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An Undergraduate Thesis

Exchange Rate Regimes and Economic Growth

Amandarae Matthew

Advised by: Dr. Hongwei Song

Readers: Dr. Francis E. Raymond, Dr. Bradley Stevenson

Abstract

This paper explores the relationship between economic growth and exchange rate regimes among countries of lower income, lower middle income, upper middle income, and high-income countries. Countries must make careful consideration when choosing an exchange rate regime because each regime can have different long-term effects. A cross section pooled time series data will be used for a sample of 42 countries over the period of 2000-2018. Multiple models will examine the various relationships between types of exchange rate regimes, changes in exchange rate regimes, and economic growth. The components of the models being tested include political stability, change in terms of trade, population growth, investment/GDP, and exchange rate regime classification because they are all determinants of the robustness of a country's economic growth. This paper used the pooled OLS model, fixed effects model, and random effects model as estimation strategy. This paper finds that changing from an intermediate regime to a floating regime is negatively correlated with economic growth while utilizing fixed and floating regimes are positively correlated with growth. Changing regime types in general is also negatively correlated with growth. Further research can be done to expand on these findings and include income classifications of the countries as an important determinant in growth and a time lag as a more accurate depiction of growth since the effects of changing regimes on growth may not be seen for multiple years.

Acknowledgements

I want to extend a tremendous thank you to my advisor, Dr. Hongwei Song, for all your guidance and expertise. You made the process incredibly less challenging and more exciting. I always looked forward to our meetings whether they were in person or virtual. Thank you for the time you have invested in me and this thesis, for all the edits and late-night presentation prepping, and for believing in me. I have learned so much from you and treasure this experience.

To my readers, Dr. Francis E. Raymond and Dr. Bradley Stevenson, thank you for reading my drafts, providing input, listening to my presentations, and supporting me throughout this process. I appreciate all the time and work you invested in me and this paper.

To all the faculty and staff who believed in me, supported me, and helped in a multitude of ways, thank you.

Lastly, to my friends and family. Thank you for your support and encouragement. Many of you read my drafts and listened to me excitedly chatter, or not so excitedly depending on the day, about this project for the past year and a half. Thank you for listening and for urging me to put my best foot forward despite the many challenges that arose.

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1. Introduction

In theory, economic growth is correlated with economic development and poverty reduction. One important component that affects economic growth is the exchange of goods and services through international trade. The foreign exchange market could facilitate both international trade and international financial investment by allowing transactions to occur between countries with different currencies of different values using an exchange rate. The effective exchange rate is a common indicator for the exchange rate and is an index that measures the value of one currency in terms of another currency.

Under a floating exchange rate regime, the value of a currency is determined by the market demand and supply of that currency. Under a fixed exchange rate regime, government monetary authorities keep the exchange-rate value fixed or pegged, even if the rate they choose differs from the current market equilibrium rate (Pugel, 2016). The goal is to keep the exchange rate within a narrow band around the par value. If the currency appreciates, imports become cheaper, exports become more expensive, and capital outflows rise. This causes the balance of payments to fall. If the currency depreciates, imports become more expensive, exports become cheaper, and capital outflows fall. This causes the balance of payments to rise.

Since there are multiple types of exchange rate regimes, the government authorities face the choice of which exchange rate regime to implement. There has been much debate about which regime leads to more economic growth. Among others, Imam (2012) finds that for industrialized countries, a flexible exchange rate should yield the highest economic growth because of the high credibility of the central bank and a thoroughly established financial system allow the country to better absorb shocks that could affect the exchange rate. Conversely, in developing countries a fixed exchange rate regime typically yields higher economic growth

because it creates stability. The developing country will be more prone to shocks, but the exchange rate can minimize the effects of the shock.

Besides further exploring the relationship between economic growth and exchange rates, this paper also explores whether a positive or negative relationship exists between changing regimes and economic growth. Three types of regime changes will be examined: the transition from fixed to intermediate regimes, the transition from intermediate to floating regimes, and the transition from floating to intermediate regimes. There are many other types of regime changes. However, these are three of the most popular transitions, so the paper will focus on these.

The remainder of the paper will consist of a literature review to detail the current theory and literature surrounding exchange rate regimes followed by the models and estimation strategy. After a section detailing the data description and sources, the paper will conclude with a discussion about the results and future implications.

2. Literature Review

2.1 Exchange rate classification system

Prior to the fallout of the Bretton Woods agreement, most countries had a fixed exchange rate agreement. In 1944, countries met around the world and agreed to use a fixed but adjustable exchange rate and to the creation of the World Bank Group and a central monetary authority, the International Monetary Fund (IMF). With the new system, the U.S. dollar was pegged directly to the gold standard and other countries' currencies were pegged to the U.S. dollar. The collapse of the Bretton Woods agreement prompted new exchange rate arrangements to be used. For example, the U.S. dollar was no longer pegged directly to the gold standard. Besides facilitating the balance of payments between countries, the IMF classifies the exchange rate arrangements.

The IMF publishes a classification system based on the de jure rate, the publicly announced rate, as opposed to the de facto rate, the rate that the country is using in practice (Broda & Tille, 2003). The drawback of using this system is that the de jure rate does not always match the de facto rate. Broda & Tille (2003) detail some discrepancies in the IMF classification system by specifically noting instances where the declared exchange rate systems do not match official data collected. For instance, El Salvador in 1983-84, Guatemala in 1986-88, and Nicaragua in 1985-87 are classified as fixed exchange rate regimes when their currencies depreciated by 10 percent, 41 percent, and 106 percent during those periods. Depreciating currency is not indicative of a fixed exchange rate, especially in the case of Nicaragua with 106 percent depreciation, since it should only fluctuate a small amount within the specified band. Furthermore, India and Bolivia are classified as flexible regimes despite having little fluctuations in their exchange rate regime.

Because of the discrepancies in the IMF classification system, not all scholars utilize it. Instead, some scholars opt to use other classification systems or develop their own. Broda & Tille (2003) and Ghosh et al. (1997) use a combination of the rates declared by the central bank in the IMF classification system and their own system to divide the pegged regimes into two distinct categories, frequent and infrequent adjusters. A frequent adjuster being all regimes that change purchasing power parity more than once in a given year, while infrequent adjusters change purchasing power parity either once a year or once every few years. In his paper, Cespedes (2015) uses the GGW (Gosh, Gulde, and Wolf) system from which a consensus classification is constructed to serve as the intersection between the de jure and de facto classifications.

Ghosh et al. (1997) uses their own three-way classification of exchange rate regimes to because using numerous regimes can identify similarities between regimes while only using three regimes can mask differences between them They detail nine types of exchange rate regimes:

single currency pegs, special drawing pegs (SDR), basket pegs, secret basket pegs, hard pegs, unclassified floats, managed floats, pure floats, and floats without a predetermined range. They later classify these into three categories: fixed, intermediate, and floating/flexible. Under a fixed exchange rate regime, the government manages currency by keeping the value of the exchange rate within a certain band. In an intermediate regime, the band increases in width, so it is still managed by the government to a degree. For a floating/ flexible regime, the market determines the value of the exchange rate.

This paper will not use the exchange rate regimes detailed by Ghosh et al. (1997), but the arrangements detailed by the IMF in their reports (IMF).¹ The IMF groups the arrangements into hard pegs, soft pegs, floating, and residual where the hard pegs are the fixed regimes, and the soft pegs are the intermediate regimes. For the purposes of this paper, the residual arrangement will be considered an intermediate regime because it is still managed.

