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SSA's Development Delay: Three Essays on The Monetary System, The International Trade and Property Rights

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Abstract

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Julie Lohi

This dissertation focuses on the issues of economic performances in Sub-Saharan Africa (SSA). It includes three essays on the monetary system, the international trade and property rights.

The first chapter discusses the inflation dynamics across different exchange rate regime groups in SSA. In particular, a comparative analysis is conducted between the CFA franc currency union countries and the non-members of SSA to see whether the CFA franc countries exhibit lower inflation in the short and the long run compared to other countries. This chapter also assesses the money supply growth, output growth and money velocity growth as the sources of inflation in the region. The empirical results support the inflation- growth trade-off in the CFA zones. While the CFA countries experience relatively lower inflation in the short and the long run, they suffer from a pronounced output loss relative to all other non -CFA countries in general and relative to the pegged non-CFA countries in particular.

The second chapter analyses the implications of the Heckscher-Ohlin (HO) theory of factor abundance and the increasing return to scale (IRS) theory of product differentiation in the bilateral trade within SSA. It shows that the similarity of the factors of production proportions and the lack of product differentiation reduce the extent of trade between African countries. Trade policies that are aimed to promote trade within the region (i.e., FTA, custom unions) are likely to fail because SSA countries produce similar homogeneous products. The key factor for economic success from international trade for the SSA region relies on how to manufacture products in different varieties and how to export their comparative advantage goods outside the region.

The last chapter identifies the effects of property rights on the total factor productivity (TFP) across different property rights levels and income groups in Sub-Saharan Africa (SSA). I subdivide SSA countries by their property rights score and by their income levels. Then, I estimate a model in which TFP depends on human capital and institutional qualities. The results mainly show that private property rights have a positive and statistically significant effect on the TFP in SSA. This result indicates that private property rights are important determinants in the process of economic development. If well-defined and enforced by state laws, private property rights will contribute to growth in SSA.

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Chapter 1

Exchange Rate Regimes and Inflation in Sub-Saharan Africa

1.1 Introduction

The impact of exchange rate regime (ERR) on economic performance is one of the hotly debated issues in the field of international finance. This correlation gained more importance in the face of financial crises as international capital flows become increasingly unstable. The critical role of ERR in economic performance in our globalizing world has induced many countries in recent years to switch from one regime to another. If, following the demise of the Bretton Woods system, the choice of an ERR was important for stabilization outcomes, then, nowadays the choice of ERR may have important policy implications - particularly, for policy aimed at tackling external shocks and speculative attacks (Eichengreen, 2008).

Across the globe, different types of ERR ranging from hard peg to free floating regimes exist. There is no consensus on which type of regime better enhances economic performance. Alternative ERR have some strengths and weaknesses regarding economic outcomes in the country when they are at work. There are some arguments in favor of and against each type of the ERR. For instance, Mundell (1963) and Fleming

(1962) argue that under a fixed ERR, trade and investment are more certain. The trade and investment advantages of the fixed ERR stem from the reduction of transaction costs and lower inflation expectations. These advantages are what led the European Economic Community (EEC) to adopt the fixed ERR to achieve their single market program. The lower inflation associated with the fixed ERR has been an important incentive that enticed Great Britain to return to the gold standard in 1925 after abandoning it in the wake of world war I in 1914 (Capie, Mills and Wood, 1986a). By fixing a currency to a foreign anchor, the domestic country imports the monetary policy of the anchor country. Such import is associated with political commitment and disciplinary monetary policy (i.e., alignment to the anchor country's monetary policies) for anti-inflationary outcomes. However, the fixed ERR is criticized for poorly insulating the economy against external shocks (Obstfeld and Rogoff, 1995).

Supporters of the flexible ERR argue that it confers more independence of monetary policy through the flexibility of the nominal exchange rate. By changing the nominal exchange rate, the country gains control over the impact of disruptive economic shocks. Friedman (1953) pointed out that the speed at which a country adjusts relative prices when hit by a real shock depends on the ERR at work in that country.

Friedman (1953) argues that in a world of sticky prices, the flexible ERR absorbs the effects of external shocks more effectively than the fixed ERR. Indeed, under a flexible regime, in the presence of shocks, the nominal exchange rate adjusts immediately, allowing relative prices to change. This mechanism reduces the effects of shocks on macro variables, especially on output. Previous empirical work has found support for Friedman's hypothesis. For example, Broda (2004) tests Friedman's hypothesis on the terms of trade shocks and finds that the response of real GDP to a terms of trade shock is much smaller under a flexible regime than under a fixed regime. Broda notes that in response to a 10 percent negative shock to the terms of trade, the real exchange rate depreciated faster under the floating system while the depreciation was slower in the pegged regime. As a result, real GDP fell by 1.9 percent under fixed regime and

only by 0.2 percent in the flexible exchange rate regime.

The advantage of the floating ERR is that it insulates the economy from external shocks and eventual speculative attacks. However, floating regimes are expected to exhibit high volatility in exchange rates and high inflation. Mussa (1986) underlined that real exchange rates fluctuate a lot more in the short run in countries with flexible ERR than in countries with fixed ERR. This is so because nominal exchange rates are very volatile under flexible regimes. Similarly, Shambaugh (2004), Klein (2005), and Klein and Shambaugh (2008) show that exchange rates are more volatile under a floating ERR than under a fixed ERR. Specifically, Klein and Shambaugh (2008) find that in magnitude, pegged (fixed) ERR have about 16 percent less volatility in the nominal exchange rate than a floating ERR. After classifying counties by the de facto behavior of the country's monetary authorities, Levy et al. (2001) show that a flexible ERR exhibits higher exchange rate volatility with lower volatility in international reserves while the opposite holds under a pegged ERR.

Whether in the aftermath one type of ERR outperforms the others in terms of the economic outcome, ERRs are crucial determinants of economic performance. Rose (2011) states that *"the exchange rate is an important asset price, perhaps the most import asset price"*. This implies that the regime monitoring the exchange rates is important to assets' prices and therefore economic outcomes. An ERR can impact the economy through different macroeconomic channels. For instance, the flexible ERR can expose the economy through the inflationary channel; the fixed regime by retarding the adjustment of prices in the face of external shocks allows large fluctuations in output. Inflation expectations can lead to higher or lower interest rates in the country and thereby affect trade and investment incentives. In short, an ERR is a crucial determinant of economic outcomes.

Despite the prominent connection between ERR and economic performance, little work exist in the empirical literature that addresses how the type of ERR implemented is retarding the economic take-off of some developing countries. This paper

attempts to fill this gap for some Sub-Saharan African (SSA) countries which are still lagging economically. Specifically, this paper focuses on the inflation dynamics between two groups of countries with different types of ERR in SSA: the CFA franc currency unions with a pegged ERR and the Non-CFA SSA countries with a non-fixed [1] ERR. Two important facts explain the choice of the country sample. First, the countries of the CFA currency unions[2] have been using a common currency - the CFA franc with a conventional peg even before their independence from the French and up to date. The CFA franc had been pegged to the French Franc since December 26th 1945 - the date of its creation and it has been pegged to the Euro since January 1999. From this fact, it is hard to identify how these countries would have performed economically under an alternative ERR.

The main feature of the CFA franc currency is the guarantee of its parity and convertibility by the treasury since the creation of this currency. This convertibility is achieved and maintained by the central banks with the French Treasury through the mechanism of an operations account. The convertibility of the CFA franc by the French Treasury has some political and economic incentives. Politically, this allows the French authorities to remain implicated and influence the monetary decisions of their former colonies. The CFA franc remains the emblem of colonization and a powerful channel of France's imperialism over its "former" colonies. Under the economics point of view, the convertibility of the CFA franc benefits most to France. The guarantee of the convertibility based on colonial financial arrangements advantages French multinational firms who invest in Africa and transfer the funds to France by reducing transaction costs. Most importantly, since the monetary decisions are made upon France's agreement,

[1]Different types of ERR exist within the non-CFA sample, ranging from a managed ERR to a floating ERR.

[2]The West African Economic and Monetary Union (WAEMU) - The countries of WAEMU are: Benin, Burkina Faso, Cote d'Ivoire, Guinea-Bissau Mali, Niger, Senegal and Togo. But Guinea-Bissau is not included in the analysis as it joined the union only in 1998, and the Central African Monetary and Economic Community (CAMEC) - The countries of CAMEC are: Cameroon, Central African Republic, Chad, Congo Republic, Equatorial Guinea and Gabon.

these decisions are made in favor of the French companies (see IMF 1969).

Since its creation, the CFA franc has been devaluated only once. A 50 percent devaluation of the CFA franc in foreign currency occurred on January 13, 1994. The 1994 devaluation explains the high inflation peak of the CFA zones in the Appendix Figure 1. Between 1990 and 1993, the CFA franc turned out to be overvalued. During this period, the member countries faced severe fiscal imbalances accompanied by rapid growth of the external debt. Moreover, the CFA franc countries have been also subject to adverse terms of trade movements. The devaluation of the CFA franc in 1994 was intended to alleviate the macroeconomic issues. Though, this peak does not influence the empirical results.

Secondly, SSA countries exhibit many commonalities in terms of their history and economic characteristics (market access issues, dependence on the export of few primary commodities, financial markets development, geography, level of industrialization, government efficiency, etc.). Therefore, it is appropriate to compare the economic performances of the CFA countries to that of the non-CFA SSA countries with alternative ERR. Discussing the correlation between economic outcomes and ERR for the CFA countries and distinguishing between the CFA and non-CFA countries of SSA can provide important policy prescriptions - for both exchange rate regime and monetary policy reforms - to aid in solving the countries' growth delay. This paper focuses on inflation dynamics across the two samples because a key purpose of participating in a currency union is to benefit from lower inflation.

The goal carried out in this paper is so far an uncovered topic, especially distinguishing between the CFA and Non-CFA countries of SSA countries on inflation dynamics. The remainder of this paper is organized as follows: Section 2 states the stylized facts about the fixed and flexible ERR. Section 3 describes exchange rate regimes in general and provides the classification of SSA countries by exchange rate regime and by monetary policy framework. Section 4 describes the data, presents the models, and states the hypothesis. The results and their interpretations are in section

5. Section 6 concludes the paper. Regression tables and figures are stored in separate sections.

1.2 The Stylized Facts about Fixed and Flexible Exchange Rate Regimes

Across the literature there are three key stylized facts about the ERR. The first is the inconsistency between the de facto and the de jure ERR (i.e., countries that officially claim to float heavily intervene in the exchange market to regulate the rate of exchange of their currencies). The second is that many countries have shifted to a flexible ERR since the demise of the Bretton Wood System. The third fact is what Eichengreen (1994) named the "hollowing-out hypothesis" and Fischer (2001) refers to as a "bipolar view". The "hollowing-out hypothesis" or the "bipolar view" stipulates that intermediate regimes including conventional pegs are incompatible with capital flows. Only the two extremes: hard peg or free floating are sustainable in the face of high capital flows. Some recent facts across the world support the vulnerability of the pegs in the face of capital mobility. More or less, countries involved in crises in the 1990s were associated with the fixed (pegged) ERR. The 1994 Tequila crisis of Mexico, the 1998 exchange rate crises of Russia and Brazil, and those of Turkey and Argentina in 2000, are a few examples. Fischer (2001) mentions that in contrast to the emerging countries with pegged currencies who experienced the exchange rate crisis, other emerging countries with more flexible rates (South Africa, Israel) avoided crises of this type. The implication of this third fact is that fixed ERR's are less efficient in insulating economies from external shocks.

With a fixed ERR the country sacrifices its ability to stabilize the economy against attacks in return for credibility gains through commitments (Klein and Shambaugh, 2010). Under a fixed ERR, the slow responsiveness of the nominal exchange rate to adjust relative prices in the face of external shocks allows disturbances in real

GDP (e.g., Friedman, 1953; Levy et al., 2001; Caballero, 2002; Broda, 2004, Edwards and Yeyati, 2005). Therefore, fixed regimes would exhibit more loss in their per capita outputs while the reverse is expected for floating regimes. Nevertheless, for the fixed ERR, the loss in output is expected to be compensated by lower inflation through credibility and disciplinary monetary policies associated to the commitment of pegging the domestic currency to a foreign currency that plays the role of an anchor.

Note that pegging a currency is associated with various political commitments which allow importing the anchor country's monetary policies (disciplinary monetary policy), reduce inflationary policies, increase the credibility of the domestic monetary authorities, reduce inflation expectations and stabilize the economy. The high political cost of fixing the exchange rate is what forces policy makers to adopt certain monetary and fiscal policies to avoid the demise of the regime. This constraint confers credibility and discipline to the fixed ERR (e.g., Meltzer, 1986; Ghosh et al. 1997; Yagci, 2001; Levy et al., 2001). On the other hand, under a flexible ERR the management of the nominal exchange rate to facilitate the quick adjustment of relative prices is associated with higher inflation expectations. In fact, the flexibility of the nominal exchange rate makes the relative price less predictable.

The correlation between inflation and the exchange rate regime is well described in the literature. The investigation of inflation persistence shows three main findings: 1) inflation rates vary over time and across countries due to the monetary policy framework; 2) the speed of this variation differs over time; 3) there is an inflation-output trade off associated with inflation adjustment (see Fuhrer and Moore, 1995; Sargent, 2001; Cecchetti and Debelle, 2006). Although not all papers directly relate inflation to the ERR, three main models are used in the literature to study inflation: the flexible and sticky price models and the sticky information model. The flexible price model argues that inflation evolves over time due to the monetary authorities' action of adjusting monetary policy very frequently. The expansionary policy of the policymakers leads to inflationary outcomes (Barro and Gordon, 1983). The pioneers of the sticky

price model use the wage contract in explaining inflation (Taylor, 1979; Calvo, 1983). However, the sticky price model falls short in explaining inflation after introducing the real wage (Fuhrer and Moore, 1995). Lastly, the sticky information model developed by Mankiw and Reis (2002) shows that, rather than sticky wages, prices adjust slowly because the cost of information prevents economic agents from frequently updating prices according to current macroeconomic conditions. The flexible price model has some incarnation of the ERR. In fact, the frequent price adjustment of the monetary authorities reflects the flexibility of the nominal exchange which is the foundation for the flexible exchange rate. Conclusively, a flexible exchange rate is associated with higher inflation.

Recently, Obstfeld and Rogoff (1995) described inflation dynamic in the contest of exchange rate regimes. The theoretical framework developed by the authors focused on the cost and benefits of the fixed exchange rate regime. According to Obstfeld and Rogoff (1995), there are three main reason why countries fix (peg) their currency's foreign value. The first reason is to avoid exchange rate volatility like the one under the floating ERR. Exchange rate volatility creates uncertainty about future assets' prices and reduces trade and investment (see also Mundell, 1963; Fleming, 1962). The second reason is to import the anchor country's inflation rate. Fixing the domestic currency to a foreign one with lower inflation allows the domestic country to experience lower inflation due to the credibility by committing to disciplinary policies. The third reason, closely related to the second is the disinflationary objective. Some countries adopt the fixed ERR after they have experienced higher degrees of inflation. Fixing (pegging) the currency in this case becomes an objective solution to reducing inflation. Among all, the main purpose and the theoretical benefit of fixing a currency's foreign value is to have price volatility under control.

Obstfeld and Rogoff (1995) also point on one inconvenience of fixing the exchange rate: the forgone control over domestic money supply that would have been used for stabilization purposes. Theoretically and practically, in the face of external

shocks such as the drop in demand for exports goods, the country would adjust import and export prices by depreciating the real exchange rate. That is the monetary authorities can reduce the domestic interest rate. The reduction of the home interest rate puts demand pressure on foreign assets with a relatively higher interest rate. Therefore, the domestic currency depreciates and stimulates the short run demand for domestic goods. If quick, this adjustment reduces the impacts of the shock. But, if prices and nominal exchange rates are rigid in the short run like under the fixed exchange rate regime, firms will have to hire less or fire some workers to reduce output in the face of the lower demand for their products. In this situation, as the domestic interest rate is determined by the foreign rate, the domestic monetary authorities have no power to change it. Thus, domestic attempts to change the money supply have no effects. Indeed, under the fixed exchange rate, the money supply is out of the control of the monetary authorities.

Given these stylized facts and the theoretical frameworks about flexible and fixed exchange rate regimes, this paper tests whether the CFA franc currency union countries- whose common currency is pegged to a foreign anchor experience lower inflation rates in the short and long run compared to the others, the non-CFA countries of SSA as their benefit for scarifying output in the face of shocks.

1.3 Exchange Rate Regimes in Sub-Saharan Africa

The official classification of countries by their exchange rate regime (ERR) has been traditionally provided by the International Monetary Fund (IMF). But Calvo and Reinhart (2000) show how some countries that officially claim to have a floating regime intervene in the foreign exchange market. The mismatch between the de jure and the de facto classifications of countries has led economists in the field of international finance to make a clear distinction and reclassify countries based on their de facto regimes. The most known alternative classifications of countries based on the de facto approach

are those of Levy et al. (2000a, 2003), Reinhart and Rogoff (2004), Shambaugh (2004), and Ilzetzki, Reinhart and Rogoff (2008). Each of them uses different methodologies.[3] However, the classifications of SSA countries from any of the above cited classification sources match those of the IMF. For this reason, the recent IMF's de facto classification of countries provided in the AREAER[4] is used in this paper.

The IMF's annual report on exchange rate arrangement and monetary policy frameworks classifies exchange rate arrangements based on the degree to which the exchange rate is determined by the market. Ten key types of ERR are listed from across the world. (1) No separate legal tender (hard pegs), (2) currency board regimes (hard peg), (3) conventional peg [5] (soft peg). (4) Crawling pegs, (5) crawl-like arrangements, (6) pegged exchange rates within horizontal bands[6]; (7) Stabilized arrangements, (8) other managed arrangement[7] regimes, (9) floating and (10) free floating[8] exchange rate regimes employ monetary aggregate target and inflation targeting as their monetary policy frameworks.

All of the above types of ERR associated with different monetary policy frameworks are at work in different countries in SSA. WAEMU and CEMAC that make up the two CFA franc zones, use the conventional peg as their exchange rate regime. The

[3]The techniques of Levy et al.,(2003) are based on the exchange rate and international reserves. Shambaugh employs the band of exchange rate fluctuation. The author classifies an ERR as peg if the exchange rate fluctuates within a narrow band over a long period and non-peg otherwise. Reinhart and co-authors use the variations in the market rates of exchange.

[4]Annual Report on Exchange Arrangements and Exchange Restrictions.

[5]The peg regimes use an exchange rate anchor as the monetary policy framework. Under the exchange rate anchor, the monetary authority buys or sells foreign exchange to maintain domestic currency's rate of exchange at the targeted rate or within a range. The exchange rate represents the nominal anchor or intermediate target to monetary policy for these regimes (see IMF's AREAER, 2010.

