

Does the choice of exchange-rate regime effect economic growth?

A study across different levels of country development.

By: Sebastian Fristedt

Mentor: Stig Blomskog
Södertörns University | Institution of Economics
Bachelor Thesis 15 HP
Economics | Spring Semester 2016



SÖDERTÖRNS HÖGSKOLA | STOCKHOLM
sh.se

ABSTRACT

Does the choice of exchange-rate regime effect the economic growth performance of a country? And does the significance of such a relationship vary across different levels of development? Few questions in international economics, whether it be in academic or policy circles, have inspired as much debate yielding as little consensus. Although both economic growth theory and empirical literatures suggests the existence of direct and indirect channels, through which the choice of regime may indeed impinge the growth rate, neither has managed to provide an unambiguous answer. The aim of this paper is to analyze the theoretical arguments as to the relationship between the choice of exchange-rate regime and economic growth and to empirically investigate if there is an optimal regime, in terms of growth, and if the significance of this impact differs across various levels of country development. Applying a cross-sectional regression estimation of 60 countries over the period 2000-2010, this paper finds that the choice of exchange-rate regime holds no significant explanatory power over economic growth. These findings were robust to dividing the sample based on the level of country development. Although no direct relationship was found, these findings supports the argument that the choice of regime may indeed effect growth indirectly, through its impact on other deterministic growth factors, such as trade, investment and productivity. The findings of this paper are both in accord and discord with previous results and underlines how divergent the empirical research is on this continuously debated issue.

Keywords: *Exchange-rate regime; economic growth; country development.*

TABLE OF CONTENT

1. Introduction	1
1.1 Background	1
1.2 Study objective	2
1.3 Problem statement	2
1.4 Methodology	2
1.5 Scope of study	2
1.6 Thesis structure.	3
2. Defenitions	5
2.1 Breakdown of Bretton Woods	5
2.2 Exchange rate regime	5
2.3 Exchange Rate Regime Classification	7
2.4 Level of development	8
3. Previous Studies	9
4. Theoretical Discussion	11
4.1 General growth framework	11
4.2 Exchange rate regimes' effect on economic growth	12
4.2.1 Level of uncertainty	13
4.2.2 Shock absorber	14
4.2.3 Link to productivity	14
5. Empirical Analysis	16
5.1 Regression model	16
5.2 Data and specification of variables	17
5.3 Regression analysis	20
6. Conclusion	23
References	27
Appendix	29

TABLES, FIGURES AND EQUATIONS

Tables

Table 5.1: Overview and expected outcome	17
Table 5.2: Regression analysis results (1)	20
Table 5.3: Average annual GDP growth	21
Table 5.4: Regression analysis results (2)	23
Table A.1: Country statistics	29
Table A.2: Country classification	31
Table A.3: Descriptive statistics	32
Table A.4: Correlation matrix	32

Figures

Figure 2.1: Typology of exchange-rate regimes	6
Figure A.1: Scatter plot of regime and growth	33
Figure A.2: Multicollinearity of explanatory variables	33

Equations

Equation 4.1: General growth framework specification	11
Equation 5.1: Regression model equation	16

1. Introduction

1.1 Background

The collapse of the Bretton Woods system and the following approval of the Second Amendment to the IMF's Articles of Agreement, marked the beginning of an era where by member states obtained the freedom to autonomously adopt an exchange-rate regime of their own choice. Since then, a returning issue in international economics, whether it be in policy or academia circles, is the dispute of which exchange-rate regime to adopt and what its subsequent macroeconomic implications may be.

One standpoint of this debate, known as the hollowing-out hypothesis or the two-corners view, is the notion that only polar regimes (hard pegs or pure floats) are expected to be sustainable in a world of increasing international capital mobility. On the contrary, another stance in the debate claims that only intermediate regimes will remain to be a sustainable option, particularly for developing countries (Williamson 2000).

One of the central issues in this debate is whether and how the choice of exchange-rate regime effects the economic growth of a country. After all, the natural-rate hypothesis states that the best macroeconomic policy can do in the medium-run is to achieve price stability, thus, an effort to over-stimulate an economy through currency devaluation or expansionary monetary policy will only result in a higher rate of inflation, without any increase in real economic growth (Goldstein 2002). However, both economic growth theory and the literature on exchange-rate regimes suggest a feasible relationship, where the choice of exchange-rate regime could indeed be statistically significant in explaining the succeeding economic growth of a country, both directly, via how effectively it adjusts to economic shocks, and indirectly, through how it affects other key deterministic factors of growth, such as international trade, investment, financial sector development, and productivity. However, economic theory falls short in providing a clear explanation of which exchange-rate regime that is most likely to stimulate economic growth, therefore, making the question of whether a specific type of regime is superior in promoting growth, an empirical matter.

1.2 Study objective

The objective of this paper is to empirically investigate the significance of the relationship between the choice of exchange-rate regime and the subsequent economic growth. Additionally, carry out an examination to test whether the significance of such a relationship is robust across different levels of country development. The paper will attempt to analyze both general economic growth theory and exchange-rate literature, in order to develop a foundation for the empirical specification that will be used in its econometric analysis. The paper seeks to provide a comprehensive assessment on whether the choice of exchange-rate regime holds a significant explanatory power over economic growth, and if the significance of such a relationship varies across different levels of country development.

1.3 Problem statement

The key questions that will form this analysis are: (i) Does the choice of exchange-rate regime effect the economic growth of a country? and (ii) Does the significance of such a relationship vary across different levels of country development?

1.4 Methodology

This paper will apply an econometric cross-sectional regression analysis of 60 countries over the period 2000-2010 in order to investigate the statistical significance of the relationship between exchange-rate regime and economic growth, and if such a relationship is dependent upon the level country development. The dependent variable will measure the average annual per-capita GDP growth for the period 2000-2010. The explanatory variables included in this regression analysis are dummy variables denoting the choice of exchange-rate regime, initial GDP, population growth rate, education expectancy, FDI (%GDP), capital formation (%GDP), private credit (%GDP) and trade (%GDP). The analysis will use secondary data collected from the World Bank organization, United Nations Development Programme and IMF.

1.5 Scope of study

The sample studied in the following empirical analysis will be confined to a selection of 60 developing and developed countries. To avoid a biased result, the sample was randomly drawn from the population to include thirty developing countries and thirty developed countries, ensuring that both groups are equally represented by the outcome of the study. The observed countries were picked from the list of low-, and high-income countries, as specified by the World Bank organization. Thus, it deems important to emphasize that a different or larger sample may have yielded a significantly different result then the one

produced by this study. Nevertheless, the sample is still large enough to produce a credible regression analysis, thus potentially rendering several statistically significant inferences.

Furthermore, it is important to recognize that an average value of the observed countries financial data for the period 2000-2010 has been computed¹ in order to avoid temporary fluctuations and allowing the use of a cross-sectional regression model. The data input used for the variable education expectancy (EDU), is the average years of education at the beginning of the examined period (2000). It follows that the composition of this variable fails to include any quality measure of education, causing an issue, since education is believed to have a positive impact on economic growth. International test-scores may be a considerably superior measurement of human capital, as it has been shown to significantly effect economic growth. Unfortunately, such data is not always available when dealing with developing economies, causing the expected years of education to be the second best choice to capture the impact that education has on economic growth (Barro 2006).

1.6 Thesis structure

This paper will lead with a section of definitions of important concepts that are necessary for the reader to fully comprehend in order to be able to follow the succeeding sections. This approach is preferable as it makes the flow of the remaining sections smoother and easier to follow. In addition, less contextually fundamental concepts are explained in footnotes throughout the paper.

This will be followed by a section of previous studies, where earlier research and empirical findings on the relationship between exchange-rate regime and economic growth will be presented and compared. This section is meant to be objective and aims to provide the reader with a number of previous studies with dissimilar outcomes.

Next, a theoretical discussion will follow. This section will articulate the arguments as to how the choice of exchange-rate regime might effect economic growth, examining both economic growth theory and the literature on exchange-rate regimes. Firstly, we present and examine the general growth theories that has been adopted in order to develop a basis for the empirical specification used in the subsequent econometric analysis. Secondly, we review the channels through which the exchange-rate regime may effect economic growth, both directly and indirectly.

¹ *The countries' average annual statistics can be seen in Appendix (Table A.1).*

The following section will be comprised of the empirical analysis, where the results of the regression analysis' will be presented and assessed. This section will display the specification of the regression model, including a detailed description of the type of regression model and functional form, and its adequacy for this study. The explanatory variables will be presented and theoretically justified, along with a detailed description of the data that will be used.

The final section will be the conclusion, containing the decisive results of this analysis. This part includes a discussion where the results of the paper are linked to both economic growth theory and earlier empirical inferences, followed by concluding remarks, that will summarize an answer to the problem statement.