There are two types of hard pegs. One type is no separate legal tender, also called formal dollarization. It is when the domestic country uses the currency of a foreign country as legal tender, meaning the domestic country does not have its own separate currency. A currency board arrangement is the second type of hard peg. The country uses its own currency; however, the currency is backed by foreign assets. Both will be discussed further in the section detailing exchange rate arrangements.

Soft pegs include conventional peg, stabilized arrangement, crawling peg, crawl-like arrangement, pegged exchange rate within horizontal bands, and other managed arrangement. When a country uses a conventional peg, they manage the exchange rate through official intervention, buying and selling domestic currency to keep the value of the exchange rate within a

¹ For the years 2000-2018

band of less than plus or minus one percent. A stabilized arrangement is like a conventional peg; however, the exchange rate must stay within two percent for at least six months. With a crawling peg, the currency is altered by small amounts. The rate can be set as forward looking, a pre-determined fixed rate below the projected inflation, or backward looking, inflated adjusted changes. A crawl-like arrangement differs. The exchange rate arrangement must remain within two percent of the pre-determined rate. However, with a pegged exchange rate within horizontal bands, the value of the currency can fluctuate at least one percent around a fixed rate. Other managed arrangements are used when the exchange rate arrangement changes frequently and does not meet the other categories.

The flexible exchange rate category consists of floating and free floating regimes. A floating regime is determined by the market with no pre-determined path for the exchange rate. A free floating regime differs because the rate is mainly market determined, although intervention can occur only three times within a six month period.

Despite the development of new exchange rate systems, a consensus has not been reached regarding an effective alternative to the IMF classification system, so most scholars still default to the IMF system. However, many scholars can agree about the importance of distinguishing between the de jure and de facto rates since acknowledging the rate the country is using will yield more accurate results when researching. This paper will use the IMF classification system since an alternative system has not been widely accepted, and this will also allow for the results to be more comparable to other papers that have used the same system.

2.2 Types of Exchange Rate Regimes

After detailing how exchange rates are classified, we can now explore the types of exchange rate regimes. This paper will use one exchange rate regime from each of the three

categories: exchange arrangement with no separate legal tender, conventional pegged arrangement, and floating.

A fixed exchange rate can offer stability and credibility to the economy and the central bank of the country. However, under a fixed exchange rate regime the central bank must manage terms of trade imbalances, or balance of payments. If a country has a balance of payments deficit, they owe money to their trading partners. The IMF manages the balance of payments deficit by transferring credits to the trading partner who's owed money. Since fixed exchange rates are essentially price controls on currency, shortages and surpluses can occur. The central bank must then buy or sell domestic currency in order to defend its value and return the market to equilibrium. The central bank buys and sells the currency through the IMF, yet another reason why it was created. To limit the amount of official intervention needed on behalf of the government, different types of fixed exchange rates can be implemented.

The hard peg is a type of fixed exchange rate, but there are multiple types of exchange rate regimes within a hard peg. Imam (2012) describes the three different types: dollarization, currency board arrangement, and a hard peg. Dollarization occurs when a country keeps a foreign currency as legal tender, which adds credibility to the Central Bank but can be hard to reverse. Because it is hard to reverse, adopting a new exchange rate arrangement will take time and could disrupt the economy in the process. Adopting a foreign currency as legal tender is usually for political reasons because the domestic country wants independence, but it does not have an established economy of its own, so it remains dependent on the mother country. Doing this allows the domestic country to build its economy and create stability resulting from a currency that does not fluctuate in value, so that it can eventually establish its own currency. However, in order to adopt its own currency, consumers must have confidence in the new currency and the central bank, so this process often

takes time. With having an exchange rate pegged to a foreign country, if the foreign country experiences a change in value of their exchange, this will affect the domestic country as well.

A currency board arrangement has its own currency, but all coin and reserves must be backed by foreign currency. As a result, the currency board arrangement is considered less robust and credible than full dollarization in which only part of the country's money is backed by foreign currency. One benefit of a currency board arrangement is that it allows all notes and coins to have unlimited convertibility with the anchor currency. Because of this, inflation rates and interest rates are generally closer to the country with the anchor currency. However, because the countries have different rates of productivity, this could lead to higher or lower inflation rates.

On the other hand, a soft or crawling peg entails the use of monetary policy to keep the exchange rate within a certain target. This makes it a type of intermediate exchange rate regime. For the crawling peg, authorities adjust the target exchange rate more frequently and in smaller increments in order to stay within the band. This is like a fixed exchange rate by keeping the exchange rate around a certain value but differs in the width of the band that the exchange rate must stay within. Because the crawling peg is like the fixed exchange rate, the crawling peg can suffer from the same problems as the fixed exchange rate, so it is not as commonly used.

A conventional fixed peg exchange rate is pegged to a major currency or a basket of currency where it can fluctuate within a narrow band. If the exchange rate reaches a value outside the band, the government will intervene by buying or selling the local currency. Selling domestic currency and buying foreign currency would increase the supply of domestic currency and lower its exchange rate. Buying domestic currency and selling foreign currency would increase the demand for domestic currency and push its exchange rate higher. Having a pegged fixed exchange rate requires a strong central government in order to predict the turns in the economy. It has higher

institutional costs as opposed to dollarization because the country still has its own currency to maintain. Under all types of fixed exchange rates, inflation is generally lower because of the monetary discipline effect and confidence effect. With these effects, fixed exchange rates are associated with slower monetary growth and slower velocity growth, meaning that because growth is slower, prices are less apt to rise quickly.

There are two types of exchange rates within the flexible exchange rate regime: free floating and managed floating (Tavlas, 2003). With a free-floating exchange rate regime, there is no official intervention by buying or selling currency or setting interest rates. Market supply and demand are the only determinants of the exchange rate. As opposed to a freely floating exchange rate, a managed floating exchange rate allows for official intervention, yet the authorities have no specific exchange rate target. Authorities may intervene to smooth short-term volatility in the exchange rate or to push the exchange rate towards the perceived equilibrium value. Despite some government intervention, the managed float is not considered an intermediate regime because there is no pre-announced path for the exchange rate. This is necessary in order to be classified as fixed or intermediate.

2.3 Exchange Rates and Economic Growth

2.3.1 Exchange Rate Regimes and Growth in Advanced Economies

Advanced economies have a long established, centralized monetary authority and stable currency. Most advanced countries utilize a flexible exchange rate because the fluctuations in the value of their currency allow for the absorption of shocks. After the collapse of the Bretton Woods exchange rate classification system, many countries moved to a flexible exchange rate arrangement. Because of the stability the regime offered, it allowed for less management and

intervention by the government, especially for more advanced economies. Husain (2005) finds that flexible exchange rate regimes offer lower inflation, higher growth, and greater durability. Because a change in inflationary expectations can cause an economic shock, it can impact the exchange rate. For instance, if the currency depreciates, imports are more expensive. If the country were reliant on particular imports such as food or petroleum, inflation could be more rampant. Since prices and the economic condition would be less likely to fluctuate due to automatic stabilization of shocks, inflation would be less likely to occur. With a flexible exchange rate regime, the government is free to conduct monetary policy measures and make decisions regarding investing in the international trade market, which will affect the fluidity of the capital inflow and outflow (Jakob, 2016). Due to this fluidity, the flexible exchange rate is the most durable out of all the exchange rate types (Husain, 2005).