[6]Pegged exchange rates within horizontal bands also use the exchange rage anchor framework.

[7]Managed arrangement regimes use exchange rate anchor, monetary aggregate target and inflation targeting as monetary policy frameworks. Under the monetary aggregate framework the targeted aggregate serves as the anchor to monetary policy. For inflation targeting framework, monetary policy decision depends on inflation forecasting and how the forecasted inflation deviates from the targeted one. Thus inflation forecast is the nominal anchor to monetary policy.

[8]Floating and free floating regimes employ monetary aggregate target and inflation targeting as their monetary policy frameworks.

CFA franc of CEMAC and that of WAEMU have the same rate of exchange to the euro to which they are pegged. The monetary policy framework at work in the CFA zones is the exchange rate anchor. Eritrea, Cape Verde, Comoros, Sao Tome and Principles, Lesotho, Namibia and Swaziland also use the conventional peg as their exchange rate regime. The difference between the CFA franc zones and these countries is that the zones form a currency union (the CFA franc zone countries are linked to one central bank in each zone and use a common currency: the CFA franc) while the other countries have their own central banks. Zimbabwe uses the no-separate-legal-tender regime and is pegged to the U.S. dollar.

Burundi and Rwanda use a stabilized arrangement ERR with a monetary aggregate target as their monetary policy framework. Botswana has the crawling peg regime with the currency compositely pegged. Ethiopia is pegged to the U.S. dollar under the crawl-like-arrangement exchange rate regime. Angola, Liberia, Guinea, Malawi, and Nigeria exhibit other managed arrangement regimes. Angola and Liberia are pegged to the U.S. dollar with an exchange rate anchor while Guinea, Malawi, and Nigeria use a monetary aggregate target framework. Twelve SSA countries operate under the floating exchange rate regime. Ten[9] of these target a monetary aggregate while the other two - Ghana and South Africa, have inflation targeting as their monetary policy framework. Mauritius is the only SSA country where a free floating exchange rate regime is at work. In this paper the SSA countries will be grouped as CFA and non-CFA zones, where the non-CFA zone combines pegged, floating and some intermediate ERR's.

[9]Congo, Dem. Rep., Gambia, Kenya, Madagascar, Mozambique, Seychelles, Sierra Leone, Tanzania, Uganda, and Zambia.

1.4 The Model and Data Description

1.4.1 Data Description

The data on all variables used in this investigation are retrieved from the World Bank's World Development Indicators (WDI) database. The variables employed include: Consumer price index inflation (CPI), money supply (M2), real GDP, population, the terms of trade (computed as the ratio of exports to imports prices), and the trade openness (calculated as the ratio of the sum of exports and imports to GDP). The data covers a panel of 36 SSA countries over the period from 1980 to 2007. Countries included in the examination are those with valid data on all variables of interest over the entire period. Countries with hyperinflation (inflation rate exceeding 50 percent and persistent over many years during the examination period) are excluded. Countries like Zimbabwe, the Democratic Republic of Congo, and Angola are not included for both reasons, the hyperinflation issue and the lack of data. Guinea Bissau, a current member of WAEMU is excluded from the analysis because it joined the union in 1998. So, this country has been a member for less than 20 years according to the data period. Benin and many other countries were not included for lack of data on key variables over many years.

1.4.2 The Models

Studies of inflation have frequently used augmented Phillips curve models in which the policy preferences of the natural rate of unemployment and the expected supply of expansionary policy are incorporated. Although these models well suit inflation persistence, there is no reliable record on employment for many SSA countries; making it difficult to use such models to empirically test inflation in SSA. Other models have been used to examine the inflation effects of exchange rate regimes in many developing countries. For instance, Levy and Sturzenegger (2001) developed an inflation model in

which inflation is related to the changes in money supply growth, the change in GDP growth, the real interest rate and the change in money velocity. However, their model appears as an identity[10] and thus, it gives less opportunity to conduct the comparative analysis on inflation across the SSA countries. Kamin (1997) studies the linkage between inflation and the ERR for Asian, industrialized and Latin American countries. But the model does not distingush between the short and the long run. I explain Kamin's model in Appendix III.

To capture the short and the long run inflation differences between my subsamples while avoiding estimating an identity model, I construct a model where inflation depends on trade openness,[11] external shocks (terms-of-trade) and the lagged inflation. In this model, I add the dummies for exchange rate regime groups in Sub-Saharan Africa (SSA) (Equation 1). The terms-of-trade shocks and the trade openness are important to be controlled for in the model, because they are potential inflationary channels. The reason for the inclusion of the lagged inflation is that there can be some serial correlation between current and past inflation (the inertia problem). The augmentation with the CFA dummy allows identification of whether the fixed ERR succeeds in maintaining lower inflation against the flexible regime in the short and the long runs as a result of enhanced credibility and disciplined monetary policies.

$$\pi_{it} = \beta_0 + \beta_1 Open_{it} + \beta_2 TT_{it} + \beta_3 \pi_{it-1} + \beta_4 CFA_i + \epsilon_{it}, \tag{1.1}$$

where, π_{it} is inflation rate in country i at time t. CFA_i, $Open_{it}$, TT_{it}, and π_{it-1} represent respectively the dummy for the CFA zone, trade openness, terms of trade, and lagged inflation. The CFA dummy takes the value of 1 if country i belongs to the CFA franc currency union or zero otherwise.

For the short run, I estimate equation (1) on the full sample (sample S1 comprising

[10] $\pi_{it} = \beta_0 + \beta_1 \Delta(M2_{it}) - \beta_2 \Delta(RGDP_{it}) + \beta_3 I_{it} + \beta_4 \Delta(\nu_{it})$

[11] Trade openness is denoted "open" and calculated as the ratio of the sum of imports and exports to GDP.

CFA and all non-CFA countries), the first reduced sample (the S2- sample without pegging non-CFA countries), the second reduced sample (the S3- sample with only the CFA and floating ERR non-CFA countries), and the third reduced sample (the S4- sample with only the CFA and pegged ERR non-CFA countries) using pooled OLS and fixed effects estimation. For the long run inflation regression, the average inflation ($\overline{\pi_i}$) over the data period is estimated based on the CFA dummy (Equation 2). By the theory, if the CFA countries have lower inflation relative to the other countries, it would be a result of a lower money growth. To examine the extent of money supply growth in the CFA zones relative to other SSA countries, I estimate equation (3) below. equation (3) is similar to equation (2). However, the average growth of money supply ($\overline{growthM2_i}$) is used as the dependent variable in Equation, 3.

$$\overline{\pi_i} = \beta_0 + \beta_1 CFA_i + \epsilon_i \tag{1.2}$$

$$\overline{GrowthM2_i} = \beta_0 + \beta_1 CFA_i + \epsilon_i. \tag{1.3}$$

1.4.3 The Testable Hypothesis

From the theory, the testable hypothesis is that, if a fixed exchange rate regime provides lower inflation, the CFA franc must have lower inflation in both the short and the long run compared to the non-fixed exchange rate regime countries. Thus in equation (1), one would expect β_4 to be negative and statistically significant, and in equation (2), β_1 to be negative and statistically significant. The negative signs of these coefficients would imply that the CFA franc countries exhibit lower inflation relative to the non-CFA countries. Theoretically, there is no incentive to increase the money supply in an attempt to lower the nominal interest rate under a fixed exchange rate regime. Under a fixed ERR, inflation can be reduced by maintaining lower money supply growth. From this point of view, we would expect β_1 in equation (3) to be

negative and statistically significant. In addition, if the main source of lowering inflation is the extent of money suppy growth, then the magnitude of β_1 in equation (3) would match the size of β_1 in equation (2). However, if there is any mismatch between β_1 of equation (2) and that of equation (3), then other sources might be influencing the inflation rates. These sources could be the extent of the growth of the real GDP per capita and/or the growth of money velocity.

The see how the growth of the real GDP per capita and money velocity influence inflation in the CFA zones, I estimate equation 3.1 and 3.2 below.

$$\overline{RGDP/cap_i} = \beta_0 + \beta_1 CFA_i + \epsilon_i \tag{1.4}$$

$$\overline{Velocity_i} = \beta_0 + \beta_1 CFA_i + \epsilon_i \tag{1.5}$$

where, $\overline{RGDP/cap_i}$ and $\overline{v_i}$ are respectively, the average of the growth of real GDP per capita and that of the growth of money velocity over the data period. CFA_i is the CFA dummy. Theoretically, we would expect a negative correlation between inflation and money velocity growth. Also, a higher growth of output would contribute in lowering inflation. If there is a mismacth between the sizes of β_1 in equation 2 and 3, then the coefficient restriction on β_1 in equation 3.1 and 3.2 will depend on the type of the mismatch.

Case 1: If the size of β_1 in equation (3) is larger than that of β_1 in equation (2) in absolute value, this would imply that the extent of the RGDP per capita is rather resisting to the reduction of inflation. This resistance will be reflected in a negative coefficient of β_1 in equation (3.1). Nevertheless, a negative β_1 in equation (3.1) would meant the CFA countries face a loss in their output per capita. Which loss could be detrimental to welfare. In addition, if the sum of β_1 in equation (3) and β_1 in equation (3.1) still mismatches the size of β_1 in equation (2), then the growth of the money velocity should have some influences on the inflation rates. In the case

where the sum of β_1 in equation (3) and in equation (3.1) is larger in absolute value than the magnitude of β_1 in equation (2), there must be a positive growth of money velocity in the CFA zones relative to that in other non-CFA countries. The underlying implication of a positive growth of the money supply velocity is a higher real interest rate. In fact, higher real interst rate induces banks and consumers to avoid keeping money. Thus, higher interest rates reduce money demand and allow faster circulation of money - higher growth of money velocity.

Money velocity growth is theoretically influenced by the nominal interest rate. If the CFA countries exhibit higher growth of money velocity, this would imply that these countries face higher nominal interest rate. However, the difference between the nominal interest rate and the real interest rate is the rate of inflation (real interest rate = nominal interest rate - inflation). So, if these countries face higher growth of money velocity, implying higher nominal interest rate, they should be enduring also higher real interest rates. This is so because, as inflation rates are lower in these zones, there should not be a large difference between the nominal and the real interest rates. In either case, higher interest rates (implying higher growth of money velocity) and/or output loss would decay the economic performance of the CFA countries. The reason is, real interest rates are the cost of borrowing. So, facing higher interest rates can reduce investment per capita and output. Moreover, the welfare of individuals depends on how much goods and services they can consume. Hence, output loss directly reduces people's welfare.

Case 2: If the size of β_1 in equation (3) is smaller than that of β_1 in equation (2) in absolute value, we would expect the reverse senario from case 1. Note also that for the comparisons between the CFA and the pegged non-CFA (samples S4), if the CFA countries perform better, this would be the currency union effect as both parties in the sample have the pegged ERR. the only difference is the the CFA zones are currency unions while each country of the pegged non-CFA group has its own central bank.

I estimate equations 2, 3, 3.1, and 3.2 by OLS and the robust regression for

S1, S2, S3, and S4. The robust regression methodology allows controlling for the heteroscedasticity to avoid biased parameter estimates. I report the results of the long run estimations (equations, 2, 3, 3.1, and 3.2) All tables are stored in the Table section.

1.5 Results and Interpretation

The focus on Sub- Saharan Africa (SSA) and the distinction between CFA and non-CFA countries in this examination reveals important information on the exchange rate regimes (ERR)' influences on economic performances across SSA countries. Tables 1, 2, 3, and 4 provide respectively the long run inflation, money growth, output per capita growth, and money velocity growth in the CFA countries relatively to: 1) all other non-CFA countries, 2) non-CFA-non-pegged ERR countries, 3) the non-CFA with floating regimes, and the non-CFA pegging ERR countries. The OLS estimation of the long run inflation shows that the CFA countries have respectively 11 percent, 13 percent, 16, and 3 percent less inflation relative to all other non-CFA, the non-CFA-non pegged, the non-CFA-floating countries, and the non-CFA pegged ERR countries (all the results are statistically significant at a 99 percent level of confidence).

The seemingly higher inflation of the non-CFA before the robust regression is due to a few countries in this sub-sample. Actually, at different occasions over the data period, there have been temporary hyperinflations in some non-CFA countries. However, after the peaks, the countries quickly recovered and inflation rate become as usual. For instance, in the early 1990s, Zambia experienced an occasional hyperinflation mounting up to 183 percent. But after this period, the inflation rate declined back to its common rate around 25 percent. Similarly, Uganda experienced some brief, but severe hyperinflation in the late 1980s; Ghana was subject to an inflation of 122 percent in 1983. In 1995, the inflation in Nigeria reached 72 percent; Uganda had its highest inflation (56 percent) in 1986 and Mozambique's inflation peak of 63 percent occurred in 1994. None of these countries has a peg regime. Rather, they are all floating regime

countries; that is why there is no big difference between the long run results of the sample S2 (using non-CFA without the pegs) and that of the sample S3 (using the non-CFA floating regimes only).

The occasional inflation peaks highlighted above do not reflect the usual average inflation rate of these non-CFA floating regime countries. The peaks create the heteroscedasticity (outliers) problem in the data. The presence of heteroscedasticity seems to be pumping up inflation rates of the non-CFA countries as a whole and making as if the CFA countries have relatively very low inflation rates in the long run. The classical estimation methods such as the ordinary least square (OLS) are outlier sensitive. Therefore, the presence of outliers causes the OLS estimation to be inefficient; leading to inflated and bias estimates of the residuals (Mia et al., 2008). To correct for this mitigation, I use the robust regression methodology. The robust regression is the estimation methodology that aims to control for heteroscedasticity in the data to avoid biased parameter estimates. There is an extensive literature on how outliers occur and how to limit their effects on the parameter estimates. Across literature, the most used method to correct for heteroscedasticity in the data is the robust estimation methodology (see Fellner, 1986).

After accounting for heteroscadasticity in the model, the inflation rates of the CFA countries turn out to be in average 5 percent less than that of other country samples, and 0.4 percent less than that of other pegged regimes non-CFA countries. Even though not too large, the CFA countries exhibit lower inflation relative to their SSA counterparty as a result of having a fixed ERR. Moreover, being in a currency union pays off in terms of containing inflation as the CFA countries have slightly lower inflation compared to the other pegged non-CFA countries. Basically, there is a lower inflation benefit for the CFA countries from having a fixed ERR and being a currency union.

This lower inflation is obtained in the CFA zones by maintaining lower money growth. As shown in the results of the robust regression for money growth, the CFA

countries have respectively 8 percent, 9 percent, 11 percent, and -7 percent less growth in their money supply relative to all other non-CFA, the non-CFA-non-pegged, the non-CFA-floating, and the pegged non-CFA countries. The CFA countries have a restraint growth of money. However, the comparison of the extent of the growth of money in the CFA countries to their lower inflation level reveals a mismatch. The CFA countries do not have as much lower inflation as they would in accordance to their restraint money growth. Across each sub-sample, the magnitude of the negative money growth is larger than that of inflation (-7.6 percent versus -4.7 percent in S1; -9.5 percent versus -5 percent in S2; -11 percent versus -7 percent in S3; and -7 percent versus -0.4 percent in S4).

This mismatch is due to two phenomena within the CFA zones. The first fact is the apparent negative effects of the fixed ERR on output per capita growth and the second is the higher growth of money velocity within the CFA zones. As underlined in the hypothesis section, a higher growth of output would contribute to lowering inflation. However, the CFA countries exhibit negative output per capita growth relative to the non-CFA states. The negative coefficient of the RGDP per capita growth across the three sub-samples indicates that fixed ERR hurts the CFA countries by reducing their extent of output growth. In addition, the CFA zones having less output growth compared to the pegged non-CFA implies that the CFA countries are disadvantaged by being locked in a currency union. Consequently, the negative effect of output growth diminishes the effects of money growth on inflation. Across the three first sub-samples, about 1 percent of the lower money growth compensates for output loss. In the last sub-sample (S4), 2 percent of the lower money growth is employed to compensate for the output loss.

On the other hand, the CFA countries have a higher growth of money velocity relative to the non-CFA states. The result of S4 shows that the CFA countries have a lower money velocity growth compared to the pegged non-CFA. However, the difference is not statistically significant. This positive velocity growth constitutes another con-

tracting factor to the effects of money growth in reducing inflation. The CFA countries have respectively 1.6 percent, 2 percent, and 1 percent higher growth of money velocity relative to all the non-CFA, the non-CFA-non-pegged, and the non-CFA-floating countries. So, the impact of the restrained money growth on inflation in the CFA countries is reduced respectively by these amounts of money velocity growths across the sub-samples. The higher growth of the money velocity in the CFA zones might mainly stem from the higher interest rates in these countries. After subtracting the sizes of the coefficients of output per capita growth and the money velocity growth from the coefficient of money growth, the difference is about the magnitude of the lower inflation in the CFA countries (for S1, S2, and S3), but the mismatch persists in S4. the difference in money growth between the CFA zones and the pegged non-CFA is large (7 percent at a 99 percent level of confidence), but the difference in terms of inflation between the two groups is relatively small (0.4 percent).

The sub-sample S4 reveals that the pegged non-CFA countries have the ability to achieve lower inflation (closely as much as in the CFA countries), maitain similar rates of money velocity growth, and have a higher growth of their output per capita relative to the CFA countries. As the size of the output loss in the CFA surpasse their extent of lower inflation relative to the other pegged non-CFA, being a member of the CFA currency union must be economically disruptive. Gurtner (1999) warns that the CFA zones do not meet the required conditions for an optimum curency area (OCA). According to Gurtner (1999), the CFA countries follow different supply cycles. Thus, they face growth barriers at different points of time. The paths of the GDPs of the CFA countries depends on the fluctuation of the prices of the primary commodities that underline the economies of these countries. Moreover, there is no intensive trade within the zones to necessitate the reduction of transaction cost by using a common currency. In addition labor mobility across countries within the zones is not intense (only the labor mobility in the informal sector sems to be fulfilled according to Gurtner, 1999). As the CFA union countries do not meet the requirements of the OCA, it is

not surprising that locking countries with such heterogenuous cyclical patterns under a common currency is undermining their economic performances. The reason of the pronounced difference between the CFA and the other pegged non-CFA in economic performance is the difference in interest rates between the two groups. As shown in Figure 4 of Appendix II, the pegged non-CFA have more investment per capita relative to the CFA zones. This higher investment per capita could be a result of a lower cost of borrowing (lower interest rates).

In general, the difference in inflation between the CFA and non-CFA countries is decreasing while the gap in investment per capita between them is enlarging (see Figure 1 of Appendix II versus Figure 4 of Appendix II). The inflation gap between the CFA and the non-CFA is decreasing over time. The inflation rates of the CFA countries are increasing while that of the non-CFA is diminishing on average. This convergence is due to the fact that output is growing faster in the non-CFA zone and slower in the CFA zones.

