 African countries the thesis of currency neutrality and attempts to rank, in case of rejection of this thesis, exchange rate regimes according to their economic performances by referring to economic growth rate. Second, it aims to list the specific structural characteristics of the panel countries by crosscheking them with exchange rate regimes to find out which are most favorable to economic growth.

The paper concludes the absence of currency neutrality in case of African countries and an out-performance of intermediate regimes. On the one hand, the latter are more conductive to economic growth in the case of countries experiencing positive terms of trade shocks and benefiting from FDI inflows. On the other hand, the opening of capital account is incompatible with intermediate regimes, and external indebtedness does not favor economic growth regardless of the exchange rate regime adopted. These results remain robust by testing several alternative econometric specifications (long-term estimate on five years' window data, estimates by controlling regional effects and by adopting more detailed exchange rate regimes clasifications).

Biographical Notes

Anass Abouelkair holds a master's degree in applied econometrics from the University of Hassan II and was a PhD student there.

Yasser Y. Tamsamani work as an economist at OCP Group, and teaches and supervises master's thesis and PhD dissertations at the Hassan II University. He is a coeditor of the journal Réflexions Économiques and has been a referee for several scientific journals. Yasser received his PhD in macroeconomic modelling and environmental economics in 2010 from the University of Paris 1 Pantheon-Sorbonne. He held the position of economist at the OFCE- Sciences-Po Paris between 2008 and 2012, then as an affiliated researcher until 2019. He was also an associate researcher at the DIAL - Paris Dauphine University between 2017 and 2020.

References

Aghion, P., Bacchetta, P., Rancie, R. Rogoff, K. (2009). Exchange Rate Volatility and Productivity growth: The Role of Financial development. Journal of Monetary Economics, 56.

Angrist, D. J. Krueger, A. B. (2001). Instrumental Variables and the Search for Identification: From Supply and Demand to Natural Experiments. Journal of Economic Perspectives, 15(4).

Angrist, J. (2001). Estimation of Limited–Dependent Variable Models with Dummy Endogenous Regressors: Simple Strategies for Empirical Practice. Journal of Business and Economic Statistics, 19(1).

Bailliu, J., Lafrance, R. Perrault, J. F. (2003). Does Exchange Rate Policy Matter For growth. International Finance, 6(3).

Barro, R. Lee, J. W. (2013). A New Data Set of Educational Attainment in the World, 1950–2010. Journal of Development Economics, 104.

Barro, R. J. Sala–i–Martin, X. (2004). Economic growth. Cambridge, Massachusetts: The MIT Press.

Baxter, M. (1991). Business cycles, stylized facts, and the exchange rate regime: evidence from the United States. Journal of International Money and Finance (10).

Baxter, M. Stockman, A. (1989). Business Cycles and the Exchange Rate Regime: Some International Evidence. Journal of Monetary Economics (23).

Bénassy-Quéré, A. Coeuré, B. (2002). The survival of intermediate exchange rate regimes. CEPII Working Paper (07).

Bleaney, M., Saxena, S. Yin, L. (2021). Exchange rate regimes, devaluations and growth collapses. Journal of Macroeconomics, 57.

Calvo, G. (2000). The Case for Hard Pegs in the Brave New World of Global Finance. Mimeo, University of Maryland.

Calvo G. F.S. Mishkin. (2003). The Mirage of Exchange Rate Regimes for Emerging Market Countries. NBER Working Paper series (9808).

Calvo, G. A. Reinhart, C. M. (2002). Fear of floating. Quarterly Journal of Economics, 2(117).

Chinn, M. D. Ito, H. (2008). A New Measure of Financial Openness. Journal of Comparative Policy Analysis, 10(3).

Capriata, W. Flauzino De Souza, L. (2021). The exchange rate in Orthodox, Keynesian and New Developmentalism theoretical models: a literature review. Revista de Economia Política, 41 (2).

De Grauwe, P. Schnabl, G. (2005). Exchange rate stability, inflation and growth in (South) Eastern and Central Europe. Review of Development Economics, 3(12).

De Vita, G. Kyaw, K. S. (2011). Does the Choice of Exchange Rate Regime Affect the Economic Growth of Developing Countries? The Journal of Developing Areas, 45.

Dubas, J., Lee, B. J. Mark, N. (2005). Effective Exchange Rate Classifications and Growth. NBER Working Paper Series (11272).