2. Definitions

2.1 Breakdown of Bretton Woods system

The outcome of the Bretton Woods conference was an agreement that outlined the rules and regulations of the international monetary system that prevailed from 1944- until the early 1970's. Named after the conference, instrumental in forming both the IMF and the World Bank, the Bretton Woods system negotiated harmonized monetary order formed to administrate the currency relations between its sovereign states. The system established a fixed exchange-rate, where currencies were pegged to gold (with the USD as the key currency) and the IMF was sanctioned to intervene when a discrepancy arose. This peg established the par value of each individual currency and ensured cross-currency parity (Husted & Melvin, 2010, p.464). After the collapse of the Bretton Woods system in the early 1970's, due to the unwillingness of the United States to no longer exchange the USD for gold, fellow member states have obtained the right to choose the exchange-rate regime they seem fit (Ghosh & Ostry, 2009, IMF).

2.2 Exchange-rate regime

An exchange-rate regime is a structure that each state's monetary authority implements in order to establish the exchange-rate of its own currency in the foreign-exchange market. Each state has the ability to freely adopt the exchange-rate regime that it deems optimal, and will do so typically, but not exclusively, using monetary policy. According to their degree of flexibility (figure 2.1), the distinction amid these structures are generally made between fixed, intermediate and flexible exchange-rate regimes:

Fixed exchange-rate regime

A fixed exchange-rate, commonly referred to as a peg, can be defined as a regime that holds a fixed currency, either to the currency of another country, a currency basket or any other measure of value. The exchange-rate is determined by the monetary authority of that country, whom commits to buy(sell) the home currency at a specific price. The central bank maintains this pre-determined price level by intervention in the foreign-exchange market and/or adapting the interest rates.

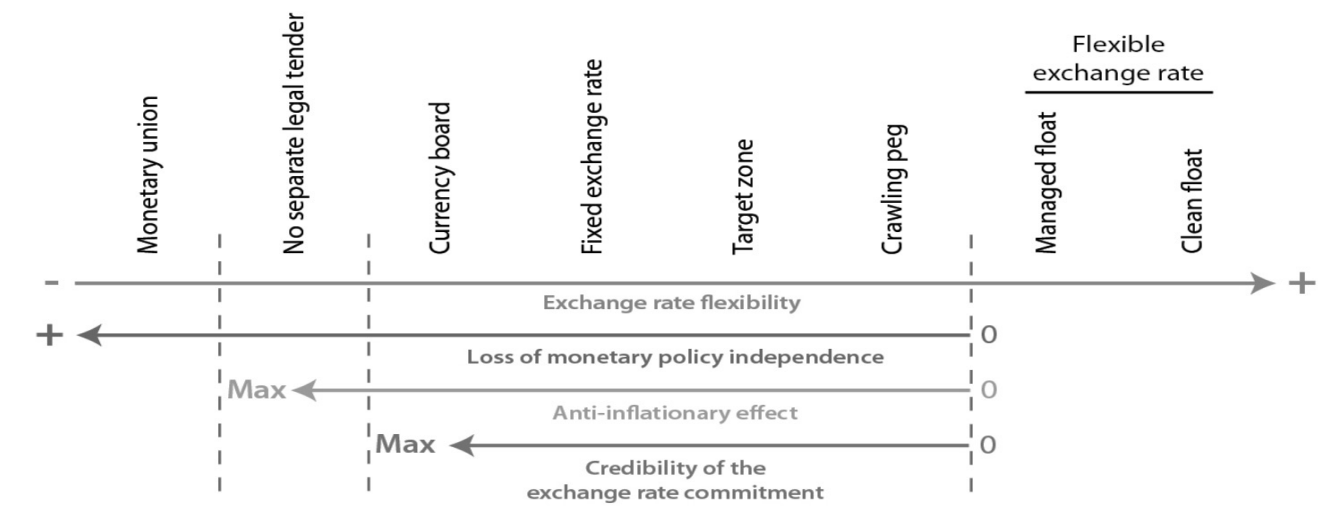
Intermediate exchange-rate regime

Crawling bands, crawling pegs and horizontal bands are often referred to as intermediate exchange-rate regimes. These regimes attempt to combine flexibility and stability by implementing a rule based system for adjusting the par value, typically through a band of rates or as a function of inflation discrepancies. The IMF provides the following explanation of crawling pegs “The currency is adjusted periodically in small amounts at a fixed rate or in response to changes in selective quantitative indicators, such as past inflation differentials vis-à-vis major trading partners, differentials between inflation target and expected inflation in major trading partners.”

Flexible exchange-rate regime

A flexible exchange-rate entails a currency with an exchange-rate that is determined exclusively by the global market forces of supply and demand, and are not pegged nor controlled by any monetary authority. There are two different types of flexible exchange-rates, pure floats and managed floats. The former exists when there is no official purchases or sales of currency under a flexible exchange-rate regime. The later occurs when there is evidence of some official intervention.

Figure 2.1 Typology of exchange-rate regimes



Source: Policonomics 2012©

The “impossible trinity” highlights the dilemma each state faces when contemplating the choice of exchange-rate regime, as it describes how any regime can only inherit two of the succeeding three characteristics: fixed exchange-rate regime; free capital flow; and sovereign monetary policy. Fixed exchange-rates requires central banks to intervene in the foreign-exchange market in order to keep the rates at equilibrium levels, countries that has adopted this regime is generally characterized by; small in size; open economy; harmonious inflation rate; and concentrated trade. Flexible or floating exchange rates are set by free-market forces of supply and demand and adopters of this regime are generally characterized by; large in size; closed economy; divergent inflation rate; and diversified trade (Edison & Melvin, 1990).

2.3 Exchange-rate Regime Classification

Intuitively, a fixed exchange-rate’s value does not vary more then within pre-determined, narrow limits, implying a formal commitment by the monetary authority to intervene in the foreign-exchange market in order to maintain parity. In contrast, the monetary authority of a flexible exchange-rate regime, holds no such a commitment. It follows that the optimal description of an exchange-rate regime is the one specified by the intentions of the monetary authority, asserting a *de jure*² classification.

However, it has been shown that noncompliant governments exploit the credibility benefits associated with a fixed exchange-rate, by pursuing an expansionary monetary policy that is inconsistent with supporting the asserted peg. Furthermore, a monetary authority that frequently intervenes in the foreign-exchange markets, while denying any formal commitment, can hardly be considered to hold a flexible exchange-rate. The preceding argument highlights how misleading results may be obtained by relying solely on a classification of countries’ regime according to their own announcement. The necessity of an alternative scheme, yields a *de facto*³ classification, which defines a country’s exchange-rate regime according to the observed behavior in regards to its nominal exchange-rate (Ghosh et al 2002). The existence of discrepancy between de jure and de facto was shown by *Calvo and Reinhart (2002)*. The behavior is commonly referred to as “*fear of floating*” and entails that countries seem to vigorously limit fluctuations in the external value of their own currency. This is a behavior that was shown to be rather pervasive across both regions and levels of economic development.

² The scheme following the *de jure* classification, sorts countries based on what their monetary authority “claims” their exchange rate regime to be.

³ The scheme following the *de facto* classification, sorts countries based on what their monetary authority actually does in regard to its own exchange-rate regime, despite what the claims may be.

2.4 Level of development

While no uniform classification of developed⁴ or undeveloped countries exist, the former is generally defined as a sovereign state with an advanced economy and technological infrastructure. The commonly used criteria for evaluating the level of economic development include, GDP, GNP, per capita income, level of industrialization, general standard of living and level of industrialization (Nielsen, 2011).

⁴ *Developed (developing), Industrialized (non-industrialized), and high income (low income) will be used interchangeably throughout this paper.*

3. Previous Studies

In an analysis of 145 countries over a 30-year period, *Ghosh et al (1995)* observed a significant relationship between the choice of the exchange-rate regime and the level of economic growth in a country. Their results proposed that the regime effects economic growth indirectly through increased productivity and/or investment. Pegged regimes engenders an increased policy confidence, triggering higher investment, with an average of 2 percent points of GDP across the sample studied. However, a pegged rate set at the wrong level, can lead to a misallocation of resources. This misallocation results in a slower productivity growth than countries with a floating exchange-rate. Partly, this higher productivity growth under floating rates echo the relatively faster growth of external trade. The fastest growth, averaging more than 2 percent annually, was found under the intermediate regimes. Conversely, it was 1.7 percent a year under floating rates and 1.4 percent a year under pegged exchange rates.