2.3.2 Exchange Rate Regimes and Growth in Developing Economies

In order to gain some stability, developing countries usually adopt a fixed exchange rate after gaining independence from another country or after experiencing a series of events that negatively impact the development such as financial crises or civil unrest (Imam 2012). Most countries who have adopted a fixed exchange rate post-independence do not change exchange rate regimes for many years because of the unstable state of the country. Separating from a mother country can leave the new country vulnerable because new systems and procedures must be established in order to begin building a credible financial system. Having a fixed exchange rate makes the central bank more credible and helps smooth the process of independence by instilling confidence in the consumers to use the currency. The effects of a changing value in currency are more pronounced in developing countries than industrialized countries. Since they lack an

established financial system, the developing countries are more prone to shocks, making economic growth more volatile.

Mundell and McKinnon developed the Optimal Currency Area (OCA) Theory where the choice of exchange rate regime lies within an optimal currency area dependent on the degree of openness, labor market mobility, stabilization of the business cycle, trade, and the symmetry of shocks (Mundell, 1961; Huang, 2005). However, the data provides contradictory results. For instance, while the fixed exchange rate regime increases trade and growth by increasing consumer confidence and economic stability, it can also reduce trade and growth by causing a lag in the price adjustment process, making the country vulnerable to speculative attacks. Because of this, emerging countries can have a 'fear of floating' where the country is reluctant to change to a floating exchange rate for fear of the instability large rate fluctuations can cause. The fear of floating often occurs after a recent financial crisis where there can be a stop in foreign investment and onslaught of capital flight. Gudmundsson (2002) mentions the limitations of the OCA Theory: the criteria are exogenous, optimal exchange rate flexibility is assumed causing credibility problems, and they overlook the uncertainty and incomplete markets generated by the assumptions about exchange rate flexibility. Monetary independence can be problematic when exchange rates are more volatile because the independent currency can cause economic shocks instead stabilizing the shocks.

Most scholars agree that in the case of developing countries, having a fixed exchange rate regime will increase economic growth due to added stability, however, some find the opposite (Ashour & Yong, 2018; Levy-Yeyati & Sturzenegger, 2003). This can result from the spot market disequilibrium and official reserve transactions that are used to balance payments outweighing the stability that a fixed exchange rate can provide. When the same model was applied to industrial

countries, results indicated that there was no significant relationship between choice of exchange rate regime and economic growth possibly because as the economy becomes more advanced, the less important it becomes to have an exchange rate that increases economic growth (Levy-Yeyati & Sturzenegger, 2003). Because this paper aims to explore how a change in exchange rate regime affects economic growth in developing countries, Ashour & Yong's (2018) findings regarding how the exchange rate regimes can impact economic growth in different types of countries, industrial and developing, will provide valuable insight to our analysis.

2.3.3 Exchange Rate Regimes and Growth in Microstates

According to Imam (2012), microstates are dependent territories or countries with a population of less than 2 million people. Many were territories of Great Britain or small islands in the Caribbean. Countries that become microstates were under the rule of another large country, most often Great Britain or Spain but are considered microstates after gaining independence due to their small size.

Microstates are relatively new with most of them developing after the 1970's. They differ in income classification, natural resource endowment, and volume of inhabitants (Imam, 2012). Though most microstates are similar in size, they vary in terms of exchange rate regime and specialization of services, although most microstates choose a form of the fixed exchange rate. Gudmundsson (2002) agrees with the consensus that smaller countries should favor a fixed exchange rate because they generally have a more open economy and are subject to both industry shocks and trade shocks. The macroeconomic costs of having a less developed and less liquid financial market are reduced when smaller countries utilize a fixed exchange rate. Higher fixed costs are typically associated with a monetary authority and larger countries can absorb these costs

whereas microstates do not (Breedon et al., 2012). Smaller countries that adopt a fixed exchange rate also have lower exchange rate volatility, meaning the value of the exchange rate changes very little over time. This can be beneficial since smaller countries tend to trade more than larger countries. However, more trade can make smaller countries more vulnerable to inflation, but the fixed exchange rate can act as a stabilizer (Breedon et al., 2012).

They commonly choose dollarization or the hard peg for political and economic stability since the value of the currency is pegged to another larger more stable country's currency. Currency board arrangements can be unstable because the value of the currency is dependent on that of another, meaning the economy of the domestic country is vulnerable to shocks that affect the foreign country. Additionally, having a fixed exchange rate removes political pressure because the central bank does not have the credibility necessary to make monetary policy adjustments. Because of the lack of policy adjustments and the fixed exchange rate providing stabilization, economic growth can increase. Some smaller countries are unwilling to get greater exchange rate volatility by transitioning from a fixed to flexible exchange rate regime because the government wants to be able to adjust the value of the exchange rate to gain credibility and control inflation (Wood, 2010).

The economies of microstates are typically highly specialized in production, so they must import goods such as fuel and natural resources since they are often unable to produce the goods themselves (Lederman & Lesniak, 2017). Countries with a more flexible exchange rate should follow the Marshall-Lerner condition, imports and exports are elastic in relation to the exchange rate and allow for reallocation of resources and adjustment to economic activity in response to exchange rate movements. Although, small states violate this condition (Lederman & Lesniak, 2017). The imports and exports in small countries are relatively inelastic, so a flexible exchange

rate would be unable to reduce economic volatility and stabilize the economy. Therefore, a fixed exchange rate would be more effective in microstates. Because the impact of exchange rate regimes on economic growth and development is more pronounced in developing countries and less literature exists regarding these concepts, the sample will be composed of countries of all income levels. Only three countries included in the sample are microstates because of data availability.

2.4 The Change in Exchange Rate Regime and Economic Growth

In addition to how each exchange rate regime affects growth, scholars have been exploring how changing the exchange rate regime impacts a country's economic growth for decades. However, a consensus has not been reached. In developing countries, a fixed exchange rate regime is considered to increase economic growth because it provides credibility to the central bank, allows for political stability, and lowers inflationary expectations. This would increase consumer confidence in the economy, causing them to spend more money, thereby increasing economic growth (Imam, 2012). A fixed peg will not allow for the absorption of shocks, so the economy absorbs them, leading to higher unemployment (Imam, 2012). Developing countries typically employ a type of a fixed exchange rate initially, then transition to an intermediate regime in preparation to fully adopt a flexible regime. Of the 42 countries in the sample, 22 of the countries changed exchange rate regimes at least once between 2000 and 2018 while the remaining 20 did not. Of the countries who did not change regimes, 9 used an intermediate regime and 11 used a floating regime in the period 2000 to 2018. There were no countries included in the sample that used a fixed regime the entire period. The types of regime changes included fixed to intermediate, fixed to floating, floating to intermediate, intermediate to floating, and intermediate to fixed.

Another goal of this paper is to look at these changes in regime and explore how a specific change relates to economic growth.

For more industrialized countries, the flexible exchange rate is the ideal option since the fluctuation of market conditions allows the exchange rate to move. Because the industrialized countries have more developed economies and central banks, the flexibility of the exchange rate yields for higher economic growth. While some industrialized countries use a fixed exchange rate, it is not the optimal choice for high economic growth because of the rigidity of the value of the exchange rate. Most of the current literature focuses on which type of exchange rate is ideal for increasing economic growth in countries at different levels of development. Since the volume of literature surrounding the effect of changing regimes on economic growth is limited, this paper will add to the discussion.

2.5 Other Components that Affect Economic Growth

While the exchange rate remains a critical component in influencing a country's economic growth, there are other factors as well as multiple ways to measure growth. The Human Development Index is an alternative way to measure economic growth through three key dimensions: a long and healthy life, access to education, and a decent standard of living. Economic development is highly correlated with economic growth.