Edwards, S. (2015). Monetary Policy Independence under Flexible Exchange Rates: An Illusion? NBER Working Paper Series (20893).

Edwards, S. Levy-Yeyati, E. (2003). Flexible Exchange Rates as Shock Absorbers. NBER Working Paper Series (9867).

Eichengreen, B. (1998). The only game in town. In The World Today, 12(54).

Eichengreen B. Hausmann, R. (1999). Exchange Rates and Financial Fragility. NBER Working Paper Series (7418).

Ferrari-Filho, F. De Paula, L. F. (2008). Exchange rate regime proposal for emerging countries: a Keynesian perspective. Journal of Post Keynesian Economics, 31(2 227).

Fisher S. (2001). Exchange Rate Regimes: Is the Bipolar View Correct? Journal of Economic Perspective, 2(15).

Frankel, J. A. (1999). No Single Currency Regime is Right for All Countries or At All Times. NBER Working Paper Series (7338).

Freidman, M. (1953). The Case of Flexible Exchange Rate. In Essays in Positive Economics. University of Chicago Press.

Frankel, J. A. (2017). Systematic Managed Floating. NBER Working Paper Series (23663).

Ghosh, A. R., Gulde, A. M., Ostry, J. D. Wolf, H. C. (1997). Does the Nominal Exchange Rate Regime Matter? NBER Working Paper Series (5874).

Ghosh, A., Gulde, A-M. Wolf, H. (2003). Exchange Rate Regimes: Choices and Consequences. MIT Press.

Guzman, M., Ocampo, J. A. Stiglitz, J. E. (2017). Real Exchange Rate Policies for Economic Development. NBER Working Paper Series (23868).

Han, X. Wei, S. J. (2016). International Transmissions of Monetary Shocks: Between a Trilemma and a Dilemma. NBER Working Paper Series (22812).

Husain, A. M., Mody, A. Rogoff, K. S. (2005). Exchange rate regime durability and performance in developing versus advanced economies. Journal of Monetary Economics, 1(52).

Kenen, P. (1969). The Theory of Optimum Currency Areas: An Eclectic View. In Mundell and Swoboda (eds.) Monetary Problems in the International Economy, University of Chicago Press, Chicago.

Kuncic, A. (2012). Institutional quality database. Kiel advanced studies working papers (457).

Levy Yeyati, E. Sturzenegger, F. (2001). Exchange rate regimes and economic performance. IMF Staff Paper (Special Issue) (47).

Levy-Yeyati, E. Sturzenegger, F. (2003). To Float or to Fix: Evidence on the Impact of Exchange Rate Regimes on Growth. The American Economic Review, 93(4).

Levy-Yeyati, E. F., Sturzenegger. (2005). Classifying exchange rate regimes: Deeds versus words. European Economic Review, 49(6).

Levy-Yeyati, E. Sturzenegger, F. (2016). Classifying Exchange Rate Regimes. HKS Working Paper (16-028).

Lu, D., Lin, J. Zhou, H. (2022). Global financial conditions, capital flows and the exchange rate regime in emerging market economies. Journal of International Financial Markets, Institutions and Money, 77.

McKinnon, R. I. (1963). Optimum Currency Areas. American Economic Review, 53(4).

Miles, W. (2006). To Float or Not to Float? Currency Regimes and Growth. Journal of Economic Development, 31(2).

Mills, T.C. Wood, G. E. (1993). Does the exchange rate regime affect the economy? Federal Reserve Bank of St. Louis Review, 4(75).

Mundell, R. A. (1961). A Theory of Optimum Currency Areas. American Economic Review, 51(4).

Obstfeld, M. Rogoff, K. (1995). The mirage of fixed exchange rates. Journal of Economic Perspectives,
    4(9).

Petreski, M. (2009). Analysis of Exchange-Rate Regime Effect on Growth: Theoretical Channels and Empirical Evidence with Panel Data. Economics Discussion Paper (2009-49).

Reinhart, C. M. Rogoff, K. S. (2004). The Modern history of exchange rate arrangements: A reinterpretation. Quarterly Journal of Economics, 1(119).

Rey, H. (2015). Dilemma not trilemma: the gobal financial cycle and monetary independence. NBER Working Paper Series (21162).