In 2004, a study was conducted to measure the relative impact of the exchange-rate regime on economic growth, depending on the level of development of that country. *Huang and Malhotra (2004)*, set out to investigate the link between the choice of regime and the following economic growth rate for advanced European and developing Asian countries, using the classification of de facto exchange rate regime by *Reinhart and Rogoff(2004)*⁵. Their results uncovered two remarkable regularities. Firstly, it seemed that the choice of regime had no significant impact on economic growth or its variability for the advanced European countries, although their results indicated that flexible exchange-rate regimes are associated with marginally higher economic growth rates. Secondly, the choice of exchange-rate regime does indeed effect the economic growth rate for developing and emerging Asian economies, where a non-linearly-managed float⁶ is superior to other regimes. This evidence suggested that the relative impact of the choice of exchange-rate regime on economic growth rate critically varies depending on the level of development of that country.

Similar findings by *Levy-Yeyati and Sturzenegger (2002)*, somewhat correspond to the former inference by suggesting that the choice of exchange-rate regime for non-industrial countries indeed matters in terms of economic growth, although this relationship seems to be far less significant for industrialized

⁵ A novel system of re-classifying historical exchange-rate regimes, employing an extensive data-base on market-determined parallel exchange-rates. For a detailed description, please see Reinhart, Carmen M. and Rogoff, K. 2004. *The Modern History of Exchange Rate Arrangements: A Reinterpretation. Quarterly Journal of Economics, Vol. 119(1), pp. 1-47*

⁶ Managed floating exchange-rates are treated as a function of the current account balance or the trade balance according to the equilibrium exchange-rate determination theory. This relationship has proved to likely be non-linear, requiring the floating exchange-rates to evolve in a gradual and proper manner and are to be managed in accordance to the state of the economy and its balance of payments position.

economies. The results indicate that fixed exchange-rate regimes within non-industrial countries are linked to higher output volatility and relatively slower growth rates. While their results support the notion of positive correlation between fixed exchange-rates and trade surveyed in *Frankel (1999)*, it is evident that this influence on growth is not ample to generate a net positive impact on economic growth.

Likewise, another group of economists uncovered significant evidence, linking the choice of exchange-rate regime to economic growth. In their study of 25 emerging-market economies over a period of 25-years (1973-1998), *Bailliu, Lafrance, and Perrault (2001)*, discovered evidence that revealed that flexible exchange-rate regimes tend to be associated with a higher growth level. However, this relationship was only true for those countries that were fairly open to cross-boarder capital flows and, in addition, that possess relatively well-developed financial markets.

Contrary to previous studies, *Petreski (2009)* found that the choice of exchange-rate regime, as a nominal variable, imposes no explanatory power over economic growth. In a dynamic panel study of 169 countries over a 40-year period (1976-2006), addressing the shortcomings of empirical literature: Errors in measurement of exchange-rate regimes' classification; Appropriateness of growth framework; endogeneity of exchange rate regime; sample-selection biased; and survivor biased, he found that choice of exchange-rate regime does not even come close to any conventional level of explanatory significance.

It is evident that earlier empirical research offers a divergent result. Certain studies argue that the linkage between exchange-rate regime and economic growth exists, however, the sign of this influence is ambiguous. While one group of researcher postulated that a fixed exchange-rate stimulates economic growth, while a flexible one doesn't, another group claims that the opposite is true. Other groups concluded that the choice of exchange-rate regime has no effect on subsequent economic growth. The former, found that the exchange-rate regime indirectly influences economic growth through channels such as trade, investment and productivity. Advocates of fixed regimes often relate the negative effect that a flexible exchange-rate has on growth, due to the high level of uncertainty it imposes. However, even though the low level of policy uncertainty under a fixed regime may promote an economic environment, conducive to economic growth, such regimes does not provide an adequate adjustment mechanism to economic shocks, thus stimulating protectionism, price distortion and consequently a misallocation of resources. Hence, the theoretical relationship between choice of exchange-rate regime and economic growth remains blurred and becomes an empirical issue (*Petreski 2009*).

4. Theoretical Discussion

From a theoretical point of view, both economic growth theory and the literature on exchange-rate regimes indicate a plausible link between the choice of exchange-rate regime and the subsequent economic growth for a country. Leading will be a presentation of the general growth framework, derived from the empirical growth literatures, that has been implemented in order to explain the economic growth process of a country⁷. Following will be a review of the empirical literatures on exchange-rate regimes, explaining the mechanics behind the idea that the choice of exchange-rate regime can have a subsequent impact on the economic growth performance of a country both in a direct manner, as an effective adjustment tool against shocks in the economy, and indirectly, through its impact on other deterministic economic growth factors, such as investment; international trade, financial market development and productivity.

4.1 General growth framework

Modern empirical growth literature draws on a general framework that specifies how the growth rate (GR) of a country at time t is a function of both state variables (SV) and control variables (CV).

Equation 4.1 General growth framework specification

$$GR_t = F(SV_t; CV_t).$$

This general specification of economic growth is in accord with both the neoclassical and endogenous growth models. In a neoclassical growth framework, state variables are integrated in order to account for the initial state of the economy, while the control variables accentuate the alterations in steady-state levels across countries. One important prediction of this framework is the notion of conditional convergence, implying that the lower the initial level of per capita GDP is in relation to the steady-state position, the higher the growth rate tend to be. This is consequently derived from the assumption of diminishing returns to capital; higher rates of return and higher growth rates tend to be associated with economies that have relatively little capital per worker, relative to there long-run capital per worker. However, the convergence is conditional due to the dependency of the steady-state levels of capital and output per worker on the rate of population growth, the saving rate, and the general position of the production function- properties that vary across economies (Barro and Sala-i-Martin, 2004, p.17).

⁷ Please review Barro and Sala-i-Martin (2004) for a thorough description of these frameworks and the numerous theoretical models of growth that underlie it.

On the contrary, an endogenous growth framework always assumes that an economy is in its long-run steady-state, therefore relying on the independent variables to capture the different levels of steady-state growth rate across countries. The endogenous growth models emphasize that the economic growth is the endogenous outcome of an economy, not the outcome of external forces. Effectively, this framework shows a dependency on government actions for the long-run economic growth rate, including; rule of law; taxation; provision of infrastructure services; intellectual property rights; regulations of international trade; and financial markets. Therefore, the government should be viewed as a deterministic factor that influences the long-run growth rate (Barro and Sala-i-Martin, 2004, p.61).

This specification is therefore consistent with both the neoclassical framework, in that it explains what determines the differences in transitional growth rates across countries as they move towards their long-run steady-states, and the endogenous framework, as it allows the user to determine the differences in steady-state growth rates across countries. It is appealing to use this growth specification (equation 4.1) as a basis for empirical work, as it complies to general theory and simultaneously offers a comprehensive foundation that accommodates both neoclassical and the endogenous growth models. As a result, the validity of the specification holds regardless whether the researcher assumes the sample country to be in their long-run steady-state or not. However, there is a major downside of using such a general specification. It becomes problematic when such a framework is to be translated into a specification that may be empirically tested due to the fact that economic growth theory offers no unambiguous consensus of which control variables to include, although this choice is relatively uncontroversial. Convention is to include both initial per capita GDP and a proxy for human capital⁸ as state variables.

4.2 Exchange-rate regimes' effect on economic growth

The natural-rate hypothesis, as argued by Goldstein (2002), suggests that macroeconomic policy can optimally achieve price stability. As an example, disallowing exchange-rate policy to use the nominal exchange-rate to sustain unemployment rates below its natural level. Thus, implementing an expansionary monetary policy to over-stimulate the economy, or devalue the home currency will cause an increase in

⁸ *The term was coined by Schultz (1960), intended to reflect the economic value of human capacities. The idea was that human capital is like any other type of capital and allows investment through education, training, or any other benefit enhancing activity that will lead to quality and productivity improvements.*

the level of inflation, but not stimulate any real economic growth. There is indeed no unambiguous theoretical evidence that suggests that a specific exchange-rate regime stimulates growth more than another, and as a nominal variable, it may not affect the long-run economic growth at all. However, the exchange-rate literature proposes, both direct and indirect channels through which, at least theoretically, the choice of exchange-rate regime may influence economic growth: i) The level of uncertainty imposed, consequently affecting trading and investment strategies; ii) The affect of adjustment to shocks; iii) The link to productivity growth, affecting financial development (Petreski 2009 p.3)

4.2.1 Level of uncertainty

A principle often highlighted by advocates of fixed exchange-rates is how the reduced uncertainty and lowered interest-rate variability it entails, stimulates an economic environment which serves both trade and investment, hence, economic growth. It is by imposing a greater openness to international trade that a fixed exchange-rate may promote a faster output growth in the medium to long-run (Petreski 2009). This notion is supported by Gylfason (2000) which argues that the stability a peg imposes stimulates foreign trade and investment, consequently invigorating economic efficiency and growth in the long-run. Furthermore, there are two contributing factors that may cause an increase in the level of output growth under a fixed regime according to De Grauwe and Schnabl (2004). Firstly, the absence of exchange-rate risk can induce international trade and division of labor; secondly, a reduction in a country's risk-premium embedded in its interest-rate, due to the credibility imposed by a credible fix. A lower interest-rate will accordingly stimulate investment, consumption, hence, economic growth. Brada and Mendez (1988) supports the above mentioned arguments and assert two ways in which a flexible exchange-rate may decrease the volume of international trade. The first way is caused by the exchange-rate uncertainty it imposes for conducting foreign trade, and the second way is through raising trade barriers as a response to high exchange-rate volatility.