Economic growth can also be measured by GDP per capita and can be influenced by government expenditures, investment, net exports, and consumption where changes in one of those variables will increase or decrease GDP. Net exports are comprised of exports and imports, both of which directly relate to consumer demand. If consumers decide to hold onto their money and buy less of a product, the demand for the product will decrease, causing imports of that product to

become more expensive and exports to become less expensive (Pugel, 2016). Thus, importing creates a demand for foreign currency and a supply of domestic currency while exporting creates a demand for domestic currency and a supply of foreign currency. Therefore, the shifting of the demand and supply in a market directly impacts the floating exchange rate regime. If the domestic currency depreciates, imports cost more while exports become cheaper. The country will import less and export more, causing net exports to increase. The increase in net exports positively affects economic growth. Alternatively, if the domestic currency appreciates, imports cost less and exports cost more. Therefore, the country will import more and export less, decreasing net exports and decreasing economic growth as a result.

Terms of trade, the relative price of imports to exports, is another concept that can affect economic growth. For example, a positive terms of trade shock would cause the price of a country's exports to rise and the cost of a country's imports to fall, which could positively affect economic growth since the country would be making more money on exports and spending less on imports (Pugel, 2016). Conversely, a negative terms of trade shock would cause the price of the domestic country's exports to fall, meaning the exports are cheaper to other countries, while the price of imports rises. The domestic country would be spending more money for the same amount of imports while making less money on the exports, causing a decrease in economic growth. The relationship between terms of trade shocks and economic growth is positive.

The exchange rate regime can act as a buffer for terms of trade shocks. Broda & Tille (2003) postulate that countries with more flexible regimes are more apt to absorb terms of trade shocks because their nominal exchange rate will serve as an automatic stabilizer versus a fixed peg, which will have variations in output due to government intervention in the form of contractionary monetary policy measures. They concluded that terms of trade shocks depreciated

the currency, decreased GDP by 0.2%, increased the CPI, and raised the prices for imports under a flexible exchange rate, while countries with a fixed exchange rate regime experienced lower wages and CPI, a 2.0% decline in GDP, and a depreciation in currency by a lesser percentage than a flexible regime. Current literature suggests that developing countries are particularly prone to terms of trade shocks but are especially vulnerable when using a fixed exchange rate.

Investment, usually defined as the share of GDP, could also affect growth. Chimobi et al. (2010) discover that investment can increase economic growth through production. Producers and consumers can invest in financial, social, and human capital, which increases the technological and production capacities and allows the economy to grow. Therefore, investment and GDP have a positive, linear relationship.

Political stability also positively effects economic growth; a stable political power gives consumers confidence in the economy and the central authority, so they will continue to spend money without fear of currency depreciation or inflation, thereby increasing economic growth. Many developing countries do not have political stability so having a fixed exchange rate will add credibility. Mancur Olson's Theory of Stability and Growth postulates that economic growth and political stability have a positive relationship, so the expected sign of the coefficient should be positive (Goldsmith, 1987).

Another determinant of economic growth is the population. A larger population has a positive relationship with economic growth because the economy must grow with the population. Therefore, high population growth produces a larger population that will consume more and stimulate the economy. Julian Simon was a proponent of the population-push theory stating that as population growth increases there will be more people with ideas that will enter the labor force (Simon, 1981). Other scholars argue that population growth is not a direct link to economic growth

rather that more advanced education generates new knowledge that enters the labor force, so high population growth will only produce high economic growth when combined with a strong education (Strulik, 2005). Furthermore, the Solow Model provides more evidence that there could be a negative relationship between population growth and economic growth; growth is dependent on capital accumulation, so higher population growth without increasing capital or production capacity can lead to lower growth (Aghion et al., 1998). Therefore, the relationship between economic growth and population percent growth can be positive or negative.

3. Model and Estimation Strategy

While many factors could affect the economic growth, the models in this paper focus on the change in terms of trade, political stability, population growth, and investment/GDP because research shows that they are more prominent in affecting economic growth in developing countries. The model specifications are as follows:

$$Y_{it} = \beta_0 + \beta_1 EER_{it} + \beta_2 PR_{it} + \beta_3 POP_{it} + \beta_4 \Delta TOT_{it} + \beta_5 \left(\frac{Inv}{GDP}\right)_{it-1} + \beta_6 FIX_{it} + \varepsilon_{it} \quad (1)$$

$$Y_{it} = \beta_0 + \beta_1 EER_{it} + \beta_2 PR_{it} + \beta_3 POP_{it} + \beta_4 \Delta TOT_{it} + \beta_5 \left(\frac{Inv}{GDP}\right)_{it-1} + \beta_6 INT_{it} + \varepsilon_{it} \quad (2)$$

$$Y_{it} = \beta_0 + \beta_1 EER_{it} + \beta_2 PR_{it} + \beta_3 POP_{it} + \beta_4 \Delta TOT_{it} + \beta_5 \left(\frac{Inv}{GDP}\right)_{it-1} + \beta_6 FL_{it} + \varepsilon_{it} \quad (3)$$

$$Y_{it} = \beta_0 + \beta_1 EER_{it} + \beta_2 PR_{it} + \beta_3 POP_{it} + \beta_4 \Delta TOT_{it} + \beta_5 \left(\frac{Inv}{GDP}\right)_{it-1} + \beta_6 FIX_{it} + \beta_7 INT_{it} + \varepsilon_{it} \quad (4)$$

$$Y_{it} = \beta_0 + \beta_1 EER_{it} + \beta_2 PR_{it} + \beta_3 POP_{it} + \beta_4 \Delta TOT_{it} + \beta_5 \left(\frac{Inv}{GDP}\right)_{it-1} + \beta_6 \Delta REG_{it} + \varepsilon_{it} \quad (5)$$

$$Y_{it} = \beta_0 + \beta_1 EER_{it} + \beta_2 PR_{it} + \beta_3 POP_{it} + \beta_4 \Delta TOT_{it} + \beta_5 \left(\frac{Inv}{GDP}\right)_{it-1} + \beta_6 \Delta FixInt_{it} + \varepsilon_{it} \quad (6)$$

$$Y_{it} = \beta_0 + \beta_1 EER_{it} + \beta_2 PR_{it} + \beta_3 POP_{it} + \beta_4 \Delta TOT_{it} + \beta_5 \left(\frac{Inv}{GDP}\right)_{it-1} + \beta_6 \Delta IntFL_{it} + \varepsilon_{it} \quad (7)$$

$$Y_{it} = \beta_0 + \beta_1 EER_{it} + \beta_2 PR_{it} + \beta_3 POP_{it} + \beta_4 \Delta TOT_{it} + \beta_5 \left(\frac{Inv}{GDP}\right)_{it-1} + \beta_6 \Delta FInt_{it} + \varepsilon_{it} \quad (8)$$

where the dependent variable Y_{it} represents the percent in GDP growth for country i and time t , the independent variables EER_{it} is the real effective exchange rate for country i at time t , PR_{it} is the political stability ranking, POP_{it} is the population percent growth, ΔTOT_{it} is the change in the net barter terms of trade value, $(\frac{Inv}{GDP})_{it-1}$ is investment as a percentage of GDP at time $t-1$, FIX_{it} is a dummy variable representing countries using a fixed exchange rate regime, INT_{it} is a dummy variable representing countries using an intermediate exchange rate regime, FL_{it} is a dummy variable representing countries using a floating exchange rate regime, ΔREG_{it} is a dummy representing if the country had any changes in the exchange rate regimes, $\Delta FixInt$ is a dummy variable representing if the country changed from a fixed regime to an intermediate regime, $\Delta IntFL$ is a dummy variable representing if the country changed from an intermediate to floating regime, and $\Delta FLInt$ is a dummy variable representing if the country changed from a floating to an intermediate regime.