The inflation-growth trade-off is a major question in the discussion of the economic performance of developing countries like the CFA states. Is it worth sacrificing output for "lower" inflation? The lower extent of output in the CFA zones is a result of different macroeconomic problem which slow economic activities. In fact, having higher nominal interest rates, the CFA countries experience higher real interest rate which is the cost of borrowing. As shown in Figure 2, the real interest rate has been high and more volatile in the CFA countries than that in the non-CFA states. As real interest rate reflects the cost of capital in the production process, facing high real interest rate can limit investments, the extents of output and the economic growth. Figure 4 supports the lower rate of investment under the CFA zones as a result of higher real interest rates.

The evidence from the hypothetical money model states three main benefits from keeping lower inflation. The first is the transaction cost reduction. The second is the reduction of the capital income tax and the third is the reduction of uncertainty.

However, Aiyagari (1990) studies the benefits and the costs of maintaining lower inflation. The paper mainly shows that the costs of such policy outweighs it benefits. For instance, the reduction of transaction could be achieved by creating more forms of money useable in transaction to earn market rates of interest. Moreover, Aiyagari (1990) argues that reducing money supply in an attempt of keeping lower levels of inflation might not systematically reduce the variability of inflation. Thus, the impact of a lowering-inflation policy on welfare could be marginal (Aiyagari, 1990). Therefore, instead of an inflation lowering policy, which is associated with higher costs, one could simply implement alternative policies, save in costs and reach the same benefits. In addition, a study like Hercowitz (1982) show that supply shocks have stronger effects on relative prices than the changes in money supply (inflation), at least for the US data.

Since wage contracts are usually not fully indexed to price level variability, as the real value of money increase due to inflation reduction, the money amount of the contract is less likely to fully change and compensate for the change in the price levels. Thus inflation reduction is associated to welfare loss (Okun, 1978; Fischer, 1984). Fischer (1984) estimates the sacrifice ratio[12] at 6 percent. Okun (1978) and Fischer (1984) argue that what matters in improving welfare is the variability of personal consumption of goods and services (Aiyagari, 1990). Thus the CFA countries incur welfare loss through their alignment to a fixed ERR as they experience output loss.

The CFA countries exhibit in average 3 percent less inflation relative to their counterparties in the short run (these results are significant at 99 percent confidence, see the pooled panel OLS estimation). The CFA dummy is omitted from the fixed effect estimation as it is time invariant. Basically, like in the long run, the CFA countries face the inflation-growth trade-off also in the short run. This implies that in the short run, the member countries of the CFA franc currency unions experience welfare loss through this trade-off.

[12]The sacrifice ratio is the cost (output loss) incurred in the economy in an attempt to fight inflation.

Another major finding in this paper is the inflation persistence in the CFA countries. As shown by the coefficient of the lag inflation in Tables 4, 5, and 6, there is remarkable inflation inertia in the CFA zones. The magnitude 0.7 (0.6 for the fixed effect estimation) of the coefficient of π_{it-1} indicates that 70 (or 60) percent of the current inflation is due to the past inflation history. The histories of output growth and money growth have less effect on current inflation compared to the past inflation itself. This finding on the inflation inertia in the CFA zones endorses Chopra (1985) and Loungani and Swagel (2001) who showed that inertial components are more influential in the inflation process in developing countries, especially those with fixed exchange rate regimes.

In summary, the CFA countries exhibit lower inflation relative to their counterparties. Thus the hypothesis of a lower inflation under a fixed ERR is proven for the CFA countries. Nevertheless, the Friedman hypothesis that predicts more loss of output under a fixed ERR relative to a flexible ERR holds also for the sample of the CFA countries (see estimation results and Figure 3). These two theories indicate that the inflation-growth trade-off is at work in the CFA zones. However, the goal of an economic policy in any country is to increase the wellbeing of its citizens. Given the empirically proven fact that the costs associated to maintaining lower inflation outweigh its benefits on the country's welfare, one can conclude that fixing the foreign value of their currency is distortive to the CFA countries' economies. Hence, the monetary authorities of the CFA countries could have use alternative policies to improve the countries' welfare rather than lowering inflation.

1.6 Conclusion

This paper finds an empirical support for the inflation-growth trade-off associated with a fixed exchange rate regime (ERR) in the case of the CFA franc currency union countries of Sub-Saharan Africa (SSA). Despite the relatively lower inflation in the CFA

countries compared to the non-CFA countries of SSA, the CFA countries experience output losses through their alignment to a fixed ERR and belonging to a currency union. As lowering inflation has less impact on welfare than the change in output, this trade-off is detrimental to the CFA economies. In fact, the economic objective of any individual is to improve her propensity to consume goods and services. In other words, economic policies of countries should be oriented to the improvement of their welfare. The CFA countries, could therefore employ alternative policies to avoid the welfare loss associated with a fixed ERR, and their alignment to a single currency. The welfare loss relative to all other non-CFA countries in general and that relative to the pegged non-CFA countries in particular lead to the conclusion that the CFA countries would have performed economically better under an alternative ERR, and/or if they did not belong to the CFA currency union.

1.7 Regression Tables

Table 1.1: **The Long Run Inflation Estimation in Sub-Saharan Africa**

	S1		S2		S3		S4	
	OLS	Robust	OLS	Robust	OLS	Robust	OLS	Robust
Variables	$\overline{\pi_i}$	$\overline{\pi_i}$	$\overline{\pi_i}$	$\overline{\pi_i}$	$\overline{\pi_i}$	$\overline{\pi_i}$	$\overline{\pi_i}$	$\overline{\pi_i}$
CFA_i	-11.3***	-4.7***	-13.3***	-5.1***	-16.3***	-6.9***	-2.9***	-0.4***
	(0.692)	(0.2)	(0.7)	(0.2)	(0.8)	(0.1)	(0.2)	(0.1)
Constant	15.5***	8.9***	17.6***	9.4***	20.5***	11.2***	7.1***	4.6***
	(0.4)	(0.1)	(0.4)	(0.1)	(0.6)	(0.1)	(0.1)	(0.1)
Obs.	1,026	1,026	891	891	648	648	459	459
R-sq.	0.21	0.30	0.30	0.43	0.40	0.75	0.34	0.04

S1 is the CFA versus all other non-CFA, S2 is the CFA versus the non-CFA-non-pegged ERR,
S3 is the CFA versus the non-CFA-floating ERR, and S4 is the CFA versus non-CFA-Pegged ERR.
Note: *** p < 0.01, ** p < 0.05, * p < 0.10
The heteroscedasticity-consistent standard errors are in parentheses.

Table 1.2: **The Long Run Growth of Money in Sub-Saharan Africa**

	S1		S2		S3		S4	
	OLS	Robust	OLS	Robust	OLS	Robust	OLS	Robust
Variables	$\overline{M2_i}$	$\overline{M2_i}$	$\overline{M2_i}$	$\overline{M2_i}$	$\overline{M2_i}$	$\overline{M2_i}$	$\overline{M2_i}$	$\overline{M2_i}$
CFA_i	-10.7***	-7.6***	-12.2***	-9.5***	-16.6***	-10.9***	-5.3***	-7.1***
	(0.7)	(0.3)	(0.7)	(0.5)	(0.7)	(0.5)	(0.5)	(0.3)
Constant	20.7***	16.3***	22.3***	18.6***	26.6***	19.7***	15.3***	15.6***
	(0.3)	(0.2)	(0.4)	(0.3)	(0.5)	(0.3)	(0.4)	(0.2)
Obs.	1,053	1,053	891	891	648	648	486	486
R-sq.	0.23	0.32	0.28	0.28	0.45	0.46	0.21	0.6

S1 is the CFA versus all other non-CFA, S2 is the CFA versus the non-CFA-non-pegged ERR,
S3 is the CFA versus the non-CFA-floating ERR; and S4 is the CFA versus non-CFA-Pegged ERR.
The dependent variable is the average growth of M2 growth.
Note: *** p < 0.01, ** p < 0.05, * p < 0.10
The heteroscedasticity-consistent standard errors are in parentheses.

Table 1.3: **The Long Run Growth of the RGDP per capita in Sub-Saharan Africa**

	S1		S2		S3		S4	
	OLS	Robust	OLS	Robust	OLS	Robust	OLS	Robust
Variables	$\overline{y_i}$	$\overline{y_i}$	$\overline{y_i}$	$\overline{y_i}$	$\overline{y_i}$	$\overline{y_i}$	$\overline{y_i}$	$\overline{y_i}$
CFA_i	-0.1	-1.0***	-0.2	-0.7***	0.6	-1.3***	0.2	-1.7***
	(0.4)	(0.1)	(0.5)	(0.1)	(0.4)	(0.2)	(0.5)	(0.15)
Constant	4.8***	3.6***	4.9***	3.3***	4.1***	4.0***	4.5***	4.3***
	(0.2)	(0.1)	(0.3)	(0.1)	(0.3)	(0.1)	(0.4)	(0.12)
Obs.	1,053	1,053	891	891	648	648	486	486
R-sq.	0.00	0.049	0.00	0.03	0.00	0.09	0.00	0.21

S1 is the CFA versus all other non-CFA, S2 is the CFA versus the non-CFA-non-pegged ERR,
S3 is the CFA versus the non-CFA-floating ERR, and S4 is the CFA versus non-CFA-Pegged ERR.
The dependent variable is the average growth of RGDP per capita.
Note: *** p < 0.01, ** p < 0.05, * p < 0.10
The heteroscedasticity-consistent standard errors are in parentheses.

Table 1.4: **Long Run Money Velocity Growth in Sub-Saharan Africa**

	S1		S2		S3		S4	
	OLS	Robust	OLS	Robust	OLS	Robust	OLS	Robust
Variables	$\overline{\nu_i}$	$\overline{\nu_i}$	$\overline{\nu_i}$	$\overline{\nu_i}$	$\overline{\nu_i}$	$\overline{\nu_i}$	$\overline{\nu_i}$	$\overline{\nu_i}$
CFA_i	3.6***	1.6***	4.3***	2.2***	1.9***	1.3***	0.8**	-0.3
	(0.36)	(0.21)	(0.40)	(0.21)	(0.30)	(0.21)	(0.4)	(0.2)
Constant	0.5***	1.5***	-0.1	0.9***	2.2***	1.8***	3.4***	3.4***
	(0.20)	(0.12)	(0.23)	(0.13)	(0.21)	(0.15)	(0.3)	(0.2)
Obs.	1,026	1,026	891	891	648	648	459	459
R-sq.	0.09	0.05	0.12	0.11	0.06	0.06	0.01	0.00

S1 is the CFA versus all other non-CFA, S2 is the CFA versus the non-CFA-non-pegged ERR,
S3 is the CFA versus the non-CFA-floating ERR, and S4 is the CFA versus non-CFA-Pegged ERR.
The dependent variable is the average growth of money velocity.
Note: *** p < 0.01, ** p < 0.05, * p < 0.10
The heteroscedasticity-consistent standard errors are in parentheses.

Table 1.5: **Short Run Inflation Estimation: CFA vs. All NonCFA Countries**

VARIABLES	Pooled Panel OLS π_{it}	FE π_{it}	Pooled Panel OLS π_{it}	Pooled Panel OLS π_{it}
π_{it-1}	0.7***	0.6***	0.7***	0.6***
	(0.02)	(0.03)	(0.02)	(0.03)
Open_{it}	-0.01	0.02	-0.003	-0.005
	(0.01)	(0.02)	(0.01)	(0.01)
TT_{it}	2.3***	2.4***	2.4***	2.6***
	(0.7)	(0.8)	(0.8)	(0.8)
CFA_i	-3.1***		-3.2***	-3.5***
	(1.02)		(1.13)	(1.13)
growthM2_{it-1}			0.04	0.05*
			(0.02)	(0.02)
GrowthRGDP_{it-1}			-0.01	-0.005
			(0.03)	(0.03)
M2Velocity_{it-1}				-0.004
				(0.004)
Constant	2.4*	0.3	1.3	1.6
	(1.4)	(1.9)	(1.6)	(1.6)
Observations	807	807	723	713
R-squared		0.41		
Number of Groups	37	37	37	37

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

The heteroscedasticity-consistent standard errors are in parentheses.

Table 1.6: **Short Run Inflation Estimation: CFA users vs. Non-CFA$_{NonPegs}$**

VARIABLES	Pooled Panel OLS π_{it}	FE π_{it}	Pooled Panel OLS π_{it}	Pooled Panel OLS π_{it}
π_{it-1}	0.7***	0.6***	0.7***	0.6***
	(0.02)	(0.03)	(0.03)	(0.03)
Open_{it}	-0.007	0.02	-0.01	-0.02
	(0.01)	(0.02)	(0.01)	(0.01)
TT_{it}	2.3***	2.6***	2.8***	2.8***
	(0.8)	(0.9)	(0.8)	(0.8)
CFA_i	-3.3***		-2.1*	-2.1**
	(1.1)		(1.1)	(1.1)
growthM2_{it-1}			0.100***	0.191***
			(0.03)	(0.03)
GrowthRGDP_{it-1}			-0.02	-0.03
			(0.03)	(0.03)
M2Velocity_{it-1}				-0.002
				(0.004)
Constant	2.5*	0.2	-0.2	-0.05
	(1.5)	(2.04)	(1.5)	(1.5)
Observations	726	726	692	691
R-squared		0.42		
Number of Groups	32	32	32	32

Note: *** p < 0.01, ** p < 0.05, * p < 0.10

The heteroscedasticity-consistent standard errors are in parentheses.

Table 1.7: **Short Run Inflation Estimation: CFA users vs. NonCFA$_{Floating}$**

VARIABLES	Pooled Panel OLS π_{it}	FE π_{it}	Pooled Panel OLS π_{it}	Pooled Panel OLS π_{it}
π_{it-1}	0.7***	0.6***	0.7***	0.6***
	(0.02)	(0.03)	(0.03)	(0.03)
Open_{it}	-0.01	0.02	-0.01	-0.02
	(0.01)	(0.03)	(0.01)	(0.01)
TT_{it}	2.3***	2.6***	2.8***	2.8***
	(0.8)	(0.9)	(0.8)	(0.8)
CFA_i	-3.3***		-2.1*	-2.1**
	(1.1)		(1.1)	(1.1)
growthM2_{it-1}			0.1***	0.2***
			(0.03)	(0.03)
GrowthRGDP_{it-1}			-0.03	-0.03
			(0.03)	(0.03)
M2Velocity_{it-1}				-0.002
				(0.004)
Constant	2.5*	0.2	-0.2	-0.05
	(1.51)	(2.04)	(1.53)	(1.5)
Observations	726	726	692	691
R-squared		0.42		
Number of Groups	32	32	32	32

Note: *** p < 0.01, ** p < 0.05, * p < 0.10

The heteroscedasticity-consistent standard errors are in parentheses.

Table 1.8: **Short Run Inflation Estimation: CFA users vs. NonCFA$_{Pegged}$**

VARIABLES	Pooled Panel OLS π_{it}	FE π_{it}	Pooled Panel OLS π_{it}	Pooled Panel OLS π_{it}
π_{it-1}	0.2***	0.2***	0.2***	0.2***
	(0.05)	(0.05)	(0.05)	(0.05)
Open_{it}	0.03***	0.04*	0.03***	0.04*
	(0.01)	(0.02)	(0.01)	(0.02)
TT_{it}	0.1	0.3	-0.02	0.5
	(0.8)	(0.8)	(0.8)	(0.8)
CFA_i	-1.5		-2.5*	
	(1.1)		(1.5)	
growthM2_{it-1}			-0.03	-0.02
			(0.02)	(0.02)
GrowthRGDP_{it-1}			-0.01	-0.01
			(0.02)	(0.02)
M2Velocity_{it-1}			-0.02	-0.21**
			(0.04)	(0.08)
Constant	2.5	0.8	3.1*	1.8
	(1.6)	(1.6)	(1.8)	(1.7)
Observations	365	365	327	327
R-squared		0.06		0.11
Number of id	17	17	17	17

Note: *** p < 0.01, ** p < 0.05, * p < 0.10

The heteroscedasticity-consistent standard errors are in parentheses.

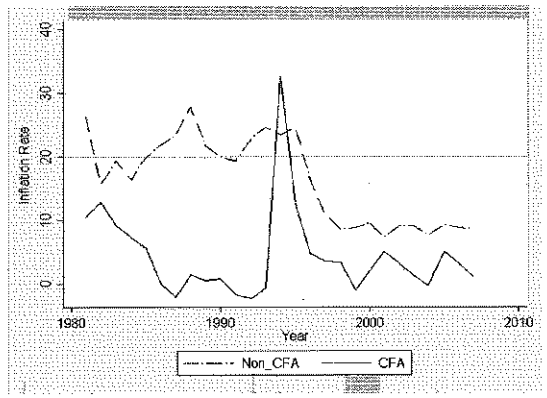

Figure 1.1: the Convergence of Inflation Rates between the CFA and Non-CFA Groups in SSA

1.8 Figures

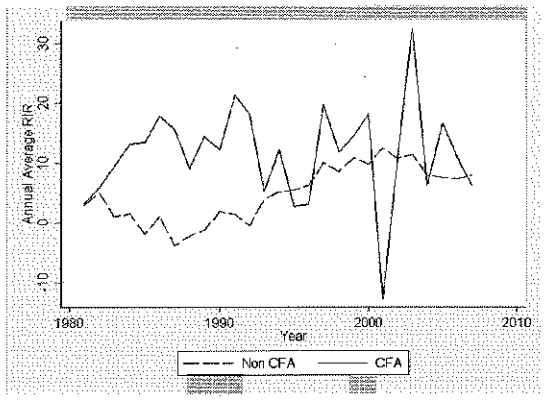

Figure 1.2: The Annual Average Real Interest rates (RIR): CFA vs. Non-CFA

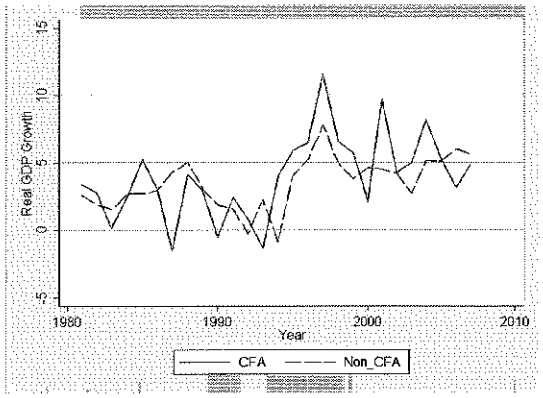

Figure 1.3: The RGDP Growth: CFA vs. Non-CFA

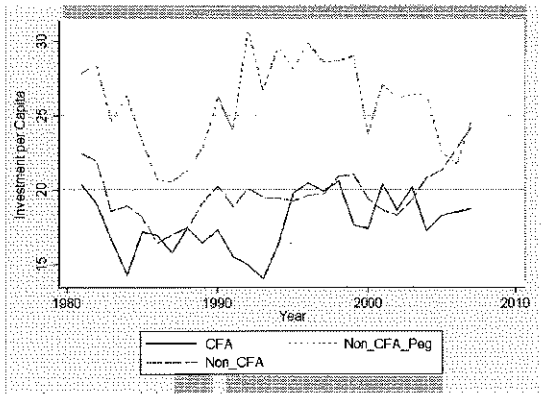

Figure 1.4: The Average Investment per Capita: CFA vs. Non-CFA, and Non-CFA pegged ERR

1.9 Appendix III: The Model by Kamin (1997)

Kamin (1997) studies the linkage between inflation and the ERR for Asian, industrialized and Latin American countries. The author constructes an inflation model that incorporate the real GDP gap, nominal and real exchange rate as follows:

$$\Delta P_t = -\alpha\lambda\psi + \lambda rer_{t-1} + \alpha\lambda\epsilon(Q_h - \overline{Q_h})_{t-1} + (1-\alpha)\Delta P_t^* + (1-\alpha)\Delta e_t + \beta\Delta P_{t-1}$$

where, Δ is the difference operator, P_t is the log of domestic CPI; rer is the log of real exchange rate; Q_h is the log of actual domestic output; $\overline{Q_h}$ is the log of potential output in domestic country; P_t^* is the log of foreign average weighted CPI, e_{t-1} is the log of nominal exchange rate (local current per dollar US). t is current time index, while $t-1$ is the lag indicator (see Kamin, 1997 for the derivation of equation (4)). Equation (4) is a short run inflation equation. To estimate equation for the sample of SSA, I use GDP deflator inflation, and I obtained the potential GDP by applying the Hodrick-Prescott filter methodology. Though not reported here, the estimation of equation (4) shows that the CFA countries have only 0.6 percent less GDP inflation in the short run compared to the non-CFA. Using the GDP deflator to estimate the long run equation (3) gives similar results as using the CPI inflation above.