The preceding consensus is related to an increased level of uncertainty imposed by adopting a floating exchange-rate, thus, suggesting that a stable macroeconomic environment stimulates international trade and investment. Such a straightforward assumption, that uncertainty would be inversely related to trade and investment, is questioned by Viaene and de Vries (1992), where they argue that intensified exchange-rate fluctuations may indeed augment agents' incentives for international trade and investment, depending on their level of risk aversion. Therefore, a positive relationship between the level of uncertainty and international trade and investment can be implied if the levels of risk aversion are sufficiently low. Namely, if agents have efficient tools for hedging the exchange-rate risk such as forward markets,

intensified exchange-rate fluctuations could in fact have positive effects on international trade and investment. Although, such hedging instruments are not always available in developing markets (Bailliu et al 2003).

4.2.2 Shock absorber

In addition to the indirect effect explained above, it is also theoretically possible that the exchange-rate regimes' impact on economic growth can be direct, as a consequence of the regime's effectiveness to adjust to shocks in the economy. This notion was argued by Bailliu et al (2003) where they propose that the effect is channeled by mitigating or magnifying the affect and adjustment to economic shocks, where flexible regimes are believed to promote fast and easy adaptation and absorption of the aggregate shocks. Thus, a relatively higher economic growth rate could be expected when the adjustment to shocks is smoother, assuming that the economy is operating close to capacity on average.

In line with this, Friedman (1953) claimed that flexible regimes are able to absorb external shocks, as apposed to fixed regimes, where the adjustment to the shock is directed through a change in relative prices. However, since Keynesian prices distribute a 'stickiness', the adjustment is gradual, thus harming the growth as an effect of the excessive burden created in the economy. Additionally, in an environment of high capital mobility, it becomes increasingly costly for an economy to defend a peg under a currency attack, due to the required changes in interest rates. Hence, pegged regimes become unsustainable when there is free movement of capital across borders in times of crisis, often resulting in severe recessions (Petreski 2009 p.7).

The notion that flexible regimes can act as shock absorbers is questioned by Levy-Yeyati and Sturzenegger (2002), where they argue that such a situation may stimulate protectionist behavior and distorted prices, ultimately leading to a misallocation of resources in the economy. However, the literature lacks consensus on this issue, as Nilsson and Nilsson (2000) explain that it may in fact be the exchange-rate volatility under a flexible regime that promotes protectionist behavior.

4.2.3 Link to productivity

Returning to the Solow model of growth, it depicts how output growth can result from an increase in one of the production factors or the total factor productivity. Thus, if the previous notion, that an exchange-rate target stimulates trade and investment is true, then the lower level of output under a pegged regime

must be associated with lower productivity growth. This affect becomes amplified in emerging markets, where there is a lack of credit markets. Nevertheless, the ultimate impact of a pegged regime on the productivity growth remains indecisive. For instance, given the underdevelopment of financial markets, the impact of an aggregate external shock under a pegged regime may channel into real economic activity. This will as a result cause an increasing amount of firms in that economy to experience a credit constraint (Aghion et al 2005).

When producing firms contemplate whether to invest in short-term capital⁹ or in a long-term venture that enhances productivity, typically the later strategy inherits a higher demand for liquidity in order to maneuver idiosyncratic liquidity shocks¹⁰ in the medium-term, often caused by aggregate shocks in the economy. Underdeveloped credit markets, unlike perfect ones, does not supply firms with the necessary liquidity. Ultimately, the liquidity shock can only be financed when the firms' profits are large enough, because in such an environment only profitable firms are able to borrow a sufficient amount to cover their liquidity cost¹¹. When firms' profitability falls as an outcome of a negative aggregate shock, the likelihood decreases that any of their liquidity needs will be met. Thus, a portion of the potential long-term productivity enhancing investments will be wasted, with obvious negative consequences for the overall economic growth. Therefore, the main implication is that firms that are active in economies with well developed financial markets will cope better with the aggregate shocks, thus, promote a tendency for firms to pursue long-term investment, which in theory should stimulate economic growth (Petreski 2009 p.8).

⁹ Funds or assets that can be transformed into liquidity for a period less than 12-months. Often the amount of available short-term capital will determine how much a firm can devote to its operating expenses, hence, effecting its growth rate.

¹⁰ An unanticipated change in the demand for liquidity that is distributed individually across holders of assets. This implies perfect investor heterogeneity, where all investors demand for liquidity is uncorrelated with one another.

¹¹ The economic cost (forgone income) that is associated with keeping cash in a liquidity account.

5. Empirical Analysis

5.1 Regression model

This cross-sectional regression analysis will use a linear model to examine the significance of the relationship between choice of exchange-rate regime and economic growth. The sample countries are categorized based on the Reinhart and Rogoff (2004) classification of *de facto* exchange-rate regimes¹². The regressions will subsequently be presented in four different models, allowing unmitigated results through distinguishing possible correlation between the explanatory variables. In order to determine if this relationship is sensitive to the level of development of a country, a second regression will be run where the observed countries are divided according to their level of development. Whereby highly developed countries are comprised of high-income and higher-middle-income economies while countries with a lower level of development are comprised of low-income and lower-middle-income economies, as specified by the World Bank's income classification system¹³.

Equation 5.1 Regression model equation

$$GDP_{GROWTH} = \alpha + \beta_1FIX + \beta_2FLEX + \beta_3GDP_{INITIAL} + \beta_4POP + \beta_5EDU + \beta_6FDI + \beta_7CF + \beta_8PC + \beta_9T + \varepsilon$$

Explanation of selected variables

GDP_{GROWTH}	=	Per-capita GDP growth 2000-2010
α	=	Intercept/constant
FIX	=	Dummy variable (=1 if Exchange rate is fixed, = 0 otherwise)
$FLEX$	=	Dummy variable (=1 if Exchange rate is flexible, = 0 otherwise)
$GDP_{INITIAL}$	=	GDP per capital year 2000
POP	=	Population growth rate
EDU	=	Education expectancy
FDI	=	Foreign direct investment (%GDP)
CF	=	Capital formation (%GDP)
PC	=	Private credit (%GDP)
T	=	Trade (%GDP)
ε	=	Error term

Descriptive statistics and correlation matrix for all variables are placed in Appendix (table A.3 and A.4)

¹² The country categorization of exchange-rate regime and level of development is found in the Appendix (Table A.2)

¹³ Based on the World Bank's income classification system that uses the World Bank Atlas method, low-income economies are defined as those with a GNI per capita of $0 < \$1,045$ or less; middle-income economies are those with a GNI per capita of $\$1,045 > \$12,736$; high-income economies are those with a GNI per capita of $\$12,736 < X$ or more. The distinction between lower-middle-income and higher-middle-income economies is made at a GNI per capita of $\$4,125$.

Table 5.1 Overview of the regression variables and expected outcome

Variable	Description	Source	Expected outcome
GDP_{GROWTH}	Per-capita GDP growth 2000-2010	World Bank	Dependent variable
FIX	Dummy variable (=1 if Exchange rate is fixed, =0 otherwise)	World Bank	≠
$FLEX$	Dummy variable (=1 if Exchange rate is flexible, =0 otherwise)	World Bank	≠
$GDP_{INITIAL}$	GDP per capital year 2000	World Bank	-
POP	Population growth rate	World Bank	-
EDU	Education expectancy	UNDP ¹⁴	+
FDI	Foreign direct investment (%GDP)	World Bank	+
CF	Capital formation (%GDP)	World Bank	+
PC	Private credit (%GDP)	World Bank	+
T	Trade (%GDP)	World Bank	+

5.2 Data and specification of variables

Per-capita GDP growth

The dependent variable in this regression analysis will be the per-capita GDP growth. This variable measures the national income-growth per capita and is adequate to include in order to determine the relationship between exchange-rate regimes and economic growth. This variable will be calculated as an average of the annual growth (%) of per-capita GDP for the period 2000-2010.

Exchange-rate regime dummy variables

The exchange-rate regime dummies are added in order to capture the impact that the choice of regime might have on the dependent variable. As this categorical variable has more than two levels, multiple dummy variables are needed. Since an intermediate regime is a mix of the other two types of regimes, it is adequate not to code this level. This means that the levels that are coded, fixed-, and flexible regimes,

¹⁴ United Nations Development Programme

will be compared to an intermediate regime. The sample countries are categorized based on the Reinhart and Rogoff (2004) classification of *de facto* exchange rate regimes.¹⁵

Initial per-capita GDP

The initial per-capita GDP will be included as an independent variable to represent the convergence effect, and should according to neoclassical theory hold a negative sign. This represents the effect of transitional dynamics, where a lower initial per-capita GDP theoretically will yield a higher growth rate, and vice versa. The value of the variable will be the per-capita GDP in 2000, measured in 2000 USD.