Models 1-3 explore if the relationship between a specific type of regime will be positively or negatively associated with economic growth. The empirical results will further confirm/refute the existing literature. Splitting the types of exchange rate regimes between three models allows for comparison of the positive or negative association of each exchange rate regime on growth individually. For example, the first model explores the relationship between having a fixed exchange rate regime and economic growth.

Model 4 also studies how regime is associated with economic growth but focuses on comparing different types of regimes. Specifically, how the fixed and the intermediate exchange rate regimes relate to growth relative to a floating exchange rate regime. Model 5 explores the relationship between any change in regime and economic growth while Models 6-8 detail specific regime changes and how they relate to economic growth.

Estimation strategies include pooled Ordinary Least Squares (OLS), the fixed effects model, and random effects model in order to control for omitted variables and compare results. The pooled OLS estimation strategy is used for a baseline regression. There could be unobserved or omitted variables that actually affect economic growth. The fixed effects estimation strategy controls for omitted variable bias. It assumes that the effects the omitted variables (time-invariant variables) will be the same at a later time. The fixed effects model controls for the effects of the time-invariant variables or partial them out but do not measure them. The random effects model estimates the effects of those time-invariant variables but do not control for them.

4. Data and Results

4.1 Data Description

The sample in this paper includes forty-two countries of varying income levels with annual observations from the period 2000 to 2018. Table 1 explains each variable, its data source, and expected sign.

Table 1. Expected Signs and Data Sources

Variable	Definition	Data source	Expected Sign
Y: economic growth	growth rate of per-capita GDP	World Bank	This is the dependent variable.
EER: effective exchange rate	national currency per SDR, ² period average	International Financial Statistics database	Ambiguous
PR: Political Stability	the percentile rank of political stability and absence of violence/terrorism relative to other countries. (value from 1 to 7)	Freedomhouse	Positive

² SDR- special drawing rate, an international reserve asset created by the IMF as a supplement of the reserves of the member countries

POP	Population % Growth (annual, the percent difference in population from year t-1 to t)	Health, Nutrition, and Population Statistics	Ambiguous
Δ TOT	Change in net barter Terms of Trade index, 2000 = 100 (calculated by taking the numerical difference in terms of trade from year t-1 to t)	The World Development Indicators	Positive
INVGDP: investment	investment/GDP	The World Bank	Positive
FIX: fixed exchange rate regime	=1 for countries that adopt fix regime; =0 otherwise	International Monetary Fund's Annual Report on Exchange Arrangements and Exchange Restrictions	Ambiguous
INT: intermediate exchange rate regime	Intermediate exchange rate regime	International Monetary Fund's Annual Report on Exchange Arrangements and Exchange Restrictions	Ambiguous
FL: floating exchange rate regimes	Floating exchange rate regime	International Monetary Fund's Annual Report on Exchange Arrangements and Exchange Restrictions	Ambiguous
Δ REG: regime change	=1 if there is any change in the exchange rate regime =0 otherwise	International Monetary Fund's Annual Report on Exchange Arrangements and Exchange Restrictions	Ambiguous
Δ FIX-INT: fixed to intermediate regime	=1 if a country changes its exchange rate regime from fixed to intermediate; =0 otherwise	International Monetary Fund's Annual Report on Exchange Arrangements and Exchange Restrictions	Ambiguous

Δ INT-FL: intermediate to floating regime	=1 if a country changes its exchange rate regime from intermediate to float; =0 otherwise	International Monetary Fund's Annual Report on Exchange Arrangements and Exchange Restrictions	Ambiguous
Δ AFL-INT: floating to intermediate regime	=1 if a country changes its exchange rate regime from floating to intermediate; =0 otherwise	International Monetary Fund's Annual Report on Exchange Arrangements and Exchange Restrictions	Ambiguous

There are a multitude of ways to measure growth from the Human Development Index (HDI) to Gross Domestic Product (GDP) to Gross National Product (GNP). GDP is used to measure economic growth and is based off the market price of current currency, the constant price of currency, or the purchasing power parity. It measures the value of goods and services produced by a nation. For this paper, GDP is based off the constant price of currency in the year 2011 instead of current price or purchasing power parity.

The effective exchange rate, measured in national currency per SDR, is the variable used for the value of the exchange rate. Scholars have not reached a consensus on the relationship between economic growth and the exchange rate value (Imam, 2012; Lederman & Lesniak, 2017; Tavlas, 2003).

Political stability measures the percentile rank of political stability and absence of violence/ terrorism relative to other countries. The World Governance Indicators from the World Bank gives each country a value from one to seven with one being the most free and seven being the least free. Annual population percent growth is based on de facto definition of population, citizenship and legal status does not count so all residents are included. The relationship between

economic growth and population percent growth is ambiguous (Aghion et al., 1998; Simon, 1981; Strulik, 2005).

The indicator the net barter terms of trade index with a base year of 2000 is used and lagged to account for changes in the terms of trade not impacting economic growth immediately. The type of terms of trade shocks, positive or negative, can determine whether there is a positive or negative effect on economic growth (Broda & Tille, 2003; Pugel, 2016). The investment variable describes investment measured as a percentage of GDP. Investment is one of the four variables in the function that determines GDP. Theory suggests that there is a positive relationship between investment and economic growth, so the coefficient should be positive (Chimobi et al., 2010).

The variables fixed, intermediate, and floating are dummy variables representing the type of the exchange rate regimes the countries are using. The International Monetary Fund's Annual Report on Exchange Arrangements and Exchange Restrictions report details the exchange rate arrangements for every country. The relationship between these regimes and economic growth is ambiguous because countries of different income levels have different relationships with each regime (Breedon et al., 2012; Gudmussion, 2002; Imam, 2012; Lederman & Lesniak, 2017). The variable for change in regime represents countries who have changed from one regime type to another but does not detail the specifics of the change.

The ideal dataset for the hypothesis would consist of over 50 countries classified as developing and microstates over at least 20 years. Initially, the sample in this paper consisted of 106 countries for a period of 1990 to 2018. Because of data limitations, the sample was reduced to 42 countries across the period 2000 to 2018. The years 2000 to 2018 were selected because the International Monetary Fund began publishing the Annual Report on Exchange Arrangements

and Exchange Restrictions in the year 2000. This yearly document is used to obtain the exchange rate regime classifications for the sample. This paper aims to see if the type of exchange rate regime and the change in exchange rate regimes is a significant factor in economic growth.

4.2 Main Results

Equations (1) – (8) are estimated by pooled OLS, the fixed effects model, and the random effect model. The first group of research questions explores the relationship between the exchange rate regime and economic growth (equations 1-4 in section 3).