Chapter 2

The Implications of HO and IRS Theories in Sub-Saharan African Trade

2.1 Introduction

The international trade flows within Sub-Saharan African (SSA) countries have been low historically relative to both, the region's trade flows with other regions and trade within other regions. The issue of the low demand for goods and services across borders in SSA has been stressed in the literature and different authors suggest different potential causes for the issue. Among others, tariff and non-tariff barriers, poor transport infrastructures, and poor private participations have been underlined to explain the issue (e.g., Alemayehu and Haile, 2008; Buys, Uwe, and Wheeler, 2010). Manner and Behar (2007) point out that the share of SSA countries' inter-regional trade in their total trade volume exceeds 80 percent. They argue that the lower trade within the region is due to tariffs and non-tariff barriers. The gravity equation predicts lower trade flows within SSA relative to trade between SSA and the rest of the world. Faezeh and Pritchett (1993) compare the actual intra-SSA trade to the predictions of the gravity

equation. They construct a gravity equation in which the trade volume between two countries is a function of the trade potential[1] of each of the countries and the trade attraction[2] between them. Using import and export data from the UNCOMTRADE at the 3-digit SITC level, they find that the predictions[3] of the gravity equation are similar to the actual trade within SSA.

Hanink and Owusu (1998) develop the trade intensity index on the basis of a spatial interaction model to examine the trade within the economic community of West African States (ECOWAS). Their results show that ECOWAS has failed to promote trade between its members. Mansoor et al. (1989) measure trade potential as the value of SSA's import from the rest of the world for products that at least one SSA country is significantly exporting (significantly means, the value of imports represents at least 1 percent of that country's total exports to the rest of the world). For instance, suppose SSA is importing a given good g from the rest of the world at time t and the import value is one thousand (dollar U.S.). Suppose further that, at this particular time t , a SSA country i is exporting this same good g to the rest of the world and one thousand (dollar U.S.) represents at least 1 percent of i's total export value in good g. Then one thousand (dollar U.S.) is the value of trade potential that is not exploited within the region. They use the disaggregated UNCOMTRADE data at 4-digit SITC and find that the intra-SSA trade potential was only 16 percent of the region's total export in 1983.

The literature has thoroughly demonstrated that the imports between SSA countries are low. However, no author has investigated the implications of the region's factor endowments and its level of product differentiation in explaining the lack of

[1]Their measure of a country's trade potential includes factors such as economic size, GDP per capita, trade intensity-the ratio of trade to GDP, and the geography of the country (area, island or not island).

[2]The trade attraction is estimated from the distance between the two countries as the proxy for the transport cost, common language, and political barriers to trade.

[3]The actual imports and exports within SSA were respectively 8.1 and 4.5 percent of the region's trade with the rest of the world, while the predictions of the gravity equation were 7.5 for imports and 4.5 percent for exports.

comparative advantage in production within SSA and understanding why trade flows remain low in this region. The difference in factor endowment proportions and the extent of product differentiation are important in enhancing trade between countries. The high volatility in the prices of world primary commodities and the resulting dramatic disturbances in African trade during the last decade have led Breton et al. (2011)[4] to conclude that the key development solution for Africa remains export diversification. Although not empirically explained, producing differentiated products is one of the main challenges African countries must undertake to boost their regional trade.

The debate about the regional trade in SSA remains one of the critical issues when it comes to economic development. The importance of this issue has led regional leaders to engage in multilateral free trade agreements and subdivide the region into overlapping custom unions and free trade areas. Despite all arrangements to boost regional trade, import flows in SSA remain low. In fact, imports of Africans from Africans have never exceeded 20 percent of the region's imports from the remaining world nor has it exceeded a quarter of the region's exports towards the rest of the world (see details in the next section).

The goal of this paper is to examine the driving forces of bilateral trade within SSA. In particular, I investigate whether the regional trade of SSA arises from cross-product specialization resulting from differences in factor abundances (Heckscher-Ohlin) or from intra-industry trade resulting from increasing returns to scale (IRS) production technology and product differentiation. My results show that the differences in factor endowment ratios within SSA are low, which indicates trade does not arise from cross-product specialization. In fact, SSA countries exhibit similar factor endowment proportions. 60 percent of the region's imports are made of homogeneous goods. The average regional Grubel-Lloyd index is low[5] (0.03) over the period I consider. The

[4]Africa Trade Policy Notes No. 15 - The Poverty Reduction and Economic Management Department of the Africa Region of the World Bank.

[5] Note that the maximum Grubel Lloyd index is 1, thus the SSA regional Grubel Lloyd is 0.03 out of 1.

low value of the Grubel-Lloyd index indicates that there is less possibility of exchanging varieties of differentiated goods. The limited patterns of product varieties cannot generate intra-industry trade within the region. This paper shows that the conditions for specialization in production under both HO and IRS theories are not met in SSA. There is little room for potential trade within SSA. The empirical results in this paper imply that industrialization and manufacturing different product varieties is crucial in boosting the region's trade in the long run.

The remainder of this paper is organized as follow: Section 2 gives an historical overview of trade in SSA. Section 3 briefly reviews the literature on trade theories. Section 4 outlines the methodology, explains the model, and summarizes the data and sources. Section 5 shows the investigation results and their implications while section 6 concludes the paper. Tables and Figures are provided in separate sections.

2.2 Overview of Sub-Saharan African Trade

2.2.1 Product Composition of Sub-Saharan Africa Trade

The bilateral imports of non-fuel products of African countries from other African countries are mainly composed of primary commodities. These commodities are agricultural goods and manufactured[6] goods that mainly consist of consumer goods. Although primary commodities, the composition of the African products has changed over the last decades. This change in the composition of the goods in SSA has remarkably affected the rate of imports within the region. In fact, between 1970 and the late 1980s, a large proportion of commodities traded in SSA consisted of agricultural goods. The

[6]Note that the manufactured goods used in this section do not include machinery and transport equipment. The reason for the exclusion is because a large portion of machinery and transport equipment imported within SSA are products of China and India. In recent decades, trade has intensified between India, China, and Africa. As Broadman (2007) explains, this increased partnership is due to the economic complementarities between the two regions. The Asian countries essentially export machinery and transport equipment towards some key African countries (i.e., South Africa and Nigeria). From these countries, these products are exported to other countries in the region (Kaplinsky et al., 2006).

share of manufactured goods was low relative to that of the agricultural goods up to the late 1980s (Figure 1). Noticeably, over that decade the total import level within SSA was stagnant and low as shown in Figure 2.

From the late 1980s, the share of manufacturing goods in the total import increased. The proportion of the manufactured goods in the total imports value within SSA surpassed that of the agricultural goods in the mid-1990s. As shown in Figure 2, the curve of intra-SSA imports changed from being flat. It is upward sloping. There is an argument that the observed dramatic increase in the SSA regional imports in the 2000s results from the increase in the world demand for primary commodities, which inflated their prices (see Gupta and Yang, 2006; Breton et al., 2011).

However, during the 1990s, even though there was not such a huge increase in the world demand for primary commodities, the trend of the regional imports had started to increase then. The moderate increase in the intra-SSA imports in the 1990s was mainly due to the growth in manufactured goods over that period. As shown in Figure 1, in the mid - 1990s, the share of manufactured goods surpassed that of the agricultural goods in the total imports within SSA. In addition, there was a new trend of an increase in the share of the manufactured goods beginning from the year 2000. Although the rise in world demand for primary commodities significantly contributed to the increase in imports within the region, a portion of this increase can be explained by the growth in the share of manufactured products in the total regional trade around that period. The reason is, even though the imports dropped after the unusual world demand, the regional imports were still higher compared to their levels before the mid - 1990s. These higher imports after the unusual event were essentially due to the growing share of manufactured goods relative to the share of agricultural goods in the total regional imports.

The above overview of the non-fuel commodities trade within SSA shows two main points. First, commodities prices in SSA depend on world prices and so they are vulnerable to external shocks. This is essentially because the commodities of SSA

consist in general of primary commodities. The second point is that manufacturing has positive effects on imports within SSA. These facts highlight the importance of product differentiation in enhancing bilateral trade in SSA. Indeed, manufacturing goods is the basis for product differentiation. SSA countries should shift their products from primary commodities to high value added ones and produce them in different varieties. Product differentiation will allow not only boosting the intra-regional demands, but also reducing the region's vulnerability to world primary commodities prices change.

2.2.2 Trade within SSA versus Trade of SSA with the Rest of the World

Historically, SSA countries trade a smaller share of their GDP among themselves relative to the portion of GDP that they share with the rest of the world. To identify how much are imports within SSA relative to SSA's imports from (exports to) the rest of the world, I use aggregated data at UNCOMTRADE (1- digit SITC) to compute the total export (import) values of SSA towards (from) the rest of the world per year, and the yearly total intra- regional import value of SSA. Figures 3 and 4 provide respectively, the ratio of intra-SSA imports to SSA's exports to the world, and intra-SSA imports to SSA's imports from the rest of the world. The observation reveals that imports within SSA have always been smaller than the region's trade (both import and export) with the remaining world.

SSA imports more from the world than within itself. As shown in Figure 4, the proportion of the intra-regional imports in SSA's imports from outside the region has been historically less than 10 percent. This proportion reached 20 percent in the mid-2000s due to the worldwide increase in demand for primary commodities and the growth of manufactured goods share in the regional trade (see Gupta and Yang, 2006; Breton et al., 2011). Both, the ratios of regional imports to external exports and imports increased from the late 80s to the mid - 2000s and then declines in the following years.

The periods of increase and decrease in these ratios coincide with the period when the share of manufacturing goods increased and declined. Thus, manufacturing can explain some part of the success in trade within SSA.

Despite the contribution of manufacturing to the regional trade enhancement, trade within SSA is still not a grand success. Even though the share of manufactured goods in the regional production has increased over the last decades, more than 60 percent of the region's product consists of non-manufactured goods; and imports within SSA remain largely low compared to the region's trades with the rest of the world. This indicates that the level of manufacturing is still too low to highly promote trade in the region. The inability of SSA countries to add more value to their products (manufactured goods in a large extent) can be explained by the market access constraints that these countries face. SSA countries are distant from developed markets from where they import capital equipment and intermediate goods required for production. For instance, Redding and Venables (2004) find that each 10 percent increase in ad valorem transport costs of final output and intermediates goods is associated with a 30 percent reduction in value added in the domestic country. Countries facing higher transport costs (i.e., countries suffering from large markets and supplier access issues) are less likely to produce high value added goods. In this paper, I examine how the extent of manufacturing goods in different varieties and the difference in factors of production proportions explain the level of demand across borders within SSA.

2.3 A Brief Literature Review on Bilateral Trade Theories

Despite the improvement in trade within SSA during the last decades, the trade flows within the region are still low. Different factors might explain the persistence of the issue. This paper focuses on analyzing the factor endowments differences- the Heckscher-Ohlin theory and the extent of product differentiation within SSA to explain

why the regional trade is still low. The Heckscher-Ohlin model is the trade theory initiated by Heckscher (1919) and reformulated by Ohlin (1933). This theory provides a basis for empirical analysis of the origins of comparative advantage. The model proposes that international differences in factor endowments are sources of comparative advantage under two key assumptions: (1) the immobility of the factors of production across borders: factors are immobile across borders but move freely across industries within a country, (2) factor abundance does differ across countries but does not differ too much so that countries are within the factor price equalization (FPE) set. The relative factor endowment differences can lead to comparative advantage in the production of goods and services across countries. Within an industry this will reflect the relative intensity of one factor over others in the production of a good or the marginal rate of substitution between factors in the production process.

For bilateral trade to be enhanced within SSA, the countries must specialize in particular goods or services in the production of which they have a comparative advantage over other countries. According to the HO theory, countries export the goods that they produce intensively with their abundant factor. Thus, a labor abundant country will specialize in and export goods that require labor intensively in their production while a capital abundant country will specialize in and export a good that requires capital intensively in the production process. In the case where two countries have similar factor endowments, they tend to trade less with each other because the production prices of goods are similar across the two countries.

The Heckscher-Ohlin model assumes that different combinations of the production factors are used in the production of different goods. Based on the HO theory, if a country is abundant in factors that are used intensively in the production of a given good, this country will have a comparative advantage in the production of that good over other countries. Thus, this country would specialize in the production of this good and export it to other countries that produce the good with higher costs.

Bilateral trade between two countries can also be intensified as a result of

product differentiation where the love of varieties creates demand for products across countries. Krugman (1979) initiates the theoretical framework for the idea of product differentiation under the assumptions of increasing returns to scale (IRS) production technology and monopolistic competition. Krugman's contribution has been extended by a wide range of works (i.e., Krugman, 1980; Bergstrand, 1989; Eaton and Kortum, 2002; Helpman, Melitz, and Rubinstein, 2008). This type of trade has been proven to be the driving force of bilateral trade among industrialized nations. Helpman (1987) and Dabaere (2002)[7] show that a large portion of trade between developed nations is made up of trade between industries producing different varieties of a product. One of the primary objectives of this paper is to study whether the IRS theory is relevant to trade within SSA.

The HO and IRS theories are the foundations for empirical investigations on international trade patterns. Moreover, the gravity equation which remains the most successful model in explaining the variations in trade volume between countries, can be derived from both of these two theories (e.g., Helpman and Krugman, 1985; Evenett and Keller, 2002). In the following sections, I employ Evenett and Keller's framework to study the driving forces of trade within the SSA, and identify whether this region exhibits opportunities for international trade based on the two theories.

2.4 Methodologies

I follow the empirical strategies of Evenett and Keller (2002) who tackle the factor endowment difference and the increasing return to scale theories of trade in a framework of the gravity equations. They study to what extent each of the theories explains the

[7]Helpman (1987) uses a gravity model and provided support that the trade volume within a region relative to the regional GDP is proportional to the dispersion index that measures the regional degree of intra-industry trade. Debaere (2002) examines the results of Helpman (1987) on the samples of 14 OECD countries where product differentiation is of great importance and another sample of Non OECDs with less differentiated goods. He concludes that the increasing similarity in GDP among the OECD countries leads to higher bilateral trade whose large proportion consists of intra-industry trade.

volume of bilateral trade. I apply their methodology to the bilateral trade within SSA region and compare it with that of other regions.[8] The model of Evenett and Keller (2002) is convenient under the goals of this paper because it can test the endowment based issue and product differentiation from a single framework of a gravity equation.

2.4.1 Trade Theories and the Gravity Equation

Under the assumptions of perfect specialization, identical and homothetic preferences, and frictionless trade, one can derive a gravity equation, in which the value of imports of a country i from a country j at time t is proportional to the product of the GDPs of the two countries (Y^{it} and Y^{jt}) divided by world GDP (Y^{wt}):

$$M^{ijt} = \frac{Y^{it}Y^{jt}}{Y^{wt}} \tag{2.1}$$

where M^{ijt}, Y^{it}, Y^{jt}, and Y^{wt} are respectively, imports of country i from country j, GDP of country i, GDP of country j and the world's GDP at time t (hereafter, superscripts i, and j represent country indexes and t is the time index). This paper modifies equation (1) to apply it to intra-regional trade.

$$M^{ijt} = \frac{Y^{rt}}{Y^{wt}}\frac{Y^{it}Y^{jt}}{Y^{rt}} \tag{2.2}$$

where, Y^{rt} is the regional GDP (hereafter, superscript r represents the regional index). Equation (1) or (2) above have very important theoretical features. They hold as long as countries completely specialize in different products. Moreover, these equations can be derived from the product differentiation, complete specialization across varieties, as well as the cross-industry specification arising from factor endowment differences.

The increasing return to scale theory states that the love of varieties is what creates demand for goods across borders. However, each country demands the varieties

[8]East and South Asia, Europe and North America, Latin America and Caribbean, and the Middle East and North Africa.

of differentiated goods from its partners relative to its GDP. If the two countries produce a common good (Z) (homogeneous good) and different varieties of another good (X) (differentiated product), then each country will import different varieties of the differentiated good from the other country, but not the common good. Based on identical and homothetic preferences, the quantity of the varieties of goods that country i imports from j is a function of i's share of world GDP, which in this case is: Y^{it}/Y^{rt}. Nevertheless, the quantity of product varieties country i expects to import from j is reduced as the share of homogeneous goods between the two countries increases.