Education expectancy

The inclusion of education expectancy is necessary in order to measure the stock of human capital. Both neoclassical-, and endogenous growth theory states that a country with more human capital will tend to have a higher rate of economic growth, thus the coefficient should have a positive sign. The value used is the average education expectancy (years) for the start of the measured period 2000.

Capital formation (%GDP)

Capital formation is included to capture the effects that changes in capital accumulation has on economic growth. Capital formation signifies the net addition of capital stock and net changes in the level of inventory (IMF). A nation uses a combination of capital stock and labor to produce goods and services, thus, an increase in capital stock should increase the nation's capacity to produce, which should ultimately lead to economic growth. Thus, the expected sign of the coefficient is positive. The value of this variable will be expressed as an average of the gross capital formation (% of GDP) for the period 2000-2010.

Trade (%GDP)

Trade is the sum of exports and imports of goods and service as a percent of GDP, and is added to capture the effect that openness to international trade has on economic growth. A higher level of foreign trade is believed to invigorate economic efficiency and promote faster output growth in both the medium and long-run (Gylfason, 2000), thus the expected sign of the coefficient is positive. The value of this variable will be expressed as an average of the trade (% of GDP) for the period 2000-2010.

¹⁵ The country categorization of exchange-rate regime is found in the Appendix (Table A.2)

Private credit (%GDP)

Private credit is included to capture the relationship between financial market development and economic growth. Domestic credit to the private sector refers to the financial resources that are provided to the private sector by financial corporations through loans, purchases of non-equity securities, and trade credits. Firms active in economies with highly developed financial markets are more likely to pursue long-term productivity enhancing investments, which should stimulate economic growth (Petreski, 2008), hence, the expected sign of the coefficient is positive. The value is calculated as an average of the reported figures for the period 2000-2010.

FDI (%GDP)

FDI is added to capture the flow of foreign investments into the home country. The flow of FDI is expected to show a positive sign in its coefficient, as it has been shown how it can stimulate growth through technological transfers, capital formation, etc. (Borensztein, Lee, and Gregorio 1998). The value of this variable will be expressed as an average of the FDI (% of GDP) for the period 2010-2010.

Population growth

Population growth is included to capture the effects of changes in population on economic growth. This variable is expected to have a negative sign, as an increase in population should lead to a decrease in per-capita GDP, *paribus ceteris*. The measurement of population is based on the *de facto* definition, which include all residents regardless of legal status or citizenship, apart from refugees, who are generally accounted for in the population of their country of origin (World Bank). The value of this variable will be an average of the annual population growth for the period 2000-2010.

5.3 Regression analysis

Table 5.2 Regression results for all countries

Dependent variable: Annual per-capita GDP growth				
Models:	(1)	(2)	(3)	(4)
Independent variables :	Estimated Coefficient	Estimated Coefficient	Estimated Coefficient	Estimated Coefficient
Constant	3.38857 (0.572309)***	0.000137 (1.05237)	0.0582286 (1.06050)	1.74491 (1.71862)
Fixed regime	-0.874481 (0.732100)	-0.172035 (0.619506)	-0.162101 (0.624247)	-0.426074 (0.626428)
Flexible regime	-0.509821 (0.720139)	-0.127009 (0.608542)	-0.119287 (0.613084)	0.0453028 (0.612164)
GDP initial	-	-0.000112866 (2.55315e-05)***	-0.000102787 (3.26545e-05)***	-0.000101007 (3.33804e-05)***
Education expectancy	-	0.163044 (0.0952415)*	0.173719 (0.0982624)*	0.0376300 (0.141582)
Capital formation	-	0.103018 (0.0390066)**	0.106321 (0.0398350)**	0.0948127 (0.0406013)**
Trade	-	0.00544153 (0.00396773)	0.00490489 (0.00413727)	-0.00140541 (0.00554979)
Private credit	-	-	-0.00379069 (0.00756980)	-0.00335648 (0.00749225)
Foreign direct investment	-	-	-	0.130575 (0.0731921)*
Population growth	-	-	-	-0.411477 (0.352064)
R-squared	0.024452	0.411991	0.414813	0.458399
Adjusted R-squared	-0.009778	0.345424	0.336038	0.360911
F-statistic	0.714343	6.189110	5.265782	4.702095
P-value	0.493843	0.000057	0.000137	0.000153
N = 60				

Standard errors in parenthesis

***Level of significance at 1%

**Level of significance at 5%

*Level of significance at 10%

These results indicate that there seems to be no statistically significant relationship between the choice of exchange-rate regime and economic growth of a country, as depicted in the scatter plot found in Appendix (figure A.2), where the link appears to be rather irregular between the two. The choice of exchange-rate regime does not come close to any conventional level of significance in any of the four models that were tested. The signs on the exchange-rate regimes' coefficients were however rather constant over the four models, and only deviated in Model 4. The negative signs in front of these estimated coefficients indicate that an intermediate exchange-rate regime is superior to that of a fixed, or flexible exchange-rate regime, *ceteris paribus*, all thought not at any conventional level of significance. This is supported by the inferred statistic in table 5.3, that depicts how the highest growth level, on average, is achieved by countries that have adopted an intermediate regime.

Table 5.3 Average annual GDP per capita growth rate 2000-2010(%)

	All countries	Low-income countries	High-income countries
Fixed regime	2,51	3,15	1,43
Intermediate regime	3,38	3,56	2,13
Flexible regime	2,87	3,52	1,86

The values presented above are derived by grouping the sampled countries based on their exchange-rate regime and income level and calculating the arithmetic mean of the average annual GDP per capita growth rate 2000-2010.

The estimated coefficient of the initial GDP variable exhibits the expected sign and is significant at 1% in models 2-4, which supports the hypothesis of conditional convergence, explaining how economies with lower initial GDP have the potential to grow at a faster rate due to the mechanics of diminishing returns. Education expectancy proved significant at 10% in models 2-3, but did not hold any explanatory power in model 4. This disparity may be due to its relatively high correlation (-0.7258) with the population growth variable, causing imperfect multicollinearity in model 4, as can be seen in Appendix (figure A.3). This imperfect linear relationship justified the omission of the population growth variable in models 2-3. Capital formation proved significance at 5% in models 2-4 and supports the hypothesized belief that the effects of changes in capital accumulation has a positive impact on economic growth. The estimated coefficient of the trade variable is insignificant in all models and shows an unexpected sign in model 4, which might have been caused by the relatively high level of correlation (0,7269) between it and FDI. Trade does however show a negative correlation with flexible regimes which supports the principle often highlighted by advocates of fixed exchange-rates; that the reduced uncertainty and lowered interest-rate

variability it entails, stimulates an economic environment which serves trade by imposing a greater openness to international trade (Petreski 2008). The results attributed no significant explanatory power to the private credit variable over economic growth, along with an unexpected sign on the estimated coefficient, meaning that we can dismiss the assumption of how firms active in economies with relatively developed financial markets are more likely to pursue long-term productivity enhancing investments, and even if this notion is true it seems not to be related to economic growth over this sample. The estimated coefficient of the FDI variable exhibits the expected sign and is significant at 10% in model 4, this result supports the notion that the flow of foreign investment into the home country will indeed stimulate economic growth, mainly as a result of technology transfers and capital formation. The variable for population growth showed no significance in model 4 and was excluded from models 2-3 due to its relatively high level of correlation with the education expectancy variable.

The overall fit of these models are relatively good, considering that the adjusted R-squared value tends to be rather low in cross-country empirical studies. The best fit is found in model 4, however, this model exhibits an unexpected sign for two variables, private credit and trade. The unexpected sign on private credit contradicts general theory of the existence of a positive relationship between highly developed financial markets and economic growth (Petreski, 2008), nevertheless, similar unexpected results for this variable has been found in previous empirical studies (Bailliu et al. 2002). Furthermore, the unexpected sign for trade, implying that a greater openness has a negative impact on economic growth, contradicts economic growth theory (Gylfason, 2000). However, the result depicts a strong correlation between trade and FDI, that may have caused this unexpected result.