Table 2. Pooled OLS Regression Results				
Coefficients (P-Values)				
Variables	Model 1	Model 2	Model 3	Model 4
ERR	-0.000263 (0.000360)***	-0.000268 (0.000255)***	-0.000278 (0.000166)***	-0.000268 (0.000267)***
PR	-0.082 (0.38)	-0.031 (0.741)	-0.019 (0.844)	-0.034 (0.720)
POP	0.660 (0.000141)***	0.675 (0.000091)***	0.641 (0.000225)***	0.672 (0.000102)***
Δ TOT	0.025 (0.001)***	0.025 (0.001)***	0.026 (0.000422)***	0.024 (0.001)***
INV/ GDP ₋₁	0.125 (4.7825E-12)***	0.128 (1.4402E-12)***	0.120 (3.7659E-10)***	0.128 (1.4402E-12)***
FIX	0.546 (0.296)			0.139 (0.801)
INT		-0.762 (0.013)***		-0.735 (0.024)**
FL			0.624 (0.049)**	

*** Significant at the 1% level

** Significant at the 5% level

* Significant at the 10% level

The effective exchange rate is negatively associated with economic growth and is significant at 1% level across all four models. Political stability is negatively associated with

growth, but it is not statistically significant. For example, in Model 1, for every 0.082% increase in political stability, there is a 1% decrease in growth. While the coefficient has a different sign than what the literature predicts, the results are not significant. Population growth, change in terms of trade, and investment in the previous period all have are positively associated with economic growth and are significant at the 1% level. These results are consistent with the literature.

In looking at the relationship between specific exchange rate regime and economic growth, the fixed exchange rate regime is positively associated with growth, but the impact is not significant (see Model 1 in Table 2). The intermediate regime was significant at 1% in Model 2 but had a negative relationship with growth, indicating that if a country uses an intermediate regime economic growth will decrease. The floating regime in Model 3 was significant at 5% and had a positive coefficient, indicating that having a floating regime increases economic growth. The fixed regime in Model 4 is insignificant with a positive coefficient, indicating that relative to the floating regime, the fixed regime would experience higher levels of economic growth. The intermediate regime in Model 4 is significant at 5% with a negative coefficient, indicating that using an intermediate regime relative to a floating regime can decrease economic growth. This is inconsistent with current literature but could result from not separating the countries based off income classification. Scholars believe that an intermediate regime can be useful for developing countries but detrimental to advanced countries.

Table 3. Fixed Effects Model Regression Results				
Coefficients (P-Values)				
Variables	Model 1	Model 2	Model 3	Model 4
ERR	-0.000266 (0.004)***	-0.000261 (0.004)***	-0.000284 (0.002)***	-0.000262 (0.004)***
PR	-0.667 (0.002)***	-0.738 (0.001)***	-0.603 (0.008)***	-0.698 (0.001)***
POP	1.029 (0.018)**	0.994 (0.022)**	0.883 (0.043)**	1.044 (0.016)**
ΔTOT	0.030 (0.000028)***	0.129 (0.000037)***	0.031 (0.000012)***	0.029 (0.000042)***
INV/ GDP ₋₁	0.127 (0.000006)***	0.129 (0.000005)***	0.114 (0.000135)***	0.128 (0.000005)***
FIX	2.459 (0.001)***			1.781 (0.050)**
INT		-1.392 (0.002)***		-0.707 (0.219)
FL			0.597 (0.304)	

*** Significant at the 1% level

** Significant at the 5% level

* Significant at the 10% level

In the fixed effects estimation strategy, the effective exchange rate and political stability both have negative coefficients and are significant at the 1% level, indicating that economic growth increases as each variable decreases (see Models 1-4). Population percent growth is significant at 5% and has a positive coefficient (see Models 1-4). As indicated by Model 1, as population percent growth changes by 1.029%, economic growth increases by 1%. Change in terms of trade and investment/ GDP are significant at the 1% level and have positive coefficients (see Models 1-4). In Model 1, as the change in terms of trade increases by 0.030% and as investment increases by 0.127%, economic growth increases by 1% each.

The fixed exchange rate regime is significant in Model 1. The positive coefficient indicates that having a fixed exchange rate regime increases economic growth. In Model 2, the intermediate regime is significant at 1% and has a negative relationship with growth, meaning

that if a country uses an intermediate regime, growth will decrease. Like the pooled OLS model, this is contrary to current literature likely from countries of all income levels being included in the sample. The floating regime in Model 3 is not significant and has a positive coefficient, indicating that if a country uses a floating regime, more economic growth will occur.

In Model 4, the fixed exchange rate regime is significant at the 1% level. Relative to a country that has a floating regime, a country that uses a fixed regime will experience more economic growth. The intermediate exchange rate regime is not significant and experiences less growth as compared to the floating regime indicated by the negative coefficient (see Model 4).

The effective exchange rate, political stability, population percent growth, change in terms of trade, and investment/ GDP have similar results to Models 1-4 in Table 2. They share the same expected coefficients and all of these variables are significant at the 1% level except for population percent growth. This is significant at the 10% level.

Table 4. Random Effects Model Regression Results				
Coefficients (P-Values)				
Variables	Model 1	Model 2	Model 3	Model 4
ERR	-0.000276 (0.001)***	-0.000278 (0.001)***	-0.000289 (0.000356)***	-0.000276 (0.001)***
PR	-0.250041 (0.058)*	-0.186321 (0.146)	-0.146056 (0.258)	-0.215066 (0.100)*
POP	0.814763 (0.001)***	0.840201 (0.001)***	0.764191 (0.002)***	0.835480 (0.001)***
Δ TOT	0.028447 (0.000052)***	0.028169 (0.000064)***	0.029453 (0.000033)***	0.027820 (0.000076)***
INV/ GDP ₋₁	0.127779 (2.7314E-8)***	0.129364 (1.2426E-8)***	0.118510 (5.8299E-7)***	0.129804 (1.4372E-8)***
FIX	1.489608 (0.016)**			0.962824 (0.160)
INT		-0.919190 (0.013)**		-0.669010 (0.108)
FL			0.516850 (0.199)	

*** Significant at the 1% level

** Significant at the 5% level

* Significant at the 10% level

The effective exchange rate is significant in Models 1-4 and has a negative relationship with economic growth, so as the value of the exchange rate increases economic growth decreases. Using Model 1 as an example, when the effective exchange rate changes by 0.000276%, economic growth will decrease by 1%. Political stability was only significant in Models 1 and 4 at the 10% level. The coefficient is negative indicating that as the country becomes more stable, economic growth decreases. This result is contrary to theory; as a country becomes more stable, growth should increase. Population percent growth, change in terms of trade, and investment/ GDP are all significant at the 1% level and have a positive relationship with economic growth.

The fixed exchange rate regime had a positive coefficient in Models 1 that is significant at the 5% level, so having a fixed exchange rate regime will increase the economic growth of a country. The intermediate regime in Model 2 is significant at the 5% level but has a negative coefficient, indicating that having an intermediate regime decreases economic growth. The floating regime in Model 3 is insignificant with a positive coefficient. The fixed exchange rate regime in Model 4 is insignificant with a positive coefficient. The intermediate regime in Model 4 has a negative coefficient, indicating that relative to an intermediate regime, a floating regime is better for economic growth. Although, it is not significant. Table 4 details the results.

Model	Relationship	Pooled OLS	Fixed Effect Model	Random effect model
1	Fixed Regime & Growth	+	+ & significant	+ & significant
2	Int. Regime & Growth	- & significant	- & significant	- & significant
3	Floating Regime & Growth	+ & significant	+	+
4	Fixed Regime, Intermediate Regime, and Growth	Fixed +, Intermediate - & significant	Fixed + & significant, Intermediate -	Fixed +, Intermediate -

Table 5 summarizes the results for Models 1-4. The fixed regime has a positive coefficient across all three estimation strategies, indicating that if a country uses a fixed regime, economic growth increases (see Model 1). However, results were only significant in the fixed and random effects models. The intermediate regime is significant and negative across all three estimations strategies (see Model 2). This finding indicates that a country experiences a decrease in economic growth while using an intermediate regime. The floating regime has a positive coefficient across all three estimation strategies, but results were only significant in the pooled OLS regression (see Model 3). The findings indicate that having a floating regime increases growth. Lastly, the fixed regime has a positive relationship across the estimation strategies but is only significant in the pooled OLS (see Model 4). Therefore, a country using a fixed exchange rate experiences more growth than a country who uses a floating regime. The intermediate regime has a negative coefficient across the three estimation strategies with significant results in the pooled OLS and fixed effects regressions (see Model 4). A country using an intermediate regime experiences less economic growth relative to a country who uses a floating regime.