The reason why bilateral trade between the countries declines in the presence of a homogeneous good is the following: suppose the two partner countries produce a given amount of a homogeneous commodity Z. The shares of the good Z in i and j's GDPs are respectively Z^i and Z^j. Country i's share of varieties in its GDP is $(1 - Z^{it})Y^{it}$. Thus, i's share of world market is $(1 - Z^{it})Y^{it}/Y^{wt}$. If there were no common good produced in both countries, the importing country would import all varieties from the partner at the full value of its share in the world GDP (Y^{it}/Y^{wt}). In this case, equation (2) where the coefficient of the right hand side is unity would hold. That is, i imports one hundred percent of the different varieties from j so does j from i. With the existence of common good Z, the total imports of i from j is reduced by the share Z^{it}. Incorporating the share of homogeneous goods in equation (2) gives:

$$M^{ijt} = (1 - Z^{it})\frac{Y^{rt}}{Y^{wt}}\frac{Y^{it}Y^{jt}}{Y^{rt}} \tag{2.3}$$

We would expect high regression coefficients for country pairs where products are differentiated than for country pairs with large shares of homogeneous goods. That is: for $Z^{it} > 0$, the trade volume between partners declines. Consequently, countries with high Grubel Lloyd index will tend to have a high alpha (α^{it}), where $\alpha^{it} = (1 - Z^{it})$.

Equation (3) holds perfectly to test trade based on the endowment proportion differences between countries as well. In the world of two countries, two goods, and two

factors Heckscher-Ohlin model, each country exports the good that uses intensively its abundant factors. If country i and j are respectively capital and labor abundant and produce two homogeneous goods Z and X, the first country will export capital intensive goods and the second country will export labor intensive goods. Suppose the production of good X requires more capital and less labor than the production of good Z. Both of the goods are produced in both countries. The amounts of X and Z produced in country i are $X^{it}/(X^{it}+Z^{it})$ and $Z^{it}/(X^{it}+Z^{it})$ with $X^{it}/(X^{it}+Z^{it}) > Z^{it}/(X^{it}+Z^{it})$. On the other hand, country j produces the shares $Z^{jt}/(X^{jt}+Z^{jt})$ and $X^{jt}/(X^{jt}+Z^{jt})$ with $Z^{jt}/(X^{jt}+Z^{jt}) > X^{jt}/(X^{jt}+Z^{jt})$. Country i exports a demanded proportion α^x of its production X^{it}. Thus, the world market share of country i is: $M^{ijt} = (\alpha^x/X^{it})\frac{Y^{rt}}{Y^{wt}}\frac{Y^{it}Y^{jt}}{Y^{rt}}$, and the market share of country j is : $M^{jit} = (\alpha^z/Z^{jt})\frac{Y^{rt}}{Y^{wt}}\frac{Y^{it}Y^{jt}}{Y^{rt}}$.

Let $\gamma^{it} = \alpha^x/X^{it}$ and $\gamma^{jt} = \alpha^z/Z^{jt}$. It follows,

$$M^{ijt} = (\alpha^x/X^{it})\frac{Y^{rt}}{Y^{wt}}\frac{Y^{it}Y^{jt}}{Y^{rt}} = \gamma^{it}\frac{Y^{rt}}{Y^{wt}}\frac{Y^{it}Y^{jt}}{Y^{rt}} \quad (3'),$$

and

$$M^{jit} = (\alpha^z/Z^{jt})\frac{Y^{rt}}{Y^{wt}}\frac{Y^{it}Y^{jt}}{Y^{rt}} = \gamma^{jt}\frac{Y^{rt}}{Y^{wt}}\frac{Y^{it}Y^{jt}}{Y^{rt}} \quad (3''),$$

where α^x in equation (3') and α^z in equation (3") are respectively the quantity of good X demanded by country j from country i and the quantity of good Z demanded by country i from country j.

From the above demonstration, we would expect γ^{it} and γ^{jt} to be higher when the capital to labor ratios differ sharply across the two countries at a particular time t. This is because the large difference in factor endowments will cause each country to specialize in the production of the good it produces intensively with its abundant factor, and rely on its partner for the consumption of the other good. By relying on each other, the demand increases between the two countries. Therefore, γ^{it} and γ^{jt} decrease when endowment ratio differences between the countries decline. In the extreme case if both countries are capital or labor abundant, α^x or α^z will tend to zero. This will characterize the "zero trade" case in a Heckscher-Ohlin model when endowments are identical. The coefficient γ^{it} and γ^{jt} from estimating equations (3', 3")

are expected to be smaller when factor endowments are similar or/and when products are not differentiated (i.e., in the presence of large shares of homogeneous goods).

Additional modifications from equations (1), (2), and (3) are the inclusion of the dummy for common language - if the two countries have a common official language (CL^{ijr}); the dummy for colonial links if the importing country was a colony (Col^{ijr}); the dummy for contiguity if the two countries share a common border ($Contig^{ijr}$); the log of the distance between the two countries (D^{ijr}) and the landlocked dummy (LL^{ijr}). After inclusion of these control variables and taking the log function, equation (3) becomes:

$$Log(M^{ijtr}) = \alpha^{itr}+\alpha^{itr}Log(\frac{Y^{it}Y^{jt}}{Y^{rt}})+\beta CL^{ijr}+\delta Col^{ijr}+\theta Contig^{ijr}+\vartheta Log(D^{ijr})+\rho LL^{ijr}+\epsilon^{ijtr} \tag{2.4}$$

where the constant term (α^{itr}) captures Y^{tr}/Y^{wt}. This paper estimates equation (4) using a panel pooled ordinary least square (OLS). Baltagi and Khanti-Akom (1990) stress that the Haussmann-Taylor (hereafter, HT) (1981) estimation methodology is the best estimator for equations where potential correlation might exist between the explanatory variables and the individual specific effects. Baltagi and Khanti-Akom (1990) argue that with the HT estimation methodology, the within transformation does not eliminate the individual effects and it corrects the within estimator when individual effects are correlated with the explanatory variables.

Another way to recover individual specifics is the use of fixed effect estimation. However, the fixed effect estimation automatically drops the time invariant variables. This is an issue with the gravity estimations where country specifics such as distance between countries, the common language, or common border between two countries or landlocked dummies are time invariant. If the time invariant variables are uncorrelated with the country pair effects, then one can recover the fixed effects using the two stage least square (2SLS) (i.e., estimate OLS on the residuals of fixed effect regression

(Baltagi, 2009)). For these econometric reasons, some gravity estimations have recently employed the HT estimation methodology. For instance, Serlenga and Shin (2007) estimate the gravity equation of bilateral trade among 15 European countries using the HT estimation methodology. They argue that in addition to recovering the country specific effects of variables such as distance, common border, and common language, the HT methodology allows these variables to be endogeneous.

Even though the HT methodology tackles the endogeneity problem, I use the pooled OLS because the type of gravity equation I use in this paper allows little correlation between the explanatory variable and the dummies (country specifics). Serlenga and Shin (2007) use GDP, the differences in relative factor endowment between trading partners (RLF), dummy on similarity in relative size (SIM), dummy on European community membership (CEE), common currency (EMU) and the common language dummies as the endogeneous variable when applying the HT methodology. Obviously, the design of their gravity equation exhibits potential endogeneity and it is reasonable for them to use the HT estimator. GDP, the relative country size and the difference in relative endowment could be correlated. In addition, most of the 15 European countries in their sample are members of the "CEE" and the "EMU".

The gravity equation by Evenett and Keller (2002) used in this paper is designed in such a way that the main explanatory variables are combined in the countries' sizes. The endowments proportion differences are intended to be part of the GDP and be reflected through the coefficient of the estimation. The main explanatory variable in this gravity equations, $Y^{it}Y^{jt}/Y^{rt}$ turns out to be less correlated with the dummies which reflect the country specifics. The matrix of correlation between the variables is given in Table 8 and the results from estimating equation (4) are stored in Table 6.

2.4.2 The Data Summary

The overview of the historical trade in SSA is observed over the period from 1970 through 2007 using aggregated data at the 1-digit SITC of the UNCOMTRADE database. However, due to the lack of historical data on the capital stock and the labor force, for the empirical investigation I use a panel of eleven years (from 1997 to 2007) on 136 countries[9] grouped into five regions.[10] The bilateral trade data is retrieved from the IMF's direction of trade (DOT) and *UNCOMTRADE*. The data on real gross domestic product (RGDP) converted into purchasing power parity (PPP), the capital stock, the labor force, and the population is retrieved from the IMF's International Financial Statistics (IFS). The gross capital formation was retrieved from the World Bank's World Development Indicators (WDI) data and is adjusted by the depreciation rate of 6 percent. The gross capital formation is used as a proxy for countries' capital stock.

The data includes countries with valid data on capital stock and labor force over the indicated period. Note that capital and labor are used as the main factor endowments in this paper. Whenever a country lacks the data on capital stock or labor force for a given year, the countries pairs in which that country is involved are dropped out. This is because the paper is interested in investigating the endowment ratio difference across countries. All variables are converted to purchasing power parity adjusted in real international dollars to be internationally comparable. The averages of: the number of trade relations per importing countries in SSA, the countries' GDP per capita, and the capital per worker over the period from 1997 to 2007 are summarized in Table 4. The capital to labor ratio is also calculated for countries within each region. The maximum and minimum capital per worker and the average capital per worker within each region between 1997 to 2007 are reported in Table 1.

[9]The list of countries by region is given in Table 9.

[10]*Asia*, $EU-NAM$, *LAC*, *MENAF*, and *SSA* denote respectively region of East Asia and Pacific and South Asia, Europe and North America, Latin America and Caribbean, Middle East and North Africa, and Sub-Saharan Africa.

This paper follows the literature to test the rates of intra industry trade by computing the Grubel-Lloyd index. The data used to calculate the Grubel-Lloyd index (1975) is extracted from the UNCOMTRADE database on two-way trade at the 3 digit level in SITC. To assess the extent of product differentiation, the paper classifies the commodities by differentiated and homogeneous goods based on Rauch (1999) and Hallak (2006) concordance. Only the differentiated goods are used to calculate the Grubel Lloyd index. The average regional Grubel Lloyd index over the period from 1997 to 2007 is reported in Table 2.

The Grubel-Lloyd index is computed using the following equation:

$GL^{ijtr} = 1 - [\frac{\sum_g |M_g^{ijtr} - M_g^{jitr}|}{\sum_g |M_g^{ijtr} + M_g^{jitr}|}]$, where $0 < GL^{ijr} < 1$

where, g represents a commodity. GL^{ijtr} is the Grubel-Lloyd index and reflects the degree of intra-industry trade (imports and exports) of country i from (to) country j. M_g^{ijtr} is the export value from country i to country j in a differentiated good and M_g^{jitr} is the import value of country i from j in the good g.

The Grubel Lloyd index reflects the degree of intra-industry trade in differentiated goods. This index can be assessed only if a good is simultaneously imported and exported by a country from (to) the other country. GL^{ijtr} equals zero whenever g is either exported or imported only. In contrast, if the value of imports is equal to the value of exports in commodity g, then GL^{ijtr} equals unity. Therefore, the Grubel-Lloyd index allows determining the proportion of intra-industry trade in the regional trades. The shares of differentiated and homogeneous goods in the total trade volume as well as the capital to labor ratios are calculated to further highlight the nature of endowments and the characteristics of goods in SSA trade. This exercise is conducted for all regions to facilitate the comparison of SSA to other regions. Note that the relatively higher GL^{ijtr} index indicates intensive intra-industry trade or the existence of the wide range of product varieties tradable between industries across borders.

2.5 Results and Interpretation

2.5.1 The Endowments Proportions and Intra-Industry Trade in Sub-Saharan Africa

The endowment analysis shows that SSA countries are in the majority labor abundant. The ratios of capital to labor within SSA indicate that there is less capital available per worker in SSA as compared to that within other regions. On average, the value of capital per labor in SSA is 546 ($ U.S.) and it is the lowest as compared to the value of capital per worker in other regions (Table 1). Factor endowment ratios are similar across countries in SSA than in other regions. The mean difference in the capital to labor ratio in SSA is 845 and it is also the lowest among regions. In SSA, the minimum difference in the factor production ratio is between Burundi and the Democratic Republic of Congo (DRC), whereas the maximum difference in this ratio is between Equatorial Guinea and Zimbabwe. More than 38 pairs of countries in SSA exhibit no significant difference in factor endowment ratios (factor proportion difference is close to zero between the countries composing the pair). The endowment ratio within SSA indicates that the region is labor abundant rather than capital abundant. Given the countries' endowments, the opportunity cost of producing capital intensive goods in SSA is high. This indicates the lack of comparative advantage in the production of goods within the region. Therefore, specialization in production of goods based on the factor endowments is less likely to occur in SSA.

There are few varieties of differentiated goods traded in SSA. From 1997 to 2007, the imports of SSA countries from other SSA countries was mainly composed of: tobacco; metallic structures; furniture; cotton fabrics; footwear; perfumery and cosmetics; fertilizers; road motor vehicles; alcoholic beverages; rubber tires; telecommunication equipment; wood simply worked; tools; electric machinery parts; printed matter and medicaments. As we can see, the manufactured goods in SSA are mostly

consumption goods, not high value added goods. In addition, most of the SSA countries do not intensively participate in trade in differentiated goods. Over the total period of observation, South Africa's share of the total market value in differentiated goods is almost 50 percent. The remaining countries have shares of market value which are less than 5 percent (Table 5). The lower participation and the limited patterns of differentiated goods are indications of the less extent of differentiated goods and the low trade within the region.

Intra-industry trade is almost missing in SSA. The average regional Grubel Lloyd index - which measures the rate of trade between industries across borders, is low in SSA compare to that of other regions (Table 2). The average Grubel Lloyd index is 0.03 in SSA and the index is zero for more than 60 percent of the countries over many years. The lack of intra- industry trade reflects the fact that products are not differentiated in the region. Thus, specialization based on the IRS theory cannot take place under these conditions. The factor endowment and increasing return to scale theories of trade explain why SSA countries trade less among themselves. Based on the HO theory the lower difference in factor proportions cannot generate perfect specialization within SSA whereas the absence of product differentiation reduces bilateral trade.

The low extent of product differentiation in SSA can be explained by the lack of technology which is known as the driving factor of labor productivity. Whether new technologies are available or not in the production process in SSA, their application requires skilled labor force. However, SSA has a very small share of its labor force that can be considered as skilled workers. In fact, using the education level of individuals as the proxy for their skills, the percentage of people aged 15 and older with secondary education as well as the percentage of population aged 25 and above with tertiary education are negligeable in SSA compared to that in other regions (Table 3).

In fact, the proportion of skilled workers in the total labor force matters to the extent of how countries trade. The degree of trade between two countries turns

out to also depend on the skills in both countries. In the Tables (10, 11, 12) in the Appendix Annex, I use the total proportion of people aged 15 and above as a proxy for the skilled labor. Then, I merged all pairs from all regions to create five ν classes: (1) with ν increasing by the increasing order of education in the importing country (Table 10); (2) ν increasing by the increasing order of education in the exporting country (Table 11); and (3) ν increasing by the increasing order of the sum of the proportions of education in both countries (Table 12).

After estimating equation 4, the results show that the proportions of educated people in both, the partner countries matter to trade between them. The coefficient of $Y^{it}Y^{jt}/Y^{rt}$ in Table 12 increases as ν increases. However, the effect of education on trade is not clear in Tables 10 and 11. The order of the coefficients of $Y^{it}Y^{jt}/Y^{rt}$ in Tables 10 and 11 are ambiguous. This can be explained by the fact that ν is ranked only by the education in one country of the pair. So, the other country forming the pair might have lower or higher level of education, leading to an ambiguous effect. From this point of view, with the lower level of education within SSA, the lower extent of trade in this region is also not surprising.

2.5.2 The Results from the Gravity Equations

The coefficient alpha (α^{itr}) from estimating equation (4) is lower for the regions where the share of homogeneous goods in total imports is high. It is not surprising that Latin America, the Middle East and SSA have similar and low coefficients (α^{itr}) compared to that of Asia and Europe. In fact, Latin America, the Middle East and SSA have lower intra industrial trade expressed as small Grubel Lloyd index. Moreover, these regions have higher share of homogeneous goods relative to the shares of differentiated goods in their total import. The average difference in the endowment proportions for these three regions are lower compared to that of Asian and European samples.

SSA has the lowest rate of intra industrial trade and the lowest average difference in the factor endowment ratios. SSA's coefficient alpha ($\alpha^{itr} = 0.04$) being similar to that of Latin America and slightly greater than that of the Middle East might result from SSA having relatively higher share of differentiated goods in total imports compared to that of the other two regions. This indicates that SSA could trade more by differentiating more its products.

Product differentiation and the relative endowment differences between countries are critical in enhancing bilateral trade. This is supported as well by the benchmark exercise conducted in this paper. I merged all the samples and subdivided it into two subsamples using a benchmark of GL^{ijr}[11] $= 0.05$. The first subsample includes pairs countries with GL^{ijr} less than 0.05 and the second includes pairs with GL^{ijr} greater than 0.05. The subsamples include pairs with valid GL^{ijr} and difference in factor endowment numbers. The sample of lower GL^{ijr} contains 12,502 observations and that of higher GL^{ijr} has 18028 observations. I estimate equation (4) for each of the two subgroups. The coefficient (α^{ijtr}) for the lower GL^{ijr} sample is 0.01 and that of the higher GL^{ijr} sample is 0.08. Both coefficients are significant at 99 percent confidence (Table 7, last row). This indicates a 1 percent increase in the GDPs of countries with low GL will increase trade between them by only 1 percent, while similar increase in GDP for countries with high GL^{ijr} will boost their bilateral trade by 8 percent. The difference in the GL^{ijr}, which reflects the degree of product differentiation, makes a large difference in the trade patterns.

In addition, I subdivided each of the two subgroups into five classes named ν classes (ν =1, 2, 3, 4, 5). Within the lower GL^{ijr} group, ν increases in the increasing order of the difference in factor endowment ratios (DFER). Meaning for instance that the DFER in the class of ν =5 is greater than that of the ν =1 class. There are about 2,500 observations per ν class within the low GL^{ijr} subgroup. Similar ν classes are created in the subgroup of the high GL^{ijr}. However, in this group, the ν classes are

[11] GL^{ijr} without subscript t reflects the period average

first ranked by increasing GL^{ijr} order and then by increasing DFER order. The ν classes of the higher GL^{ijr} have about 3,605 observations each. After creating the ν classes, I estimate each class sample using equation (4) and following the same estimation methodology- pooled panel OLS. As shown in Table 7, within the low GL^{ijr} sample, the estimation coefficients are all significant at 95 percent confidence. These α_{ν}^{it} increase as the DFER increases and reaches the largest value of 0.012 for the ν =4 class. The lower coefficient for the ν =5 class could result from many pairs having extremely lower GL^{ijr} despite their higher DFER.

Similar patterns of the α_{ν}^{it} is observed within two class types of the high GL^{ijr} sample. For the classes ranked by increasing GL^{ijr} order, the α_{ν}^{it} increases as the GL^{ijr} rate increases and reaches the maximum at the class of $\nu = 4$. In the other ordering classes within the high GL^{ijr}, the coefficients seem not to change much across the three first classes. But these coefficients are high for the last two classes. Interestingly from this analysis, the coefficients (α_{ν}^{it}) are significant and large in magnitude for all classes and ordering within the high GL^{ijr} sample than within the low GL^{ijr} sample. Moreover, within the high GL^{ijr} sample, the higher ν classes have higher α_{ν}^{it} in each of the two ordering. This indicates the importance of product differentiation and the relative endowment differences.