Table 5.4 Regression results for countries categorized based on income

Dependent variable: Annual per-capita GDP growth				
Country groups:	Low-income and lower-middle income countries		High-income and upper-middle-income countries	
Model	(1)	(2)	(1)	(2)
Independent variable	Estimated Coefficient	Estimated Coefficient	Estimated Coefficient	Estimated Coefficient
Constant	3.64333 (0.617114)***	2.55949 (1.50951)	1.86000 (1.40479)	-3.73243 (1.77286)**
Fixed regime	-0.486667 (0.942657)	-0.402431 (0.908904)	0.209231 (1.50899)	-1.13207 (0.883678)
Flexible regime	0.404444 (0.942657)	-0.440877 (0.895378)	0.317333 (1.49552)	-0.554015 (0.828333)
GDP initial		-0.00196926 (0.000978622)*		-6.86638e-05 (2.49256e-05)**
Education expectancy		0.375222 (0.137243)**		0.0756066 (0.147082)
Capital formation		0.0586466 (0.0530003)		0.281109 (0.0478989)***
Trade		-0.0108679 (0.0114949)		0.00655935 (0.00294297)**
R-squared	0.028238	0.352711	0.002010	0.751008
Adjusted R-squared	-0.043744	0.183853	-0.071915	0.686054
F-statistic	0.392293	2.088803	0.027186	11.56210
P-value	0.679294	0.094121	0.973207	5.71e-06
N =30	N=30			

Standard errors in parenthesis

***Level of significance at 1%

**Level of significance at 5%

*Level of significance at 10%

This second regression analysis, divided the countries according to their level of income, in order to examine whether the significance of the relationship between the choice of exchange-rate regime and economic growth varies across different levels of country development. The reasoning behind using model 2 was that it proved to be superior to model 3-4 in the previous regression in that it didn't show any unexpected outcomes that contradicted general growth theory and additionally yielding a satisfactory fit considering the nature of cross-country empirical studies.

The results indicate that there is no disparity between the income-levels of countries, and that the choice of exchange-rate regime seemingly holds no significant explanatory power over the economic growth for neither group. The signs on the exchange-rate regimes' coefficients were however constant, and showed negative signs for both low-, and high-income countries, indicating that an intermediate exchange-rate regime is superior to that of a fixed, or flexible exchange-rate regime, *ceteris paribus*, all thought not at any conventional level of significance. Furthermore, the significance of the initial GDP variable was lower for the samples in regression 2 than that of the previous one. This result is not surprising as the observations were divided based on the level of income, causing the dynamics of conditional convergence to be mitigated. The regression proves significance at 5% for education expectancy among the low-income countries, while it fails to show any significance in explaining economic growth among the high income countries. The spread of education expectancy is immensely higher among the low-income countries, indicating that a higher level of education may be a comparative advantage for these countries, and serves as an important deterministic factor of explaining economic growth. This supports the endogenous growth theories as the estimate, representative of human capital, promotes economic growth through an increase in productivity. Conversely, high-income countries have a more developed, and often law enforced educational standard, causing the difference of educational expectancy to be insignificant among these countries. The estimated coefficient of capital formation proves significant at 1% for high-income countries, while exhibiting no significance for the low-income countries. This supports the idea that high-income countries are capital intensive in their production and that a change in capital accumulation has a significant impact on output growth. The estimated coefficient for trade shows an unexpected sign for low-income countries, implying that an increased openness will result in a decrease in economic growth. This result is not in consensus with the economic theory, that predicts that a higher level of foreign trade is believed to invigorate economic efficiency and promote faster output growth in both the medium and long-run (Gylfason, 2000). The estimated coefficient for trade proved significant at 5% for the high-income countries. This disparity may be caused by important deterministic economic growth factors for low-income countries being omitted in the specification, such as rule of law; taxation; provision of infrastructure services; intellectual property rights; and regulations of international trade (Barro and Sala-i-Martin, 2004).

6. Conclusion

The aim of this paper was to present the arguments as to the relationship between the choice of exchange-rate regime and economic growth, furthermore, to empirically investigate if there is an optimal choice of exchange-rate regime, in terms of its impact on economic growth, and if the significance of such a relationship is dependent upon the level of development of a country. At a theoretical level, the direction in which the choice of regime may effect growth, both in a direct-, and indirect manner, are plentiful. Exchange-rate literature proposes channels through which the choice of regime may impact growth such as investment, trade, financial markets and productivity.

Using a cross-sectional regression model of 60 developed-, and developing countries over the period 2000-2010, this study found no supporting evidence that the choice of exchange-rate regime has a significant impact on the economic growth of a country, nor do these findings show that the importance of regime choice is amplified or mitigated depending on the level of development of a country. These findings both supports and opposes previous results and highlights how divergent the empirical research is on this issue. Although certain studies argue that the linkage between exchange-rate regime and economic growth exists, the sign of this influence is ambiguous. While one group of researcher concluded that a fixed exchange-rate stimulates economic growth (Mundell 1995) (Obstfeld and Rogoff 2000), another group claims that the opposite is true (Bailliu et al 2001). Additionally, further groups argue that an intermediate regime promotes the fastest economic growth (Ghosh et al 1995). Furthermore, it has been shown that the relative impact of the choice of exchange-rate regime on economic growth rate critically varies depending on the level of country development, where the impact is more significant for non-industrialized countries (Huang and Malhotra 2004) (Levy-Yeyati and Sturzenegger 2002). The findings of this paper are in accordance to the findings of Petreski (2009), that the choice of exchange-rate regime, as a nominal variable, imposes no explanatory power over economic growth and that studies with a different result may be due to the shortcomings of empirical literature; Errors in measurement of exchange-rate regimes' classification; Appropriateness of growth framework; endogeneity of exchange rate regime; sample-selection biased; and survivor biased.

The empirical result suggests that there are other deterministic factors of economic growth that are far more significant then the choice of exchange-rate regime, and that the later has no direct effect on growth. However, since the literature claims that the choice of exchange-rate regime can impinge some of these growth factors, it implies that the effect could in fact be indirect. Thus, it is noteworthy to highlight that although the choice of exchange-rate regime per se, might not impact economic growth directly, its indirect effect on other deterministic factors may. One example of such an indirect effect can be inferred

by the negative correlation between trade and flexible regimes¹⁶, which supports the principle that the reduced uncertainty entailed by fixed regime, subsequently stimulates an economic environment which promotes trade by imposing a greater openness. The importance of the reduced uncertainty a fixed regime arguably entails, is also supported by the negative correlation between FDI and flexible regimes, where a reduced level of uncertainty supposedly fuels a stream of investment into a country. However, such a straightforward inference is questioned by Viaene and de Vries (1992), where they argue that intensified exchange-rate fluctuations may indeed augment agents' incentives for international trade and investment, depending on their level of risk aversion and access to efficient hedging instruments. Nevertheless, since such instruments are not always accessible in developing markets (Bailliu et al 2003), this may explain the inferred discrepancy.

The composition and presentation of this paper is autonomous from other papers', emitting an original and comprehensive assessment of this seemingly never-ending debate on whether the choice of exchange-rate regime effects economic growth or not. The answer to the problem statement is that the the choice of exchange-rate regime is not statistically significant in explaining economic growth for the studied sample, and that this conclusion is robust to dividing the observed countries based on their level of development. Although these findings allow us to reject the notion of a direct relationship between the choice of exchange-rate regime and economic growth, it doesn't allow us to dismiss the possibility of an indirect one. The extent of this indirect relationship between the choice of exchange-rate regime and economic growth are beyond the scope of this paper, giving rise to the concluding remark that the relationship between choice of exchange-rate regime and economic growth, both for developed and developing economies, remains blurred and requires further, more in-depth investigations.

¹⁶ See correlation matrix Appendix (Table A.4)