The second group of research questions explores the relationship between the change in exchange rate regime and economic growth (equations 5-8 in section 3). Table 6, 7 and 8

summarize the results from Pooled OLS estimation, the fixed-effect model and the random effect model respectively.

Table 6. Pooled OLS Regression Results				
Coefficients (P-Values)				
Variables	Model 5	Model 6	Model 7	Model 8
ERR	-0.000266 (0.000389)***	-0.000261 (0.001)***	-0.000265 (0.000397)***	-0.000257 (0.001)***
PR	-0.053 (0.588)	-0.075 (0.440)	-0.063 (0.515)	-0.081 (0.403)
POP	0.681 (0.000130)***	0.682 (0.000137)***	0.668 (0.000169)***	0.686 (0.000117)***
ΔTOT	0.027 (0.000308)***	0.027 (0.000398)***	0.027 (0.000360)***	0.027 (0.000391)***
INV/ GDP ₋₁	0.115 (4.5345E-9)***	0.121 (3.8599E-10)***	0.117 (1.205E-9)***	0.124 (1.5564E-10)***
ΔREG	-0.848 (0.154)			
FIX-INT		0.173 (0.891)		
INT-FL			-2.225 (0.034)**	
FL-INT				1.159 (0.211)

*** Significant at the 1% level

** Significant at the 5% level

* Significant at the 10% level

Table 6 summarizes the results using pooled OLS for equations 5-8. The effective exchange rate is negatively associated with growth. The political stability has no impact on growth. The population growth, the change in TOT, and previous period's investment are positively associated with economic growth. These results are consistent across the model specifications in this paper. As the regime changes in period t , economic growth decreases in the same period (see Model 5). Since the data for regime changes is not lagged, the negative coefficient could make sense. In the short run when the initial change in regime is made, growth may decrease because it could take time for the economy to adjust. As the country changes from

a fixed to intermediate regime, economic growth increases (see Model 6). However, it is not statistically significant. As the country moves from an intermediate to floating regime, economic growth decreases and it is significant at 1% level. This is contrary to literature but could result from using a wide range of income classifications in the sample. In the end, as the country changes from a floating to intermediate regime, there is no statistically significant impact on economic growth.

Table 7. Fixed Effects Model Regression Results				
Coefficients (P-Values)				
Variables	Model 5	Model 6	Model 7	Model 8
ERR	-0.000282 (0.003)***	-0.000275 (0.003)***	-0.000279 (0.003)***	-0.000273 (0.004)***
PR	-0.735 (0.002)***	-0.735 (0.002)***	-0.737 (0.002)***	-0.732 (0.002)***
POP	0.816 (0.079)*	0.806 (0.083)*	0.857 (0.064)*	0.828 (0.075)*
Δ TOT	0.032 (0.000010)***	0.032 (0.000013)***	0.032 (0.000010)***	0.032 (0.000012)***
INV/ GDP ₋₁	0.136 (0.000037)***	0.144 (0.000013)***	0.140 (0.000019)***	0.143 (0.000012)***
Δ REG	-0.660 (0.275)			
FIX-INT		0.875 (0.489)		
INT-FL			-2.548 (0.015)**	
FL-INT				1.210 (0.190)

*** Significant at the 1% level

** Significant at the 5% level

* Significant at the 10% level

The results for Table 7 are similar to the results in Table 6. The effective exchange rate is significant and has a negative relationship with growth, so as the value increases, growth decreases. Political stability has a negative coefficient but is only significant in Model 8 at the

10% level. Population percent growth, change in terms of trade, and investment/ GDP are all significant at the 1% level and all have positive coefficients (see Models 5-8).

Model 5's change in regime has a negative coefficient but is not significant. In Model 6, the variable fixed to intermediate regime was insignificant with a positive coefficient. The change from intermediate to floating regime in Model 7 was significant at the 5% level and had a negative coefficient. If the country changed from an intermediate to floating regime, growth would decrease. There is a negative association between changing from a floating to intermediate regime in Model 8. The findings indicate that changing exchange rate regimes can negatively impact growth.

Table 8. Random Effects Model Regression Results				
Coefficients (P-Values)				
Variables	Model 5	Model 6	Model 7	Model 8
ERR	-0.000283 (0.001)***	-0.000277 (0.001)***	-0.000282 (0.001)***	-0.000274 (0.001)***
PR	-0.196129 (0.137)	-0.216129 (0.103)	-0.208150 (0.116)	-0.217555 (0.100)*
POP	0.803797 (0.001)***	0.797580 (0.002)***	0.802491 (0.001)***	0.807652 (0.001)***
ΔTOT	0.030271 (0.000030)***	0.029917 (0.000036)***	0.030116 (0.000030)***	0.029934 (0.000035)***
INV/ GDP ₋₁	0.123033 (8.7282E-7)***	0.129411 (2.3545E-7)***	0.125024 (4.6251E-7)***	0.130916 (1.4829E-7)***
ΔREG	-0.683185 (0.246)			
FIX-INT		0.623901 (0.615)		
INT-FL			-2.355628 (0.022)**	
FL-INT				1.231991 (0.174)

*** Significant at the 1% level

** Significant at the 5% level

* Significant at the 10% level

The change in regime in Model 5 is insignificant with a negative coefficient. The variables fixed to intermediate regime and floating to intermediate regime are both insignificant with positive relationships to economic growth (see Models 6 and 8). The intermediate to floating variable in Model 7 is significant with a negative relationship to economic growth. As the country changes regimes, growth would decrease.

Table 9. Comparison of Estimation Strategies II				
Model	Relationship	Pooled OLS	Fixed Effect Model	Random effect model
5	Any Change in Regime & Growth	-	-	-
6	Moving from Fixed to Intermediate Regime & Growth	+	+	+
7	Moving from Intermediate to Floating Regime & Growth	- & significant	- & significant	- & significant
8	Moving from Floating to Intermediate Regime and Growth	+	+	+

Table 9 offers a comparison of the results of Models 5-8. The results for each model are significant across each estimation strategy. Any change in regime has a negative association with growth. This result makes sense because countries of all income classifications are included in the sample. It may not be beneficial for an advanced country to transition from a floating regime to a fixed regime. Meanwhile, moving from a fixed to intermediate regime has a positive association with growth while moving from an intermediate to floating regime has a negative, significant association with growth. This negative result is contrary to literature but could, again,

result from the income classification of the countries used in the sample. Moving from a floating to intermediate regime has a positive association with economic growth. All the findings from the models indicate that specific regime changes can result in either a positive or negative association with economic growth.

4.3 Robustness Check/Other Testing

This section will focus on models 4-8. Since three estimation strategies are used, the Durbin-Watson test is run in order to determine whether serial correlation is present within the models. Models 4-8 had Durbin-Watson test statistics close to 1.5, meaning that positive serial correlation is present.³ Values under 1 and greater than 3 indicate the presence of severe serial correlation (Field, 2009). Since the value of 1.5 is relatively normal, the specifications will not be modified. The fixed effects and OLS pooled estimation strategies will be used to evaluate and modify the models from this point forward. No Hausmann's test is performed, so it cannot be said whether the fixed or random effects models is more effective.