The IRS and the HO explain why trade flows are low in SSA. The lower factor endowment ratio differences and the less extent of intra industrial trade cannot generate perfect specialization. Given these results, trade policies like custom unions or free trade agreements are likely to fail in SSA. SSA countries have similar factors of production, they produce homogeneous primary commodities and the level of product differentiation is not high enough to allow specialization and increase demand across the border. Trade policies to boost trade within SSA must focus on how to manufacture the regional goods in different varieties.

2.6 Conclusion

The finding of this paper supports those of the previous works that SSA trades less within itself. However, this paper uses the HO and IRS theories to show that the lack of comparative advantage in production is an impediment to bilateral trade in SSA. I argue that the homogeneity of the factor proportions and the lack of product varieties lower demand across borders in SSA. Similar factor endowment ratios and the insignificant extent of product differentiation in SSA cannot generate perfect specialization and enhance regional trade. Based on these results, trade policies that aimed to promote trade within the region (i.e., FTA, custom unions) are likely to fail because SSA countries produce similar homogeneous agricultural products. Product differentiation is the key to the success of trade within SSA. The main challenges are therefore industrialization and manufacturing products in more varieties.

2.7 Tables

Table 2.1: **The Average Regional Capital per Labor, Countries with the Minimum and the Maximum Capital per Labor between 1997 and 2007**

Capital to Labor Ratio (C/L)			
Region Name	$AV.VKL$[1]	Min C/L Country	Max C/L Country
Europe and North America	10,043	Romania: 283.7	Norway: 15,216
East and South Asia	3,746	Afghanistan: 64.7	Australia: 20,509
Middle East and North Africa	3,234	Djibouti: 147	Emirates: 15,600
Latin America and Caribbean	2,219	Guyana: 286.5	Bahamas: 15,556.6
Sub-Saharan Africa	546	DRC[2]: 7.25	Equatorial Guinea: 18,256

[1]Average value of capital per labor.

[2]The lowest value of c/L between 1997 and 2007 was recorded in Democratic Republic of Congo (7.25 in 1998).

Source: Author's calculation using WDI database.

Table 2.2: **Regional Grubel Llyod Index, Shares of Differentiated and Homogeneous Goods (1997- 2007)**

Regional Grubel Llyod Index					
Region Name	Mean	Minimum	Maximum	DG[1]	HG[2]
Europe and North America	0.24	0.00	0.43	72	28
East and South Asia	0.12	0.00	0.28	70	30
Latin America and Caribbean	0.05	0.00	0.16	34	66
Middle East and North Africa	0.05	0.00	0.17	34	66
Sub-Saharan Africa	0.03	0.00	0.11	40	60

[1]Differentiated Goods.

[2]Homogeneous Goods.

Source: Author's calculation using UNCOMTRADE data.

Table 2.3: **The Proportion of Skilled Labor in the Regional Labor Force**

15 Years and Older; 25 Years and Older				
Region Name	[1]Total 15+ in SS (%)	[2]15+ CSS (%)	[3]Total 25+ in TS (%)	[4]25 + CTS (%)
ASIA	27.3	13.9	6.5	3.9
EU and NAM	39.9	20.9	10.6	6.8
LAC	26.2	10.9	5.6	3.6
MENA	20.3	10.8	6.1	3.8
SSA	13.9	4.9	1.4	0.8

[1]Total of people aged 15 and above in Secondary School.

[2]People aged 15 and above who completed Secondary School.

[3]Total of people aged 25 and above in Tertiary School.

[4]People aged 25 and above who completed Tertiary School.

Source: Five Years Average of Attainable Education by Barro and Lee from 1950 to 2010.

Table 2.4: **Average Trade Relations, GDP per Capita and Capital to Labor Ratio (1997 to 2007)**

Country Name	# of Trade Relations	GDP/Capita	Capital to Labor
Angola	27	1218	384
Benin	35	452	209
Burkina Faso	31	299	124
Burundi	24	113	20
Cameroon	35	786	357
Cape Verde	32	1668	1309
Central African Republic	30	302	62
Chad	26	337	216
Comoros	21	515	126
Democratic Republic of Congo	32	115	29
Congo, Republic	35	1265	739
Cote d'Ivoire	31	763	215
Equatorial Guinea	20	7433	8337
Ethiopia	27	148	73
Gabon	32	5084	2928
Gambia	32	318	153
Ghana	32	481	251
Guinea	34	388	152
Guinea-Bissau	13	173	63
Kenya	36	483	179
Madagascar	35	284	118
Malawi	31	204	84
Mali	31	319	278
Mauritius	35	4430	2486
Mozambique	31	266	113
Niger	29	202	87
Rwanda	32	266	93
Senegal	35	631	339
Sierra Leone	29	212	57
South Africa	36	3904	1938
Tanzania	36	318	133
Togo	30	305	127
Uganda	35	282	132
Zambia	36	503	276
Zimbabwe	31	509	126

Table 2.5: **Statistics on Trade in Differentiated Goods in SSA (1997-2007)**

Reporter Name	IV^1	EV^2	$RMS^3(\%)$	GLI^4
South Africa	42781.6	6502.3	47.16	0.027
Kenya	3107.8	1650.9	4.55	0.023
Zimbabwe	1153.0	3556.7	4.51	0.031
Mozambique	246.0	4112.8	4.17	0.027
Nigeria	644.9	3177.5	3.66	0.029
Cote d'Ivoire	3090.1	679.0	3.61	0.027
Ghana	609.0	3034.7	3.49	0.027
Tanzania	475.8	2448.3	2.80	0.025
Burkina Faso	309.8	2347.3	2.54	0.026
Mali	73.7	2440.0	2.41	0.026
Malawi	366.4	2073.4	2.33	0.027
Mauritius	906.0	1263.2	2.08	0.023
Senegal	1394.0	756.2	2.06	0.023
Togo	1024.2	1103.5	2.04	0.029
Uganda	137.8	1584.3	1.65	0.021
Botswana	993.6	620.8	1.54	0.033
Benin	652.1	911.7	1.50	0.027
Madagascar	129.3	1249.1	1.32	0.021
Cameroon	447.1	819.2	1.21	0.025
Guinea	38.9	745.3	0.75	0.022
Gabon	126.5	640.5	0.73	0.022
Niger	92.2	504.1	0.57	0.024
Namibia	457.8	58.6	0.49	0.031
Rwanda	20.9	470.7	0.47	0.025
Ethiopia	28.2	416.8	0.43	0.024
Seychelles	37.1	380.4	0.40	0.022
Gambia	32.5	383.3	0.40	0.022
Burundi	16.2	306.1	0.31	0.023
Sierra Leone	21.7	239.0	0.25	0.024
Guinea-Bissau	28.8	173.2	0.19	0.022
CAF^5	4.5	145.3	0.14	0.020
Comoros	3.5	119.8	0.12	0.021
Eritrea	18.2	41.1	0.06	0.024
Cape Verde	14.3	38.3	0.05	0.022
So Tom and Prncipe	7.6	10.3	0.02	0.026

[1]Import Value (million $ U.S.); [2]Export Value (million $ U.S.);
[3]Regional Market Share; [4]Grubel Llyod index; [5]Central African Republic.
Source: Author's calculation using UNCOMTRADE data.

Table 2.6: **Estimation of Equation (4) using Pooled Panel OLS**

VARIABLES	$Asia^1$ $Log(M^{ijtr})$	$EU-NAM^2$ $Log(M^{ijtr})$	LAC^3 $Log(M^{ijtr})$	$MENA^4$ $Log(M^{ijtr})$	SSA^5 $Log(M^{ijtr})$
$\text{Log}(Y^{it}Y^{jt}/Y^{rt})$	0.15***	0.08***	0.04***	0.03***	0.04***
	(0.002)	(0.002)	(0.0003)	(0.001)	(0.001)
LL^{ijr}	0.32	-2.81***	-0.06		0.005***
	(0.63)	(0.94)	(0.06)		(0.001)
$Contig^{ijr}$	2.4**	10.78***	0.52***	0.08	0.02***
	(0.93)	(1.4)	(0.06)	(0.05)	(0.002)
CL^{ijr}	2.33***	11.03***	0.002	0.06	0.002
	(0.55)	(1.46)	(0.03)	(0.04)	(0.001)
Col^{ijr}	-8.9***	-12.35***	-0.56**		
	(2.66)	(1.62)	(0.29)		
$log(Dist^{ijr})$	-0.67**	-2.86***	-0.01**	-0.06***	-0.004***
	(0.32)	(0.45)	(0.02)	(0.02)	(0.001)
Constant	5.06*	22.3***	0.11	0.42***	0.025***
	(2.7)	(3.36)	(0.18)	(0.15)	(0.01)
Observations	6,170	9,900	6,339	2,306	11,658
Number of Groups	606	900	631	247	1,151

[1]East and South Asia; [2]Europe and North America

[3]Latin America and Caribbean; [4]Middle East and North Africa;

[5]Sub-Saharan Africa.

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

The heteroscedasticity-consistent standard errors are in parentheses.

Table 2.7: **Benchmark Case: Estimation of Equation (4) for Different Classes of GL and DFER**

HO Model: Low-GL (GL^{ij}¡0.05)		IRS/HO Model: High-GL (GL^{ij}¿0.05)	
$\nu_i Classes$	$^1\alpha_\nu^{it}$	$^2\alpha_\nu^{it}$	$^3\alpha_\nu^{it}$
ν= 1	0.002**	0.013***	0.088***
	(0.000825)	(0.000432)	(0.00220)
ν= 2	0.003**	0.032***	0.060***
	(0.00119)	(0.000594)	(0.00204)
ν= 3	0.011***	0.153***	0.059***
	(0.000542)	(0.00205)	(0.00196)
ν= 4	0.012***	0.265***	0.136***
	(0.000699)	(0.00413)	(0.00397)
ν= 5	0.005***	0.070***	0.123***
	(0.000731)	(0.00230)	(0.00160)
AllObservations	0.010***	0.088***	0.088***
	(0.000334)	(0.00111)	(0.00111)

[1]ν_i ranked in increasing order of $DFER$[4] within the lower Grubel Lloyd (GL) sample.

[2]ν_i ranked in increasing order of GL within the higher GL sample.

[3]ν_i ranked in increasing order of DFER within the higher GL sample.

[4]Differnce in Factor Endowment Ratio.

Note: *** p < 0.01, ** p < 0.05, * p < 0.10

The heteroscedasticity-consistent standard errors are in parentheses.

Table 2.8: **Correlation Matrix**

Variables	M^{ijt}	$Y^{it}Y^{jt}/Y^{rt}$	LL^{ij}	CL^{ij}	Col^{ij}	$Contig^{ij}$	D^{ij}
M^{ijt}	1						
$Y^{it}Y^{jt}/Y^{rt}$	0.49	1					
LL^{ij}	-0.051	-0.0604	1				
CL^{ij}	-0.0201	-0.053	0.0352	1			
Col^{ij}	0.0914	0.218	-0.0153	0.0106	1		
$Contig^{ij}$	0.1638	0.0134	0.0651	0.1205	0.1093	1	
D^{ij}	-0.1378	0.0459	-0.0403	0.0058	-0.1105	-0.4479	1

Table 2.9: **Countries List by Region**

ASIA	EU-NAM	LAC	MENA	SSA
Afghanistan	Albania	Argentina	Algeria	Angola
Australia	Austria	Bahamas, The	Bahrain	Benin
Bangladesh	Belgium	Barbados	Djibouti	Burkina Faso
Brunei	Canada	Belize	Egypt	Burundi
Cambodia	Croatia	Bolivia	Iran	Cameroon
Hong Kong	Cyprus	Brazil	Israel	Cape Verde
China	Czech Rep.	Chile	Jordan	CAF
Fiji	Denmark	Colombia	Kuwait	Chad
India	Finland	Costa Rica	Lebanon	Comoros
Indonesia	France	Dominican Rep.	Libya	DRC
Japan	Germany	Ecuador	Mauritania	Congo, Rep.
Korea, Rep.	Greece	El Salvador	Morocco	Cote d'Ivoire
Lao	Hungary	Guatemala	Oman	Equatorial Guinea
Malaysia	Iceland	Guyana	Qatar	Ethiopia
Maldives	Ireland	Haiti	Saudi Arabia	Gabon
Moldova	Italy	Jamaica	Sri Lanka	Gambia
Nepal	Malta	Mexico	Tunisia	Ghana
New Zealand	Netherlands	Nicaragua	Emirates	Guinea
Pakistan	Norway	Panama		Guinea-Bissau
PNG	Poland	Paraguay		Kenya
Philippines	Portugal	Peru		Liberia
Singapore	Romania	Suriname		Madagascar
Solomon Islands	Slovak Rep.	Tonga		Malawi
Thailand	Slovenia	TTO		Mali
Vanuatu	Spain	Uruguay		Mauritius
Vietnam	Sweden	Venezuela		Mozambique
	Switzerland			Niger
	Turkey			Rwanda
	United Kingdom			Senegal
	United States			Sierra Leone
				South Africa
				Tanzania
				Togo
				Uganda
				Zambia
				Zimbabwe

Table 2.10: **Estimating Equation (4) by *Increasing*[2] Order of *Education*[1] of the Importing Country**

VARIABLES	*All* $log(M^{ijt})$	ν= 1 $log(M^{ijt})$	ν= 2 $log(M^{ijt})$	ν= 3 $log(M^{ijt})$	ν= 4 $log(M^{ijt})$	ν= 5 $log(M^{ijt})$
$log(Y^{it}Y^{jt}/Y^{rt})$	0.08***	0.003***	0.08***	0.04***	0.07***	0.08***
	(0.002)	(0.001)	(0.002)	(0.003)	(0.004)	(0.003)
LL^{ij}	-0.8**	0.001	0.05	-0.28	-1.423*	
	(0.35)	(0.006)	(0.24)	(0.40)	(0.73)	
$Contig^{ij}$	3.47***	0.03***	-0.44	1.51***	7.02***	17.31***
	(0.51)	(0.01)	(0.32)	(0.44)	(1.00)	(2.38)
CL^{ij}	0.15	0.01	0.03	-0.87****	-0.19*	3.25**
	(0.29)	(0.01)	(0.19)	(0.25)	(0.60)	(1.36)
Col^{ij}	-4.75***	0.40***	-0.32	-0.25	-3.60**	-14.11***
	(1.08)	(0.05)	(1.44)	(0.97)	(1.66)	(2.61)
$log(Dist^{ij})$	-1.36***	-0.002**	-0.34***	-0.31**	-1.26***	-3.8***
	(0.175)	(0.00436)	(0.123)	(0.139)	(0.351)	(0.644)
Constant	11.21***	0.02	2.76***	3.16***	10.93***	30.46***
	(1.38)	(0.036)	(0.99)	(1.08)	(2.68)	(5.08)
Observations	5,204	1,041	1,043	1,039	1,039	1,043
Number of Groups	2,678	592	672	683	663	588

[1]The total proportion of people aged from 15 and above in the tertiary school is used.

[2]The lower ν, the lower the proportion of people in the tertiary school.

Note: *** p < 0.01, ** p < 0.05, * p < 0.10

The heteroscedasticity-consistent standard errors are in parentheses.

Table 2.11: **Estimating Equation (4) by *Increasing*[2] Order of *Education*[1] of the Exporting Country**

VARIABLES	ν= 1 $log(M^{ijt})$	ν= 2 $log(M^{ijt})$	ν= 3 $log(M^{ijt})$	ν= 4 $log(M^{ijt})$	ν= 5 $log(M^{ijt})$
$Log(Y^{it}Y^{jt}/Y^{rt})$	0.17***	0.11***	0.06***	0.09***	0.08***
	(0.002)	(0.004)	(0.002)	(0.003)	(0.004)
LL^{ij}	0.003	-0.21	-0.29	-0.16	-1.82
	(0.02)	(0.44)	(0.28)	(0.72)	(1.42)
$Contig^{ij}$	0.02	1.3**	1.6***	5.2***	16.34***
	(0.03)	(0.63)	(0.37)	(0.84)	(2.38)
CL^{ij}	-0.02	0.5	-0.6***	-0.2	3.1**
	(0.02)	(0.36)	(0.21)	(0.50)	(1.36)
Col^{ij}	0.25**	-0.39	0.20	-3.86***	-11.90***
	(0.12)	(2.74)	(0.89)	(1.39)	(2.63)
$log(dist^{ij})$	-0.003***	-0.07***	-0.32***	-1.54***	-3.78***
	(0.01)	(0.23)	(0.12)	(0.30)	(0.64)
Constant	0.02	0.37	3.1***	12.5***	30.8***
	(0.09)	(1.92)	(0.91)	(2.27)	(5.07)
Observations	1,041	1,041	1,040	1,040	1,042
Number of Groups	608	691	680	660	592

[1]The total proportion of people aged from 15 and above in the tertiary school is used.

[2]The lower ν, the lower the proportion of people in the tertiary school.

Note: *** p < 0.01, ** p < 0.05, * p < 0.10

The heteroscedasticity-consistent standard errors are in parentheses.

Table 2.12: **Estimating Equation (4) by *Increasing*[2] Order of the *Sum*[1] of Educations of the Importing and Exporting Countries**

VARIABLES	ν= 1 $log(M^{ijt})$	ν= 2 $log(M^{ijt})$	ν= 3 $log(M^{ijt})$	ν= 4 $log(M^{ijt})$	ν= 5 $log(M^{ijt})$
$Log(Y^{it}Y^{jt}/Y^{rt})$	0.05***	0.06***	0.08***	0.10***	0.11***
	(0.01)	(0.002)	(0.01)	(0.003)	(0.003)
LL^{ij}	0.004	0.006	-0.29	0.27	-2.10
	(0.002)	(0.07)	(0.55)	(0.52)	(1.59)
$Contig^{ij}$	0.016***	-0.000**	3.358***	3.93***	18.26***
	(0.004)	(0.09)	(0.66)	(0.69)	(2.33)
CL^{ij}	0.000496	-0.109**	0.368	-0.495	2.403*
	(0.00229)	(0.0516)	(0.380)	(0.394)	(1.300)
Col^{ij}		-0.25	-1.7	-0.26	-10.8***
		(0.27)	(1.56)	(1.16)	(2.70)
$Log(dist^{ij})$	-0.006***	-0.11***	-0.06***	-1.2***	-3.4***
	(0.002)	(0.034)	(0.220)	(0.25)	(0.56)
Constant	0.043***	0.95***	0.63	9.76***	28.17***
	(0.013)	(0.28)	(1.68)	(1.9)	(4.52)
Observations	1,041	1,041	1,040	1,040	1,042
Number of Groups	540	644	677	704	651

[1]The sum of the total proportion of people aged from 15 and above in tertiary schools in the two countries.