References

- Aghion, P., Bacchetta, P., Ranciere, R. and Rogoff, K. (2005) ‘‘Productivity Growth and the Exchange Rate Regime: The Role of Financial Development’’. *NBER Working Paper Series*, 23, p. 1-27.
- Barro, J. R. 2006. ‘‘Barro on growth’’. *ECON TALK library of Economics and Liberty*. Accessed April 25, 2016 from http://www.econtalk.org/archives/2006/07/an_interview_wi_1.html
- Barro, J. R., and Sala-i-Martin, X. 2004 ‘‘Economic Growth’’ second edition. The MIT Press, Cambridge, Massachusetts, London, England. (2004) Massachusetts Institute of Technology.
- Bailliu, J., R. Lafrance, and J.-F. Perrault. 2001. ‘‘Exchange Rate Regimes and Economic Growth in Emerging Markets.’’ In *Revisiting the Case for Flexible Exchange Rates*, 317–45. Proceedings of a conference held by the Bank of Canada, November 2000. Ottawa: Bank of Canada.
- Bailliu, J., Lafrance, R. and Perrault, J.F. (2003) ‘‘Does Exchange Rate Policy Matter for Growth?’’ *International Finance*, 6th edition.
- Borensztein, Lee, and Gregorio. 1998. ‘‘How does foreign direct investment affect economic growth?’’ Elsevier Science B.V.
- Brada, J. C. and Méndez, J. A. (1988)’’ Exchange Rate Risk, Exchange Rate Regime and the Volume of International Trade’’, *Kyklos*, 41(2), p.263-280.
- Calvo, G.A. and Reinhart, C.M. (2002) ‘‘Fear of Floating’’. *Quarterly Journal of Economics*, 117, p.379-408.
- De Grauwe, P. and Schnabl, G. (2004)’’Exchange Rates Regimes and Macroeconomic Stability in Central and Eastern Europe’’. *CESifo Working Paper*, 1182,
- Edison, H. and Melvin, M. (1990) ‘‘The Determinants and Implications of the Choice of an Exchange Rate System, in Monetary Policy for a Volatile Global Economy’’, ed, W. Haraf and T. Willett, Washington, D.C.: American Enterprise Institute.
- Frankel, J. ‘‘No Single Currency Regime is Right for All Countries or at All Times.’’ National Bureau of Economic Research (Cambridge, MA) Working Paper No. 7338, September 1999.
- Friedman, M. (1953)’’The Case of Flexible Exchange Rates’’. Cited in: De Grauwe, P. and Schnabl, G. (2004)’’Exchange Rates Regimes and Macroeconomic Stability in Central and Eastern Europe’’, *CESifo Working Paper*, 1182, p.1-34.
- Ghosh, A., Gulde, A-M., Ostry, J. and Wolf, H. ‘‘Does the Nominal Exchange Rate Regime Matter?’’ IMF Working Paper 95/121 (December 1995).
- Ghosh, A., Gulde, A-M., Ostry, J. and Wolf, H. ‘‘Exchange rate regimes: choices and consequences.’’ The MIT Press, Cambridge, MA, 2002.
- Goldstein, M. (2002)’’Managed Floating Plus’’. Washington DC: Institute for International Economics, Policy Analyses in International Economics.

- Gylfason, T. (2000) "Fix or Flex? Alternative Exchange Rate Regimes in an Era of Global Capital Mobility", *North American Journal of Economics and Finance*
- Haizhou H. and Priyanka M. (2004) "Exchange Rate Regimes and Economic Growth: Evidence from Developing Asian and Advanced European Economies". Research Department, IMF.
- Husted, S., and Melvin, M. (2010) "International Economics: Eighth Edition." Pearson
- Levy-Yeyati, E. and Sturzenegger, F. (2002) "To Float or to Fix: Evidence on the impact of Exchange Rate Regimes on Growth." *American Economic Review*, 12(2), p. 1-49.
- Nielsen, L. 2011. "Classifications of Countries Based on Their Level of Development: How it is Done and How it Could be Done." IMF Working Paper.
- Nilsson, K. and Nilsson, L. (2000) "Exchange Rate Regimes and Export Performance of Developing Countries." *Blackwell Publishers*, 2000.
- Petreski, M. (2009) "Analysis of exchange-rate regime effect on growth: *Theoretical channels and empirical evidence with panel data.*" National Bank of the Republic of Macedonia
- Petreski, M. (2009) "Exchange-rate regime and economic growth: A review of the theoretical and empirical literature, *Economics.*" Discussion Paper No. 2009-31, Kiel Institute for the World Economy, Kiel.
- Reinhart, Carmen M. and Rogoff, K. 2004. "The Modern History of Exchange Rate Arrangements: A Reinterpretation." *Quarterly Journal of Economics*, Vol. 119(1), pp. 1-47.
- Viaene, V.M. and de Vries, C.G. (1992) "International Trade and Exchange Rate Volatility." *European Economic Review*, P.1311-1321.
- Williamsson, J. 2000. "Exchange Rate Regimes for Emerging Markets: Reviving the Intermediate Option." Washington, D.C.: Institute for International Economics.

Appendix

Table A.1 Averaged yearly values 2000-2010

Country	GDP_{GROWTH}	$GDP_{INITIAL}$	EDU	CF	T	PC	FDI	POP
Argentina	2,52	7669,273	9,1	17,65	33,37	23,9	1,98	1,06
Armenia	8,51	621,4248	10,8	29,25	68,36	13,01	6,16	-0,39
Australia	1,71	21665,12	11,9	26,8	41,02	109,66	3,05	1,38
Austria	1,27	24517,7	9,1	24,25	92,575	102,6	5,24	0,41
Bangladesh	3,99	406,317	3,7	25,34	34,35	30,8	0,71	1,48
Belgium	1,19	23207,41	10	22,94	142,86	77,8	16,77	0,59
Benin	0,85	396,7009	2,6	21,99	52,77	12,1	0,91	3,12
Bolivia	1,92	1007,003	7,4	15,25	63,13	42,69	3,69	1,74
Brazil	2,45	3738,719	5,6	18,96	25,92	36,92	2,79	1,24
Cambodia	6,3	299,5622	5,7	19,1	124,95	14,33	5,22	1,68
Chad	6,11	166,008	1,5	31,98	84,69	3,42	10,98	3,55
Canada	1,2	24031,95	11,1	22,03	69,93	160,5	3,54	0,98
Chile	2,72	5229,177	8,8	22,1	68,16	81,64	6,26	1,15
China	9,67	954,23	6,6	41,56	51,89	112,3	3,67	0,59
Denmark	0,61	30743,56	10,6	22	89,77	166,53	3,15	0,37
Egypt	3	1461,018	4,7	18,93	52,59	47,54	3,71	1,82
Ethiopia	5,54	124,051	1,5	0	0	23,1	2,61	2,77
France	0,8	22465,64	9,8	22,32	53,38	85,1	2,61	0,65
Georgia	5,92	691,9977	12,1	27,78	79,37	19,12	8,79	0
Germany	1,15	23718,747	10,5	20,25	69,93	119,5	2,46	-0,03
Ghana	2,94	264,70258	6,3	23,67	87,86	13,76	4,17	2,54
Greece	1,78	11952,858	8,6	24,03	53,09	47,4	0,82	0,22
Guatemala	0,99	1650,366	3,7	18,53	63,98	25,44	1,67	2,32
Guyana	2,02	960,1868	7,7	20,92	168,94	47,27	7,45	0,16
Honduras	2,37	1138,147	4,3	27,42	123,53	42,9	5,45	1,86
India	5,52	452,4136	3,6	31,79	38,67	28	1,56	1,57
Indonesia	3,81	780,0921	6,7	25,72	58,17	24,88	0,59	1,33
Italy	0,27	20059,21	8,4	21,07	50,27	75,5	1,02	0,36
Japan	0,82	37299,64	10,8	22,47	26,34	184,53	0,21	0,1
Korea. Rep	4,3	11947,58	10,6	31,9	76	125,2	1	0,5
Latvia	5,46	3351,469	9,4	30,69	92,37	19,2	3,97	-1,18
Luxembourg	1,77	48992,31	10,8	20,89	297,63	102,3	23,73	1,48
Mali	1,63	240,3781	1,2	21,75	55,95	16,5	3,85	3,14
Mexico	0,68	6649,717	6,7	22,41	54,43	18,48	2,82	1,43
Moldova	5,15	354,0013	9	27,52	130,89	26,92	6,36	-0,21
Morocco	3,49	1265,395	3,4	30,4	69,12	51,41	2,1	1,04
Nepal	2,79	231,443	2,4	26,83	47,33	37,01	0,12	1,29
Netherlands	1,13	25921,28	10,8	21,54	124,47	134,2	23	0,45

Table A.1 Continued

Country	GDP_{GROWTH}	$GDP_{INITIAL}$	EDU	CF	T	PC	FDI	POP
New Zealand	1,39	13641,056	12	23,8	60,93	110	2,18	1,14
Nigeria	6,04	377,5003	5	9,06	62,68	19,57	3,22	2,59
Norway	0,88	38146,72	11,5	23,1	70,73	66,5	3,03	0,83
Pakistan	2,07	534,158	3,3	17,62	32,42	25,29	1,67	2,08
Philippines	2,87	1039,702	8	20,26	91,2	31,22	1,32	1,8
Portugal	0,71	11502,4	6,6	24,19	65,31	126,3	3,38	0,31
Poland	4,04	4492,728	11,1	21,33	71,87	37,98	3,92	-0,14
Senegal	1,24	474,5771	3,7	23,07	68,36	18,7	1,94	2,7
Singapore	3,83	2379253	7,6	25,6	389,59	97,9	16,31	2,26
South Africa	1,97	3099,132	8,8	18,79	57,26	138,28	1,88	1,53
Spain	1,09	14787,76	8,4	27,9	54,78	97,8	3,69	1,4
Sri Lanka	4,49	854,9267	10	25,33	70,27	28,8	1,26	0,73
Sweden	1,85	29283,01	11	22,57	83,92	104,8	4,87	0,51
Thailand	3,9	2016,041	6,1	24,98	39,9	98,89	3,39	0,66
Togo	-0,8	265,5017	4,4	16,16	91,65	16	3,16	2,7
Uganda	3,51	260,6845	3,9	21,92	41,59	9,92	4,06	3,31
Ukraine	5,44	635,7128	10,7	22,11	105,16	47,25	4,29	-0,72
United Kingdom	1,19	26400,66	11,6	18,33	55,05	129,3	4,96	0,61
United States	0,93	36449,86	12,7	21,54	25,44	168,4	1,61	0,93
Vietnam	5,4	433,3337	4,5	33,6	29,96	35,3	5,2	1,15
Yemen	1,21	541,513	1,1	18,98	75,16	4,19	1,52	2,81
Zambia	4,24	340,1565	5,9	29,87	62,94	8,12	5,83	2,72