In performing the White Test on Models 4-8, results indicated that heteroskedasticity is present. See Table 8 for detailed results. Although heteroskedasticity is present, it is not significant.

³ Model 4 DW=1.435, Model 5 DW=1.408, Model 6 DW=1.403, Model 7 DW=1.402, Model 8 DW=1.405

Table 10. Heteroskedasticity Tests					
White Test (Breusch-Pagan Test)					
Model	4	5	6	7	8
Chi-Square Value	738.491 (489.156)	697.019 (478.111)	695.771 (470.721)	697.084 (472.407)	695.657 (478.963)
df	291 (1)	282 (1)	267 (1)	270 (1)	274 (1)
Significance	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Heteroskedasticity Present?	Yes	Yes	Yes	Yes	Yes

Multicollinearity is minimal in models 4-8 as the VIF's are all less than 1.5. Some of the signs of the coefficients do not match the predicted signs. Political stability has a negative coefficient and is significant. Theory maintains that if a country is politically stable, then economic growth will occur. Instead of using an indicator that ranks political stability on a scale of one to seven, a variable measuring economic freedom could be a better indicator. The variable intermediate regime also has a negative coefficient. Again, this could result from not separating the countries by income classifications or from the possibility that the model did not account for if a change in regime took place that year or a prior year. The change in regime in Model 5 had a negative relationship with growth as well. Like the intermediate regime in Model 7, this could result from not using a time lag.

No changes will be made to any of the specifications as heteroskedacity and multicollinearity are not present. While there is minimal serial correlation, the results from the Durbin-Watson indicate that a value of 1.5 is normal. Further tests should be performed to increase the fit of the models since the R square values were all below 0.4.

5. Discussion and Conclusion

In ancient times before currency was created, trade between countries and individuals existed as a bartering system. As civilization developed, currency was created so that trade could be made more equitable. With each country developing their own currency, an exchange rate was necessary in order to facilitate trade between the countries. Since the same resources and advancements are not present within every country, countries quickly realized that trading the good they had the comparative advantage with would benefit both parties. Over time, the foreign exchange market evolved to include not just international trade but international financial investment. Furthermore, as countries grew so did the need for advancement in the foreign exchange market.

Exchange rates arrangements were created and then classified with the creation of the IMF. With the creation of exchange rate arrangements, countries had to decide which regime would be the most advantageous for their economy. One measure to consider when evaluating regime performance is the amount of economic growth that occurs with each type of regime. Flexible regimes are generally associated with higher economic growth but only for more advanced countries (Jakob, 2016). Less developed and developing countries experience more growth under a fixed regime (Imam, 2012). This is comparable to the results from Models 1-3. The results for Model 1 indicated that having a fixed regime is associated with increased economic growth while Model 2 indicates that using an intermediate regime is associated with less growth. However, the results from Model 2 are significant whereas the results from Model 1 are not. If a country uses a floating regime, there is a positive yet insignificant relationship with growth (see Model 3). Relative to a floating regime, a country utilizing a fixed regime will experience increased growth (see Model 4). In contrast, a country with an intermediate regime

experiences less growth relative to a floating regime (see Model 4). The results obtained regarding fixed regimes relative to floating regimes are inconsistent with literature. Growth under a floating regime should be higher relative to growth under a fixed regime. This could result from only a few countries in the sample utilizing a fixed regime and more countries having a floating regime.

Across all three estimation strategies, this paper finds the change in regime at period t has a negative relationship with growth and was insignificant (see Model 5). This is contrary to what is expected but could result from not controlling for income classifications and from not lagging the variables. Future modifications of this model could involve adding a variable to measure the income of a country, possibly per capita income in order to minimize possible heteroskedasticity.

This paper also addresses specific regime changes and economic growth. Model 7 found that there is a negative relationship between moving from an intermediate to floating regime and economic growth. It is significant at the 5% level. This relationship is also unexpected but could occur for multiple reasons. Problems could exist with the specification that result in bias of the coefficients. Income classifications of countries are not included as a variable, so it could add omitted variable bias. Models 6 and 8 had positive relationships with growth but are insignificant. Based on the findings, it is clear that more research should be done to determine how changing regimes will impact growth as many countries experience regime changes.

Initially this paper was going to focus on the relationship between a change in the exchange rate regime and economic growth in developing countries with an emphasis on microstates. However, because of their size, microstates have limited data available to the public. Therefore, the sample was widened to include countries of all income classifications. However, the sample size is still relatively small with only 42 countries over a span of 18 years. This is

partially due to data limitations. After the fallout of the Bretton Woods system, there was not a widely accepted method of classifying exchange rates until the IMF began publishing their annual report in 2000. Because of the variables chosen for the model, there were only a limited amount of countries that shared the same data. This can be remedied in the future by using different indicators for political stability and adding variables such as the amount of capital and education a country has to reduce omitted variable bias. Instead of using the constant market price as a measure of economic growth, the HDI could be used. This includes sociological measures like education in the determination of growth instead of solely using the exchange of goods and services.

There was not a large enough spread or sample to divide the countries based on income classification like initially planned. This is another area for future work. Exploring the relationship between income classifications and regime changes could shed valuable light on which regime a country of a particular income classification should choose if it wants to transition exchange rate regimes. For example, if a developing country is experiencing large economic shocks and fluctuations in the exchange rate, it could be beneficial to move to a floating exchange rate since it can absorb shocks. Therefore, it could be beneficial to classify countries by income. In doing so, the results could be different in the future and could explain why the intermediate regime consistently had a negative coefficient across most models and estimation strategies. However, not using a time lag could be another reason for this negative coefficient and insignificant variables. If a country changes exchange rate regime, the true effect on economic growth may not appear until years after the change because the economy has to adjust. One way to remedy this would be to develop multiple models that lag the economic growth variable. One model could lag growth by one year, another model could lag growth by

two years, and third model could lag growth by five years. Using multiple models with different time lags can allow for the comparison of the short and long terms effects of changing regimes on growth. A variable representing income classification could also be included in the model as a control and provide further results as to which regimes are best used for developing economies, advanced economies, etc.

Another way to examine the true effect of changing regimes on growth is to do an event study. For example, if Angola were to change regimes in 2015, we could look at the growth rate from 2013-2015 and then the growth rate from 2015-2017 to see how the economic growth rate changed with a new regime. An event study would also allow for a more in depth look at possible reasons why a country would change regimes and if changing regimes had the desired outcome. This is another area for future work.

While there are many areas for expansion and future work, the findings from this paper have contributed to current literature and confirmed the findings of others. With the importance of the foreign exchange market and economic growth as a driving factor of success, research regarding exchange rate regimes is necessary. The magnitude of the relationship between changing regimes and specific regime changes could not be determined, however the results indicated the direction of the change in economic growth. Future work can expand on this and shed light on how countries can maximize economic growth when choosing and transitioning between exchange rate regimes.

7. References

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8. Table 11

Country Sample		
Algeria	Ecuador	Morocco
Angola	Egypt, Arab Rep.	Namibia
Argentina	El Salvador	Nigeria
Bangladesh	Equatorial Guinea	Pakistan
Bolivia	Gabon	Paraguay
Botswana	Ghana	Peru
Brazil	Guatemala	Philippines
Cabo Verde	India	Senegal
Cameroon	Jordan	South Africa
China	Lesotho	Thailand
Colombia	Malaysia	Tunisia
Congo, Rep.	Mauritius	Turkey
Costa Rica	Mexico	Venezuela, RB