[2]The lower the sum of the proportions of people in tertiary schools, the lower ν.

Note: *** p < 0.01, ** p < 0.05, * p < 0.10

The heteroscedasticity-consistent standard errors are in parentheses.

2.8 Figures

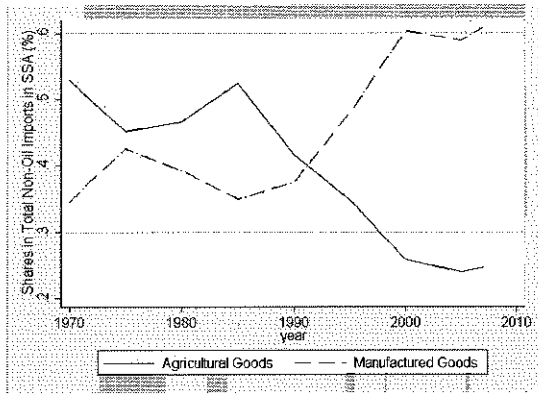

Figure 2.1: Value Share of Agricultural and Manufactured Goods in total N0n-Oil Imports in SSA

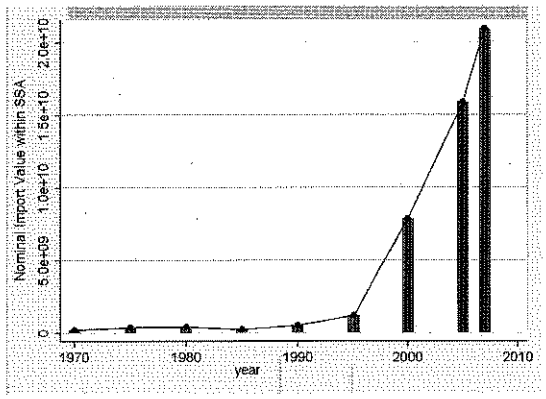

Figure 2.2: Nominal Value of Imports within SSA

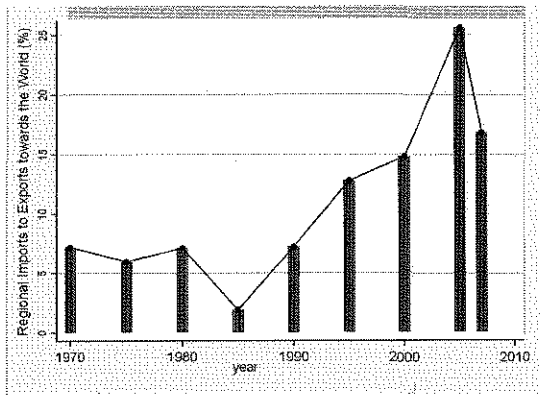

Figure 2.3: The Ratio of within SSA Imports to SSA's Exports towards the Rest of the World

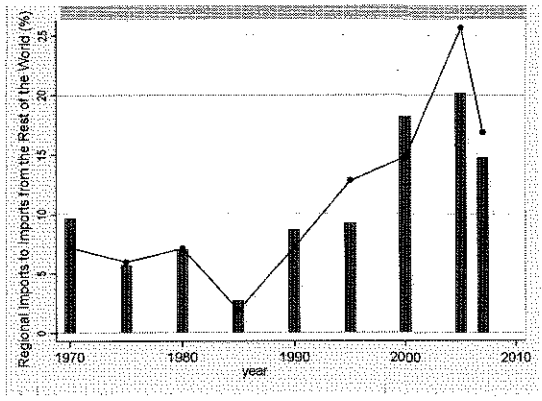

Figure 2.4: The Ratio of within SSA Imports to SSA's Imports from the Rest of the World

Chapter 3

Property Rights and Economic Development in Sub-Saharan African

3.1 Introduction

3.2 Introduction

The importance of institutions in the process of economic development has been emphasized in the field of development economics, especially after the publication of the Nobel Laureates North, Douglas's Institutions (1991). North (1991) defines institutions as *"humanly devised constraints (formal and informal) that structure political, economic and social interactions"*. Institutions mainly affect the economic outcomes through the economic incentives they alter in citizens to engage in productive activities. Both, informal and formal constraints (institutions) are shown to have strong effects on economic performances. For instance, informal institutions related to social capital such as norms, civic cooperation and trust are shown to be associated with stronger economic performance (Knack and Keefer, 1997; Putnam, 1993).

Nevertheless, particular attention has been devoted to the impacts of formal institutions on economic development. On one hand, some researches focus on the correlation between economic development and political risk factors including government stability, democratic accountability, bureaucracy, and corruption. There is a consensus that economies prosper in the environments where political institutions constraint government actions (e.g., Rodrick et al., 2004). Acemoglu and Johnson (2003) show a strong correlation between corporate governance and political governance. Faria and Mauro (2009) argue that weak institutions can deteriorate foreign direct investment (FDI) and consequently the economic progress. Their supporting argument is that before investing in a country, a foreign firm considers the degree of political tension, transparency in the corporate sector, and the probability of exposure to corruption. Shleifer and Vishny (1993); Mauro (1995) warn that corruption lowers economic performance. Works like Barro (1997), Easterly and Ross (1997), and Keefer and Knack, (2002) show that government stability and government spending are crucial to economic prosperity.

On the other hand, the emphasis is on property rights institutions. North (1990) argues that countries where property rights are well defined, secured and enforced by state laws tend to experience higher economic performances. According to North, secured and enforced private property rights reduce transaction costs in exchange and produce economic incentives, given the expectations that assets will not be expropriated. In fact, the presence of an efficient judicial system to enforce the third party interests (contracts) generates investment incentives which lead to competition, technological innovations and new opportunities. Secured private property rights are argued to induce more investment in physical and human capital (e.g., Jones, 1981), whereas, human capital is an important determinant of growth (Romer, 1990).

Although the correlations between property rights and economic outcome have received great attention, different measures of property rights are used in the literature and the sample countries on which they are examined differ across papers. For instance,

under the assumption of an overlapping generation, Zak (2002) constructs a growth model in which property rights are unsecured and costly to enforce. In the model, the proxy for weak property rights is the access of workers to expropriation technology by which they can accumulate resources from the capital owners (i.e., violate the property rights of the owner). Zak (2002) finds that the imperfect protection of property rights reduces growth and perpetuates poverty. Acemuglu et al., (2001) uses settler mortality as a proxy for property right institutions and estimate the impacts of these institutions on income per capita.

Despite the unanimity about the effects of property rights on economic performance, the magnitude of these effects has not yet been measured, at least for the exclusive sample of SSA countries. Studying the effects of property rights on the basis of regional average or by grouping all developing countries in a single sample can be misleading. Such averages mitigate the wide heterogeneity between countries within regions and across regions regarding the levels of property rights and the degrees of their enforcement. For a particular region like SSA, there exist large differences in the level and the legal enforcement of property rights across the countries. On one extreme, in SSA, Zimbabwe has the lowest average property rights score[1] (21.66) over the period from 1995 to 2007. On the other, Botswana has the largest average (70) over the same period. Different levels of property rights exist in between.

I subdivide SSA countries to identify the magnitude of the effects of property rights on the total factor productivity (TFP), and to see whether the sizes of the effects vary or are uniform across income groups and property rights levels. The paper uses a model in which TFP depends on human capital and different institutional measures[2] including property rights. This model allows identifying the effects of property rights on

[1]I use the property rights score database by the "Heritage Foundation" in this paper. The component "property rights" of the economic freedom database refers to private property rights creation and protection by state enforced laws. Property rights scores are assigned from zero to one hundred, with higher scores indicating greater existence and enforcement of private property rights.

[2]Political risks indicators - variables from the international country risk guide database (ICRG) and some economic freedom variables - property rights and government spending.

TFP relative to that of the human capital and the other institutional measures. Twenty SSA countries are grouped into sub-samples by the property rights benchmark[3] and by income level benchmark.[4] The model estimation is performed on the whole sample and the sub-samples.

I estimate how different institutions affect the TFP because the TFP has been pointed out in the literature to explain most of the variation in the development gap across countries. In fact, a number of papers in the field of development economics question whether the cross-country differences in per worker income stem from the differences in factor input or the differences in the TFP (that is the difference in the efficiency of the use of these factor inputs). To assess whether the factor input or output accounts the most for income disparity, the development accounting quantifies the relationship where income is a function of factor input and output: Income = F(input, TFP) (Caselli, 2005). The empirical finding suggests at the unanimity that the total factor productivity accounts for more than 50 percent of the development gap (Denison, 1962, 1967; King and Levine, 1994, Easterly and Levine, 2001; Caselli 2005). Given the importance of the TFP in the process of growth, any determinant factor to the TFP would also be determinant in explaining the development gap or economic growth differences. Thus, I examine whether property rights and other institutional measures matter to the change in the TFP. In addition, the total factor productivity includes the labor productivity. Therefore, it can be used to describe the production function; whereas, the process of growth depends on the shape of the production function (Barro

[3]The average regional property right score from 1995 to 2007 is used as the property rights benchmark based on which the countries are subdivided into two sub-samples: the lower and the upper benchmark sub-samples. The average regional property rights score from 1995 to 2007 is equal 42.92). Countries with average property right score below this average are classified in the lower benchmark sub-sample. Those with the average score greater than the benchmark level are grouped in the upper benchmark sub-sample.

[4]The benchmark for the income sub-samples is the average regional income per capita over the period from 1995 to 2007. This average is 2767 using World Development Data (WDI). Countries with the average income per capita less than the regional average are grouped in the lower income sub-group and those with the average RGDP per capita greater than the regional average are classified in the upper income sub-sample.

and Sala-i-Martin, 2003).

The choice of the SSA countries for this analysis stems from three main reasons. The first is the wide heterogeneity that exists among SSA countries in respect to property rights and income. The second reason is the overall lower average property rights of SSA compared to that of other regions. From 1995 to 2010, the lowest average regional property rights score was recorded in SSA. The third reason is that SSA lags in terms of the per capita GDP over time. The average regional GDP per capita and the average regional property rights scores are distinctly lower in SSA relative to those of other regions (Appendix Figure, 1, 2). I examine the magnitude of the effects of property rights on TFP for the sample of 20 SSA countries using data over the period from 1995 to 2007. Note that 1995 is the year when the first data on property rights were made available. The countries included in the analysis are those with full data over the entire period.

The main contribution of this paper is to show the sizes of the effects of property rights on the TFP across different income groups and different levels of property rights in SSA. In general, in SSA the change in private property rights has a positive and strong effect on the TFP. As the total factor productivity is an indicator of economic growth, this correlation between private property rights and the TFP suggests that property rights reforms in SSA will enhance the economic growth in the region. The remainder of this paper is organized as follows: section 2 gives an overview of the history of the emergence of property rights. Section 3 provides the data description and the model. Section 4 presents the results and their interpretation while section 5 concludes the paper.

3.3 The History and the Point of Divergence in the Paths of Nations' Development

The evolution of legal property rights and taxation in America and Great Britain (common law countries) can be traced throughout diverse agreements, declaration,[5] and the philosophical views of Thomas Hobbes (1588-1679) and John Locke (1632-1704). For Hobbes, property rights protection must be enforced by a strong sovereign, while Lock supports that property rights are morally above any government claim. According to Locke, by applying their labor to things of nature, one could acquire property rights (John Lock's second treatise on civil government, 1689). Even though these two philosophical views are diametrically opposed, both authors agreed that property rights protection must be the objective of any society. The basis for the civic law can be found in the Napoleonic code adopted during the French revolution of 1789-1795. This code constitutes the constitutional document for the French and other civic law countries. The civic law is simply the expansion of state power and is opposed to custom and common law. However, under both, the common and the civic laws, property rights are well defined and have been the driving force of economic expansion in Europe and North America.

The effective existence of property rights gives economic incentives; it is a fundamental stimulus for citizens to engage in productive activities. In "reflections on French revolutions", Burke[6] wrote the following: *"...The power of perpetuating our property in our families is one of the most valuable and interesting circumstances belonging to it, and that which tends the most to the perpetuation of society itself. It makes our weakness subservient to our virtue; it grafts benevolence even upon avarice".* This thought endorses the multiplicative incentive that property rights provide. When

[5]The agreement of the people (1649), the English declaration of rights (1689), the Virginia Bill of Rights (1776), the Declaration of Independence (1776), the Northwest Ordinance (1787), and the U.S. Constitution (1787).

[6]See full text at http://www.blupete.com/Literature/Essays/BluePete/PropertyRights.htm.

one has the legal rights on her asset(s) and knows that these assets can be legally transferred to her children, she will have incentive to work hard to increase her stocks of assets, to enjoy it and leave valuable bequest to her future generations. The type of property rights philosophy that was nourished in the West and North America is what allowed and continue to ensure economic expansion in these regions.

Even though there were many similarities between earlier societies of Europe and Africa, the ideology of property rights as a social need was not developed in many Sub-Saharan African societies. This discrepancy makes a huge difference in the paths of economic developments between SSA and the other regions. For instance, about more than two hundred years earlier, some African kingdoms like the kingdom of Aksum[7] (the actual Ethiopia) and the kingdom of "Kongo" (the actual Democratic Republic of Congo), were as much as powerful and rich as the then Great Britain. The Aksum kingdom especially had its own written language and was able to mint coins and successfully traded with some other regions. During these eras, in the most prosperous African and European kingdoms the social structures tended to be more absolutist and based on slavery and serfdom institutions. However, the path of the nations' history diverged from the point where reforms in social organization took place in Europe and expanded to North America while in Africa the absolutism continued to reign.

Great Britain's 1640 civil war and the revolution of 1688 drove the demise of slavery, serfdom and all types of social and political absolutism. The end of absolutism in Europe, allowed the emergence of property rights, labor market institutions and people's accession to lands. These new ideologies and mentalities in Europe spilled over to America. The access to lands and the introduction of property rights institutions created competition and the incentives to improve the properties and receive the most fruits of them.[8]

Robinson (2010) argues that as slavery, serfdom and absolutism continued in

[7]See full history about the Aksum kingdom at http://sharepoint.chiles.leon.k12.fl.us/mcneilt/Textbook
[8]See detailed test at http://www.hoover.org/publications/defining-ideas/article/5352.

Africa, no economic incentive for property improvement was created. In contrast, people tend to work less to reduce the amount of their labor that will be expropriated by the rulers. There were no incentive to stimulate research and discoveries. In this contest Acemoglu (2005) stated that industrialization did not take place where extractive institutions were established. Citizens have no incentive to engage in creative activities as they will not enjoy the fruits of their efforts. But, the rulers (expropriators) are less likely to come up with ideas that generate new technologies. Expropriation[9] or lack of property rights explains why Africans took the opposite development path compared to Europeans. The history and some investigations on contemporaneous African countries endorse the fact that property rights are nascent and still weakly secured in different points of SSA region. For instance, Joireman (2007) points that property rights are not well defined in SSA and argues that customary laws and the status of women are the main impediment to property rights enforcement in the region. The lack of strongly enforced property rights might explain the lower level of incomes across the region.

3.4 The Model and Data Description

3.4.1 Data Description

The analysis in this paper covers a panel of twenty (20) SSA countries[10] from 1995 to 2007. The variables[11] used are real GDP, the attainable education as a proxy

[9]James Robinson (2010) wrote *"...to have become more prosperous, the Kongolese would need to have saved and invested in plows, for example. But this would not have been worthwhile in that any extra output they produced by using plows and wheels would have been expropriated by the king and his lords. Many people's property rights were highly unsecured; many moved their villages away from roads so as to reduce the incidence of plunder."* In these circumstances, parliaments, rather than creating patent laws, were motivated to fight the king and defeat absolutism.

[10]Botswana (BWA), Cameroon (CMR), Gabon (GAB), Gambia (GMB), Ghana (GHA), Ivory Cost (CIV), Kenya (KEN), Malawi (MWI), Mali (MLI), Mozambique (MOZ), Namibia (NAM), Niger (NER), Republic of Congo (COG), Senegal (SEN), Sierra- Leone (SLE), South Africa (ZAF), Tanzania (TZA), Togo (TGO), Uganda (UGA), Zambia (ZMB), Zimbabwe (ZWE).

[11]The tables of the summary statistics and the correlation tables of the variables are given in the Table section.

for the human capital or technology, capital stock and different sets of institutional quality measures. The choice of countries and the data period is driven by the data availability. Countries included are those with data available on key variables over the entire period. "Property rights" is the main institutional variable of interest in this paper. The data on property rights is retrieved from the Heritage Foundation's economic freedom database.[12] The methodologies used to compute the property rights scores are complex and reflect property rights creation and enforcement. The details about the computation can be found at the institution's website.

The variables - government stability, ethnic tension, internal and external conflict, bureaucracy, and corruption are the political risk components and they are retrieved from the international country risk guide "ICRG". The measurement methodologies of these variables can be found on the ICRG's website. All the indexes of the economic freedom, and the ICRG are compiled using complex methodologies including statistical models to give sufficient credibility to the data (see the different sources of these indexes).

I constructed the data on capital stock using the perpetual inventory equation: $K_{it} = I_{it} + (1 - \delta)K_{it-1}$, where K_{it} is the current capital stock of country i; K_{it-1} is the capital stock of the previous period. δ is the depreciation rate of capital. I_t is the current real aggregate investment in purchasing power parity and it is computed as follows: $I_{it} = RGDPL_{it} \times POP_{it} \times KI_{it}$, where $RGDPL_{it}$ is the real income per capita (Laspeyres), POP_{it} is the current population of country i and KI_{it} is the investment share in total income. The perpetual inventory method is a method of updating data

[12]The Heritage Foundation defines property rights as: an assessment of the ability of individuals to accumulate private property secured by clear laws that are fully enforced by the state. Property rights measures the degree to which a country's laws protect private property rights and the degree to which its government enforces those laws. It also assesses the likelihood that private properties will be expropriated and analyzes the independence of the judiciary, the existence of corruption within the judiciary, and the ability of individuals and businesses to enforce contracts. The scores of property rights are ranked from zero to hundred. The more certain the legal protections of properties in a country, the higher the country's PR score. Similarly, the greater the chances that the country's government will expropriate properties, the lower score the country's PR score. Intermediate scores are attributed to countries that fall between two categories.

that has been widely used in the literature. For instance, Caselli and Feyrer (2007) used the perpetual inventory equation to update the data on capital stock for countries. Barro and Lee (2010) uses this methodology to assess the current flow of adult people added to the existing stock of the educational attainment. The depreciation rate is set at 6 percent following the literature. The initial capital stock is computed as: $K_{i0} = I_{i0}/(g_{it}+\delta)$, where I_{i0} is the value of investment series in the first year. In general, the average geometric growth g_{it} is computed as the average growth rate between the first year of data availability and 1970. The reason is before the 1970, capital stocks were roughly at their steady state (see Solow, 1956). However, for the SSA countries the first year of data availability is 1950. Thus, g_{it} is calculated between 1950 and 1970.