GDP_{GROWTH} (%), $GDP_{INITIAL}$ (2000 USD), EDU (years), CF (%GDP), T (%GDP), PC (%GDP), FDI (%GDP), POP (%)

Table A.2 Exchange-rate regime and income classification

Country	Regime description	Regime Classification	Country	Regime description	Regime Classification
Argentina(H)	Dual market	Intermediate	Latvia(H)	Peg	Fixed
Armenia(LM)	Crawling band	Intermediate	Luxembourg(H)	Currency union	Fixed
Australia(H)	Free float	Flexible	Mali(L)	Peg	Fixed
Austria(H)	Currency union	Fixed	Mexico(HM)	Managed float	Flexible
Bangladesh(LM)	Managed float	Flexible	Moldova(L)	Managed float	Flexible
Belgium(H)	Currency union	Fixed	Morocco (LM)	Moving band	Intermediate
Benin(L)	Peg	Fixed	Nepal(L)	Crawling band	Intermediate
Bolivia (LM)	Crawling band	Intermediate	Netherlands(H)	Currency union	Fixed
Brazil(HM)	Managed float	Flexible	New Zealand(H)	Managed float	Flexible
Cambodia(L)	Managed float	Flexible	Nigeria(LM)	Dual market	Intermediate
Chad(L)	Peg	Fixed	Norway(H)	Managed float	Flexible
Canada(H)	Moving band	Intermediate	Pakistan(LM)	Crawling band	Intermediate
Chile(H)	Managed float	Flexible	Philippines(LM)	Managed float	Flexible
China(HM)	Peg	Fixed	Portugal (H)	Currency union	Fixed
Denmark(H)	Dual market	Intermediate	Poland(H)	Managed float	Flexible
Egypt(LM)	Peg	Fixed	Senegal (LM)	Peg	Fixed
Ethiopia(L)	Peg	Fixed	Singapore(H)	Managed float	Flexible
France(H)	Currency union	Fixed	South Africa(HM)	Free float	Flexible
Georgia(LM)	Managed float	Flexible	Spain(H)	Currency union	Fixed
Germany(H)	Currency union	Fixed	Sri Lanka(LM)	Crawling band	Intermediate
Ghana(LM)	Managed float	Flexible	Sweden(H)	Managed float	Flexible
Greece (H)	Currency union	Fixed	Thailand(HM)	Managed float	Flexible
Guatemala(LM)	Crawling band	Intermediate	Togo(L)	Peg	Fixed
Guyana(LM)	Crawling band	Intermediate	Uganda(L)	Crawling band	Intermediate
Honduras(LM)	Crawling band	Intermediate	Ukraine (L)	Peg	Fixed
India(L)	Crawling band	Intermediate	United Kingdom(H)	Managed float	Flexible
Indonesia(LM)	Free float	Flexible	United States(H)	Free float	Flexible
Italy(H)	Currency union	Fixed	Vietnam(LM)	Peg	Fixed
Japan(H)	Free float	Flexible	Yemen(LM)	Managed float	Flexible
Korea. Rep(H)	Free float	Flexible	Zambia(LM)	Managed float	Flexible

The column specifying regime classification is based on the Reinhart and Rogoff (2004) classification of de facto exchange-rate regimes.

The lettering that follows each country indicates its income-level, as specified by the World Bank organization that uses the World Bank Atlas method whereby low-income(L) economies are defined as those with a GNI per capita of $0 < \$1,045$ or less; middle-income economies are those with a GNI per capita of $\$1,045 < \$12,736$; high-income(H) economies are those with a GNI per capita of $\$12,736 < X$ or more. The distinction between lower-middle-income(LM) and higher-middle-income(HM) economies is made at a GNI per capita of $\$4,125$.

For the purpose of the empirical analysis of this paper, higher developed countries are comprised of high-income and upper-middle-income economies and lower developed countries are comprised of low-income and lower-middle-income economies.

Table A.3 Descriptive statistics

Variables	Mean	Median	Maximum	Minimum	Std. Dev
<i>GDP_{GROWTH}</i>	2.8640	2.2200	9.6700	-0.8000	2.1310
<i>FIX</i>	0.36667	0.0000	1.0000	0.0000	0.48596
<i>FLEX</i>	0.4000	0.0000	1.0000	0.0000	0.49403
<i>GDP_{INITIAL}</i>	9599.5	1555.7	48992.	124.05	12668.
<i>POP</i>	1.2412	1.1500	3.5500	-1.1800	1.0637
<i>EDU</i>	7.4233	7.8500	12.700	1.1000	3.3013
<i>FDI</i>	4.4478	3.3000	23.730	0.12000	4.7485
<i>CF</i>	23.157	22.440	41.560	0.0000	5.9613
<i>PC</i>	62.078	42.795	184.53	3.4200	49.308
<i>T</i>	78.144	66.735	389.59	0.0000	59.821

N = 60

Table A.4 Correlation Matrix

Correlation	<i>GDP_{GROWTH}</i>	<i>FIX</i>	<i>FLEX</i>	<i>GDP_{INITIAL}</i>	<i>EDU</i>	<i>CF</i>	<i>T</i>	<i>PC</i>	<i>FDI</i>
<i>GDP_{GROWTH}</i>	1								
<i>FIX</i>	-0,1259	1							
<i>FLEX</i>	0,0056	-0,6212	1						
<i>GDP_{INITIAL}</i>	-0,4906	0,1518	0,1034	1					
<i>EDU</i>	-0,1346	-0,0941	0,2820	0,6473	1				
<i>CF</i>	0,3705	0,0220	0,0369	-0,0607	0,0975	1			
<i>T</i>	0,0340	0,0934	-0,0114	0,2833	0,1543	0,1242	1		
<i>PC</i>	-0,3627	0,0853	0,1340	0,7561	0,6178	0,0622	0,0661	1	
<i>FDI</i>	0,0487	0,2372	-0,1009	0,3593	0,2156	0,0616	0,7269	0,1329	1
<i>POP</i>	-0,0974	-0,0477	-0,0486	-0,3270	-0,7258	-0,2763	-0,0222	-0,4249	-0,037

Figure A.2 Scatter plot of exchange-rate regime and economic growth

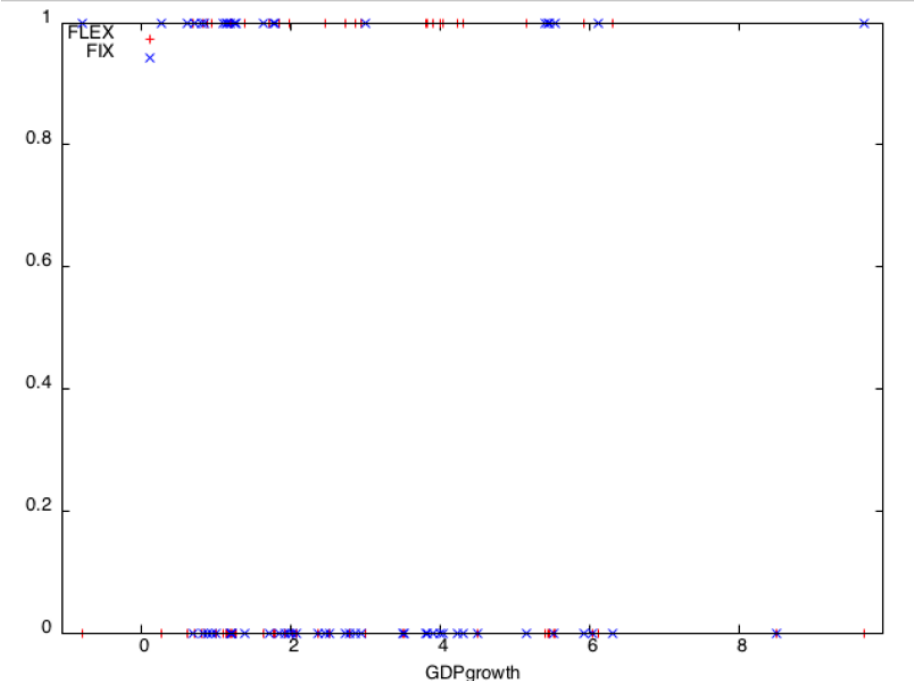


Figure A.3 Multicollinearity between EDU and POP variables