Rogoff, K. S., Husain, A. M., Mody, A., Brooks, R., Oomes, N. (2003). Evolution and performance of exchange rate regimes. Working Paper, International Monetary Fund (03/243).

Rose, A.K. (1994). Are exchange rates macroeconomic phenomena? Federal Reserve Bank of San Francisco Economic Review (1).

Russell, J. (2012). Herding and the shifting determinants of exchange rate regime choice. Applied Economics (44).

Szirmai, A. (2009). Industrialisation as an Engine of Growth in Developing Countries 1950–2005. UNU–MERIT working paper (10).

Taşdemir, F. (2020). The Main Determinants of Capital Inflows in Emerging Market Economies: Does the Exchange Rate Regime Matter? World Journal of Applied Economics, 6(2).

Williamson, J. (1999). Are Intermediate Regimes Vanishing? Peterson Institute for International Economics, https://piie.com/commentary/speeches-papers/are-intermediate-regimes-vanishing.

Willimason, J. (2000). Designing a Middle Way between Fixed and Flexible Exchange Rates. Peterson Institute for International Economics, online.

Yeyati, E. L. F. Sturzenegger. (2001). Exchange rate regimes and economic performance. IMF Staff Paper (Special Issue) (47).

Yougbaré L. (2009). Effets Macroéconomiques des Régimes de Change: Essais sur la Volatilité, la Croissance économique et les Déséquilibres du Taux de Change Réel. Thèse de Doctorat au Centre d'Etudes et de Recherches sur le Développement International (CERDI).

Appendix

Table 6: Determinants of the choice of a fixed exchange rate regime (Logit model)

	I 1	I 2	I 3	I 4
Δ terms of trade (-1)	-0.0119**	-0.00865	-0.0125**	
	(-2.26)	(-1.42)	(-2.27)	
Domestic credit (-1)	-0.0271***	-0.0166**	-0.0160**	-0.0266***
	(-5.18)	(-2.57)	(-2.45)	(-3.63)
Size of the economy	-11.96***	-8.205*	-9.876*	-4.886
	(-3.32)	(-1.90)	(-1.88)	(-1.03)
Reserves/broad money (-1)	-0.595***	-0.0376	-0.0945	0.0936
	(-5.16)	(-0.28)	(-0.67)	(0.72)
External debts (-1)	-0.00403***	-0.00456**	-0.00525***	0.000362
	(-2.68)	(-2.36)	(-2.66)	(0.18)
Institutional quality		-5.407***	-5.549***	-6.921***
		(-6.72)	(-6.81)	(-7.56)
Trade openness (-1)			0.632**	
			(2.21)	
Inflation(-1)				-11.22***
				(-6.37)
Inflation^2 (-1)				1.826***
				(5.81)
C	1.482***	3.115***	2.746***	4.246***
	(6.62)	(6.81)	(5.90)	(8.24)
N	721	542	542	579
Pseudo R	0.1070	0.1530	0.1598	0.2869

Table 7: GMM estimation of the effect of the exchange rate regime on economic growth

	I 1	I 2	I 3	I 4
Δ terms of trade (-1)	-0.0119**	-0.00865	-0.0125**	
	(-2.26)	(-1.42)	(-2.27)	
Domestic credit (-1)	-0.0271***	-0.0166**	-0.0160**	-0.0266***
	(-5.18)	(-2.57)	(-2.45)	(-3.63)
Size of the economy	-11.96***	-8.205*	-9.876*	-4.886
	(-3.32)	(-1.90)	(-1.88)	(-1.03)
Reserves/broad money (-1)	-0.595***	-0.0376	-0.0945	0.0936
	(-5.16)	(-0.28)	(-0.67)	(0.72)
External debts (-1)	-0.00403***	-0.00456**	-0.00525***	0.000362
	(-2.68)	(-2.36)	(-2.66)	(0.18)
Institutional quality		-5.407***	-5.549***	-6.921***
		(-6.72)	(-6.81)	(-7.56)
Trade openness (-1)			0.632**	
			(2.21)	
Inflation(-1)				-11.22***
				(-6.37)
Inflation^2 (-1)				1.826***
				(5.81)
C	1.482***	3.115***	2.746***	4.246***
	(6.62)	(6.81)	(5.90)	(8.24)
N	721	542	542	579
Pseudo R	0.1070	0.1530	0.1598	0.2869