The data on the investment share in total income is taken from the Penn World Tables (PWT. Version 7). For the data on the human capital, I use the updated educational attainment data by Barro and Lee (2010), for the population aged 15 and plus. The data on the real GDP, labor force and population are retrieved from the World Bank's world development indicators (WDI). All variables are purchasing power parity (PPP) converted to allow international comparison. The indexes are in level value.

3.4.2 The Models

The model estimated in this paper correlates is the model where the TFP in a country is a function of the human capital available, the degree of property rights, government spending, socio economic conditions, corruption, the extent of internal and external conflicts, bureaucracy and government stability. This model is estimated to examine the effects of property rights on the total factor productivity (TFP) across the property rights groups and income groups of SSA. I first compute the TFP based on

Coe and Helpman (1995) as follows:

$$log(A_{it}) = log(Y_{it}) - \alpha log(K_{it}) - (1-\alpha)log(L_{it}) \tag{3.1}$$

where A_{it} is the total factor productivity, Y_{it} is the output, K_{it} is the capital stock, and L_{it} is the labor force. The magnitudes of the coefficients of capital and labor are found in the literature to be: $\alpha = 1/3$ and $(1-\alpha) = 2/3$. To assess the effects of property rights on the TFP, I estimate equation (2) below using the fixed effects estimation methodologies across the property rights groups and the income groups. I present the results of this estimation in Table 1.

$$Log(A_{it}) = \gamma_1 log(Educ_{it}) + \gamma_2 log(PR_{it}) + \gamma_3 log(GSP_{it}) + \gamma_4 GST_{it} + \gamma_5 Cor_{it} + \gamma_6 SEC_{it} + \gamma_7 IC_{it} + \gamma_8 EC_{it} + \gamma_9 Bur_{it} + \epsilon_{it} \tag{2},$$

where $log(A_{it})$ is the log of the total factor productivity, $Educ_{it}$, PR_{it}, GSP_{it}, GST_{it}, Cor_{it}, SEC_{it}, IC_{it}, EC_{it}, ET_{it} and Bur_{it} represent respectively the educational attainment (used as a proxy for the human capital), property rights, government spending, government stability, corruption, socio-economic condition, internal conflict, external conflict, ethnic tension, and bureaucracy of country i at time t.

The choice of the institutional variables included is driven by the collinearity between the variables. Moreover, I include variables upon consideration of the omitted variables bias and model specification error issues. The question of the consistency of the parameter estimates is one of the recently debated issues over the results of empirical analyses- especially when dealing with panel data analysis and the effects of one variable on another. The inconsistency of parameter estimates can stream from the existence of simultaneity, endogeneity or omitted variables within the panel (see Stock and Watson 1993; Baltagi, 2010). The debate over the inconsistency of parameters has led for instance Coe et al. (2009) to revise Coe and Helpman (1995) in examining the effects of research and development (R&D) capital on factor productivity. The new econometric methodologies recently employed to deal with these issues are the

panel co-integration techniques. Coe et al. (2009) argue that panel co-integration increases the consistency of the parameter estimates and provides robust coefficient to the simultaneity, endogeneity or omitted variables problems. The authors perform the unit root and co-integration tests of the dependent and independent variables. The unit root test allows using the first difference of the dependent variable if the null hypothesis of unit root is not rejected.[13] The co-integration test captures whether there is a long-run stable relationship between the dependent variable and the independent variable(s) within the panel of countries. Given the possibility of eventual simultaneity, endogeneity or omitted variables problems within the panel, I performed the unit root and co-integration tests for the variables used in equation (2) specified above using the methodologies of Levin et al. (2002) and Pedroni (2001). Based on the econometric tests results, I estimate equation 2 using the fixed estimation methodology.

3.5 Results and Interpretation

The investigation on property rights across Sub-Saharan African (SSA) countries reveals the importance of property rights in the economic performance of SSA countries. Across the sub-groups classified by property rights levels and income levels, property rights have a positive and statistically significant effect on the total factor productivity (TFP). Property rights explain at least 0.2 percent of the variation in TFP in SSA. This effect is economically large. Given the standard deviation of 0.4 in the log of property rights in SSA, a 1 -standard deviation in the change in property rights leads to 0.08 proportionate rise or 8 percent increase in the TFP.

Within the classification by property rights levels, the change in property rights explain 0.3 percent of the variation in the total factor productivity (TFP) under the upper sub-sample and 0.2 percent for the lower sub-sample, both at 95 percent con-

[13]The null hypothesis of unit root is rejected if the test statistic is significant (see Levin et al., 2002; Im et al. 2003; Coe et al., 2009).

fidence. For the classification by incomes, a one percent increase in property rights is associated with 0.2 percent increase in TFP for both sub-income groups. However, for the upper income group, this effect is at a 99 percent level of statistical confidence while for the lower sub- sample the effect is at a 90 percent level of confidence (Table 1).

The estimation results show two important facts about property rights in SSA. First, there is a difference in the effects of property rights on TFP across the sub-groups within each classification type. Secondly, the differences in these effects are not very large between the sub-groups within each classification type and between the two classification types. In fact, the estimation result reveals a remarkable pattern of the effects of property rights on the TFP between the sub-samples within each classification parameter. Within the classification by income level, the significance of the effect of property rights on the TFP decreases from the upper sub-group to the lower one, but the size of the effect remains constant (0.2 percent at 99 percent significance for the upper sub-sample and 0.2 percent at a 90 percent level of confidence). In the classification by property rights levels, even though the statistical significance does not vary, the size of the effect of property rights on the TFP decreases from the upper sub-sample to the lower sub-sample (0.3 percent at a 95 percent level of confidence in the upper sub-sample and 0.24 percent at a 95 level of confidence for the lower sub-sample) (Table 1). There seems to be pronounced effects (in the magnitude or the statistical significance) of property rights on TFP where property rights are relatively better and where incomes are relatively higher. In contrast, the effects are either lower statistically or in magnitude in countries with lower income and countries with lower levels of property rights (lower sub-samples under both types of classification).

These changes in the effects of property rights on TFP across the lower and the upper sub-samples highlights two important facts. First, in countries with relatively higher incomes, property rights have significant impacts on the TFP. From this first fact, it is ambiguous whether property rights are contributing to the growth of the TFP

or whether the effects are due to the income level. This fact suggests that relatively higher income countries have better property rights or countries with better property rights have better incomes. Whether higher income leads to better property rights or better property rights provide higher income is hard to untangle and is uncovered in this paper. It might be the case that both matter. The second fact is that better defined and secured private property rights have higher impacts on TFP. This second fact clearly sheds light on the importance of private property rights in the growth of TFP. Thus, property rights reforms will highly contribute in enhancing economic growth in SSA.

Despite the differences in the effects of property rights on TFP across countries within SSA, these differences are not too large; both between the groups within the same classification and across the classifications. This second remark from the investigation results points out that SSA there is no big difference in income levels across SSA countries and the levels of property rights do not vary too much across countries within this region. This revelation on the non-large difference in income and property rights in SSA together with the fact property rights matter for the growth of TFP, answer the question why the SSA countries lag in economic development. Indeed, most of the SSA countries have lower incomes (15 countries out of 20 countries in the data sample have their average income per capita below the regional average.) and weakly defined and enforced private property rights (about half of the countries have an average property rights below the regional average. The averages of the others slightly surpasses the regional average.)

Even though not too large, the variation in the effects of property rights on the TFP across the sub-income and property rights groups in SSA are an indication that property rights matters for growth. Countries with relatively higher property rights experience higher effects on the growth of the TFP. Given the finding of previous empirical works emphasizing that TFP explains most of the variations in the cross country differences in income per worker, the strong and positive correlation between

property rights and TFP demonstrates that property rights Property rights reforms will enhance growth in SSA. Most importantly, these reforms are needed in most countries in the region.

The overall results of this paper highlight that property rights are important determinants in the process of economic development in SSA. The access to enforced private property rights will accelerate the economic growth of SSA countries. In practice, the effect of property rights enforcement on growth has been experienced in Botswana. Figure 3 shows the correlation between the property right scores in 2005 and the average investment per capita over the period from 2005 to 2009 in some SSA countries. In this correlation graph, Botswana lies at the upper right. In fact, Botswana has experienced a substantially high growth relative to other SSA countries in recent years. Although different factors might have contributed to this success, many economists believe that the private property rights protection policy of Botswana is the main driver of its high growth. Devarajan, Easterly and Pack (2003) write that *"the government of Botswana clearly convened it would protect private property rights"*. The paper states further that the political stability in addition to the relative low corruption and press freedom made Botswana attractive for investment. In short, private property rights enforcement matters in stimulating investment and hence the economic growth.

These conclusions are robust with respect to civil liberties. The impacts of the civil rights on the total factor productivity are similar to those of property rights. I use the civil right from the *"freedom in the world"* database to check the robustness of the effects of property rights on the TFP. Civil Liberties are measured on a one-to-seven scale, with one representing the highest degree of freedom and seven the lowest. This implies that the higher the score the least degree of civil liberties. Thus, if better civil liberties improve the TFP, one would expect negative and statistically significant coefficients for this variable in the regression. I subdivided the country sample into lower civil liberties sub-group (civil liberties scores of 1, 2, and 3) and an upper civil liberty sub-group (scores of 4, 5, 6, and 7). As shown in Appendix Table 4, the effects

of civil liberties on the TFP are large and statistically significant in both sub-samples. The increase in the scores lowers TFP. It is remarkable that the coefficient is lager in the sub-group of the lower civil liberties. This indicates that TFP in these countries will dramatically decline in these countries for a given percentage drop in the civil liberties. While, in the upper sub-group, the same proportional change in the civil liberties will have less adverse effect.

Civil liberties and property rights are components of individuals' rights. These rights when available and enforced by state laws, they give incentive to citizens to engage in productive activities and to contribute to their countries' economic growth. The results on the effects of civil liberties on the TFP confirm the importance of private property rights in the process of economic growth.

3.6 Conclusion

This paper mainly shows that the lack of property rights is an impediment to the economic growth of Sub-Saharan African (SSA) countries. Improving property rights would significantly increase the total factor productivity (TFP) within the SSA region in general. Even though some differences exist, the countries in SSA do not differ to a large extent in their incomes and property rights levels. Moreover, the income and property rights levels are lower in the region. Given the finding of this paper, that property rights are important determinants of TFP growth and the finding of previous works that TFP accounts for a large proportion of the development gap across countries, this paper recommends private property rights reforms in SSA. The creation of private property rights and their enforcement by clear state laws would contribute to SSA's economic growth.

3.7 Regression Tables

Table 3.1: **The Effects of Property Rights on the Total Factor Productivity**

		PR^1 Groups		Inc^2 Groups	
	Whole	Upper	Lower	Upper	Lower
	FE	FE	FE	FE	FE
VAR.	$log(TFP_{it})$	$log(TFP_{it})$	$log(TFP_{it})$	$log(TFP_{it})$	$log(TFP_{it})$
$log(Educ_{it})$	0.8***	0.8**	1.0***	1.4**	1.0***
	(0.24)	(0.34)	(0.33)	(0.55)	(0.32)
$log(PR_{it})$	0.22***	0.30**	0.25**	0.20***	0.23*
	(0.07)	(0.13)	(0.09)	(0.07)	(0.11)
$log(GSP_{it})$	0.02	0.13	-0.24	0.16	-0.18
	(0.19)	(0.23)	(0.35)	(0.21)	(0.28)
ET_{it}	-0.18***	-0.12**	-0.28***	-0.16***	-0.20***
	(0.03)	(0.04)	(0.05)	(0.05)	(0.04)
Bur_{it}	-0.07*	0.003	-0.02	0.06	-0.09
	(0.04)	(0.06)	(0.06)	(0.08)	(0.05)
SEC_{it}	0.05***	0.08***	0.02	-0.03	0.08***
	(0.02)	(0.03)	(0.03)	(0.03)	(0.02)
Cor_{it}	0.05*	-0.03	0.11***	0.002	0.06
	(0.03)	(0.04)	(0.04)	(0.04)	(0.04)
EC_{it}	0.03	0.04*	-0.003	-0.001	0.03
	(0.02)	(0.02)	(0.03)	(0.04)	(0.02)
IC_{it}	0.02	0.01	0.04*	0.07**	0.005
	(0.01)	(0.02)	(0.02)	(0.03)	(0.02)
GST_{it}	0.01	-0.005	0.06***	-0.01	0.01
	(0.01)	(0.01)	(0.02)	(0.02)	(0.01)
Const.	0.3	-0.9	1.5	-1.4	1.12
	(1.13)	(1.64)	(1.74)	(1.5)	(1.5)
Obs.	246	138	108	62	184
R-sq.	0.20	0.15	0.41	0.40	0.21
Groups	20	11	9	5	15

[1]Property Rights Groups; [2]Income Groups

Note: *** p < 0.01, ** p < 0.05, * p < 0.10

The heteroscedasticity-consistent standard errors are in parentheses.

Table 3.2: **Summary Statistics: The Whole Sample**

Var.	Obs	Mean	Standard Deviation	Min	Max
$Log(TFP_{it})$	258	2.5	0.5	0.9	4.5
$log(Y_{it}/L_{it})$	260	8.5	0.8	7.1	10.3
$log(Educ_{it})$	260	1.4	0.6	-0.1	2.2
$log(PR_{it})$	247	3.7	0.4	2.3	4.2
$log(GSP_{it})$	247	4.4	0.2	3.8	4.6
$log(K_{it}/L_{it})$	258	5.7	1.0	3.6	8.3
GST_{it}	260	8.9	1.8	3.3	11.1
SEC_{it}	260	4.1	1.4	1.5	8.0
ET_{it}	260	3.6	1.0	1.5	5.0
IC_{it}	260	9.0	1.6	1.3	12.0
EC_{it}	260	10.2	1.4	4.6	12.0
cor_{it}	260	2.4	0.9	0.0	5.0
Bur_{it}	260	1.4	0.9	0.0	3.5

Table 3.3: **Correlation Table: The Whole Sample**

Var.	$Log(TFP_{it})$	$log(Y_{it})$	$log(Educ_{it})$	$log(PR_{it})$	$log(GSP_{it})$	$log(K_{it}/L_{it})$	GST_{it}	SEC_{it}	ET_{it}	IC_{it}
$Log(TFP_{it})$	1.0									
$log(Y_{it})$	0.1	1.0								
$log(Educ_{it})$	0.1	0.5	1.0							
$log(PR_{it})$	0.1	0.2	0.3	1.0						
$log(GSP_{it})$	0.0	-0.5	-0.4	-0.3	1.0					
$log(K_{it}/L_{it})$	-0.3	0.8	0.5	0.2	-0.4	1.0				
GST_{it}	0.2	0.1	0.1	-0.1	0.0	0.1	1.0			
SEC_{it}	0.3	0.3	0.2	0.4	-0.2	0.2	0.0	1.0		
ET_{it}	0.0	0.1	0.0	0.2	-0.4	0.2	0.0	0.2	1.0	
IC_{it}	0.0	0.2	0.1	0.2	-0.4	0.3	0.0	0.3	0.5	1.0

Table 3.4: **Civil Liberty and TFP**

	Higher Civil Liberty	Lower Civil Liberty
VARIABLES	$Log(TFP_{it})$	$Log(TFP_{it})$
$log(Educ_{it})$	0.8***	0.3
	(0.22)	(0.42)
$log(CL^1_{it})$	-0.25*	-0.62**
	(0.14)	(0.29)
$log(GSP_{it})$	-0.002	-0.01*
	(0.003)	(0.005)
Bur_{it}	-0.1	-0.01
	(0.07)	(0.06)
GST_{it}	0.01	0.02
	(0.01)	(0.02)
ET_{it}	-0.1***	-0.06
	(0.03)	(0.06)
$Regulatory_{it}$	0.4**	0.24
	(0.14)	(0.16)
PST^2_{it}	-0.04	0.06
	(0.08)	(0.11)
$CCor^3_{it}$	-0.104*	-0.593***
	(0.09)	(0.17)
Constant	1.9***	3.3***
	(0.52)	(1.018)
Observations	94	140
R-squared	0.40	0.22
Number of countryid	12	15

[1]Civil Liberty;

[2]Political Stability;

[3]Control of Corruption

Note: *** p < 0.01, ** p < 0.05, * p < 0.10

The heteroscedasticity-consistent standard errors are in parentheses.

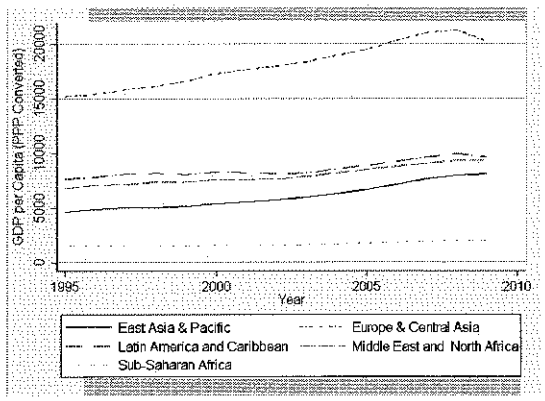

Figure 3.1: Average Regional Real GDP per Capita

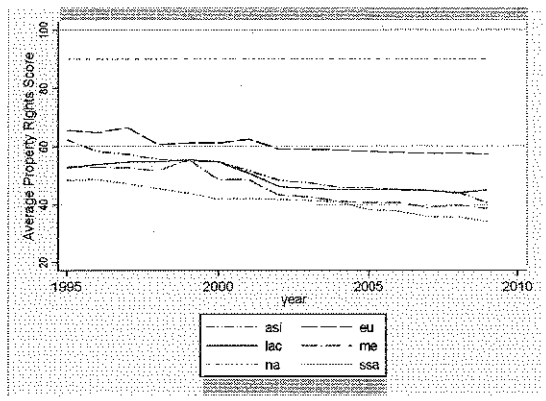

Figure 3.2: Average Regional Property Rights Scores

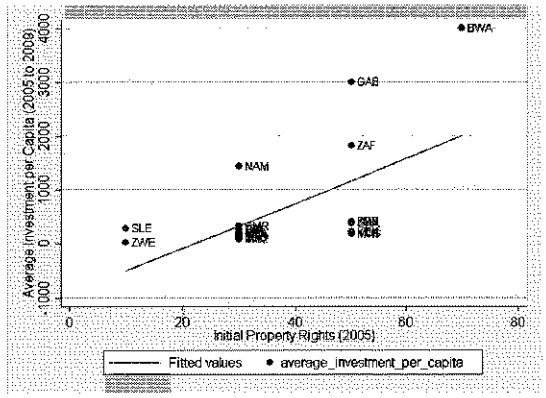

Figure 3.3: Correlation between Property Rights and Investment per Capita

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